

Information and Communication Technology in Lifelong Learning: Opportunities for People with Disabilities

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ABSTRACT

People with disabilities are underrepresented in adult education programmes that integrate information and communication technology (ICT), posing a challenge in adopting the pace of change facilitated by technological advancement. The increased use of ICT in facilitating lifelong learning presents challenges for training and retraining people with disabilities in the sense that, they are denied access to ICT. This study employed constructivism and communities of practice theories to investigate innovation in how ICT can be used to create lifelong learning opportunities for people with visual and hearing disabilities. The study involved 30 people with disabilities enrolled in ICT skills training classes at the Open University of Tanzania. Data were collected through interviews. The findings suggest that people with disabilities can learn the use of ICT if involved in collaborative action research. It was also found that enhancing ICT skills training for people with disabilities faced physical, fiscal, and human resources challenges. The study recommends increased funding for ICT skills training for people with disabilities to enhance their participation in lifelong learning.

Keywords: *Disability, lifelong learning, adult education, innovation, assistive technology*

INTRODUCTION

The global report on assistive technology indicates that despite ratifying the UN Convention on the Rights of Persons with Disabilities (UNCRPD) and the existence of legislation, policies and public budgets, the population's need for assistive products is not fully met in most countries (WHO & UNICEF, 2022). The report further indicates a need for further attention and improvements to make assistive technology affordable and accessible for everyone in need. With the increased use of technology in education, Tanzania, like other nations, is facing a challenge on how to increase access and participation of persons with disabilities in lifelong learning opportunities. People with disabilities face widespread barriers in accessing

health care services (including rehabilitation), education, transport and employment (WHO, 2013). As a result of widespread barriers, people with disabilities are perceived as a low class in society because of their living limitations, low level of education, unemployment, meagre income and participation restrictions in life lifelong learning situations. For this reason, people with disabilities become more dependent (Braum, 2020). Disability in Tanzania needs to be addressed by developing systems that support people with disabilities in accessing lifelong learning opportunities. ICT skills training, as a growing industry through which all people improve life standards, must be accessible to all, including people with disabilities. In Tanzania, the Disability survey 2008 indicated 9% of children with disabilities under the age of 18 years had no fathers, 1.8% had no mothers and 1.3% had neither fathers nor mothers. About half of the PWDs (47.6%) were illiterate compared to 25.3% of the persons without disabilities. About 35% of people with disabilities aged 15 years and above reported having a problem with the availability of information in an accessible format; 50% of children with disabilities either were born with disabilities or got them before the age of one year.

About 2% of children with disabilities were using assistive devices (URT, 2008). The facts presented in the Disability Survey 2008 indicate that persons with disabilities face challenges in accessing social services including education. According to WHO (2011), disability is the umbrella term for impairments, activity limitations and participation restrictions, referring to the negative aspects of the interaction between an individual (with a health condition) and that individual contextual factors (environmental and personal factors). In Tanzania, 7.8% of the population has a disability (Mnyanyi, 2014). ICT involves technology, which comprises the use of electronic devices and human interactive materials that enable the user to employ them for various personal uses, including teaching and learning processes. Beri and Shu'aibu (2019) assert that ICT touches every aspect of human endeavour in the contemporary world, and lifelong learning is necessary to keep up with the current technology trend. ICT can be defined as the hardware, software, and media used to collect, store, process, send and show information in the form of voice, text, data, and images, as well as the services that go along with them. People with disabilities in less developed countries face challenges related to income

and thus, an inability to participate in the use of technology. People with disabilities face challenges in using ICT as a means of accessing information and learning resources. The challenges are associated with inadequate opportunities for learning the skills to use modern technology, including inadequately skilled facilitators and relevant ICT infrastructure for persons with disabilities (Fernández-Batanero et al., 2020; Iredale, 2018; Mnyanyi et al., 2010). Other challenges are associated with a low level of availability of resources and institutional strategies (Ramsten, 2018; Oswal, 2019; Rueda, & Cerero, 2019). Creating access to ICT for all requires professionals with the pedagogical skills necessary to enhance ICT skill development (Günes & Bahçivan, 2018). Access to information for all requires skills in using ICT tools that are believed to increase or reduce equality, depending on the social, political, and economic contexts within which they are introduced (Unwin, 2009; Fernández-Batanero et al., 2018). Lifelong learning (LLL) is the pursuit of knowledge for personal development and skill enhancement, involving people in continuous learning to keep up with current issues and meet modern life technologies (Beri & Shu'aibu, 2019; Chaulia, 2015; Repetto & Trentin, 2008).

