CNU Journal of Higher Education
Volume 18 (2024), p 61-73

Evaluating the Impact of Braille Signage on Wayfinding System: A Phenomenological Study of Campus Accessibility for Students with Visual Impairments

Irene Bacalla, Alliyah Laika A. Barcelonia, Franklyn R. Gisultura, Rosemarie A. Pacatang, Keisha P. Romarate, Venus M. Cortes, Angelito Cabanilla Jr.
Cebu Normal University, Cebu, City, The Philippines

Date Submitted: March 24, 2024
Date Revised: May 18, 2024
Originality: 91%
Plagiarism Detection: Passed

ABSTRACT

Accessibility within educational institutions poses significant challenges for students with visual impairments, particularly in navigation. This study evaluates the impact of a Braille signage wayfinding system on enhancing campus accessibility for students with visual impairments. Using a phenomenological approach, the study focused on the experiences of three (3) college students with visual impairments before and after implementing the Braille signage wayfinding system at a higher education institution in Cebu, Philippines. A semi-structured questionnaire with open-ended questions was employed to gather data, which was then analyzed using thematic analysis. The findings revealed three key themes: (1) difficulties faced when navigating without the Braille signage wayfinding system; (2) positive feedback on the Braille signage's readability and placement; and (3) overall positive impact on the students' ability to navigate independently. In theme 1, participants described challenges such as difficulty identifying rooms, encountering obstacles, and getting lost due to the absence of navigational aids. In theme 2, students highlighted the effectiveness of the Braille signage, noting the raised and clear dots, appropriate placement, and its contribution to their navigation. In theme 3, students shared how the system increased their independence, reduced anxiety, and allowed them to familiarize themselves with routes and obstacles. The study recommends adding indicators for left-side placement of Braille signage, installing markers on vacant rooms to avoid confusion, and expanding the Braille signage system campus-wide to promote a more inclusive and accessible learning environment.

Keywords: *Visual Impairment (VI), Braille Signage Wayfinding System, Special Education, Higher Education, Philippines*

INTRODUCTION

There are approximately 272,527 Filipinos who are visually impaired and 40, 000 of the entire population are of school age (Robredo, 2018). However, university campuses often have structures that make it hard for people with disabilities and special needs to move around easily and on their own (Kanakri, 2023). In line with the Philippine Constitution, every person has the right to travel from one place to another, including students with disabilities such as VI (1987 Constitution, Article III, Section 6)**.** Even though students with VI may not see their way or path, using a white cane helps them navigate their environment (Attia & Asamoah, 2020). Unfortunately, not all passageways or buildings, like universities or academic institutions, are accessible or challenging to walk for students with disabilities, especially for students with visual impairments.

In a study conducted by Bacalla et al. (2024) at a state university in Cebu, Philippines, it was found that college students with VI have

difficulty accessing the university due to poor accommodations in terms of accessibility. This limitation hinders their ability to navigate independently since they also have a hard time remembering the place where they are standing. Hence, students with VI faced challenges in accessibility, mobility, understanding of instructional materials, socialization, educational support, and compliance with requirements, affecting their academic experience and well-being (Bacalla et.al., 2024)

In addressing these challenges, implementing the 'Protection and Safety Program for Older Persons and People with Disabilities' is essential and crucial under Batas Pambansa 344, R.A. No. 7277. This program provides architectural features enhancing mobility and safety, such as ramps, accessible toilets, tactile pavements, and assistive devices, ensuring universal access and inclusion for persons with disabilities (NCDA et al., 2024).

A wayfinding system is essential for users with disabilities. According to the Americans with Disabilities Act (ADA) and the American National Standards Institute (ANSI), it is recommended that guidelines must be followed in creating instructional signage to help make a more effective and manageable system for individuals with disabilities and the entire population. This highlights that wayfinding for persons with disabilities should be based on a new design code to help users with visual impairments navigate the environment safely (De Lobo, 2010). Also, it is recommended in wayfinding to use and organize definite sensory cues from the external environment. Hence, braille signages serve as a tactile guide that plays a crucial role in helping visually impaired students navigate university buildings. According to Guidice and Legge (2008), incorporating braille signs with room numbers in newly constructed buildings can significantly improve accessibility and safety for individuals with visual impairments. Additionally, an indoor wayfinding system can assist visually impaired individuals in finding their way to a specific location within an unfamiliar environment (Ko and Ju et al., 2011).

A significant challenge for people with visual impairment or low-vision encounters is ‘wayfinding,’ which is finding one’s way to navigate unknown environments and locate a destination (Ko & Kim, 2017). In fact, according to Bacalla et al. (2024), whose study was conducted at the university, students with visual impairments encounter significant challenges related to accessibility and mobility specifically in transferring from one place to another and remembering the pathways which adversely affect their academic experiences and overall well-being.

