Wayfinding learning techniques and its challenges: a case study at Malaysian association for the blind (MAB)

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Article Info	ABSTRACT
	Navigating safely in the real environment especially in the outdoor setting requires a blind person to be equipped with the spatial knowledge and possess the skills in mobility and orientation. The aims of this study are to investigate the existing wayfinding learning techniques taught to blind people and to identify the challenges during the teaching and learning processes. A two days of observation during a mobility practical session was conducted at Malaysian Association for the Blind (MAB). The first objective was to explore the current techniques used by mobility instructor to teach visually impaired students for a wayfinding and second, to identify the challenges faced by the mobility instructor and the visually impaired students in the teaching and learning processes of wayfinding. The study discovered that the major problem faced by the mobility instructor was with the lack of teaching aids to describe a new environment to visually impaired students. This leads to the lack of time that caused the visually impaired students perceived insufficient information which was hard for them to construct the intended cognitive maps. From the findings, this paper concludes by discussing the recommendations primarily on the use of technology in addressing the problems identified in this study.

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1. INTRODUCTION

Wayfinding can be defined as the ability of an individual to learn a route which includes encoding the information perceived, processing and retrieve the information from memory [1, 2]. In addition, performing a wayfinding also includes the process of planning and making decision to reach a destination [3]. With the absence of vision, performing a wayfinding in the real environment especially in the outdoor setting can be cumbersome [4]. People with visual impairment in particular the blind people need to rely on other senses, for instance, touch and hearing, to perceive information about their surrounding [1, 5]. For a safe and successful wayfinding to be achieved, the internal representation or cognitive map of a place needs to be formed [6]. The development of the cognitive map of blind people depends on the exposure of the information that best described the place (e.g. landmarks that available, directions between places, type of environment) [7-10]. The development of the cognitive map happens in stages [11] but the initial development occurred at the preparation phase that is before the wayfinding activity takes place. The preparation phase is crucial to provide the blind people with advanced information that describe the environment because by learning the features on the map, they can gradually perceived the configurational knowledge [1]. At this stage, they can then learn direction between places after they have acknowledge of the features that represent the place. There are two methods in acquiring knowledge of a place; direct exploration

in the environment and through secondary source (e.g. maps, books, verbal description, modelling, drawing) [1, 12]. These methods can be used in preparing blind people to get advanced information at the preparation phase. However, the use of maps has been recommended in preparing blind people for wayfinding after comparing the map use with other mobility aids, such as, verbal description and direct exploration in the environment [8, 13]. The map use at preparation phase has more advantages in providing blind people with almost a complete representation of a place [8]. Despite of the advantages of maps, the use of maps is not included in the Mobility and Orientation training curriculum in Malaysia.

Therefore, in order to understand the actual learning process of wayfinding is being done, a study has been conducted at Malaysian Association for the Blind (MAB), Brickfields, Kuala Lumpur. The objectives of this study are; 1) to investigate how learning techniques of wayfinding for visually impaired students is being conducted at MAB and 2) to identify the challenges of the existing learning techniques on the learning and teaching processes face by the visually impaired students and the mobility instructor.

2.   RESEARCH METHOD

The aim of this study is to understand how learning techniques of wayfinding for visually impaired students at MAB is being conducted. The investigation has been conducted qualitatively that is using observation method. The observation was performed during a two-hours mobility practical session that took place at several places within MAB as well as outside the MAB compound. There were 8 participants (3 males and 5 females) with different sight status (totally blind and moderately impaired) from Mobility and Orientation class who volunteered to participate for the observation session. The students who participated in the observation had various visual impairment history. The visually impaired participants who has some residual vision were requested by the mobility instructor to be blindfolded. The participants age ranges from 18 to 20 years old. They also had different level of travelling experience in the real environment from zero experience to frequent traveller. However, none of the participants were familir with the places involved in the wayfinding task used in this study. The observation session was video recorded for further analysis to get a clear picture on the techniques used in learning wayfinding as well as to understand the challenges face by the visually impaired participants and the mobility instructor.

3.   RESULTS AND DISCUSSION

In this section, the results of the observation on the mobility practical session are presented and discussed as the following.