Lifelong learning reflects the provision of education in its totality, which covers both formal and non-formal patterns of education characterized by flexibility and diversity in content, learning tools, techniques, and learning time (Tasç & Titrek, 2020). The European Union [EU] (2006) defines eight key competencies for LLL. They include (1) communication in the mother tongue; (2) communication in foreign languages; (3) mathematical competence and basic competencies in science and technology; (4) digital competence; (5) learning to learn; and (6) social and civic competencies. Others are (7) initiative and entrepreneurial spirit; and (8) cultural awareness and expression. People with disabilities rarely have digital skills training options they might need throughout their lives (Kauppila, Kinnari, & Niemi, 2020; Raja, 2016; Mnyanyi et al., 2010). With the growing use of ICT, lifelong learning is enhanced through the use of technology. The ICT can facilitate learning in all its forms, including formal (with a curriculum), non-formal (incorporating elements of formal and informal patterns), and informal (without guidance from a curriculum). Improving lifelong learning for all necessitates a more thorough examination of how people with and without disabilities at all ages can make use of and be included in the

development of ICT skills. In addressing ICT skills training opportunities for people with disabilities, the issues to consider include content, approach to learning, skills training facilitators, connectivity, culture, economics, the learning environment, financial viability, and relevance to the learners. The main goal of the current paper is to find out what needs to be in place for people with disabilities to be able to use information and communication technology (ICT) to learn for the rest of their lives.

Literature Review

The theories of social constructivism by Vygotsky (1978) and communities of practice by Wenger (1999) guided the study. Social Constructivism is based on assumptions about reality, knowledge, and learning, emphasizing culture and the context of human relationships and activity (Kim, 2001; Kumari, 2020; Vygotsky, 1978). For example, Kumari (2020) asserts that reality is socially constructed through human activity. Social constructivists also claim that learning is a social process shaped by external forces that occur when individuals are engaged in social activities (Elias & Mansouri, 2020). The communities of practice tend to be separated by boundaries that reflect the specificity of various enterprises focusing on the ongoing production of meanings and experiences. Boundary objects include *artifacts, documents, terms, concepts, and other forms of reification around which communities of practice can organize their interconnection* (Wenger, 1999). Boundary objects can also be representations or metaphors that have the power to speak to different communities of practice (Wenger et al., 2011). The created meanings and practices can cross borders, as the practice involves multiple interactions between the local and global communities.

For example, in this study, the boundary objects between the communities of practice are ICT skills in different contexts. The broker community, for example, can connect people with hearing impairments and cross-influence. According to Wenger (1999), connections are made by people who can introduce one practice into another; in this study, the broker community includes the researcher and the ICT skills facilitators. The broker community (Wenger 1999) influences both the visually impaired community and the people with hearing impairment community, allowing them to participate in a global society that values the use of ICT for lifelong

learning. In this study, participants from the three communities were cross-influencing their ICT skills through collaborative action research as they collaboratively reflected on and learned new skills (Mnyanyi, 2014). Information and communication technology provides opportunities that enable the full participation of people with disabilities in all aspects of life like education, civic participation, employment, disaster management, e-governance, and financial inclusion (Raja, 2016). However, the challenges of accessing ICT facilities among people with visual and hearing disabilities are enormous, leading to unequal opportunities and benefits. Creating inclusive lifelong learning opportunities is important since training, retraining, and reskilling are becoming crucial for creating skills-mixes for future jobs. The future jobs require people with strong cognitive skills, basic information and communication technology skills, analytical skills and the 21st century skills such as creativity, problem-solving, critical thinking, and communication (Kim & Park, 2020). Social constructivism contributes to understanding of the external world, its meaning, and its value, which are necessarily achieved through social interaction. Elias and Mansouri (2020) assume that humans develop social frameworks and environments to scrutinize and assess their experiences concerning the external world. Learning, in this context, becomes an avenue through which individuals become community members, mediated by cultural artifacts such as work ethics, rules, and regulations. Individuals who engage in lifelong learning make sense of their experiences.