According to Jeamwatthanachai et al. (2019), a tactile map is rarely used since it is difficult to use and interpret. The majority stated that understanding the contents of the tactile map required a significant amount of effort. Many old buildings do not have accessible signage for students with visual impairment; even if they do, it only represents a small number and uses printed but not in braille (Ko and Ju et al., 2011). Another research conducted at a university in Ontario found that 70% of participants identified accessing and moving through indoor spaces as the most challenging aspect of navigating the campus (Oyelola, 2014). More specifically, locating classrooms was mentioned as the most challenging task. Students are most likely to express dissatisfaction with wayfinding for classrooms as they prefer it to be straightforward and effective in reducing feelings of anxiety (Scott et al., 2008).

One of the primary challenges faced by students with visual impairment is the lack of accessible wayfinding systems for braille signages in educational institutions. There has yet to be any research conducted in a particular higher education institution that provides a wayfinding system using braille signages that aids students with VI in helping them navigate places independently.

Hence, this study aims to assess the experiences of college students with VI after implementing the braille signage wayfinding system and evaluate its effectiveness in improving campus accessibility. Additionally, it provides recommendations to enhance the learning environment for college students with visual impairments in higher education institutions based on the Protection and Safety Programs for Older Persons and Persons with Disabilities by the National Council on

Disability Affairs (NCDA et al., 2024).

Domain of Inquiry

This study explores the phenomenological experiences of using the Braille signage wayfinding system as an evaluation for campus accessibility enhancement among students with visual impairments. Specifically with the guide questions:

1. What are the experiences of the students with VI in navigating the university before the utilization of the braille-based wayfinding system?
2. What are the experiences of the students with VI in navigating the university after the utilization of the braille-based wayfinding system?

MATERIALS AND METHODS

Research Design

This study used a qualitative research methodology, which involves exploring a particular situation from the perspective of the respondents (Wilson et al, 2021). The researcher employed the phenomenological evaluation approach to evaluate the experiences of college students with visual impairment on using the braille signage wayfinding system. According to Stone (1975), phenomenological evaluation focuses on the broader reality that the oher evaluation. Personal viewpoints, reactions and experiences of the participants are collected and the interaction between and among them are collected (Anderson et.al, 1974 as cited by Stone, 1975). This research identifies the experiences of college students with visual impairment regarding the efficacy of the braille signage wayfinding system in navigating the CTE building to enhance campus accessibility.

Respondents

The sampling design used in this study was criterion sampling, in which three (3) participants were specifically chosen based on predetermined criteria pertinent to the study's objectives (Cohen & Crabtree, 2006). Criterion sampling was utilized in the study to ensure that the participants met the following criteria: (1) college students ages 18-21 years with visual impairment, specifically functional blind and totally blind; (2) enrolled in Cebu Normal University, under the College of Teacher Education (CTE), Bachelor of Special Needs Education program; and (3) without the aid of a shadow teacher.

Table 1. Overview of the profile of each participant included in the study.

Profile of Research Participant

Participants	Gender	Age	Type of Blindness
A	Female	26	Partially Blind
B	Female	21	Totally Blind
C	Female	26	Partially Blind

Environment

This study was conducted at Cebu Normal University, a higher education institution that caters to visually impaired learners in Cebu, Philippines. This higher education institution offers a unique setting that enables students with visual impairment to navigate a specific building using braille signages as a wayfinding system, which are made and placed by researchers to particular places of each door of offices, rooms, and classrooms following the 2010 ADA Accessibility Standards of Access Board USA, considering the references of average height of Filipinos according to Bostock and Jankowicz (2023) which enables to assess its efficacy of the system project in terms of campus accessibility.

Instrument

The main instrument of this study was the braille signages, and the researchers adopted a semi-structured questionnaire to collect the required data, posing open-ended questions that underwent content validation by the research adviser to gather in-depth information and participant evidence. While carefully considering the study's focus, researchers used this approach to seek detailed responses instead of yes/no. This semi-structured interview helped researchers identify and investigate the effectiveness of braille signages in wayfinding

among college students with visual impairment.

Data Gathering Procedure

The researchers complied with the requirements of the Research Ethics Committee. Afterward, researchers secured a letter of approval for Braille Signage installation signed by the concerned school authorities. With approval in hand, the researchers began by creating a braille-based map using an editing app to design floor plan layouts for each floor of the CTE building. Then, proceeded to print each floor on a tarpaulin measuring two by three (2x3) feet. The researchers attached each tarpaulin print to an illustration board, which served as its base to enhance durability. To add more emphasis on the walls of each room in the map, researchers used Sintra boards measuring 0.5 millimeters in width

