The White Cane Technique: a Skill for Reducing Mobility Dependence for Student With Visual Impairment

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Research Article

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Abstract

This study was an action research to improve the orientation and mobility skills of a level 100 student with visual impairment at Wesley College of Education, Kumasi, Ghana. The data was collected through the use of interviews and observations. The sample size for the study was one (1) level 100 student with visual impairment. Data collected for the study was represented on tables and descriptively analysed. The results from the interventional strategies revealed an improvement in the performance of the student based on the skills he was taken through. The problem of fine motor skills which were pre-requisite skills needed for the use of the white cane was addressed after the visually impaired student was taken carefully through the selected activities. The study finally outlined some measures needed to overcome the problem identified on the student and recommended some important measures in training visually impaired persons to be able to move.

INTRODUCTION

A major problem facing people with visual problems especially the blind around the world is the inability to move from one place to another (Ocloo, 2003). This means that individuals with low vision and blindness are unable to orientate themselves to other people or objects in their environment simply because they do not understand their own relative position in space. According to World Health Organization (2004) as cited in Avoke (2005), over 40 million people in the world are blind, and over 120 million people have significant low vision conditions that cannot be corrected, cured or treated by conventional refraction, medicine or surgery which affect their physical locomotion especially the blind. This number is expected to double by the year 2025. This depicts the movement challenges that will prevail around the world during the said year.

Ghana as a nation has numerous people who have visual impairment that have challenges in orientation and mobility skills. Wesley College of Education, Kumasi in particular has few students with visual impairment that exhibit these problems which one of the students’ condition really demands early orientation and mobility training. Severe visual impairment students have immediate challenge such as getting to and from school, to and from transportation sites, and to and from indoor areas like dormitory, lockers and others. Such persons may be unable to engage themselves with other people or objects in their environment simply because they cannot see them, and therefore will not understand their own relative position in space. Again, they may be unable to move in the right direction and may fear getting accidents and injured, so they attempt to restrict their movements in order to protect themselves.

A visually impaired person needs training in some skills to compensate for the effect of vision loss in order to function independently in society. These skills are called compensatory or adaptive skills (Hallaman and Kauffman, 2013). On the contrary, the skills mentioned are learnt by the sighted persons through observation, imitation or incidental learning. Inferring from above, it is not disputed that orientation and mobility are very vital issues and form part and parcel of man's life since its contribution to his survival cannot be underestimated. It indicates that, the quest for man's survival and actualization
of his aims, goals and objectives demand utmost skill and grace in physical movement in order to undertake the never-ending tasks from one place to another, near to far so that he can accomplish them in terms of satisfying basic needs and insatiable wants (Hulme, 1981). It is in view of this that the researcher has chosen to improve the orientation and mobility skills of a visually impaired student through the use of white cane technique to facilitate independent living.

**Diagnosis**

Having observed the movement of the student under study, it became clear that he always move with sighted guides. Upon further observation, it was realised that this student could not move about freely without a sighted colleague.

**Evidence of the problem**

During the orientation programme organized for the fresh students of 2021/2022 academic year, the researcher observed that a level 100 student had a challenge with orientation and mobility as he could not find his way out of the socialization ground to the hall of residence as other friends who were visually impaired went straight to their halls exhibiting orientation and mobility skills. He bumped into people and objects arranged around the socialization grounds. In the lecture halls also, the researcher observed that he also bumped into benches and tables. This student was assisted to sit down. On another day, the same student fell into a gutter and had severe bruises on the legs as a result of crossing the gutter to the school canteen.

This attracted the attention of the researcher to observe this particular student at any time. A continuous vigilance on him indicated that this student had problem with orientation and mobility skills as a result of the severe visual impairment imposed on him. This student falls into gutters on campus, bumps into furniture and other objects, walks into his own friends and also lost his way whenever he goes for social gatherings such as church service and others.