The negotiation of meaning is a predominant feature in Wenger's theory of communities of practice. In this theory, practice is a process by which individuals can experience the world and their engagement with communities as meaningful practices (Wenger, 1999). Wenger developed this concept to enhance understanding of what is happening in communities. Wenger (1999) states that the central themes surrounding the practice are "about meaning as an experience of everyday life" and that life's meaning is a philosophical issue. The implication here is that people in everyday endeavours experience meaning. As features of the negotiation of meaning, people talk, act, think, and solve problems. Later Wenger et al. (2011) referred to communities of practice as "learning partnerships" among people who find it useful to learn from and with each other about a particular domain. Further, the authors noted that communities use each

other's practices as a learning resource. The two theories are linked in creating a social environment for ICT skills training sessions in which they collaboratively share experiences within the groups while learning and later across the communities they are engaged. For example, people who are deaf and people with visual impairment (two communities) learn on their own before they can share information between the groups. The premise "learning is a continuous process" has continued to shape how we learn, live, and participate in addressing social demands. Lifelong learning results from the globalization of life and work demands (Billet, 2010; Billett, 2018; Organization for Economic and Cultural Development [OECD], 2010; World Economic Forum, 2019). Lifelong learning differs from lifelong education in that lifelong learning is a personal process (Billett, 2010; Billett, 2018). Lifelong education occurs all the time as individuals think and act, some of which occurs through their engagement with educational institutions (lifelong education) programmes that contribute periodically to an individual's life history (Billett, 2010). Alternatively, lifelong education is institutionally organized learning with specific learning outcomes (Billett, 2010). Ngure (2022) defines "lifelong learning" as "learning and development that emerge from and are secured by individuals throughout their lives through diverse experiences, activities, and interactions in various settings (e.g., workplaces, communities, and educational institutions)." Lifelong learning and lifelong education cannot be separated directly, even though they complement each other, with lifelong learning being the most powerful.

The question to be addressed is, "How can people with disabilities, particularly those with visual and hearing impairments, benefit from lifelong learning opportunities in the technological evolution and innovation era?" People with disabilities have a right to lifelong learning. The rights-based approach towards people with disabilities as reflected in the 2030 Agenda is aligned with the UN Convention of 2006 on the Rights of People with Disabilities (CRPD). According to the convention, people with disabilities have the right to education and learning. In this paper, the emphasis is on learning, not education, for education is a relational concept that refers to the interaction between an educator and a student, whereas learning refers to something one can do alone and by oneself (Biesta, 2006). Much knowledge must be learned and unlearned in formal and non-

formal education systems (Billett, 2010). According to Biesta (2006), lifelong learning is an individual issue and responsibility. Lifelong learning requires social theories because individuals learn as they participate and engage in dialogues individually, with some elements of the teaching and learning process occurring through informal learning patterns unrelated to academic courses and qualifications (Coffield, 1999; Nind, 2016). Nind (2016) is of the view that it is rare for the concepts of lifelong, community, formal, or informal learning to be discussed in relation to people with disabilities. While there are increasing discussions related to creating lifelong learning opportunities for the older adult population to increase their well-being, intellectual stimulation, and social engagement (Hansen et al., 2019; Iredale, 2018; Pstross et al., 2017; Talmage et al., 2016), little is said about people with disabilities. Lifelong learning programmes are not designed for improved job skills or qualifications but rather to offer opportunities to expand knowledge of diverse topics, improve creativity, and broaden and deepen perspectives (Hansen et al., 2019; Talmage et al., 2015). Individuals with disabilities require knowledge and skills in using information and communication technology (ICT) to participate in and benefit from educational programmes, social life experiences, and secure employment opportunities (Egaga & Aderibigbe, 2015; Escueta et al., 2017; Lersilp & Lersilp, 2019). Studies indicate that ICT can enhance learning among persons with disabilities in school and social participation. However, rarely one finds opportunities for people with visual and hearing disabilities to access ICT skills training (Ali, 2008; Dadzie-Bonney & Hayford, 2017; Mnyanyi et al., 2012). The paper addresses the issue of creating ICT skills training opportunities for people with visual and hearing disabilities so they fully participate in lifelong learning. The paper focused on: facilitating the learning of basic ICT skills for people with visual impairment and people who are deaf; assessing ICT skills developed; assessing their views on ICT skills training; and assessing the contribution of ICT skills training on enhancing LLL.