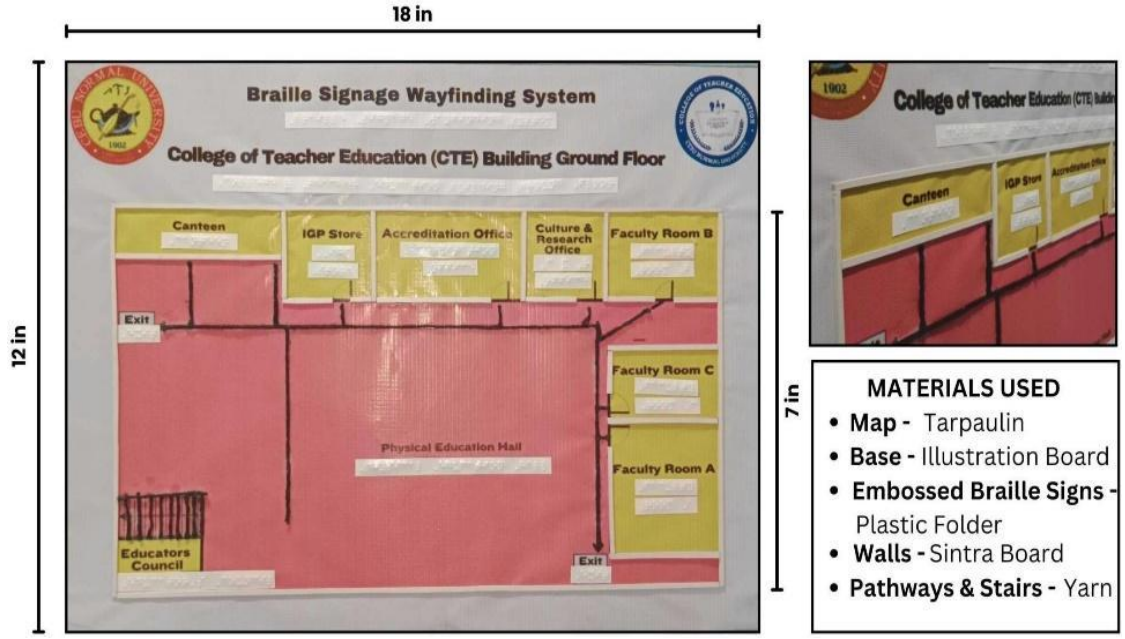

Figure 1. Braille-based Map

Additionally, the researchers used yarn to represent stairs and pathways, enhancing the tactile experience of the product. Researchers used plastic folders and individually embossed braille signs of each room and office on the map for the braille signage prototypes. Afterward, the visual-impaired students checked the embossed braille signs to ensure their readability and clarity. Aside from the braille labels, researchers also created cut-out 3D letters for every room and office to add a tactile impression to every signage. Next, the extra Sintra board was cut as a base for the braille signage and painted to enhance its appearance. After that, the braille signage was assembled at the base by attaching the 3D letters, which have a minimum of ⅜ inch space below the embossed braille signs, following the guidelines set by the American Disability Act (ADA). Once the tactile map and braille signage were ready, the researchers mounted them on designated walls of each room on every floor.

Figure 2: Braille Signage

The researchers selected three (3) probable college students with VI who encounter difficulties navigating independently within the campus environment. A consent form was given to determine the participant's willingness to participate in the study; if not, the participant may withdraw without penalty. The researchers let the participants utilize the braille signage systems for wayfinding within the College of Teacher Education (CTE) building three consecutive times, depending on the availability of students with visual impairments. This ensures ample opportunity for practice and reinforcement of skills. Next, participants were scheduled for a semi-structured interview with open-ended questions about their experiences before using braille signages. After the implementation phase, interviews were conducted to gather feedback on the effectiveness and their experiences after using braille signage to evaluate its effectiveness in enhancing campus accessibility. The interview recording was transcribed verbatim. No experts were involved in interviewing the students with visual impairment; only the researchers were the ones to gather information from the participants. The participants' answers remained confidential and only be used for school purposes. After collecting data, the researchers provided a meal worth one hundred fifty pesos after each implementation session as a token of gratitude for the participants' willingness and cooperation.

Data Analysis

Thematic analysis was utilized to analyze the transcripts of the interviews. This analysis involved identifying patterns or themes within the qualitative data. Braun & Clarke's (2006) six-phase guide was employed as a useful framework for conducting this analysis. The first phase is to become familiar with the data; the second is to generate initial codes; the third is to involve searching for themes; the fourth is to entail reviewing themes; the fifth is to define themes; and the sixth is to write up. Themes were derived by carefully considering participant responses and their relevance to the research objectives. A thematic analysis of qualitative data is sought to determine the primary meaning of the context's complexity rather than a measure of the frequency. To keep the originality and complexity of a qualitative study while making the survey easier to grasp, this analysis allowed for the search for patterns in the meanings being explored and the understanding of how such patterns might be arranged into themes (Sundler et al., 2019). Also, cross-case analysis was utilized to compare the

differences of the three cases aiming to identify the distinct characteristics in the participants' responses to gather the necessary data. According to Khan et al. (2014), cross-case analysis allows case study researchers to identify the factors that may have influenced the outcome of the case and provide opportunities to learn from various cases and collect essential information. One technique for conducting cross-case analysis is using tables and graphs to organize case data (Cruzes et al.,2014).