**Statement of problem**

A level 100 student with visual impairment at Wesley College of Education, Kumasi had various challenges in orientation and mobility skills when observed for a few months he had spent as a student in the College. He was not able to move to the places such as the classrooms, assemble hall, dormitories and school canteen alone. He easily falls into gutters when crossing the road in the College premises and gets bruises. He always bumps into people during social gatherings and gets confuse at times. At times he just bumps into trees and branches on the Campus.

**Research question**

The following questions were used to guide the direction and scope of the study.

To what extent will the use of long cane /white cane help to improve the orientation and mobility skills of the visually impaired student at Wesley College of Education, Kumasi?
LITERATURE REVIEW

The concept of orientation and mobility

According to Olcoo (2003), orientation and mobility skills are processes of using the remaining senses to establish one's position in relation to all other significance objects in the environment. Mutuelle and Odeku (2013), stated that mobility and orientation means the degree of free, unaided movement that a person achieved in the performance of day to day activities. Skellenger and Sapp (2015), also noted that mobility is a capacity or facility of movement and it has two components. One is mental orientation and the other is physical locomotion. Orientation and mobility therefore is knowing where you are and the ability to get to where you want to go. Orientation and mobility is different for each student as the instruction is tailored to meet their specific needs and desires. It is a profession which focuses on instructing individuals who are blind or visually impaired to safely and effectively travel through their environment. For a student who is visually impaired and may have additional disabilities, orientation and mobility happens in every moment of the day as he explores and interacts with the physical world. Sensory awareness allows students who cannot control their surroundings visually to access information through hearing, touch or smell (Avoke, 2004).

Moreover, orientation and mobility is a key component of the expanded core curriculum which integrates essential life skills into the education of students who are visually impaired and may have additional disabilities. According to Ferrell (2007), these foundational skills including social interactions, independent living and alternate communication needs such as braille require orientation and mobility skills. For a blind person, competency in developing an awareness of his surroundings is a result of concentration and practice over a period of training. Orientation and mobility skills follow a sequential process in which visually impaired individuals are taught to utilise their remaining senses to determine their position within their environment and to negotiate safe movement from one place to another. According to Olukotun (2005), competency plays a key role in the person's psychological self-concept and self-esteem and for that matter the skill of orientation and mobility is essential to the visually impaired person who wishes to complement his mobility skills. It is believed that visually impaired individuals often have lived sheltered lives and their exposure to various environmental situations has been quite limited.

D’andrea and Presley (2007) remarked that mobility, when used in reference to the blind means the degree of free unaided movement that a person has achieved in the course of his/her model daily routine. He elaborated that mobility implies a good, methodological sense of discretion, smooth, well co-ordinate movements and concise, clear cut-actions that denote confidence. Orientation and mobility and related skills such as time, money, shopping, communication and social skills are combined in exciting ways both in individual and group travel to build confidence and enable students to participate as fully as possible in community activities with their school mates and families.
How orientation and mobility skills help children with visual impairment

According to Scholl (1986), orientation and mobility skills help the visually impaired in psychological, physical, social, daily living skills and economic aspects.

1. **Psychological**: Orientation and mobility skills contribute positively to one’s self-concept. The idea of being able to move efficiently and independently in various environments enhances not only self-esteem but also self-confidence.

2. **Physical**: Since orientation and mobility involves movement in space, the body is exercised in the process. Both gross motor skills, eg. Walking and fine motor skills, e.g. using a cane are continually taught and reinforced throughout the orientation and mobility process.

3. **Social**: Possessing good orientation and mobility skills creates more social opportunities for the individual. One who does not possess good orientation and mobility skills is restricted (socially) in the amount, diversity, and spontaneity of social encounters.

4. **Economic**: Having good orientation and mobility skills helps one economically from two perspectives. First, being mobile should create more employment opportunities for the individual. Secondly, the options to walk or use public transportation systems versus using a taxi to get to somewhere certainly should save the individual money.

Olukotun (2003) noted that orientation and mobility skills provide the visually impaired child with the ability to know where he is going, and convert use of environmental clues to get there. Orientation and mobility involves teaching or training the visually impaired on the use of mobility aids for independent travels. In addition, orientation and mobility techniques enable the child with visual impairment to know sound localization skills eg. determining where a vehicle is coming from or going, and also to determine whether footsteps are coming towards him or her. The child could also determine the location of the doorways through sound produced by the door when opening or closing. Sound localization equally enables the blind child to face the individual he/she is talking to and ascertain his or her height.

