ISSN 2962-5548
https://doi.org/10.56773/ejer.v4i1.77
Eureka: Journal of Educational Research, 4(1), 22-36

Strategies addressing orientation and mobility challenges facing students with visual impairment in selected Tanzanian universities

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Received: April 28, 2025
Revised: June 20, 2025
Accepted: July 28, 2025

Abstract

The increased number of students with Visual impairment (VI) in universities has been noticeable in recent years. The growing population faces multiple challenges regarding orientation and mobility (O&M). This study explores the strategies to address the challenges encountered in O&M by university students with VI in Tanzania. An intrinsic case study design was employed to generate in-depth information on the challenges and strategies used to overcome the obstacles faced in the orientation and mobility for students with visual impairment. Eighteen students with VI, three orientation and mobility specialists and four administrators were purposively selected to participate in the study. Data were collected through interviews, focus group discussions and observation to ensure data triangulation. Inductive thematic analysis was used to make sense of the data generated from two selected universities. The findings revealed a variety of challenges, including internal and external challenges such as unsupportive infrastructure, extreme fear and an absence of clear landmarks in the university environments. The strategies employed to overcome these challenges included self-development, resilience, as well as awareness and adaptability to the environment. Based on the findings, it is recommended that universities continue to build and modify infrastructure while considering the inclusivity of students with VI to facilitate effective use of O&M skills, allowing for confident and independent movement within the universities.

Keywords

Challenges, higher education, orientation and mobility, strategies, visual impairment.

INTRODUCTION

The inclusion of students with VI in universities necessitates the utilization of O&M skills to reduce difficulties they encounter in navigating the university environment [1]. Travelling safely and independently enables students with VI to obtain the opportunity to participate in various academic and social interactions and maintain a quality of life [2]. United Nation [3] underlines the principle of equal access to educational opportunities for individuals with disabilities. Equal opportunities are better realized when students have access to learning facilities in which O&M skills provide such avenues.

Visual impairment entails a collective term of vision loss ranging from low vision to total blindness [4]. Owing to vision loss, students with VI require alternative O&M skills to interact with the environment. Orientation entails knowing

one's position by interpreting the information concerning the environment [5]. Mobility denotes actual movement from one point to another using various mobility assistance, like the white canes, sighted guides and electronic devices [4]. O&M service provided to students with VI enables them to understand the environment and move around freely and confidently. The O&M skills work concurrently to provide equal access to different places [6]. The choice of mobility assistance empowers students with VI to become individuals with high self-confidence and autonomy [7]. The study conducted by Malik et al. [8] identified that the major challenge that blind individuals face in their day-to-day lives is the inability to move from one point to another independently.

Although students with VI are accommodated in higher education institutions, Kamali and Ashori [2] observed that they encounter challenges in O&M. Various literature indicates that students with VI use support from peers, white canes and other assistive technology to navigate the environment and address the challenges encountered; however, these studies were not looking at the strategies [9]–[12]. There is limited literature on the strategies employed by students with VI to overcome the hindrances they encounter in O&M. In Pakistan, Aftab et al. [13] conducted a study focusing on the challenges encountered by students with VI in accessing O&M; however, the study was silent on the strategies used by the students to address the challenges they confronted. Similarly, in Turkey, Altunay et al. [7] looked at O&M problems of adults with VI and suggested solutions; still, the study concealed the strategies used by adults to overcome the difficulties as they navigated their environment.

In Tanzania, no study has been conducted on O&M nor the strategies employed by students with VI to address the challenges encountered in O&M. However, Bhalalusesa [1] and Kisanga [14] incorporated a small part in their studies, which focused on students with VI in higher education institutions. Bhalalusesa [1] noted that students with VI sought support from their peers to guide them in navigating the university environment. Moreover, one of the strategies used by students with VI in overcoming various challenges is accepting themselves and their situation. A study by Kisanga [14], noted that among the strategies used by students with VI in overcoming the educational barrier is seeking support from their fellow sighted students, where they assisted them in reading and navigating the university environment.

Although Tanzania practices inclusive education at all levels of education [1]. Still at the universities, students with VI encounter various challenges in O&M. Failure to move independently from the hostels to classes, the library, administration buildings, cafeteria, and so forth makes them too dependent on their peers, and these places are critical venues for their learning within the university. Regardless of the obstructions, students with VI accomplish their studies as their sighted peers do [15], [16]. Thus, this study seeks to explore the strategies employed by students with VI to address the challenges they encounter in their university inclusion.

The study focused on answering two main research questions: (RQ1) What challenges do university students with VI encounter in utilizing O&M skills?; (RQ2) What strategies do Tanzanian university students with VI employ to address the challenges encountered in O&M?

RESEARCH METHOD

This study adopted a qualitative approach to explore the strategies used to address O&M challenges encountered by students with VI in higher education institutions in Tanzania. The study employed intrinsic case study design where the researcher studied one case, which is the 'skill' of orientation and mobility among students with VI from three units of study (campuses), One campus in university B and two campuses in university A (named as campus X and Y respectively) [17], [18]. The design allowed the participants to share in-depth information about the phenomenon under study.