Ethical Considerations

In this research study, several ethical considerations were taken into account. First, the researchers submitted the research protocol for ethical review. They obtained a certificate of approval from the ethics committee by ensuring compliance with the ethical standards and protecting the participants' rights and welfare. After discussing the study's goals and purpose, the participants were asked about their informed consent and how their rights and privacy are protected. Participants' privacy and anonymity were protected, and the data collected were stored securely and accessible only by the research team. Participants had the right to withdraw from the study without consequences. Moreover, the study adhered to ethical guidelines and regulations set forth by relevant institutions or governing bodies.

Scope and Limitations

This study focuses on the rooms and offices within the CTE building of Cebu Normal University, emphasizing providing accommodations for VI. However, several limitations hindered the study. First, the research funding was constrained as the researchers' allowances served as the only source of money for the study. Second, due to financial and material constraints, the implementation of the Braille-Signage wayfinding system encountered a problem: the use of low-quality materials that potentially affected its durability. Lastly, due to time constraints and participant availability, the participants were only allowed to use the Braille Signage Wayfinding System three (3) times to navigate the CTE building.

RESULTS AND DISCUSSIONS

This chapter introduces the study's results and discussion. It analyzes and discusses the detailed narrative reports and emergent themes of each student with visual impairment on their experiences before and after the utilization of the Braille Signage Wayfinding System.

Table 1. Overview of the profile of each participant included in the study.

Profile of Research Participant

Participants	Gender	Age	Type of Blindness
A	Female	26	Partially Blind
B	Female	21	Totally Blind
C	Female	26	Partially Blind

(Note: The information above indicates the comprehensive profile of the respondents participating in the research, detailing their key characteristics and demographics to provide an in-depth understanding of the participant group.)

After conducting interviews with three (3) college students with VI, the table below outlines the themes that emerged from the experiences of visually impaired students before and after using the Braille Signage Wayfinding System.

TABLE 2. Themes and subthemes identified from the students' experiences with VI before using the braille signage wayfinding system.

Before Implementation: Challenges in Navigating Without Braille Signage Wayfinding System

Themes	Sub-Themes
1. Difficulty in Navigation and Room Identification	1.1 No markers in the room 1.2 Encountering obstacles 1.3 No companion and getting lost
2. Emotional and Psychological Impact	2.1 Embarrassing moments 2.2 Lower confidence
3. Challenges in Independence Navigation	3.1 Distractions while navigating 3.2 Inability to focus navigating 3.3 No one to ask for help

TABLE 2.1 Themes and subthemes identified from the students' experiences with VI after using the braille signage wayfinding system.

After Implementation: Positive Impact of the Braille Signage Wayfinding System

Themes	Sub-Themes
4. Readability and Clarity of Braille Signages	4.1 Raised and Clear Dots
5. Effectiveness the Placement	5.1 Appropriate Height and Positioning
6. Readability and Clarity of Braille Signages	6.1 Ability to navigate independently
	6.2 Becoming confident to navigate
	6.3 Familiarizing the obstacles
	6.4 Familiarizing navigation

Before Implementation: Challenges in Navigating Without Braille Signage Wayfinding System

Findings revealed that students faced significant challenges navigating without the Braille signage wayfinding system.

Theme 1: Difficulty in Navigation and Room Identification

1.1 **No markers in the room**

"Ang pianakalisod jud sa akoa kay kanang nag mahibaw-an jud kung unsa nana siya na number or room kay walay ilhanan" - Student A
(The most difficult thing for me is to find out the number or room because it doesn't have a sign.)

1.2 **Encountering obstacles**

"Usahay gyud basta naa pay obstacle kay mabangga mi so mao nay challenge." - Student B
(If there are obstacles, I bump into those, making it more challenging.)

1.3 **No companion and getting lost**

"Wa koy kuyog unya nasaag jud ko unya wala ko kabalo unsa nani na floor" - Student C
(I don't have anyone with me, and I got lost, and I don't know what floor this is.)

Navigating in unfamiliar surroundings is hard for visually impaired people. Without the braille signage wayfinding system, they usually require the assistance of a sighted guide to become acquainted with the location first (Loomis et al., 2005). The classrooms and offices in the university have no markers, have some obstacles that might need to be addressed, and the students who are VIs sometimes have no companions since these companions are just their classmates or co-students in the university and most particularly getting lost in one of the buildings of the

university. A wayfinding system should be given to them as their guide to address these problems.

