

## **An Eye-Opening Experience with Visual Impairment Students' environment in Brunei Darussalam**

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### **ABSTRACT**

*This paper aims to explore the experiences of students with visual impairment (VI) within their built school environment. A qualitative case study of four students with VI from three secondary government schools were interviewed following site observations of their schools. The study found that the students with VI do face anxiety towards their built school environment alongside the barriers they faced which can be thematically categorized into physical barriers, auditory barriers and lighting barriers. The study also revealed that many aspects of the school buildings and environment presented challenges and are intimidating to maneuver for VI students. The study has implications in expanding the field of study into Universal Design within Brunei Darussalam where future research can approach UD and its aspects in depth. Finally, the country had started dialogue regarding accessibility and its significance in the country's National Vision Plan 2035 and the study hopes to bring insight into the types of barriers the built environment can have on students with VI and signal future development projects forward.*

### **Keywords:**

Universal Design; Visual Impairment (VI); Mobility; Disability; Anxiety.

### **ABSTRAK**

*Tulisan ini bertujuan untuk mengeksplorasi pengalaman siswa tunanetra (VI) di lingkungan sekolah binaan mereka. Sebuah studi kasus kualitatif terhadap empat siswa dengan VI dari tiga sekolah menengah negeri diwawancarai setelah observasi lapangan di sekolah mereka. Studi ini menemukan bahwa siswa dengan VI memang menghadapi kecemasan terhadap lingkungan sekolah yang mereka bangun bersama dengan hambatan yang mereka hadapi yang dapat dikategorikan secara tematis menjadi hambatan fisik, hambatan*

*pendengaran dan hambatan pencahayaan. Studi ini juga mengungkapkan bahwa banyak aspek bangunan dan lingkungan sekolah yang menghadirkan tantangan dan mengintimidasi manuver siswa VI. Studi ini memiliki implikasi dalam memperluas bidang studi Desain Universal di Brunei Darussalam di mana penelitian masa depan dapat mendekati UD dan aspek-aspeknya secara mendalam. Terakhir, negara tersebut telah memulai dialog terkait aksesibilitas dan signifikansinya dalam Rencana Visi Nasional 2035 negara tersebut dan penelitian ini berharap dapat memberikan wawasan tentang jenis hambatan yang dapat ditimbulkan oleh lingkungan binaan terhadap siswa dengan VI dan menandakan proyek pembangunan di masa depan.*

***Kata kunci:***

Desain Universal; Tunanetra (VI); Mobilitas; Disabilitas; Kecemasan.

## **1. Introduction**

Education is an integral part of a child's development and even more so in the case of children with disability. World Health Organization (2011) reported that students with disabilities achieve low educational outcomes, reveal a considerably lower rate of completing elementary school and encounter more barriers to pursuing higher-level education at a global level. The provision of educational rights for students with disability has brought about positive movements in the political realm over the years and amassed international recognition and support. The Convention on the Rights of Persons with Disabilities (United Nations, 2006) steered the paradigm of the education system towards a practice of 'education for all' – commonly known as inclusive education which emphasized an education that is free and accessible for students of diverse backgrounds and disabilities referring to space in schools where students with a disability would feel included among the other students – schools with 'universal design' in mind.

Despite the acceptance of inclusive education, there are various uncertainties in managing such students in the education sector by the government, educators and professionals alike (Alur, 2001). A local study by Aborsi & Koay (2008) who stated adequate focus towards disability in education are lacking in terms of planning, organization, funding, commitment and lack of cooperation among experts and negative views influenced by traditional values. Even within the premise of inclusive education, there are however researchers such as Florian and Black-Hawkins (2011) as well as Lourens and Swartz (2016) who argued that due to the global recognition of inclusive education, most research has been conducted on the premise of attitudes and teaching strategies for students with disabilities in mainstream schools and less on the environment of such schools.