Purposively, 25 participants from two selected universities were selected to participate in the study (thus, eighteen, students with VI, three O&M specialists and four administrators). Students with VI, O&M specialists and administrators selected provided views on the phenomenon in their natural settings [19].

Interviews, FGDs and observations were used to generate data. Semi-structured interviews were administered to students with VI, O&M specialists and administrators, whilst the FGD guides were administered to three small groups of students with VI, one from University B (FGDB-5 students) and two groups from University A

(FGDX- 6 students and FGDY- 7 students). The observation checklist was used to observe the environment where students with VI applied O&M skills. All the interviews and FGDs were audio recorded with the participants' consent. Synonyms were used throughout the process for confidentiality purposes.

Data were analysed thematically using NVIVO version 10 following Braun and Clarke's six steps, familiarizing with data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and reporting [20]. The themes and subthemes that emerged are demonstrated in tables.

RESULT AND DISCUSSION

The findings are presented in: (1) challenges in using O&M skills among university students with VI, and (2) strategies employed to address the challenges encountered by students with VI in O&M. Each corresponds to a research question.

Challenges in using O&M skills among university students with VI

The study revealed that students encountered different challenges in using O&M skills. From the findings, several themes and subthemes emerged as shown in Table 1.

Table 1. The themes and subthemes emerged about students' challenges

Themes	Subthemes	Related codes
1. Challenges in using mobility techniques	- Sighted guides	- Untrained guides, guiding while chatting, failure to be on time, failure to inform the blind students about the environment
	- White canes	- Unsupportive in some seasons, like the rainy season, difficulties in using it in muddy places, lack of training on how to use the long canes
2. Environmental Challenges	- Environmental complexity	- Distance between buildings, Numerous routes, Scattered buildings, unclear landmarks
	- Unsupportive infrastructure	- Lack of ramps, Lack of bannisters in staircases, Presence of numerous stairs, No elevators
	- Emergence construction/ Repair	- Continuous construction, Presence of construction materials, Changes of the physical appearance of some places
	- Unfavorable road/route condition	- Hasty moving cars, Uncovered gutters, Stagnant water, Impassable routes
	- Unfavorable weather conditions	- Rain, blowing wind
3. Personal challenges	- Fear	- Uncomfortable moving in places with cars, Anxiety moving in unfamiliar places, Difficult in initiating independent mobility
	- Hitting	- Hitting objects, hitting other students unwillingly, hitting doors and other things
	- Feeling Embarrassed	- Feeling shy moving with the white cane
4. Social challenges	- Awareness	- Sighted students feel too much empathy, Sighted students spend time wondering about students with VI, Students with VI are being untrusted
	- Perception	- Sighted students think students with VI are pretending, others think they are in a relationship (when using sighted guides), it's a fashion to hold hands while moving
	- Noises	- Noises destroyed audio clues, Noises directed students with VI with the directions

Challenges in using mobility techniques

The study clearly revealed that students encountered different challenges in effectively using mobility techniques, including the sighted guide and white canes. Among the challenges identified in O&M was using the sighted guide and the white cane as the major techniques used by students with VI to move around the

university. The study revealed that a lack of training among the guides after being recruited led to some problems in the orientation and guiding of students with VI. Further, the participants reported failure to use the white canes, thus relying on sighted guides. In the interviews with students with VI, they narrated their experiences,

> SWVIX6: *When using a sighted guide, sometimes I fail to arrive on time in a required place, like attending class late, because I depend on a guide. Occasionally, I need to go early, but I have to wait for the guide to be ready*.
> SWVIY3: *I move with a guide who is not trained on how to guide a blind person, because the guide does not inform me about the environment, and sometimes, I hit or dip in water*.

Lack of training for guides after being recruited/assigned students with VI resulted in some problems in the orientation and guiding of students with VI. Sighted guide is the best technique for providing safe travel for students with VI [6]. Due to a lack of training among students with VI and their guides, the participants claimed that sometimes the guides failed to orient them properly because some guides were chatting while moving, resulting in students with VI hitting other students or objects unknowingly. This occurred as some guides were students selected by students with VI to guide them. Thus, they never attended training on how to guide a blind individual. Vanderpuye et al. [21] noted that the sighted guide technique is challenging when a guide is not knowledgeable about guiding a person with VI. This agrees with the findings by Arslantekin [22] who observed that lack of training for both blind students and the guides resulted in incorrect guiding, where the sighted peers guided their fellow blind students by pulling on their arms, holding them by the shoulders or walking side by side. Sighted guides offer efficient travel while serving as a source of information about the environment to an individual with VI [21].

Inadequate O&M training led to students with VI being more dependent on the guides, consequently following the guides' schedule rather than their own. This affected students with VI in several ways, including attending the class late, failing to accomplish their goals on time and wasting time waiting for the guides. Thus, training the sighted guides is necessary to avoid some challenges in using the guide technique as the most common way of initiating the independent movement.