Theme 2: Emotional and Psychological Impact

2.1 **Embarrassing moments**

"Actually kay kanang naka try ko kanang pinaka embarrassing moment nako sa CTE kay nisulod ko ug wrong room ba niya ni lingkod pajud ko ato". - Student A
(My most embarrassing moment in the CTE building was entering the wrong classroom.)

"*First day sa klase to and then mao to wala mi kabalo na nalapas nagyud diay mi naadto mi sa pikas na room nya medyo naaulaw mi kay naa pud nagklase didto*"- Student B
(It was the first day of class, so I did not know that I already passed the exact room and ended up in the wrong room. I am a bit embarrassed because there was also an ongoing class in the room)

2.2 **Lower confidence**

"Maulaw man sad gud ko na maghikap-hikap sa mga door"- Student A
(It's hard because I'm too shy to touch classroom doors.)

The participants experience negative emotional and psychological moments in navigating inside the university. This agrees with the study of Saitis and Kalimeri (2018) that students with visual impairment experience intense emotional and cognitive reactions when navigating unfamiliar urban environments, with significant differences across vision impairment categories. Low confidence in locating classrooms or offices and embarrassment in entering the wrong class or wrong classroom are one of the negative emotional and psychological experiences. These are some of the concerns to address so that they can navigate the university independently. A wayfinding system should be given to them as their guide to avoid these problems.

Theme 3: Challenges in Independent Navigation

3.1 **Distractions while navigating**

"If daghan ug estudyante nya saba kay di nasad mi ka focus sa among paglakaw, so lisod jud siya sa pag identify unsa nani siya na room, mao nay piankalisodan nako." - Student A
(Students can be so loud that we can't focus walking and identifying the rooms using the counting system.)
Inability to focus navigating
"Need pa mi mo count ba ron ika pila na ni room, ushay dili man mi ka focus kay daghan ug tao or for example ga dali dali na mi muadto sa room so dili na mi kakuan kay mag count pa mi , mo take siyag time kung mo count pa mi , maoy challenge namo kung walay braille" - Student B
("I need to count the rooms in locating classrooms, and sometimes we cannot focus because there are a lot of students and very noisy; it is a challenge to count in between while in a hurry because it will take time, that is the disadvantage when there is no braille.)

3.2 **No one to ask for help**

"Mao to kay wala sad koy ka pangutan.an, maglisud jud ko atoh. nibalik kog naog unya nicount kog 1234, 1234."- Student C
(No one was there, so I couldn't ask anyone, so I had a hard time. So I went back down and counted 1234, 1234.)

All participants experience difficulty navigating the university independently. This agrees with the study of Hewett et.al (2019) where mobility (e.g. being able to navigate around the school and community independently) is one of the highlighted areas of concern. This implies that there are environmental distractions of pathways around the university, also lack of help in locating a particular classroom is one of their main concerns in navigating the university. This implies that there is a need for something like a wayfinding system to guide them.

After Implementation: Positive Impact of the Braille Signage Wayfinding System

Findings revealed that the Braille signage wayfinding system positively impacted navigation for students with VI.

Theme 4: Readability and Clarity of Braille Signages

4.1 **Raised and Clear Dots**

"Ganahan kayko sa gigamit ninyo na materials ba kay readable rajud siya niya clear kay ang mga dots bitaw."- Student A
(I like the materials used because they are readable, and the dots are clear.)

"Yes, ang iyang braille signage kay readable ra siya. Naka raise ra ang dots well." - Student B
(*Yes, the braille signage is readable. The dots are raised well.)*

Both students emphasize the importance of clear and well-raised Braille dots in making the signages readable. The positive experiences from the students highlights that raised and clear Braille dots enhance the accessibility of the VI students when the braille signages are well-designed with properly raised dots. This implies that properly embossed braille contributes to the effectiveness of the braille signage for students with VI. It highlights the importance of ensuring the clarity and legibility of the braille dots. According to Gokgur (2014), Havik et al. (2015), and Lukman et al. (2019), this design offers great support to people with visual impairment in interpreting their surroundings.

Theme 5: Effectiveness of the Placement

5.1 Appropriate Height and Positioning

"Ganahan ko sa inyong pagka place sa inyong each braille signages. Ganahan ko sa placement na naa siya sa right since ang right hand man pud ginagamit sa pag read sa braille. In that way mas easier iyang pag locate." - Student B
(I like how you place each of your braille signages. I like the placement on the right side since the right hand is also used to read braille. In that way, it is easier for us to locate it.)
Sa height placement kay okay ra pud." – Student

All the participants find the height and placement of the signages appropriate which make locating and reading the signs easier. This ensures that the signs are within easy reach for the VI, enhancing the overall effectiveness of the navigation. This implies that positioning the signage on the right side near the doors and at the appropriate height is convenient since it corresponds to the natural hand movement for reading braille, making it easier to read the signs effectively (Papadimitriou & Argyropoulos, 2019).