Methodology

The study was qualitative in nature, adopted action research design guided by a participatory action research approach. Chevalier and Buckles (2019) suggest that participatory action research works on reconciling and integrating research and the advancement of knowledge with people's

active engagement. Action research helps practitioners change their practices because it is practice-oriented but contains elements of research that help practitioners gather information, process the information, reflect, plan, and evaluate (Argyropoulos & Thymakis, 2014; Kemmis & McTaggart, 2007; Mnyanyi, 2014). The researcher acted as a facilitator; during the whole process of the study, people with visual and hearing disabilities were involved in defining social issues, reflecting on the process, and addressing the continuation of the process of solving the challenge they face in participating in LLL and how ICT can mitigate the challenges. The participants of this study were graduates of the ICT skills training programme of the Open University of Tanzania (OUT). The OUT started ICT skills training for people with visual impairment in 2011 and ICT skills training for the deaf in 2015. All participants with visual impairment were secondary school graduates and 20% of participants who are deaf were secondary school students. A purposive, convenient sample of 36 (15 people with visual impairment, 15 people who are deaf and 6 facilitators) at the Open University of Tanzania were selected for interviews. The OUT facilitated ICT skills training for the blind at Lugalo Secondary School Iringa region (December 7th – 21st, 2016) and ICT skills training for the deaf at Njombe School for the deaf (January 8th -22nd, 2017). The training was for 15 days each. Facilitators for ICT skills training for people with visual impairment were people with visual impairment, and facilitators for those with hearing impairments were also with hearing impairment. The training focused on what is a computer, Computer fundamentals (turning it on and off, as well as parts of a computer), using Microsoft Word and Internet in general for all.

There were also additional modules for specific disabilities, including Using Non-Visual Desktop Applications and Keyboarding for the Visually Impaired. Additional modules for people with hearing impairments included PC maintenance and developing ICT sign language for computer terminologies. The idea was that once people with disabilities learned and used basic ICT skills, they could improve their quality of life by participating in lifelong learning opportunities. In this study, the interviews for people with hearing impairment were conducted with the support of a sign language expert. Data were collected through individual interviews. This method is suitable when the researcher wants to inquire into people's

experiences and opinions, as they express their values, social interactions, differing experiences, and how the participants interpret their real-life situations (Doody & Noonan, 2013). This study was about participation of people with disabilities in lifelong learning experiences. During the individual interviews, the author's role was to explore attitudes, perceptions, feelings, and ideas regarding ICT skills training for persons with disabilities in terms of importance, the relevance of the skills training and what might be the outcome of the training among the participating groups. The interview transcripts were subjected to content analysis for formulations of categories and themes. The content analysis was useful in categorising responses from participants' stories to reveal their views on the contributions of ICT skills training for enhancing participation of people with disabilities in LLL (Elo et. al., 2014).

Results

This study explored views of people with disabilities who participated in ICT skills training on creating ICT skills opportunities for enhancing their participation in LLL. The participating groups in the study reflected different social backgrounds with some slight variations based on their core disability and their practice of lifelong learning. For example, people with visual impairment indicated that their learning depended on sighted people – for learning and information sharing; the deaf depended on sign language experts. They all indicated a challenge with increased use of ICT where information sharing and learning are less dependent on hard copies. The author presents findings on aspects related to the evaluation of the facilitating learning of basic ICT skills for people with visual impairment and people who are deaf; assessing ICT skills developed; assessing their views on ICT skills training; and the contribution of ICT skills training on enhancing LLL.

Participant views on the ICT Skills Training

As indicated in the methodology, ICT skills training for people with visual impairment was conducted in Iringa and ICT skills development for the deaf was conducted in Njombe. The ICT skills training outcomes included developing the use of ICT for people with disabilities, using basic ICT skills in searching for information and using ICT skills in communication.