Concerning the white canes, other participants claimed a lack of training regarding the white canes, while others' failure of some long canes to work in some places, like in mud areas, prevented them from moving freely. In the interview, the participants disclosed the following important information,

> SWVIB4: *In mud areas, some white canes provide wrong information, especially in the rainy season.*
> SWVIX5: *When I use the white cane, I am slow. Also, some white canes in wet environments, especially in the rainy season, are not very friendly*.

Accessing O&M training is crucial to students with VI for better selection of the mobility technique depending on the environment. The white canes are designed to be used in a particular environment. Failure to make the best choice made students with VI slow, as some white canes were not friendly in some environments in some seasons. Further, students with VI were slow when using white, which resulted in arriving late in class and other places as intended. Various studies demonstrate the unavailability of formal /professional training of O&M in Tanzania, Lugome [23], and Kisanga [14], thus failing to apply proper techniques in a particular season and environment. This lack of training limits students' ability to develop effective mobility techniques, leading to challenges in their application.

In the study by Aftab et al. [13] in Pakistan, researchers observed that students with VI experienced difficulties using sighted guides and challenges with the search technique. Similarly, Attia and Asamoah [12] and Randiki [24] revealed the failure of students with VI to employ effectively their white canes. Randiki [24] noted that failure to apply the technique prevented them from accessing the learning environment, consequently affecting their academic success. The study by Vanderpuye et al. [21] demonstrated that although students with VI employed a sighted guide to move around the environment, they still used it incorrectly.

Environmental challenges

The study revealed that the environment posed challenges to students with VI in utilizing O&M skills due to the complexity of the environments, unsupportive infrastructure, unfavorable route conditions, weather challenges, and emergency constructions/repairs

Firstly, environmental complexity. The study revealed that the wideness of the universities' environment, and the significant distance from the hostels where students stayed to the classes, cafeteria, administration block, and other crucial places like the library were located far from each other which in turn posed challenges to students with VI in using O&M skills owing to failure to master the environment. The participant claimed the environments were unfavourable for them due to numerous routes. In the interviews with the students with VI, they narrated

> SWVIB3: *The distance from the hostel to the classes, library, administration block, and cafeteria is a big challenge to students with VI because of its width.*
> SWVIB1: *The environment is not friendly because of the many confusing routes.*

The administrators and O&M specialists narrate,

> ADP8X: *The buildings in this university are scattered when students with VI need to move from the hostel to the cafeteria, receiving a first mental picture of the routes is difficult, especially when they report in the first year.*

In the observation, the study universities were observed to have scattered buildings where students with VI used tricycles to move within the university to save time and arrive at their classes on time without delay. Similarly, the wideness of the environment and scattered buildings stimulated nervousness among students with VI in moving independently due to numerous routes in some places. The participants declared that they are favoured by the environment where the buildings are closer, like in their hostel/blocks. Thus, the distance and width of the university made it difficult for students to move independently because of the distance.

The study by Reed and Curtis [25] observed that the systematic planning of the institutions can reduce the barriers facing students with VI in navigating their environment. Moving in scattered and distant buildings increases travel time and physical fatigue, which affects the participation of the students with VI in other campus activities. Cushley et al. [26] stated failure of the individual with VI to navigate the building was evident due to various issues, including the wideness of the environment, which makes it difficult to identify the landmarks and clues. Addressing the challenges creates more inclusive environments which support the principles of inclusion, including accessibility, adaptability, availability and acceptability [27].

Secondly, unsupportive infrastructure. The study revealed that the presence of unsupportive infrastructure demonstrated a failure to consider the inclusion of students with disabilities, including those with VI. The participants claimed that most of the old buildings are not supportive as they lack ramps and bannisters; instead, stairs dominate, which contributes to the inability of students with VI to use O&M skills freely and manoeuvre the university environment independently. Some participants narrated,

> SWVIX4: *Some of the infrastructures are unsupportive to students with VI because of the presence of stairs.*
> SWVIY1: *Some places are challenging to reach because of the infrastructure, lack of bannisters, and the distance from one point to another.*
> SWVIB4: *there are some places where we can move ourselves, but because they are not well designed, we cannot move.*

In FGDs and interviews with the administrators, the participants added,

> FGDX1: *Due to the nature of this area, stairs are unavoidable; they are almost everywhere, although they pose a barrier to students with VI in moving independently.*
> FGDB1: *The issues of stairs are not only in lecture rooms or venues, even in administration blocks.*

Further, the administrator added,

> ADPX8: *Outside the buildings, there are a few flat areas, and the stairs surround almost everywhere.*

The universities under study were built and introduced in years when the inclusion of students with disabilities in education was insignificant [28]. These universities possess new and old buildings, where the old buildings demonstrate a failure to favour inclusivity. The presence of unsupportive infrastructure poses challenges for students with disabilities, including those with VI, to move freely within their environment [29]. The stairs dominated the indoor and outdoor areas of the university's buildings. Being the big universities with huge numbers of students, the buildings are tall and connected by stairs, which were built in different magnitudes depending on the nature of the environment. Mastering the stairs with various heights and lengths is a trick for students with VI, which creates difficulties and triggers the anxiety of falling and hitting among them. Similarly, stairs posed a barrier for students with VI to utilise O&M skills and initiate independent movement. This is because for students with VI to build confidence to move in staircases requires supportive structures. Thus, the lack of bannisters and ramps contributed to the inability of students with VI to use O&M skills freely and poses a challenge for them to go up and down stairs independently and comfortably.