Theme 6: Increased independence and confidence

6.1 **Ability to navigate independently**

"So through the braille signages kay makanavigate rajud mi on our own kay makabalo nami asa na nga room"- Student A
(With the Braille signages, we can navigate independently because we'll know where the rooms are.)

"Ang pag put sa signage kay okay raman naka increase syag independency in navigating or locating and walking around the CTE building" - Student B
(The placement of braille signages is helpful as it increases my independence in navigating around the CTE building.)

6.2 Becoming confident to navigate

Yes, very effective and mas confident and independent nako mag navigate bahalag naay obstacles, naa ramay cane." - Student C
(Yes, it's very effective, and I'm more confident and independent in navigating despite obstacles, as long as I have a cane.)

6.3 Familiarizing the obstacles

"Kay sa sige nakog agi maka familiarize raman sad kos mga obstacles" - Student C

(Because as I pass by the CTE building, I can also familiarize myself with the obstacles.)

6.4 Familiarizing navigation

"Siguro naka improve siya in a way na naa koy na develop na technique like aside sa basahon nako ang braille signages, na familiarize na nako ang room and kung unsay naa sa left and right na room"- Student C

(It probably improved in a way that I developed a technique. For example, aside from reading the braille signages, I've become more familiar with each room and what's left and right of each room.)

Implementing the Braille signage wayfinding system improved the overall experience of the students with Vi in navigating inside the CTE building. In the study conducted by Sulaiman (2013), braille signage contributes significantly to the effectiveness of the wayfinding experience. Braille signages help the people with VI locate entrances, exit, restrooms, and other essential areas in public buildings and facilities (Saad,2024). This implies that the braille signage wayfinding system positively impacts the navigation of students with VI. According to Sight Scotland (2024), braille signage effectively enhances navigation and improves students' independence with VI. This also promotes a more inclusive environment as it breaks down barriers for students with VI in terms of difficulty navigating. Implementing the Braille signage wayfinding system ensures accessibility for students with VI inside the CTE building. This encourages independence in navigating.

CONCLUSION AND RECOMMENDATIONS

College students with VI often use counting as a wayfinding technique and rely on peer assistance to navigate buildings. However, this study's findings revealed several challenges in navigating unfamiliar buildings, such as difficulty in navigation and room identification, emotional and psychological impact, and challenges in independent navigation. In addressing these challenges, the implementation of the Braille Signage Wayfinding System was tested to resolve the problems and challenges of college students with VI. Several adjustments were made during the first implementation. However, with three repeated implementations, they became familiar with the wayfinding system and developed effective techniques.

The study's findings revealed that the Braille signage wayfinding system improves efficiency and independence and ultimately enhances accessibility and inclusivity when navigating the CTE building.

Based on the findings, the following are the various recommendations to improve the braille-based wayfinding system to enhance campus accessibility for students with VI:

1. Provide indicators for left-side Braille signage to inform learners about the left-side placement of the signage, ensuring complete awareness of the locations of offices and classrooms.
2. Install braille signages on vacant rooms to prevent confusion when locating the signages for these rooms.
3. Campus-wide Implementation of Braille Signage to expand the use of braille signage across the campus and foster a more inclusive and accessible learning environment for students with VI.

ACKNOWLEDGEMENT

The researchers would like to acknowledge and give thanks to the people behind the success of this study. This study would not have been possible without the invaluable support and assistance of the following individuals and groups:

To the researchers' parents, for their financial support and unwavering encouragement;

To our dear participants, they willingness to share their time and effort;

To Dr. Venus M. Cortes, for her expertise, time, guidance, and patience throughout the research process;

To the panelists, Mr. Angelito Cabanilla and Mrs. Fanny Mae Mobida, for their guidance and

thoughtful suggestions that greatly enhanced our study.

To our classmates, for their assistance and moral support whenever needed;

Above all, to the Almighty Father, for granting the researchers the strength, time, and guidance to complete this study.

REFERENCES

Arditi, A. May 2017. Rethinking ADA signage standards for low-vision accessibility | JOV |ARVO Journals. Journal of Vision. https://jov.arvojournals.org/article.aspx?articleid=2628138 (May 15, 2024).