**Mobility techniques available for training children with visual impairment in acquisition of mobility skills**

According to Olukotun (2003), the major basic techniques available to help the visually impaired in the acquisition of orientation and mobility skills are the sighted guide technique, dog guide technique, electronic travel aids technique and long cane technique. The dog guide technique is where the dog has been trained very well and offers the blind an opportunity of independent travel when the dog is instructed regarding the route to follow and the yarns to made at the corners (Nasiforo, 2015). The dogs are generally trained separately for some period of about three (3) months to perform these functions. One major disadvantage of dog guide technique is that the dog can fall ill at any time or even die (Scholl, 1986). Dogs guide are also expensive.
Moreover, the sighted guide technique is where a sighted person moves with the visually impaired individual to wherever he/she wants to go. Also, skills that enable a visually impaired to travel with the sighted person are called sighted guide skills (Nasiforo, 2015). The sighted guide skills can also be used in combination with other mobility systems such as the cane and dog guide. According to Nasiforo, (2015) when the sighted guide techniques are used correctly with proficient sighted guide, travel is safe and efficient. On the contrary, many sighted persons are not knowledgeable on how to guide visually impaired persons. Sighted guide technique used as the only mobility system may foster dependency rather than independence. Some handicapped travelers may not pay attention to environmental information and orientation when travelling with a sighted guide.

According to Abang (2005), an electronic travel aids technique may be described as a device that sends out signals to sense the environment within a certain range or distance, processes the information received, and furnishes the user with certain relevant bits of this information about the immediate environment. This technique allows the visually impaired to sense the dangers ahead but they are really expensive and scarce which when relied on for the training of orientation and mobility skills to the visually impaired will pose a problem especially in Ghana as a whole and Wesley College of Education, Kumasi in particular.

**The white cane and how it helps to improve the orientation and mobility skills of the visually impaired**

**The white cane**

There are several types of cane available for visually impaired travellers. There are various orthopedic canes, folding canes and long canes. The long cane is also known as the white cane because the colour from the tip to the edge of the handle is white. The handle is painted red. This is for easily identification. Deverell, Taylor and Prentice (2009), also added that most long canes used today are made from aluminum, have a rubber grip, a nylon lip, and a crook. Although the use of long cane started from the United State of America in the centre for the war-blinded ex-servicemen during and after second world war (middle-late 1940s), it was only as recently in 1965 that the first attempts were made to introduce the system of using long cane for independent travels by the blind in England.

The system is based on developing the fullest use of the senses to maintain maximum intimacy with the environment and to secure skills in using the long cane (Arslantekin, 2015). The cane is employed to explore the ground immediately ahead and to protect the blind user against hazards and obstacles. The size and height of the long cane depends upon the age and height of the individual (Schroeder, 2008). The cane is smart and distinctive in appearance. It is made up of aluminium and is strong, light and sensitive. When held vertically, it reaches generally form the ground to the base of the breast bone. It has replaceable nylon tip at one end, and at the other a rubber grip for comfort of handling. Its use is adapted to the circumstances but normally the visually impaired person holds the cane in front of the middle of the body, moving the tip so as to touch the ground lightly ahead of the near foot.
Hallahan and Kauffman (2012) opined that the long cane is the most effective and efficient mobility aid for the visually impaired and for that reason, it should be good conductivity, durable, light weight, low cost, strength and resilience, easy reparable, easy availability and also meet the specific length requirements. According to Rosen (2010), cited in Hallaman and Kauffman (2013), most long canes require no accessories and virtually no maintenance except occasional replacement if a worn tip. The cane can be accommodated to most users’ physical specifications and in some instances, their disabilities.

**The use of the white cane**

According to Attia and asamoah (2020), one of the most common systems of orientation and mobility is the use of the long cane for independent travel. Students who are visually impaired and use a long cane must learn variety of techniques in order to travel efficiently and safely. They stated that there are two most widely used cane techniques which are ‘touch technique’ and ‘diagonal technique’.