However, the participant claimed that the universities demonstrated efforts to modify the infrastructure at least to meet the needs of students with disabilities [29], by building ramps and bannisters in new buildings, but in old buildings, it is still a challenge as changing almost everywhere is impossible. Therefore, students with VI are unsuccessful in using O&M skills effectively as modifications are still ongoing. In the interview, SWVIY4 said,

> SWVIY4: *Recently, they have started building ramps in places with only stairs, so there is an alternative to using ramps or stairs. Very few places, especially in the inherited infrastructures, but the recently constructed building infrastructures are supportive.*

It's the responsibility of the institutions to create a supportive and friendly environment for students with VI [1], [30]. Embracing the era of inclusive education, the social model of disability insists on restructuring the environment and removing the barriers that exclude students with VI from accessing various places easily [31]. In acknowledging the needful, endless efforts are made to ensure a supportive and inclusive environment for students with disabilities, including those with VI [29]. Eliminating all the barriers allows students with VI to live an inclusive life together with their peers [4], and apply O&M skills for equal access to the learning places and other university environments.

Thirdly, emergence construction/repair. The finding revealed that the restructuring process did not consider the presence of students with VI. Expected objects created obstacles in exploiting O&M skills and maintaining independent mobility. The participants claimed that a fear of hitting developed as the results remained dependent on the guides to move around the university. The following are some of the participants' excerpts

> SWVIB5: *... some constructions are done without our knowledge, which creates disturbances and fear.*
> SWVIY4: *When the construction starts, they leave the construction materials, so blind students hit the stone, bricks and other objects. ... To us blind students, it's a barrier to moving.*

The administrator proved the presence of ongoing construction activities within the university.

> ADPX8: *All new buildings constructed currently consider the inclusivity of students with disabilities. The buildings have provisions for elevators and ramps. …. As it stands, some of the old buildings are modified by building ramps for students who are blind and wheelchair users.*

Restructuring the environment to suit the needs of students with VI is a continuous process; however, it requires communication, especially with students with VI, to avoid unexpected hitting and falling, which creates fear and makes them dependent on their peers. The participants reported that the objects placed in an improper arrangement reduced their confidence in moving independently and utilizing the O&M skills as expected, due to fear. This finding is similar to Joseph [32] in Uganda. The researcher revealed that the mobility of students with VI was affected by the construction of new structures in the environment, which posed a challenge to students

with VI in moving around the university freely due to hitting objects.

Fourthly unfavorable route conditions. The study revealed that some routes from the hostel to other crucial places like classes, the library, and cafeterias were unfavourable for students with VI to move independently. The presence of hasty moving cars, open canals, lack of Bannisters, stagnant water, and impassable routes created anxiety among students with VI. Similarly, it was discovered that numerous routes in one place generated confusion, thus students with VI struggled to move independently due to the fear of being lost. Further, the routes connecting the hostels and other places had no pedestrian crossing points; however, drivers were inconsiderate of students with VI when moving. In the interviews, the participants narrated

> SWVIB2: *The drivers are not careful; they drive anyhow without any consideration for blind persons, and they can hit us and cause an accident.*

In the focus group discussions, the participants added that,

> FGDX4: *I do not think there are guidelines followed. The speed of the cars within the university environment is unknown. The drivers drive speedily.*
> FGDX1*: Our routes lack guardrails, so it is impossible to understand whether I have reached the edge. So, we end up falling into the canals or unwillingly dipping into water*.

The student with VI requires well-designed roads and routes to foster the intrinsic confidence in initiating independent movement. In all the study universities, students used the pedestrian crossing points to cross the road; however, the hasty-moving cars intimidated students with VI because the drivers were hasty. Students with VI were scared not only of the accidents, but also the sound/noises distorted the auditory clues essential for the O&M of students with VI in navigating the environment. Reducing the speed of the cars ensures the safety of the students and the effective use of the auditory clues. The universities through the responsible offices [29] acknowledges the long distance from one lecture hall to another, which sometimes requires crossing roads; however, the posters and road signs are indicated in some places, while others lack them. Additionally, even with the directives and signs, some drivers maintained the speed. This finding is consistent with Kisanga [14]. The study observed that reckless driving within the university environment inhibited the mobility of students with VI. In contrast, the findings contradict the social model of disability [31], [33] which requires appropriate accommodation to meet the unique needs (safety) of individuals with VI. Ignoring these accommodations creates a challenge, especially when using O&M skills.

Although the study universities have made efforts to meet the universal design standards [28] making the roads/ routes and other open spaces passable, still uncovered gutters in the routes, hostels, classes and the cafeteria, and some impassable places in various routes were reported. These created nervousness for students with VI to use O&M skills and maintain independent movement, thus retaining the dependent habits due to a low level of mastery of the environment. The study by Attia and Asamoah [12] revealed that students with VI were unsuccessful using O&M skills due to motor vehicle movement and obstacles like uncovered gutters, which resulted in ineffective use of their white cane.