Visual impairment is one of the most prevailing disabilities worldwide (Congdon, Friedman and Lietman 2003) and concurrently, there exist no common definition of blindness and visual impairment (Parvin, 2015). Visual impairment can be defined as a "measurable loss in a psychophysical visual measurement" (Leat, Legge & Bullimore, 1999, p.201). Level of vision lost

include a person with low vision who has a limited degree of vision but can still read enlarged prints, which often require a braille system to read and write (Mastropieri and Scruggs, 2010). Other stances view students with visual impairment as people with a visual complication which affects their education experience (Kirk, Gallagher, Anastasiow & Coleman, 2006).

Inclusive education is seen as a positive response that involved the alteration and accommodation of students with diverse needs such that extends to teaching strategies, teaching aids as well as infrastructural adjustments and later evolved to include beyond the scope of only educational strategies in which the sense of community was added into the philosophy of inclusive education to emphasize the worth and value of every individual. Haug (2017) supports this view of the change in definitions where the meaning attached to the word inclusion had expanded from only meaning special education and now has expended to include aspects such as culture, ethnicity, social background and others, further emphasizing the sense of community in inclusive education.

Inclusive classroom is a space for learning where same curriculum and the same objectives are taught to students with and without disabilities, which allows the modifications in management and universal design of service and equipment. These definitions, however, has shown that the inclusive classroom has evolved from only focusing on the learning space itself and later has included aspects of modification to accommodate a wide range of students.

Universal Design can be defined as the products and environments designed to be functional by people of all ages and abilities to the greatest degree achievable (Story, 1998). Rose and Meyer (2000) also stated that the concept of constructing an accessible environment for those with disabilities created a movement. They defined Universal Design as buildings constructed to house a broad range of users, including people with disabilities. There are various studies observed where researchers or scholars have looked into the features and resources that some universities have to provide UDE especially for students with disabilities. From the study conducted by the University of Washington and their DO-IT Center (Disabilities, Opportunities, Internetworking and Technology), they focus on promoting empowerment and independence of people with disabilities by the use of technology in education within the classroom as well as around the campus. They provide a considerable amount of content via free online content, publications and videos (Ozdemir & Sungur, 2018)

A number of institutions as reviewed by Ozdemir and Sungur (2018) include the University of Connecticut's Center of Post Secondary Education and Disability which was a grant-funded project that focuses of the UD aspect of Instruction. They acknowledge the diverse learning abilities each student has and provide frameworks, the Nine Principles of Universal Design of Instruction, for instructors to adapt and alter their teaching strategies. In the Istanbul Technical University, they focus the use of their projects on physical space and how technology can be used to accommodate students within their built environment. Projects such as Voice-Step and Barrier-Free and Pedestrian-Friendly Sidewalks are some projects that have been done. With Voice-Step, the university's first in-door navigating application, it allows students to navigate throughout the campus where every facility has been integrated into the application. The campus also has wide walkways throughout (3 to 4 meters

wide) as well as the ramps that were built within the campus and are not accessed separately from the stairways. This is to ensure inclusivity where people of various abilities are considered such as the size and space required for the person in a wheelchair would take up (Ozdemir & Sungur, 2018).

Since 1994, Brunei has implemented inclusive education where students with disabilities are put in the same regular classroom as students without disabilities (Koay, 2012). Past studies had always been interested in researching teaching strategies that hope to promote learning for local students with special needs in Brunei. Thus, close observation of the samples did not cover many students with Visual Impairment (henceforth, VI), especially on matters of Universal Design and the built environment in the school. Therefore, it is important to conceptualize the impression provided by students with visual impairment with specific reference to their experiences in schools and the built environment in schools.

Inaccessible infrastructure design in public space can cause potential risk and significant harm to its users. Paul (2011) cited the National Safety Council (2011) which stated that almost 1,900 deaths and 1,300,000 hospitalized in emergency rooms visits per year in the United States alone. Thus, stairways should be designed with safety and usability for people of any age and abilities as the top and main priority (Kim & Steinfeld, 2016). In another study conducted in Iran with 20 participants with visual impairment, nearly all participants mentioned as a result of their low vision, they have been involved in several accidents (Riazi et al., 2016). Examples of these accidents include falling from stairs, falling into holes and pits, bumping into objects such as low-lying tree branches, glass doors and others. The study also reported that in most urban settings in Iran, open and uncovered drains and water canals on the side of walkways were common, and these are potential risks for a person with visual impairment of falling into one (Riazi et al., 2016).