**Touch technique**

It is a method of walking with a cane that has been developed for use by blind persons. In it, wrist revolution moves the cane's tip in a sweeping motion, causing it to contact the ground at a point just parallel to the outside of each shoulder. During walking, correct rhythm manipulation times each sweep of the cane so that the cane and the heel of the foot on the opposite side of the body contacts the walking surface in unison (Scott, 2015). Variations of the touch techniques for increasing drop-off include touch-and-slide skills in which the cane is allowed to slide a few inches along the surface after the contact. Another technique here is the touch-and-drag skills in which alternate cane sweeps are dragged across the surface. The constant-contact skill is also utilized in which the sweeping cane is dragged across the surface without being lifted off the surface at all. The rationale behind the touch technique is for the traveler to clear the area with the cane for his next step.

**Diagonal technique**

This is where the cane is held in a stationary position diagonally across the body with the tip just above the ground at a point outside one shoulder and the handle extended to a point outside the other shoulder. This technique is used in familiar controlled environment or by those with low vision because the reaction time provided for changes in depth (e.g. stairs or curbs) is very short (Scholl, 1986). The instruction of orientation and mobility to the visually impaired has been elaborated when Penrod (2012), stated that when teaching the diagonal technique, the cane is held diagonally across the body so as to act like a “bumper”. The technique provides advance warning of low objects and can be thought of as an extension of the hand and forearm.

Scott (2015), added that the traveler does not “tap” the cane but sweeps it lightly in an arc while walking to gain information about the path ahead. According to Olukotun (2003), the purpose of diagonal technique is to enable the user travel independently primarily in a familiar environment with some degree of protection. For instance, the technique can be used in the room, inside the bus, approaching a group of
people within a building etc. He further stated that in using the diagonal technique, the hand is positioned on the grip of the long cane so that the back of the hand faces up and the fingers flexes around the grip.

**Reasons for using the long cane**

The use of the long cane has many reasons for improving the orientation and mobility skills of the visually impaired. The facts are listed below; (Chen, 2012)

1. It is a bumper. It contacts things that are in direct path of travel.
2. It is also a probe. An extension of the sense of touch.
3. The long cane can finds, verifies and discriminates landmarks and thus aids in orientation.
4. It helps establish the line of direction of travel (it can trail a straight edge or square off)
5. As the cane contacts things, it motivates children to explore
6. The cane identifies the blind traveler
7. The cane freezes turning cars and put drivers on alert when it moves into a street before the blind traveler.
8. The cane is an echo location device
9. The use of the cane fosters (and is a symbol of) independence.
10. The long cane allows the visually impaired or traveler to move faster.
11. A well-used cane is a vision substitution system; it replaces optical perceptual flow with tactual perceptual flow.
12. The cane detects drop offs. It is able to detect steps, manholes, gutters and curbs.

**METHODOLOGY**

**Research design**

A quasi-experimental research design was used for this action research. This design was used because the researcher identified specific challenges of a level 100 student with visual impairment and intended to use some specific orientation and mobility technique to improve his skills in it. According to Avoke (2005), this type of design gives the teacher, the skills needed to work on specific problem in their classrooms and schools. By using an actual research procedure, researching teachers can resolve their own teaching challenges.

**Population and Sample**

The total population for the research was made up of 11 visually impaired students at Wesley College of Education, Kumasi. The sample for the study was made up of one (1) level 100 student with visual impairment at Wesley College of Education, Kumasi.

**Sampling technique**
Purposive sampling technique was used in selecting the student because of the unique needs or characteristics exhibited. Cohen, Manion and Morrison (2003), cited in Avoke (2005), stated that in purposive sampling, the researcher handpicks the cases to be included in the sample on the basis of the judgment of the typicality. It is based on this, that the researcher used purposive sampling technique.