Fifthly, natural weather conditions. The participants disclosed that natural weather conditions posed a barrier to using O&M skills. The codes identified are blowing wind and rainy, which were counted to prevent independent movement among students with VI. The participants claimed that they created noises, making it too difficult for them to use the auditory clues, as they reduced the listening ability of students with VI. Below are the participants' excerpts,

> SWVIB3: *The rainfall creates noise, which poses a challenge to my hearing ability.*
> SWVIX1: *Students have clues like smell and silence in some places, so it is difficult to identify the clues when it rains.*

In the FGDs the participant recounted,

> FGDB1: *During the rainy season, the route we normally use becomes difficult because of waterlogged ….*
> FGDX6: *The holes in the routes are sometimes full of water, and normally, blind students dip in dirty and stagnant water.*

Regarding the blowing wind, the participants narrated,

> SWVIX4: *… the blowing wind causes destruction and reduces hearing ability.*
> FGDB1: *when the wind blows … oooh! I usually stand for it to stop and then I continue*

The rain interrupted the ability to identify the auditory clues and destroyed the environment, creating an unsafe environment for students with VI utilizing O&M skills. Further, the rain resulted in stagnant water, creating a barrier for students with VI to move independently by hiding the rough surfaces and galleries, leading to stumbling or falling. This made students with VI hesitate and reduced their confidence to move independently, although sometimes they were forced to. The participants reported that during the rainy season, students with VI stayed in their hostel, and where necessary, they used the tricycle to move around the university, like attending lectures.

Like in rain, the blowing wind also makes noise and reduces the hearing and listening ability of students with VI, making it difficult for students with VI to move independently. The finding demonstrated that in areas experiencing blowing wind, when it blows, the participants claimed to stop moving and wait to avoid accidents and hitting. Notwithstanding, students with VI claimed to waste time waiting for the wind to stop and proceeding with their activities, which sometimes failed to accomplish their goals timely

This finding concurs with the findings by Joseph [32] who observed that rainy weather affected students with VI to move freely in their university environment. Although the natural nature of the environment cannot be changed, it can be adapted to ensure the O&M challenges are reduced/ eliminated as suggested by the social model of disability [31], [33] which allows free movement of students with VI regardless of the effect resulting from natural weather conditions. Building pavements that sustain even in rainy conditions and allow free movement creates a conducive environment that is all-weather.

Personal Challenges

The analysis of the responses from the participants observed that applying O&M skills among students with VI depended on the individual. The student's historical background determined the student's ability to utilize the skills. The study revealed that students who passed through the inclusive schools had the confidence and courage to initiate independent movement compared to students who attended special schools in their lower levels of education. Further, students who acquired the impairment at a late age varied from those who acquired it either in the early years after birth or congenitally. Fear, hitting and feeling embarrassed emerged as subthemes.

Firstly, fear. It was observed that most students with VI failed to utilize O&M skills because of the fear of falling, hitting, and getting lost. In the FGDs with students with VI, they narrated,

> FGDB3: *The extreme fear causes the inability of students with VI to move independently from one point to another.*
> FGDX4: *I am so scared to be in places with many cars and motorcycles or crossing the roads.*
> FGDB3: *I fear moving into an unfamiliar environment, as it becomes difficult to move independently.*

In an interview with an O&M specialist and administrators, they narrated that,

> OMSPY8: *Most female students with VI have fear, unlike male students who are blind. For instance, we had a female student who could not go anywhere without a guide …. Their independence depends on the background of the students, starting from home.*

The study demonstrated that fear was the leading enemy in using O&M skills among students with VI within the study universities. A lack of O&M skills training resulted in low confidence. The participants claimed to develop fear moving to different places, including new environments, places with cars and motor vehicles, crossing the road and initiating independent movement. The fear of some students with VI was easily noted because they failed to move independently completely. The participants claimed that some students failed to move until they completed their studies at the university. While others managed to move in some places.

More practice after training perfects the skill and gains confidence, eventually removing/

reducing the internal fear. Students with VI wished to initiate independent movement; nevertheless, the natural fear developed within them limited from be independent. This contradicts Joseph [32] who observed that self-stigma and low self-esteem affected the ability of students with VI to move around the university environment.

Secondly, hitting. The study revealed that students with VI found themselves hitting due to improper arrangement of objects, unexpected clues, and a way of opening the gates, and so forth. Similarly, the participants claimed that difficulties in being identified as visually impaired due to the normal appearance of their eyes resulted in sighted students hitting them unwillingly. Adversely, hitting undesirably reduced confidence and limited them from utilizing O&M skills in moving around the university independently. Below are the participants' excerpts,

> SWVIX3: *In an unfamiliar environment, hitting is common. Here I hit the stairs, objects, and my fellow students because they failed to identify that I am blind, so I rely on a sighted guide to avoid hitting them every time.*
> SWVIY6: *Hitting objects like the stones along the routes makes me feel uncomfortable moving alone.*

Unexpected hitting happened almost everywhere due to difficulties in being identified, and unawareness of society, by placing the objects randomly. There is an increasing number of students enrolled in universities, both sighted and students with VI [1]. Thus, the large number of students moving together, especially before and after attending lectures, led to hitting. This might be due to the unawareness of sighted students or caused by the normal appearance of the eyes of some students with VI. Hitting sometimes results in falling, which increases the risk of physical injury, consequently discourages students from using O&M skills to explore their university environment freely. In Turkey, Altunay et al. [7] revealed that individuals with VI encountered various challenges in mobility, including bumping objects, accidents and injuries as they moved in their daily lives. Attia and Asamoah [12] noted that students with VI were unsuccessful in using their white canes due to hitting various obstacles. Thus, maintaining independent mobility among students with VI requires proper arrangement of objects to enhance free and safe movement.