ICT Skills for People with Visual Impairment

Only three of the 15 visually impaired trainees had attended at least one short course in ICT skills; the rest had heard about ICT skills training. During the ICT skills for people with visual impairment, the two facilitators worked with three trainees who already knew how to use ICT. The facilitators started training by discussing why they needed ICT skills and why the course was important. On the whole, the planning was done by the broker group, which later included the three trainees with ICT skills. In each lesson, the trainees were asked what difficulties they faced, and the ICT facilitators for the visually impaired supported them. It was easy to facilitate, as they all shared a common challenge: having a visual impairment. The broker, apart from having a visual impairment, had ICT skills. Traditionally, people with visual impairment relied on sighted people to read newspapers and emails; to them, ICT skills training was a liberation as improved their valued privacy and information sharing. In the case of communication, a participant with visual impairment (PVI3) communicated with a deaf facilitator (DF1) during ICT skills training for people with visual impairment at Lugalo secondary school in Iringa. This was his first time communicating with a deaf person without the support of an interpreter. He said:

When writing an email I was not aware that the one, I was writing to is a deaf person. I was given an email by the coordinator telling us that if we have any challenges contact DF1 for help. I wrote the email that I needed help on how to reduce the volume of the computer. When BDI came started reducing the voice of my computer without talking to me. I continued talking to him but was silent, until when the other facilitator told me that DF1 was a deaf person [PVI3].

According to PVI3, ICT skills training for people with visual impairment outcomes includes reducing communication barriers and increasing privacy and information sharing. According to Raja (2016), ICT is increasingly enabling persons with disabilities to level the playing field in access to lifelong education, skills development, and employment. For increasing access to lifelong learning opportunities, people with visual impairment indicated a need for ICT skills training. One of the participants of the ICT skills training for people with visual impairment, PVI12, at Iringa indicated

a need to increase access to ICT skills training to enable them to become independent and participate fully in lifelong learning as they can enrol in an online course, they find useful as narratives indicate:

When I started learning ICT, I was not sure I could learn for such a short period (two weeks). I felt it will be difficult. I am blind, how can it be possible to learn for two weeks whereas non-disabled people do say Computer is a difficult subject. In my life, I had never attended ICT skills training. I had never used a computer. I only heard about computers. After training, I can now search for information online, enrol in online courses, attend zoom meetings, enter YouTube and listen to online radio. I can download and listen to music, read online newspapers and share information with my friends using email and other applications. I also created friendships with people with hearing impairment as we can communicate through emails and WhatsApp (PVI12).

From the participants' views, ICT skills training for persons with visual impairment improves access to online learning that enhances access to lifelong learning resources and information sharing. One of the participants, PVI9, added that in my village, newspapers arrive after two to three days, with this training I have become important as I can use technology to access online newspapers and share with my friends as narrated “*I had challenges on reading newspapers. With this training I will be able to read online newspapers, listen to online radio, participate in social media and share information with others*” (PVI9). According to Abraham et al. (2022), smartphones have the potential to serve as an alternative assistive device for people living with severe visual impairment and blindness. Little is known about training on the use of smartphones among people with visual impairment in developing countries (Abraham et.al. 2020; Al-Mouh & Al-Khalifa, 2015). ICT skills training outcomes include developing the ability and capacity to improve quality of life as provides chances for changing jobs, learning new skills and enhancing networking. One of the ICT facilitators for ICT skills training for people with visual impairment (PVIF2) narrated:

To me, ICT is a change agent. Initially, I was trained as a lawyer but never had a job. After attending the first ICT skills training for people with visual impairment, I got employment as

an ICT facilitator for people with visual impairment. With ICT. I have created more friends through networking. ICT also has allowed me to change jobs and has improved my job performance. I can now work alone without needing much support from others. I can decide to go online and study different books, and online news and make online applications. ICT has changed completely my profession, from a lawyer to an IT expert for people with visual impairment (PVIF2).

When facilitating ICT, it is important to support people with visual impairment to comprehend parts of the computer. People with visual impairment come to ICT skills training with different conceptions about a computer. There are those whose views indicate learning ICT is difficult and those with different conceptions about computers and their computer parts. A participant in the ICT skills training for people with visual impairment (PVI14) indicated the importance of the ICT skills training for people with visual impairment

When I started learning ICT, I thought it was so difficult and that I cannot learn. But I decided that I would do my best and attend all the sessions. On the first day, the teacher was teaching about parts of the computer and mentioned a keyboard. Then, because I regularly go to church I thought now there are things I know, like a keyboard. But, when the teacher started teaching us, I became aware that the keyboard in the church is different from the one in computers. Since I had some skills in typewriting, it was easy for me to learn to keyboard (PVI14).