3.1. Observation on the Mobility Practical Session

During the mobility practical session, the practical activities involved; Activity 1- to prepare the participants with the information of the places that will be involved in the wayfinding task (e.g. landmarks and the directions going to and fro MAB and Tun Sambanthan Monorail Station) and Activity 2- to perform the wayfinding task to the Tun Sambanthan Monorail Station and return back to MAB. The observation of the mobility practical session took place for 2 hours which started from 10 am and ended at 12 pm.

3.1.1. Activity 1: To prepare the participants with the information of the places that will be involved in the wayfinding task

In Activity 1, the mobility instructor introduced the places that will be involved in the wayfinding task which were the MAB and Tun Sambanthan Monorail Station. He explained to the participants that they will be tested individually to go to the Tun Sambanthan Monorail Station from the MAB compound area. The participants will also required to go back to MAB from the monorail station on their own. The mobility instructor explained the direction that they need to follow and the landmarks that they would encounter along the way to the monorail from MAB. At first, the mobility instructor used verbal description to the students of the direction from MAB to the monorail station as well as the landmarks that can be as their reference points. According to the mobility instructor, the preparation phase is important to enable the blind students preparing themselves mentally and physically before going out and performing the wayfinding in the real environment.

The participants were asked by the mobility instructor whether they managed to understand the description of the places and whether they managed to build an internal representation of the places. Some of the participants required the mobility instructor to repeat the description of the direction between the places. At the same time, there was one student who was a totally blind expressed her difficulty in understanding the description provided by the instructor. She explained that she was unable to imagine the place that the instructor had described. Her face showed worrying signs and lack of confidence to perform the task.

As mentioned by the instructor to the researcher, if some students were found unable to understand his description of a place, he would normally switch to informal methods which are not covered by the curricular syllabus to make sure they understand. The methods that he usually used to help the student who faced difficulty are through "palm tracing" or a "back tracing". The tracing method involves drawing the route and landmarks on the specific part of the person's body (e.g. on the palm, at the back, on the hand) using pointy object such as a key or a pen. The aim of this method is to ensure his students can feel the tracing line goes on their skin so that they can acknowledge of their orientation. Besides that, the method also aim to help the students to understand the direction of the route that they need to follow and acknowledge the students with the position of landmarks along the route (Figure 1).

Unfortunately, the tracing approach did not help the blind student to understand well. Thus, the mobility instructor had to use other alternative by connecting several white canes on the floor to represent the path from MAB compound to Tun Sambanthan monorail station (see Figure 2).

Figure 1. A mobility instructor traced the path on a blind student's palm using a key
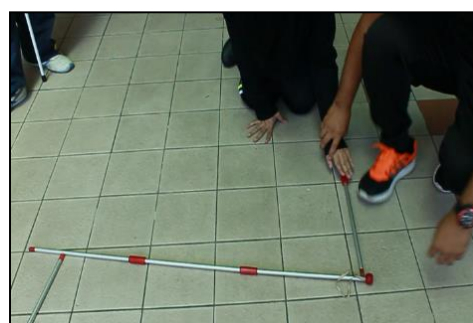

Figure 2. A blind student was assisted by a mobility instructor to touch and followed the structure of the canes that representing the path from MAB to Tun Sambanthan Monorail Station

The student was guided by the mobility instructor to touch and feel the cane while he explained the direction that the student needs to follow. The mobility instructor told the researcher that he will use whatever materials or apparatus that he can get during the teaching process. This is a normal practice use by the mobility instructor to help him to convey the description of a place to his students. He mentioned that it normally takes time for a blind student to understand verbal description of a new place.

After few attempts done by the mobility instructor to explain the direction to the blind student, he asked the student whether she managed to cope with what has been taught to her. However, she replied she was still unable to get a clear picture of the direction from MAB to the monorail station. She mentioned that this made her less confident with herself. The instructor suggested that the student needed to be accompanied by her friend throughout the wayfinding task.

3.1.2. Activity 2: To perform the wayfinding task to the Tun Sambanthan Monorail Station and return back to MAB

After the briefing of the direction and landmarks, the students were asked to start walking from MAB building to Tun Sambanthan Monorail Station. At MAB area, they walked towards the entrance guided by the tactile paving. Before that, the students were told to use their cane and search for tactile paving on the floor. The tactile paving will guide them to the entrance at the compound area. At the compound area, there are carpark for MAB staff and visitors. Students were told to be careful using their white cane when walking otherwise they would accidently hit the body of a car that parked in the compound area.