**Instrumentation**

The instrument used for this study was observation. Observation is an instrument that allows the researcher the opportunity of looking at what is happening or taking place. Eshun and Effrim (2007) explained observation as a systematic examination, noting or conscious attention to a child, setting, programme or situation for the purpose of gathering information on which to base a judgement, make a recommendation or develop a plan or strategy. It is also a method of data collection that employs vision as its main means of data collection.

**Data collection procedure**

The researcher spent four weeks to observe the student's performance in relation to orientation and mobility skills. The researcher collected data before and during intervention to the end of the research. The student in question was observed at lectures, at social gatherings such as departmental meetings and church service with regard to his orientation and mobility training on campus. This was done to enable the researcher compare results from beginning to the end of the intervention. The researcher observed the student to gather information on the progress of the use of the white cane or long cane to improve the orientation and mobility skills of the student.

**Intervention and implementation**

**First week**

The researcher designed an interventional schedule to help the student with difficult in orientation and mobility at Wesley College of Education, Kumasi. This was to enable him to overcome the difficulty he was faced with. This interventional programme was meant to enhance the relevant fine motor skills of the student to enable him go through cane techniques of mobility training successfully. The researcher planned five (5) months or twenty (20) weeks programme for the student. This programme was put into two phases. The first phase dealt with activities which enhanced the student’s fine motor skills which were pre-requisite skills for training of long cane or white cane techniques. The student was introduced to activities to develop fine motor skills for manipulation which enabled the researcher to assess the degree of his exhibition of fine motor skills. The student was assessed in areas such as rotary motion, grasppalmer, hand-finger strength and finger isolation. The student was then introduced to the use of pair of scissors. The assessment was done to enable the researcher compare results before and after intervention. This was done in the first quarter of the first phase of the programme. The scheduled days were three times a week.

**Second and third week**
In the second and third week, the student was introduced to handling and squeezing of toys. Using the principle of learning by doing and concreteness of experience the student was helped to undergo some difficulty activity. The activity was changed from squeezing of toys to play with the help of the researcher. The student was provided with containers with objects in them to pick out. The student continuously performed this activity throughout the said weeks with guidance from the researcher.

**Fourth and fifth week**

The fourth and fifth week was on activities with the thumb and fingers, and finger isolation. Papers and pieces of unwanted clothes were provided which the student cut using a pair of scissors with guidance from the researcher. This exercise was faced with some difficulties as the student found it difficult to pull the thumb and the fingers together to hold the paper. But with sometime and constant practice (over-learning), he performed the task satisfactory. The student was engaged in rotary motion and with the hand. The student was taken around the lecture halls and his hall of residence to turn the knobs of the doors continuously. He was later introduced to scooping of sand. The student was assisted to scoop and create holes in a heap of sand. This helped to develop the wrist to move with stable arm. He was then provided with hard paper such as Braille sheet to crumple. The papers were folded and he was asked to crumple them. The student was introduced to the use of the stapler. The researcher guided the student and held the stapler in hand using hand-over-hand technique to staple rough paper. But I would hasten to state here that, the student was not totally handicapped in fine motor skills before the intervention.

**Sixth and seventh week**

Souerburger (2008) suggests seven (7) stages of learning to use the cane. The researcher followed these stages as a guide in implementing the second phase of the intervention.

**Stage one (1): The grip and hand position**

The student was introduced to the grip of the cane with the thumb on the front of the top of the handle while the forefinger was fully extended. The second finger was curled behind to support the cane. The researcher then helped the student to relax the other fingers whiles the elbow was slightly bent near the body. The student was helped to place the hand holding the cane in line with the middle of the body and in front of his navel centered in front. At this stage, the student just began to understand how to grip, hold and position the hand with the cane. He practiced it continuously throughout the two weeks.

**Eighth and ninth week**

**Stage two (2): using the cane and the arc**

The researcher encouraged the student to bring the hand holding the cane in line with the middle of the body to make a correct arc by touching the tip of the cane on the ground a little wider than the width of the student’s body. The student did it repeatedly with the guidance from the researcher.