ICT skills training centres have to be equipped with facilities for people with visual impairment practice. People with visual impairment to learn to use a computer, one must learn keyboard skills because they cannot use a mouse (Ampratwum et al., 2016; Sah, 2013). There is an increased need for establishing ICT skills training centres to cater for all youth and adults who become disabled at adult age. The practice for skills training is for children in schools. PVIF3 become disabled at the age of 50 years, with ICT skills training became an ICT skills trainer for people with visual impairment at the open university. *“I became disabled at the age of 50. I started training in Braille skills and later ICT skills. ICT skills have improved my life as I got employment, graduated from an online course and created more friends (PVIF3).* Similarly, PVI12 is a teacher with visual

impairment who became visually impaired at the age of 26 years, attended ICT skills training at Lugalo secondary school in Njombe. During an interview, PVI12 indicated ICT skills training to have provided an opportunity to develop competence and has shown that disability is not inability as narrated:

I became visually impaired at 26 years old. I lost hope. This training has made me feel confident and can learn. I am planning to start a Bachelor's Degree. The challenge after training is how to get a computer and where to get further training when needed” (PVI12).

The trainees reported having created confidence as they could learn, secure training opportunities and even communicate with the global community. Most of the trainees had a view that the training had positive outcomes. However, the challenges hinted at included shortages of training opportunities, shortages of ICT tools to use and places where they can find experts to support them. It is argued here that providing ICT skills training for people with visual impairment opportunities calls for funding and government intervention.

ICT for People with Hearing Impairment

Hearing loss is the fourth highest cause of disability globally (Bell & Swart, 2018; WHO, 2018). Of the 466 million people worldwide, who have some form of hearing loss, two-thirds live in low and middle-income countries (WHO, 2018). As such, hearing loss among candidates poses challenges. Under normal circumstances, it is challenging to recognize or identify a person with hearing impairment. Such people move freely without any support, though they have to be careful not to be knocked down by vehicles as they cannot hear the noise of an oncoming motorized vehicle. They do normal manual work, and you will rarely find them begging. This calls for creating ICT skills training for the deaf so that they can participate fully in lifelong learning and the community, they live as part of local and global societies. In this era of increased use of ICT, the challenge is how to create ICT skills training opportunities. The deaf community use sign language posing a challenge on how to teach ICT skills.

In creating ICT skills, I implemented collaborative action research that calls for the shared creation of knowledge and skills by identifying a problem

and solving it step-by-step (Mnyanyi, 2014). The training started by creating ICT skills signs to use during the teaching and learning processes. During creating ICT sign language, the sign language interpreter and the three ICT facilitators lead the process. The findings indicated that ICT skills training supported the trainees with hearing impairment in developing: self-confidence; ICT Sign language; and self-determination. The ICT skills also had outcomes related to creating friends through Facebook, reducing dependence on sign language interpretation, creating job opportunities like ICT maintenance and data entry and participating in online lifelong learning, especially in the ICT industry like participating in Cisco examinations. During the interview, one of the deaf participants, PD3, a Form IV graduate, who participated in the ICT skills training for the deaf commented that most of the people who are deaf do not have opportunities for ICT training. For the deaf to learn best, they need sign language. he narrated:

When I saw a computer initially, I was afraid to touch thinking that I can destroy it, as I had no experience using ICT. My worry was whether it would be possible for me to learn ICT skills as I did not do well in my secondary education. During training, I was so amazed to see my fellow deaf teaching me. We started by creating signs, and after that, I found the course was easy for me! (PD3)

Some deaf participants indicated that the training contributed to the ability to use social media and emails that enabled them to increase the number of friends and participate in online learning. The training participant PD13 indicated to have developed an ability to communicate with others using emails and social media. Further, PD13 during ICT skills training had an opportunity to learn how to access online resources and joined CISCO courses as narrated:

I can now follow my friends on Facebook and through email. I have friends, some of them are visual impaired. I am so happy! I can communicate with my hearing friends without a need for sign language interpreter, just we text or email each other. I have already enrolled on CISCO class so I can learn more about ICT (PD13)