When they arrived at the entrance of the building, they proceed to go out to Tun Sambanthan Monorail Station according to the direction given by the mobility instructor during the briefing session. Upon their arrival at the 4-junctions, the mobility instructor asked them to stop to brief them about how to cross the road. The mobility instructor explained in details how they should cross the road and when is the best way to cross. The technique that they should use is raising one hand while the other hand holds the white cane and they should walk in that way when crossing (Figure 3). Raising up hands is the symbol to notify other road users that they are crossing the road and by having the white cane, others would recognize that these people are visually impaired.

After the students managed to cross the road safely, they eventually arrived at the Tun Sambanthan Monorail Station. The students were asked to take a 5 minutes break after arriving. After the break, the mobility instructor gave explanation about the monorail station on important information that the students need to know (Figure 4). For example, the location of ticket counter.

Figure 3. Blind students crossed the road while raising their hands up as a notification for other road users to be aware of them

Figure 4. Mobility instructor explained about where to purchase the ticket at the station

After the mobility instructor has finished with the explanation, the students were required to continue their journey back to MAB from the monorail station. The first thing that they need to do is to cross the road as they did before individually. Tactile paving is available along the side walk from the 4-junction towards the entrance of MAB. The students used the tactile paving to guide them to go back to MAB. After a short walk from the monorail station, all students successfully reached the ground floor of the building safe and sound. The observation stopped at this phase. The mobility instructor and the students were thanked for their time, energy and co-operation in helping the researcher to complete the study.

3.2. The Existing Learning Techniques of Wayfinding at MAB

The normal practice in teaching visually impaired students to perform a wayfinding at MAB is to prepare them with the information that are important to facilitate them during the wayfinding. At the preparation phase, a verbal description of the direction to the place and what landmarks they should be referred to during the wayfinding were given by the instructor. The mobility instructor aimed to allow the visually impaired students to form a mental representation of the place and familiar with the landmarks that are available before they go to the place.

As demonstrated by the mobility instructor, if some of the students are unable to form the representation based on the description given, informal methods (which are not covered by the curricular syllabus) would be used (e.g. the tracing method and modelling the places using any objects). The aim of doing this is to enable the students to understand their orientation and facilitate them in memorizing the direction of the route that they required to follow. These methods require the students to use more than one senses to acquire the information that was trying to convey by the instructor. Alternatively, a map can be used to introduce the places and its components to the blind students. However, there was a lack of map use for preparing students in learning their wayfinding. The use of these techniques at the preparation phase leads to several problems faced by the mobility instructor and the students as discussed in the following sections.

3.3. Problems Faced by Mobility Instructor in Teaching Wayfinding

The observation revealed that the mobility instructor faced problems with the existing learning techniques used to teach a wayfinding. The inappropriate teaching aids to teach the visually impaired students for a wayfinding at preparation phase contribute to the main problem. Although the instructor used alternative ways to help the blind student with the formation of their cognitive maps of; 1) the places involved in his description and 2) the direction from MAB to the monorail, using any object that he can easily get, however the information that he intended to convey was difficult to be understood by the blind student especially the inexperienced students. As observed, there were no portable maps that can be used by the mobility instructor to teach his visually impaired students at MAB.

In addition, the mobility instructor also needed to repeat the description of the same place (e.g. landmarks that available, type of environment) or the direction between places which sometimes can be hard for him to ensure that all of his students get the same and accurate information from what has been described.

It can be seen from the observation that the process to make the students understand of what being described especially on landmarks and the direction between places, was very time consuming and cumbersome due to the insufficient teaching aids which is also agreed by the mobility instructor. Due to the delay in the teaching process, such situation sometimes forced the mobility instructor to proceed with the teaching to the next level which will make those who are unable to cope left behind.

3.4. Problems Faced by Blind Students in Learning Wayfinding

The discussion focused on the problems face by the blind students in the observation as they were found having more difficulties compared to other participants who were moderately impaired. There were two different groups of blind students who were having difficulties in learning wayfinding at preparation phase. These students were grouped as new student and experience student. The students were categorized into two groups in order to examine their problems and relate the problems with their learning experience in wayfinding at the preparation phase. In general, the new student had problems in understanding verbal description given by the mobility instructor which is in line with the findings of previos studies on the weakness of using verbal description [8, 13]. This leads to the next problem where the student was unable to "visualize" the described place. In addition, following a verbal description on a direction can be cumbersome for the blind students to understand when they (blind people) tend to code information egocentrically [5, 14].