Social challenges

The study revealed different social challenges encountered by students with VI in using O&M skills to move around the environment. Several subthemes emerged, including awareness, perception and noises.

Firstly, awareness. The finding demonstrated that some students were less concerned about assisting students with VI, thinking only the guides were responsible. Other students were keen to prove whether they were truly blind or were pretending because they thought about how they reached the university level. In the focus group discussions, the participants narrated,

> FGDX4: *… some people in the university are unaware of students with special needs. Some think we are pretending.*
> FGDB1: *Some sighted students have never seen students with VI, they feel sympathy, comfort and help us perform almost everything. This hinders the transfer of O&M skills and utilizes them.*
> SWVIB3: *The biggest challenge that I face is being untrusted. Some people do not believe in my capability to do things and move independently.*

The responses from the participants revealed that different groups in the study universities lack awareness regarding students with VI. It was reported that some sighted students spent time wondering and questioning themselves about students with VI rather than helping them, especially in O&M. The study revealed that the university society still requires awareness. The ability of students with VI to use O&M skills and maintain independent movement is not well understood by sighted students and other people within the universities. Owing to their unawareness of students with VI capability, some sighted students preferred doing everything for them, thus limiting them in applying O&M skills, and their ability to transfer and use O&M skills remained dependent. This finding disagrees with the findings by Altunay et al. [7] who found that due to the awareness the society, individuals with VI received social acceptance from sighted persons by receiving assistance, including finding a seat on the bus when travelling. It is the

responsibility of the university, the Government, NGOs and other stakeholders to ensure building awareness in the societies, including the university communities.

Secondly, perception. The study revealed that the universities under study have mixed perceptions regarding students with VI, especially in O&M. The participant narrated that some people had positive perceptions while others interpreted the guides differently. Students with VI reported that sighted guides who guided the blind students were regarded as being in a relationship as they spend most of the time together. This is because most sighted students had never experienced sighted guides in O&M before. In the interviews, the participants said,

> SWVIX5: *Some people do not understand the sighted guide technique; they think it is a fashion to hold hands, others think we are in a relationship, while others think we are sick.*

In a focus group discussion, the participant narrated,

> FGDX4: *The guides assist us while other students think we are in relationships. Sometimes those words discourage our guides because they lack enough awareness*.

Different perceptions of different people in the study universities made students with VI feel inferior and lose confidence in applying O&M skills, doubting how people would judge them. Some sighted students thought these students (a blind student and a sighted student) were in a relationship, especially those with the opposite sex, due to spending most of the time together. Moreover, others thought it was a fashion to hold hands due to a lack of awareness. The study by Aftab et al. [13] in Pakistan found that the freedom of movement among individuals with VI was affected by the altitude of sighted individuals, and inadequate education worsens their efforts in moving around the environment. Further, the attitude of the bus drivers limited them from moving comfortably in the environment. Thus, raising awareness among university communities is essential to ensure a clear understanding of people with Disabilities, including those with VI.

Thirdly, noises. The responses from the participants reported noises in two-way traffic. Some participants narrated that the noises acted as a clue in identifying some places and directions, whilst others revealed that it posed a barrier as they failed to get the auditory clues in navigating their university environment. In the Focus Group Discussions, students with VI disclosed that,

> FGDX6: *The noises assist in understanding the exact place that I am. Noises are helpful, but they affect us, especially in classes.*
> FGDX5: *Noises assist in understanding where I am, whether it is the right place intended or otherwise*

On the contrary, other responses expressed the inconvenience of the noise. The Participants narrated that,

> SWVIX4: *The noises reduce my hearing ability, especially when audio clues direct the destination point.*
> FGDX1: *Noise brings a lot of challenges, which sometimes affect us moving around the university because it distracts us when listening.*

Noise posed a significant challenge for students with VI in developing effective O&M skills. Since these students rely heavily on auditory cues to navigate their environments, excessive or unpredictable noise disrupts their ability to interpret the surroundings, leading to confusion and potential safety risks. The responses demonstrated that noises assisted students with VI in giving them directions to reach the intended places easily by following the correct path and directions. Nonetheless, noises created confusion among students with VI, leading to a loss of direction and destinations ending up being lost. The study by Joseph [32] found that excessive noise in certain areas of the university prevented students with VI from moving freely and comfortably. Similarly, Zhang et al. [34] in China concluded that people with VI demonstrated two perspectives regarding noise. The noises in the parks, residential areas and shopping street were perceived to have positive impact to people with VI whilst the noises from the bus stops, hospitals, markets, and urban departments had negative effect due to various characteristics accompanied by each noise from a particular environment including the horn, construction, and manhole cover sounds, which can cause anxiety.