In the context of education, these non-accessible infrastructure may also cause harm beyond physical injuries. Continually, studies have shown school environment without Universal Design in mind can cause psychological as well as emotional harm to students with visual impairment and impact their overall education experience. A study was conducted by Lourens and Swartz (2016) where students with VI were invited to walk around within a different and unfamiliar campus to explore the level of accessibility of the campus. The results gathered from the study showed that the students experienced difficulties while they explore the campus, to the extent that some students felt scared and worried. Maneuvering around the campus is one of their main challenges. One student expressed fear and concern after stepping into a pothole of a sidewalk as well as being hit to the face by tree branches that were not trimmed properly. Another student was more concerned about finding classroom locations rather than coping to perform well in class. Classroom lighting was also a factor expressed by another student that causes her to have eye strain and reported having to rest in a dark room to recuperate back into lessons. The study also found students with VI feel discomfort such as back pain in studying due to the dimensions of their school furniture where students with VI tend to bend their heads closer to the table to read and write and this dramatically enhances the risk of having bad posture.

Similar experiences were also reported across studies (Simui, 2018; Belay and Yihun, 2020), where the obstacles mentioned, create a sense of anxiety for the students with VI. The students mentioned that occasional occurrences of accidents (mostly due to poor landmarks on campus) caused them to be unable to attend lectures which in turn impacted their academic performance. In a recent study with VI students in higher education institution in Klang Valley (Amin, Sarnon, Akhir, Zakaria, & Badri, 2021), challenges are not limited to physical space alone. Students with VI experience social stigma and poor peer acceptance, which is susceptible to the feeling of rejection in schools.

This study covers the context of Brunei Darussalam which focused on students with VI in Secondary schools. This study intends to find out how the students cope with their school environment (physical space of classrooms and buildings for education). The study also delved into the architectural design of selected schools. Thus, the main aim of this study is to explore the experiences of students with visual impairment within their built school environment. This study also hopes to bring insight to readers (most prominently architecture students and designers) that the infrastructure of the built environment should not be taken for granted and any oversight away from the diversity of users can lead to harm and injury.

## **2. Methods**

This study adopted qualitative approach by using observation and semi-structured interviews as means to address the aim of this study. The observation was made to find out the physical environment of selected secondary schools (labelled School A, B & C) while semi-structured interview was employed to understand the perspective of VI students regarding their built school environment. This research employed a case study design which aimed to understand particular individual, group, project, institution or system are given an in-depth exploration from multiple perspective (Simons, 2009). The reasoning behind this research being that of a case study is due to the advantage of conceptual validity where multiple variables of the same study can be contextualised in a given setting which increases its validity, considering this study seek to explore Universal Design in the context of Brunei and secondary public schools. This is beneficial due to UD being usually explored in the west and cover mostly universities and other higher education institutes. Utilising a case study should help to contextualise the same concept within Brunei.

A purposive sampling was utilized where secondary school students with VI serve as the criteria set for the study. Three schools were chosen for the study for observation alongside four students with VI who were interviewed. The list of secondary schools with VI students studying in them was collected from the Special Education Department where three schools were randomly selected. The mean of their ages is 14 years old. The distribution of gender shown in table 1,

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**Table 1.** A summary of the students' descriptions.

| Participant | School | Age | Gender | Diagnosis                         |
|-------------|--------|-----|--------|-----------------------------------|
| S1          | A      | 14  | Male   | Blindness                         |
| S2          | A      | 15  | Male   | Low vision                        |
| S3          | B      | 15  | Female | Low vision                        |
| S4          | C      | 13  | Female | Blindness and physical disability |

The interview questions were asked bilingually (English and Malay) variations in order to engage and communicate with people of certain language preferences and then all answers were translated and transcribed into English with the assistance of a native Malay who validated the data speaker (samples of the interview can be found in appendix). The students with disabilities may be of a young age and may be more comfortable speaking in their common tongue (*Bahasa Melayu*). A voice recorder was used to document the answers of participants with the approval of the interviewees.