Challenges facing the deaf community on participating in lifelong learning are related to communication. PD13 indicated the use of ICT signs created

during ICT skills training for the deaf at OUT enhanced skills learning. Shortage of ICT skills training opportunities hinder access to lifelong education through ICT. Use of ICT skills enhances chances to participate in lifelong learning for the deaf as narrated by PD14:

For me to learn ICT strategy used was to learn the name of the parts of the computer and their functions using sign language. It was my first time to touch a computer and thus had to learn by heart different parts. Then I learnt keyboard skills, a mouse and how computer parts are connected. After I had learnt basic computers and the internet, a new strategy was invented. This involved use of google Translate where I was speaking English words and then placing it to google Translate where it was translated in Kiswahili so that I understand and continue discussing them with my friends (PD13).

The ICT skills trainer or the deaf (PDF2) who participated in training in Kenya and later facilitated the first ICT skills training for the deaf session at OUT indicated a need to empower the deaf community to learn ICT.

I am deaf, I am happy to be a participant in the first ICT training course at OUT. After training, I am doing my internship in a government-owned company. Initially, they thought ooh a deaf! But now am happy they know that I can do things. My work is on repairing PCs and installing software and making preventive maintenance. I am happy but not sure of getting a permanent job as I do not have a certificate of secondary education (PDF2).

On the whole, trainees with hearing impairment entered ICT classes without having developed concepts about a computer. Some entered into ICT without even knowledge of using smartphones. Deaf have communication barriers that limit them accessing information and lifelong learning opportunities. ICT skills trainees believed that ICT supported them in improving their quality of life by creating opportunities for lifelong learning. Participants in this study managed to enrol on CISCO online courses and change jobs.

Discussion

The investigation addressed issues on how to create lifelong learning opportunities for people with disabilities using ICT through the lens of communities of practice (Wenger, 1998) and social constructivism learning perspective (Elias & Mansouri, 2020; Vygotsky, 1978). The assumption was that participating communities, the community of people with hearing impairment, the community of people with visual impairment and the community of brokers were connected to their indigenous knowledge and practice related to what they are used to. The broker community was exposed to indigenous knowledge about how to go about within the community and with additional ICT and facilitation skills. Lave and Wenger (1991) have shown that knowledge is distributed and shared in the community as the people interact in their day-to-day activities. For creating interaction for sharing knowledge amongst groups, a training session for 15 days was created through which the broker and other communities had the opportunity to interact. A study by Osman and Diah (2017) indicated ICT plays a key role in empowering PWD, however faces challenges related to financial, social and environmental problems in accessing sources of ICT which contributes to the weakening of their competitiveness in the labour market. The other study Kamarudin and Hussain (2019) indicated that deaf persons can communicate using sign language and thus had to develop ICT tool for translating into sign language. This study responds to Osman and Diah (2017) and Kamarudin and Hussain (2019) study by creating ICT skills training for the deaf so they contribute to the improvement of quality in life and contribute to national development.

Conclusions and Recommendations

People with disabilities account for a sizable proportion and face challenges in accessing lifelong learning opportunities, more particularly in developing countries. Lifelong learning is important in the era of technological advancement that require training and re-training for new job skills. ICT skills training has proved to have the potential to create opportunities for lifelong learning. However, rarely, we find ICT skills training for persons with disabilities. Reasons for low access to ICT skills training include expertise in training persons with disabilities, resources, and language use. In this study, challenges were reduced by involving persons who are deaf to create their ICT sign language. Above all, in classes for people with visual

impairment, the facilitator was also a person with visual impairment; in ICT skills training for the deaf, the facilitator was deaf. The skills enabled them to participate in lifelong learning opportunities as they managed to enrol in online courses, including CISCO and academic courses offered in universities. On the whole, implementing action research to develop ICT skills training improved the participation of persons with disabilities in lifelong learning. The study recommends that ICT be effectively integrated into adult education programmes. As a means to increase access to ICT skills training, funding for ICT skills training for people with disabilities has to be improved. There is also a need for government to create ICT skills training opportunities in schools and the community, in which facilitators are people with disabilities. In the case of people who are deaf, there is a need to develop contextual technical sign language to facilitate ICT skills training and extend to technical vocational skills to increase access to lifelong learning and improve their quality of life.

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