Although alternative methods (e.g. tracing method and modelling using objects) have been used but the problem of understanding of what being described still made no changes to the student. It could be due to the blind student had difficulty to understand of what have been described based on one-time explanation. At the same time, the student did not have the chance in exploring the places and directions as have been described on their own time as there was lack of materials that can aid the process. Furthermore, without improper development of the internal representation of what has been described made them confuse with the description given. Due to the problem of getting insufficient spatial knowledge of the described places, the students became less confident and formed insecure feelings when performing the actual wayfinding. The new students required more time to learn about a place in advance so that they can get sufficient information of the place before they could familiarize with the place. After going through these phases repeatedly, a complete representation (cognitive map) of the learned place can be developed which can be used in their actual journey.

Problems faced by experience student (totally blind) were quite similar to the new student however due to the different level of experiences and skills, they were found having less problems in understanding verbal description since they have been exposed to the practice many times. Nevertheless, some of them still having difficulty to "visualize" a novel place at the first time and still needed to be exposed to materials that represent the place to get them understand. Although these students have experience and skills, they also need time to learn about a place in advance on their own which is similar to the new student. Since the students had lack of information of what is available in the described place, this create insecure feelings within the students and made them low confident. The process of getting to know what are available in a place helped them to develop their cognitive map of the place before they become confident to perform the actual journey. Moreover, some of the experience students also had difficulty to understand and visualize the direction between places. Therefore, they required help from the instructor to repeat the description on the direction.

3.5. The Use of Technology to Address the Identified Problems

The identified problems associated with the teaching and learning of a wayfinding at MAB involved the lack of tools to aid the teaching process which made the process of conveying the information cumbersome and time consuming. Meanwhile, on the learning part by the blind students, the identified problems are summarized as the following; 1) difficulty on developing the mental representation of a place based on verbal description, 2) understanding the direction between places and 3) getting sufficient time to learn about a new place. Related works recommended the implementation of technology to address the identified problems and to enhance the teaching and learning processes [15].

An audio-tactile map (Figure 5) has been introduced to provide advanced information of a place to blind people, e.g. [16-19]. The use of audio-tactile maps has been discovered able to contribute to the development of blind people's cognitive maps of a place effectively compared to verbal description [8, 9, 20, 21]. The audio-tactile maps are based on multimodal approach where blind people can perceive information using touch and hearing at the same time [22]. The landmarks of a place are presented in tactile symbols and the identification of the landmarks is presented in speech [15, 22]. The use of auditory cues is recommended to represent the landmarks [7] because it can convey spatial knowledge better than speech [23]. Blind user can benefit the use of raised lines that linked between places on the map to learn about directions. Since the information of a place is readily provided on the audio-tactile maps, the learning process is independent and

the user can explore the maps repeatedly which would give them enough time to form the cognitive maps and familiar with the place at the preparation stage before they initiate their wayfinding in reality [24]. The use of audio-tactile maps would help to alleviate the problems associated with the teaching process [25] since the learning of a place can be independent and the mobility instructor can focus on the blind students who needs his or her attention throughout the map learning process.

Figure 5. An audio-tactile map [17]

4. CONCLUSION

This paper discusses the current learning techniques of wayfinding taught to visually impaired students at MAB, specifically focusing on the preparation phase. From the observation, problems have been identified where difficulty in developing mental representation of a place by blind students were discovered. The lack of appropriate learning tools in facilitating blind students in developing their internal representation of a place during the preparation phase contribute to the problem. The problems affected the teaching and learning processes between the blind students and the mobility instructor whenever a new place needs to be introduced to the blind students. Based on the identified problems, the blind people need an alternative method to help them in acquiring spatial knowledge and spatial orientation during map exploration for pre-planning before a real navigation takes place. A multimodal map is proposed as the basis for this research to address the mentioned problems and consequently able to facilitate blind people in independent wayfinding. Thus, further research on acquiring information of landmarks of a place including sound (speech and ambient sound) to be incorporated into the design of a multimodal map is crucial. Additionally, investigating environmental cues which will be presented in speech, auditory icons and tactile symbols representing the local context to the blind people at MAB is needed as the design requirements of landmarks to be incorporated into the multimodal map for blind people.

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