**Tenth and eleventh week**
Stage three (3): instep and rhythm

The researcher taught the student to simultaneously extend one of the feet forward and move the cane in the reverse. For example, as the left foot steps forward, the cane moves to the right and as the right foot comes forward, the cane goes to the left. The student was asked by the researcher to practice it repeatedly. The student was taught to lift the cane tip just clear of the ground as it traverses between two points of contact. He moved the cane back and forth at a steady speed which was accompanied by positive reinforcement. He did it repeatedly.

Twelfth week

Stage four (4): shore lining

The student was taken to the block (C) of Wesley College of Education, Kumasi, Ghana to use its lengthy wall for this activity. The student was taught to swing the cane to touch the wall and swing it back to the other side as he walks in a straight manner. The cane hits the wall lightly on one side of the arc and ground on the other side. He was guided to practice this for several times.

Thirteenth week

Stage five (5): Touch technique

The researcher guided the student to employ the wrist revolution to move the cane’s tip in a sweeping motion, causing it to contact the ground at a point just parallel to the outside of each shoulder. During walking, the student was taught correct rhythm and manipulation of the cane so that the cane and the heel of the foot on the opposite side of the body contact the walking surface in unison. The student did it repeatedly. The rationale behind the touch technique is for the student to clear the area with the cane for his next step.

Fourteenth week

Stage six (6): Diagonal technique

The student was guided by the researcher to hold the cane in a stationary position diagonally across the body with the tip just above the ground at a point outside one shoulder and the handle extended to a point outside the other shoulder. This activity was practiced on the dormitory veranda in front of his room to the bathhouse. This skill is used in familiar controlled environment because the reaction time provided for changes in depth (e.g. stairs or curbs) is very short and the cane serves as a bumper to give advance warning of low objects or obstacles. With words of encouragement he practiced it repeatedly with success.

Fifteenth, sixteenth and seventeenth week

Stage seven (7): Concentration required
At this stage, the student tried to put all the skills learnt in all the stages together. The student needed a lot of concentration to use the cane correctly. He was easily distracted with anything such as a question and other tasks and the cane would not provide full coverage and safety for the student. As he brought his right foot forward, the cane swung to the left side of the body. The touch of his foot and tap of the cane on the ground occurred at the same time. The researcher later taught the student to hold the cane across the body diagonally intermittently to integrate the diagonal and touch techniques. But the student was cautioned to use the diagonal technique in familiar environments and indoors. Little by little and with a lot of practice, the student soon began to coordinate his footsteps and swung the cane in a steady rhythm.

However, the researcher was encouraged with the level of progress in developing the student's mobility skills. This particular stage lasted for three weeks because the student was given enough time to practice. **Eighteenth, nineteenth and twentieth week**

**A lot of practices and corrections on what is taught**

In this stage, the student was given a lot of practice; hence the cane became a natural part of the student and could move it correctly even when he was distracted. Now the cane was able to provide him with protection and information in most circumstances. He observed as he moved along major and minor routes noticing important landmarks such as potholes and gutters. However, it was noticed that the student occasionally trip or fall because there were situations where he continued to move forward after his cane dropped down over a step or curb or made contact with an obstacle he did not expect. In view of this he was made to understand that, the cane must always be used for its intended purpose by exploring properly. With this in mind, the student was now able to move around on himself which made him happy, although he had not gotten the hand perfection well. He used the cane to trail landmarks such as gutters, short cemented bumpers and pavements for direction. In this stage, the student had reached proficiency. He always moved the cane correctly and noticed when the cane dropped over an edge or contacted an obstacle, even when he was not expecting it, distracted or when the ground looked flat and clear. A post intervention assessment was made on the student's progress in the use of the white cane or long cane techniques. He was observed as he moved to the lecture halls, social grounds and places of convenience other than places on the College campus. The results of this post intervention evaluation were later analyzed. It was observed that at this stage, the mobility learnt provided the student with reliable protection in situations. The student himself was happy because he realized he had made head way in his activities. Three weeks duration was spent here which gave the student ample time for over learning. **DATA ANALYSIS AND DISCUSSION**

Data collection from the study was represented on tables and descriptively analysed. The analysis was made based on the research question that was raised for the study. Analysis of data was based on the various observations made by the researcher before, during and after implementation of the intervention.
measures. The areas of concentration were handling of the long cane, swinging in an arc, rhythm with the feet and the tip of the cane of two inch above the ground.