Strategies to address the challenges encountered by students with VI in O&M

Regardless of the challenges encountered in O&M, students with VI sustained moving around the university through established strategies to make life continue. The study demonstrated that the approaches developed depended on the barrier and the environment. Several themes/subthemes (in Table 2) emerged as discussed.

Table 2. The themes and subthemes emerged about students' strategies

Themes	Subthemes	Related codes
1. Using mobility techniques strategy	- Using sighted guides	- Moving with the assigned guides in complicated places, moving with peers and friends
	- Using the white canes	- Moving with the white canes in areas with fewer obstacles
	- Using tricycles	- Moving with tricycles in far places/classes, out of campus, more complicated areas, in the rainy season
2. Safety and weather adaptation strategy	- Increase carefulness	- Moving slowly upstairs, uncovered gutters, use pedestrian crossing points when crossing the roads, move with a guide in areas with stagnant water, especially in the rainy season, change the routes to avoid impassable areas.
	- Taking precaution	- Stop moving when there is wind, stop moving alone in rain, and whenever necessary, move using tricycles when it is raining.
3. Self-development and Resilience strategy	- Self-acceptance	- Create a positive mind, accept their situation, perceive the challenges as part of their life and move on.
	- Making more practices	- Repeatedly in a particular area (stairs) to be used.
4. Social support and awareness strategy	- Building relationship	- Having friends who are sighted ensures good relationships with other students and builds a strong network
	- Raising sighted students' awareness	- Educating sighted students about the abilities of students with VI and to move independently in some places with no obstacles

Using the mobility technique strategy

The study revealed that students with VI employ the white cane, sighted guide and tricycles to overcome the barriers encountered in crossing the road, moving in impassable routes and other places, validating the need to challenge the use of O&M skills among students with VI. The participants unavoidably employed strategies to move around the environment. The participants declared in the interview that,

> SWVIB1: *I also use the tricycles. We students with disabilities usually go to classes/lecture halls using tricycles to overcome delays in attending classes.*
> SWVIY1: *I use the sighted guide in areas where I cannot go independently*.
> SWVIX4: *Usually, in the rainy season, I prefer moving with a guide. Most people with blindness in rainy seasons refuse to move independently*.

The responses from participants demonstrated that, owing to the complexity of the study universities, the wideness, presence of numerous routes, an unsupportive infrastructure and some complicated areas, the participants declared using sighted guides and tricycles for their safety and to avoid delay in attending classes and other places. The participants declared that the use of tricycles in moving various areas within the university was helpful to save time and the like; however, they claimed that it reduced the ability to master the environment quickly, as repeated moving in the environment and more practice foster mastery and build confidence in moving. Although the tricycles were helpful, further, some participants claimed that they contributed to laziness because some students with VI became more dependent and prolonged in mastering the environment, especially students who acquired blindness later in life. Although this finding agrees with other

studies on the use of sighted guides and white canes to overcome the challenges, Altunay et al. [7], Nasiforo [9], Attia and Asamoah [12] stills, they are silent on using the tricycles to overcome the challenges encountered by students with VI which this study found.

Safety and weather adaptation strategy

One of the strategies employed by university students with VI in addressing the challenges is the safety and weather adaptation strategy. Stop moving when the wind blows and stay in the hostels when it rains prevent the risk of accidents and getting lost. Increasing carefulness when crossing the road, moving upstairs with no bannisters, uncovered canals and stagnant water to avoid falling, and maintaining safety. The participants declared that whenever necessary, changing the routes was inevitable to avoid impassable places and reach the destination point safely. The participants narrated that,

> SWVIY5: *In areas with the colligations, I usually increase carefulness.*
> SWVIY7: *When it rains, I usually remain in the hostel unless necessary to move.*
> SWVIX4: *Because the wind does not blow for a long time, it's paramount to stop first after it stops, and then I continue.*
> FGDX3: *To fast-moving cars, I usually move along the sides of the road where the cars cannot reach*

Safety of students with VI is essential in their daily lives. Moving around in different vulnerable environments, including crossing the road, requires clear road signs to indicate the disabled persons' crossing places [29]. The inaccessibility of the pedestrian system exacerbates the risk of physical harm. Thus, students with VI pay increased attention to moving in risky areas. Regarding the strategies taken by the students with VI to ensure their safety, the university administration necessitates the implementation of the policy and guidelines to ensure the safety of students with VI when moving in various places that pose a hazard to them [29]. The destructive auditory cues increase the risk of errors in navigating the environment among students with VI. Thus, precautions taken by students with VI reduced the risk of accidents, hitting, and falling by avoiding slippery places and maintaining personal safety.

Self-development and resilience strategy

Owing to extreme anxiety, falling and hitting, and lack of proper training in O&M among students with VI, the study revealed that students employed their initiatives, efforts and resilience to ensure managing the environments. Two subthemes emerged: self-acceptance and practicing more to reduce extreme fear.