Attia, I., & Asamoah, D. May 2020. The White Cane. Its Effectiveness, Challenges, and Suggestions for Effective Use: The Case of Akropong School for the Blind. Semantic Scholar.https://www.semanticscholar.org/paper/The-White-Cane.ItsEffectiveness%2C-ChallengesandAttiaAsamoah/b20e 3004528c38547b0e908c267e20278eea95ad (May 23, 2024)

Bacalla, B., Barcelonia, A. L., Gisultura, F., Romarate, K. P., Pacatang, R. A., & Cabanilla, A. February 2024. Challenges and opportunities of students with visual impairment in a State University: Amulti-casestudy. https://www.researchgate.net/publication/378302692_Challenges_and_opportunities_of_students_with_visual_impairment_in_a_State_University_A_multi-case_s tudy (May 3, 2024)

Bostock, B., & Jankowicz, M. July 2023. Ranked:The countries with the shortest a. people in the world. Business Insider. https://www.businessinsider.com/shortest-people-in-world-by-country-2019-6 (May 23, 2024)

Braun, V., & Clarke, V. 2006. Using Thematic Analysis in Psychology. Qualitative Research in Psychology, 3, 77-101. (May 17, 2024)

Crossman, A. March 2020. Purposive Sampling Definition and Types. ThoughtCo. https://www.thoughtco.com/purposive-sampling-3026727 (May 23, 2024)

Cruzes, D., Dyb, T., Runeson, P., & host, M. 2014. *Case studies synthesis: A thematic, cross-case, and narrative synthesis worked example*. https://www.researchgate.net/publication/303209671_Case_studies_synthesis_A_thematic_crosscase_and_narrative_synthesis_worked_example(May17,2024)

DeLobo, T.2010.Legibility for Users with Visual Disabilities. https://link.springer.com/chapter /10.1007/978-3-642-13166-0_14 (May 23, 2024)

Demmin, D., & Silverstein, S. December 2020. *Visual Impairment and Mental Health: Unmet Needs and Treatment Options*. Semantic Scholar. https://www.semanticscholar.org/paper/Visual-Impairment-and-Mental-Health%3A-UnmetNeedsDemmin-Silverstein/7cc0a6c0892f9be1df869114af0c7226f18ee e56 (February 22, 2024)

Emerson, R. W. 2017. Outdoor wayfinding and navigation for people who are blind: accessing the built environment. In Lecture notes in computer science (pp. 320–334). https://doi.org/10.1007/978-3-319-58700-4_27 (March 14, 2024)

Giudice, N. A., & Legge, G. E. 2008. Blind Navigation and the Role of Technology.https://umaine.edu/vemi/wp-content/uploads/sites/220/2016/08/Giudi Celegge-2008-Blind-Navigation-And-The-Role-Of-Technology-Ehst.pdf (March 23, 2024)

Gökgür, P., Altay, İ., & Alpay, B. 2014. Regulations To Be Made In Urban Areas In Order To Improve Accessibility Of The "Visually-Impaired.https://iconarp.ktun.edu. tr/index.php/iconarp/article/view/3 (May 17, 2024)

Havik, E. M., Steyvers, F., & Dankers, B. May 2015. Accessibility of shared space for visually impaired persons: A comparative field study. https://journals.sagepub.com/doi/abs/10.1177/0264619615575793 (May 15, 2024)

Jeamwatthanachai, W., Wald, M., & Wills, G. January 2023. Indoor navigation by blind people: Behaviors and challenges in unfamiliar spaces and buildings. British Journal of Visual Impairment, 37(2), 140–153. https://doi.org/10.1177/0264619619833723 (March 15, 2024)

Jeamwatthanachai, W., Wald, M., & Wills, G.

2019. Indoor navigation by blind people: Behaviors and challenges in unfamiliar spaces and buildings. British Journal of VisualImpairment, 37(2), 140–153. https://doi.org/10.1177/0264619619833723 (May 23, 2024)

Kanakri, S. November 2023. (PDF) Wayfinding Systems in Educational Environments. (February 22, 2024) ResearchGate. https://www.researchgate.net/publication/309714516_Wayfinding_Systems_in_Educational_Environments(April 24, 2024) (May 14, 2014).

Khan, S., & VanWynsberghe, R. 2008. *Cultivating the Under-Mined: Cross-Case Analysis as Knowledge Mobilization*. https://www. qualitativeresearch.net/index.php/fqs/article/view/334/729 (May 17, 2024)

Kleege, G. 2006. Visible Braille/Invisible Blindness. Journal of Visual Culture, 5(2), 209–218. https://doi.org/10.1177/1470412906066909 (February 22, 2024)

Ko, E., & Kim, E. Y. August 2017. A Vision-Based Wayfinding System for Visually Impaired People Using Situation Awareness and Activity-Based Instructions. NCBI. https://www.ncbi.nlm. nih.gov/pmc/articles/PMC5580040 (May 28, 2024)

Ko, E., Sun Ju, J., & Kim, E. Y. October 2011. Situation-based indoor wayfinding system for the visually impaired. https://dl.acm.org/doi/abs/10.1145/2049536.2049545 (May 28, 2024)

Lin, B.-S., Lee, C.-C., & Chiang, P. June 2017. Simple Smartphone-Based Guiding System for Visually Impaired People. Semantic Scholar. https://www.semanticscholar.org/paper/Simple-Smartphone-Based-Guiding-System-foVisuallyLinLee/cafe3c860fc5a64522780432844ffaab234243cb (February 22, 2024)