**Results and findings**

Table 1

<table>
<thead>
<tr>
<th>Observational guide skills</th>
<th>Marks out of 25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handling the long cane with hand centered in front of the body.</td>
<td>9</td>
</tr>
<tr>
<td>Swinging the long cane in an arc that is about an inch wider than the person’s body (touch technique)</td>
<td>8</td>
</tr>
<tr>
<td>Swinging the long cane in rhythm with the feet, with the tip always being on the opposite as the forward foot (to keep in step).</td>
<td>9</td>
</tr>
<tr>
<td>The long cane’s tip slide along the ground at each end of the arc and remains not more than an inch or two above the ground (diagonal technique)</td>
<td>7</td>
</tr>
<tr>
<td>Total score</td>
<td>35/100</td>
</tr>
</tbody>
</table>

Table 1 showed the illustration of scores of the student at stage 1 of the first phase of the intervention which sought to facilitate the mobility skills of the student in order to enhance his independent travel.

One, the first observation guide skills that is, handling the long cane with hand centered in front of the body; the student scored 9 out of 25 marks. He was just holding the cane anyhow. The student scored 8 marks out of 25 on the skill; swinging in an arc that is about an inch wider than the person’s body. The fact is that, he was lifting the cane to move forward without swinging it. In the observational guide skill items three (3) and four (4), the student scored 9 and 7 marks out of 25 respectively. The cane’s tip was always on the opposite as the forward foot (to keep instep) and cane’s tip either slide along the ground or touches the ground at each end of the arc and remains not more than an inch or two above the ground. His confidence of moving with the long cane was low thereby increasing fears of walking alone. The total score of the student in the first stage was 35/100. This mark indicated a poor performance in execution of skills of long cane technique.
Table 2
Scores on student’s performance in using the white cane during and after intervention

<table>
<thead>
<tr>
<th>Observational guide skills</th>
<th>(stage 2) Learning Stage Marks out of 25</th>
<th>(stage 3) After intervention Marks out of 25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handling the long cane with hand centered in front of the body.</td>
<td>18</td>
<td>23</td>
</tr>
<tr>
<td>Swinging the long cane in an arc that is about an inch wider than the person's body (touch technique)</td>
<td>17</td>
<td>22</td>
</tr>
<tr>
<td>Swinging the cane in rhythm with the feet, with the tip always being on the opposite as the forward foot (to keep instep).</td>
<td>20</td>
<td>24</td>
</tr>
<tr>
<td>The long cane’s tip slide along the ground at each end of the arc and remains not more than an inch or two above the ground (diagonal technique)</td>
<td>19</td>
<td>22</td>
</tr>
<tr>
<td>Total Score</td>
<td>74/100</td>
<td>91/100</td>
</tr>
</tbody>
</table>

The Table 2 is an outlay of scores on the performance of the student as he was observed in executing required skills in cane mobility. At stage 2 the student was expected to move the cane correctly. He scored 18 marks out of 25 on skill one (1), that is, handling the cane with hand centered in front of the body. He had 17 marks out of 25 on skill two (2), that is, swinging the long cane in an arc that is about an inch wider than the person’s body. He also scored 20 marks out of 25 on swinging the cane in rhythm with the feet, with the tip always being on the opposite of the forward foot (to keep instep). The student again scored 19 marks out of the 25 as he slides the cane’s tip along the ground or touched the ground at each end of the arc and remained not more than an inch or two above the ground. This brought the total score of marks to 74/100. His confidence level was improved as he moved with the long cane.

Discussion of Result

Inferring from the table, the results show a good and progressive improvement in the performance of the student especially in the touch and diagonal techniques. According to Olukotun (2003), the purpose of diagonal technique is to enable the user travel independently primarily in a familiar environment with some degree of protection. The total mark was remarkable as compared to that of stage one (1) of the phase one of the intervention.