Regarding self-acceptance, the participants narrated,

> SWVIB3. *Self-acceptance creates a positive mind and gives a chance to interact with the environment to avoid delays in attending various activities.*
> SWVIY6: *The only way is to accept and overcome the setbacks by using my initiative.*

In the FGD, the participants narrated,

> FGDX6: *We accept the challenges because they are not killing, but widening our minds to think and move forward.*

In making more practices, the participants narrated,

> FGDB4: *Practice makes perfect when we practice moving from one point to another through guides, white canes, and the general symbols, both the landmarks and clues, make it easy to capture the places that we usually move to*.

Students with VI used landmarks to master the environment to build the capability to utilize O&M skills in moving independently in places with fewer obstacles and around the hostels. Although the participants reported lack of clear landmarks, they utilized the available ones to assist them in moving. From the findings, students with VI desired to move independently despite the barriers encountered. The participants disclosed that they tried to master the environment by practicing more to cope with the university environment and avoid falling and reducing nervousness, although they took time. Students with VI knew that resolving the setbacks and making the environment inclusive takes time. Thus, they accepted their condition and some challenges encountered as the best way to attain their goals. Accordingly, the negative perception and being untrusted were perceived as part of their life, which made them continue moving,

knowing nothing could be changed. Self-acceptance, perseverance and self-confidence created positive thinking among students with VI in utilizing O&M skills. This is in line with Bhalalusesa [1] who revealed that strong self-acceptance and strong motivation to succeed made students with VI cope with the challenges encountered in their universities.

Social support and awareness strategy

Another strategy revealed was to create social support and build awareness among sighted students due to their negative perceptions of students with VI. The participants claimed to demonstrate their ability by performing various activities that sighted students could not believe blind students could perform. Three subthemes emerged, including building relationships, raising awareness and reporting the challenges to the administrators. Below are the participants' excerpts.

In broadening the relationship, the participant narrated,

> SWVIB5: *I tried to have many friends in case my guide has anything, someone else has to guide me.*
> SWVIX5: *I have good relationships with many people. When the guide is unavailable, I call any friend and they assist.*

In building the awareness, participants said,

> SWVIY2: *Some have never seen or lived with blind people, meaning they saw them in the university …. So, I use that chance to build awareness in them, and they become good ambassadors to other people. Some are aware, but we still need more efforts.*

Although the universities tried to build a support system (the guides) for students with VI still it was not enough, as some were not students. This made students with VI build strong networks and relationships with their friends, to get help from their friends in the absence of guides.

Further, students with VI used an opportunity to build awareness among their sighted friends to remove their doubt and change their mind about students with VI by doing things that seemed difficult to them, like fetching water, arranging their rooms and even participating fully in the class and group discussions. Bhalalusesa [1] observed that students with VI seek help from their friends and classmates through their efforts to ensure they are supported every time they require. Literature demonstrates that students with inadequate O&M have reduced socialization and interaction skills [2], [8], [35], [36]. Thus, making friendships and building awareness enable them to improve their socialization and interaction skills.

CONCLUSION

The study explored Strategies to Address Orientation and Mobility Challenges Encountered by Students with Visual Impairment in Higher Education in Tanzania. Based on the findings, students with VI encounter environmental, personal and social challenges in applying O&M skills. The complexity of the university environments, unsupportive infrastructure, unfavorable road/route conditions, and lack of O&M training contributed to the failure to utilize O&M skills to navigate the university environment. Further, extreme anxiety, hitting and falling reduced the resilience of initiating independent movement among university students with VI. The absence of clear landmarks, lack of Orientation when students with VI report to the university, and untrained guides hindered the utilization of O&M skills among students with VI.

Regardless of the setbacks, students with VI employed various strategies to overcome the challenges encountered, including self-development and resilience strategies, safety and weather adaptation strategies, social support and awareness strategies and utilizing the mobility techniques ensured students with VI navigate the university environment. Further, the tricycles were crucial in saving time and avoiding delays for students to attend classes and other essential places. Students with VI perceived the negative perception of being untrusted as part of their lives, and continued moving. Self-acceptance, perseverance, and self-confidence, among other strategies, created positive thinking among students with VI when using O&M skills in the university environment.

Based on the findings, the following recommendations were made. Firstly, to reduce environmental challenges, the universities should continue to build and modify the infrastructure by considering the inclusivity of students with VI, to allow equal access to the university learning place and environment at large. Secondly,

although the universities raise awareness among the university members, it is recommended that more efforts should be invested in providing seminars and building awareness about students with VI, their O&M and abilities to foster a positive perception and offer assistance to students with VI whenever possible. Thirdly, due to a lack of clear landmarks, the universities should build clear landmarks to easily identify the directions and mobility of students with VI around the university. Fourthly, inaccessibility of orientation when students with VI report to the university, it is recommended that the offices responsible for students with VI should orient students with VI to the university environment soon, they report to the university for the first time.

ACKNOWLEDGEMENT

Special thanks to all the participants who contributed and shared the information during this study. I am grateful to my supervisors for their boundless support to ensure this study is successful. I am forever grateful.

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