Loomis, J. M., Marston, J. R., Golledge, R. G., & Klatzky, R. L. 2005. Personal Guidance System for People with Visual Impairment: A Comparison of Spatial Displays for Route Guidance. Journal of Visual Impairment & Blindness, 99(4), 219–232. https://doi.org/10.1177/0145482x0509900404 (May 28, 2024)

Lukman, A. L. April 2019. Luminance Contrast of Accessible Tactile Indicators for People With Visual Impairment. Luminance Contrast of Accessible Tactile Indicators for People With Visual Impairment (May 28, 2024)

Maguire, M., & Delahunt, B. 2017. Doing a thematic analysis: A practical, step-by-step guide for learning and teaching scholars. All Ireland Journal of Higher Education, 9(3). (May 14, 2024)

Mason, S. J., Legge, G. E., & Kallie, C. S. December 2005. Variability in the Length and Frequency of Steps of Sighted and Visually Impaired Walkers. Sage Publication. https://journals.sagepub.com/doi/10.1177/0145482X0509901202 (May 28, 2024)

National Council of Disability Affairs. Pambansang Sangunian Ukol sa Ugnayang Pangmaykapansanan. https://ncda.gov.ph/ (February 22, 2024)

NCDA, DBM, & NCSC. January 2024. Monitoring and Evaluation of, Accountability for, and Learning from ("MEAL") the Implementation of Section 36 of the General Provisions under Fiscal Year 2023 General Appropriations Act (GP 36 under FY 2023 GAA) or Equivalent Provision in the Years after that Entitled "Programs and Projects Related to Senior Citizens and Persons with Disabilities", Joint Memorandum Circular No. 1 Series Of 2023

National Council on Disability Affairs. National Council on Disability Affairs. https://ncda.gov.ph/monitoringandevaluation-of-accountability -for-andlearning-frommeal theimplementation -of-section-36-of-thege neralprovisionsunder-fiscal-year-2023generalappropriations-ac/ (April 24, 2024)

Nowell, L. S., Norris, J. M., White, D. E., & Moules, N. J. 2017. Thematic analysis: Striving to meet the trustworthiness criteria. International journal of qualitative methods, 16(1), 1609406917733847. (May 28, 2024)

Oteifa, I. S. D. A. P. I. i. V. I. L. E. A. S. March 2023. *Inclusive Schools Design: A Phenomenological Investigation into Visually Impaired Lived Experiences*. Inclusive

Schools Design: A Phenomenological Investigation into Visually Impaired Lived Experiences (February 22, 2024)

Oyelola, K., & Lynch, D. 2014. Wayfinding in University Settings: A Case Study of the Wayfinding Design Process at Carleton University. bac-lac.gc.ca. https://central. bac-lac.gc.ca/.item?id=TCOOCC17435&op=pdf&app=Library&oclc_number=1032992241 (April 24, 2024)

Papadimitriou, V., & Argyropoulos, V. 2019. Tracing the effectiveness of braille reading patterns in individuals with blindness: Handedness and error analysis. British Journal of Visual Impairment, 38(2), 209–221.https://doi.org/10.1177/0264619619892996 (May 28, 2024)

Robredo J. October 2018. Philippine country Report to World Blind Union Asia Pacific, General Assembly, Ulaanbaatar, Mongolia. https://wbuap.org/archives/1434 (May 14, 2024)

Saad, M. L. May 2024. Empowering everyone: The importance of braille in signage. Modulex.https://modulex.com/uncategorized/empowering-everyone-the-importance-of-brai lle-in-signage/ (February 22, 2024)

Saitis, C., & Kalimeri, K. November 2018. *Multimodal Classification of Stressful Environments in Visually Impaired Mobility Using EEG and Peripheral Biosignals*. Semantic,Scholar.https://www.semanticscholar.org/paper/Multimodal-Classification-of-Stressful-EnvironmentsSaitisKalimeri/b3d0af3569607ce90b003528c482c56a5dff7314 (May 28, 2024)

Scott, L., Jane, & Marini, M. June 2008. Higher Education Classroom Fail to Meet Needs of Faculty and Students. https://www.researchgate.net/publication/229893849_Higher_Education_Classroom_Fail_to_Meet_Needs_of_Faculty_and_Students (May 28, 2024)

Sight Scotland. 2024. Benefits of Braille. https://sightscotland.org.uk/articles/information-and-advice/benefits-braille(April 24, 2024)

Sundler, A. J., Lindberg, E., Nilsson, C., & Palmér, L. April 2019. *Qualitative thematic analysis based on descriptive phenomenology*. National Library of Medicine. https://pubmed.ncbi.nlm.nih.gov/31367394/ (February 22, 2024)

U.S. Access Board. 2010. Guide to the ADA Accessibility Standards. https://www.access-board.gov/ada/guides/chapter-7-signs/ (April 24, 2024)