According to Attia and asamoah (2020), one of the most common systems of orientation and mobility is the use of the long cane for independent travel. Students who are visually impaired and use a long cane must learn variety of techniques in order to travel efficiently and safely. Findings from Table 2 of stage
three (3) indicate the final lap. The cane was required to reliably provide information and protection to the user. The performance of the student improved immensely having taken the marks he scored into consideration. On skill one (1) which was the handling of the long cane with hand centered in front of the body, he had 23 marks out of 25. This is consistent with the assertion of Scott, (2015) who stated that wrist revolution moves the cane's tip in a sweeping motion, causing it to contact the ground at a point just parallel to the outside of each shoulder. During walking, correct rhythm manipulation times each sweep of the cane so that the cane and the heel of the foot on the opposite side of the body contacts the walking surface in unison.

On skill two (2), the student scored 22 marks out of 25 on swinging of cane in an arc that is about an inch wider than the person's body. This prevented the student from bumping into objects. The student scored 24 marks for skill three (3) which was keeping instep as he swings the cane rhythmically with the feet, with the tip always being on the opposite of the foot that is moved forward. Finally, he got 22 marks out of 25 on skill four (4) which talked at the cane's tip touching each end of the arc and remained not more than an inch or two above the ground. The student's total score was 91/100. It was an indication that the student had improved upon his task hugely. His confidence level was excellent as he moved the long cane thereby reduced fears to move alone with the long cane. This was what the student did as buttressed by Sauerburger (2008), that when correctly used, the cane searches the ground ahead of each step. It warns the user of obstacles and drop-offs and informs him of what is in front of him. According to the researcher, the performance after the intervention was an excellent one and answers all the research questions raised.

**SUMMARY OF FINDINGS, RECOMMENDATION AND CONCLUSION**

**Summary of findings**

The results of the interventional strategies proved a steady improvement in the performance of the student based on the skills he was taken through. The challenge of fine motor skills which were prerequisite skills to learn the use of the long cane techniques of mobility skills was addressed after the visually impaired student was taken carefully through the selected activities.

The main purpose of the study was to improve the mobility skills of the visually impaired student using long cane technique. The student was taken through mobility training activities for five (5) months period. It was observed that the long cane technique actually helped the student as he could now move about on his own gracefully and safely to a very large extent. The results of the second phase of the intervention pointed out that the student now uses the long cane satisfactorily to find his way out both in school premises and other places he finds himself. He easily identifies obstacles on his way and drop offs when moving with the long cane.

**Conclusion**
The researcher would like to point out that the use of the long cane technique is one of the effective systems put in place to reduce to a very large extent the restrictions the visually impaired is faced with in terms of mobility. The researcher thereby urges orientation and mobility instructors to employ the diagonal and touch techniques to teach the visually impaired persons in using the long cane to move. Instructors should also be flexible and approachable in teaching orientation and mobility to the visually impaired students to secure their trust.

**Recommendation**

Based on the findings of the study, it is recommended that orientation and mobility instructors need to be trained and posted to schools and rehabilitation centres where their services are needed to provide expertise in training the visually impaired to ameliorate the restrictions that the visual impairments pose to them especially in orientation and mobility.

It is also necessary to recommend that educational authorities and special educators intensify their supervisory role for training of the visually impaired in mobility skills in special schools and rehabilitation centres. Also, schools for the blind need to pay special attention to the training of visually impaired in fine motor skills especially those who are congenitally blind and had limited access to manipulation of objects. Parents should ensure to give support services to their visually impaired wards by consciously and continuously engaging them in purposeful activities to enhance their fine and gross motor skills. Any inclusive schools that have visually impaired students should have orientation and mobility instructors to aid their movement in such school premises.

**Declarations**

Institutional Review Board-UEW gave clearance for the conduct of the study (UEWIRB/09/01/23) and introductory letter from the faculty of education, UEW, before the study was carried out. The nature and purpose of the study was explained to participants and only participants whose consent were given were part of the study and their signatures to the consent forms were recruited. The privacy of the students was assured by making students use their index numbers instead of their names.

**References**