Additionally, an observation method as a tool was used to investigate the physical environment of the three secondary schools (labelled Schools A, B & C) to assess the extent of UD implemented in the architectural design. An observation checklist adopted from Kumari, Maniratnam and Mishra (2017) looked into the elements of the physical environment which included the stairways, corridors, floors, sidewalks, lighting and classroom furniture. These sites were observed with the companionship of the students with VI where they directed the researchers towards areas they had found difficult to move about and expressed their concerns with said areas. The students with VI were also interviewed on matters of impressions and experiences they had within their physical environment. This study is purely academic. The respondent's responses and information were treated with the utmost confidentiality.

Data gathered from the interview were grouped accordingly with common themes as expressed by the respondents with the use of thematic analysis method where coding of the responses were made along with interactive comparison as a mean of creating the themes. Multiple themes were found as a result ranging from the VI students' impressions and barriers experienced from their school environment, the teaching strategies adopted by the regular and SENA teachers to accommodate their VI students. The observation data was reported using the yes (indicating present) or no (not present) using a checklist.

Prior to conducting this research, ethics application was submitted to the Research Committee of the Sultan Hassanal Bolkliah Institute of Education of UBD which was subsequently approved. The ethical clearance was obtained to ensure protection of individual's identity (anonymity) and

maintaining confidentiality. In addition, the participants who contributed in this study gave informed consent after they were provided information about the nature of the study, and the assurance of individual identity to remain unrevealed. The consent letter for student with VI, SENA teachers and SEU officers used in this study is also attached (found in appendix). The participants were also free to withdraw from participating in the study if they so choose and the data collected from the participants can only be assessed by the researcher itself.

### **3. Results and Discussion**

#### *3.1 Results*

Table 2 below shows the ranking of the three secondary schools in terms of their accessibility concerning the physical environment. School B ranked first receiving the most accessible physical impression, followed by School C and A with the least elements available with UD in mind. The total score (15) from all three schools did not improve the observation of accessibility of the built school environment. Unfortunately, the schools did not consider the needs of students with VI, as well as other disabilities to an extent, when designing the layout of the school such as the stairways and floors. Most of the features observed made to reduce barriers were done by the teachers themselves such as putting up blinders and providing a special chair for the students.

There were however some elements that are unique to specific schools such as only School A not having hand-railings on both sides of the stairways and only School B has complex-coloured patterns on the stairway steps but this is only in the school library. In the case of floors, only school A has floor tile design that could be mistaken as steps. For sidewalks, only schools A and C have narrow sidewalks in some areas and only school B has clearly defined colored edges on its sidewalks. As for the water drainage system in the schools, only School A does not have its drains covered and is quite close to the sidewalks. In terms of lighting, only Schools A and B have sunlight exposed on their stairways and finally, in terms of school furniture, only School C provided special chairs to accommodate their students with VI.

##### **3.1.1 Physical element and built environment of schools A, B & C.**

Findings revealed that respondents' general impression of the schools is mostly negative, particularly in the beginning. All four students reported feelings of unease in one form or another upon entering secondary schools for the first time. The students also expressed concerns about having to memorise the layout of the new school they just arrived in upon arriving. Three out of four students who were interviewed in this study also used "feeling left out" to describe their early experiences in school. Feelings of being "nervous" was also added by one of the students alongside the phrase "feeling left out" to describe her experience. Another one of the students with VI attributed her initial school experience to her physical bodily disability where she felt "afraid" due to her physical appearance that comes with her disability.

##### **3.1.2 Students with Visual Impairment's impression of their Built School Environment**

Although each student falls into a spectrum of VI which differentially affects their vision, the findings showed that the students shared some similar experiences, particularly on the barriers they faced in school. Other unique instances are also identified based on the responses from a particular student within the sample group. These barriers faced by the students with VI include physical barriers, auditory barriers and lighting barriers.

**Table 2.** Physical elements and observation checklist of schools of A, B and C by score

| Observation checklist of school physical elements |                     | Score NO (0) or YES (1)  |          |   |   |
|---|---------------------|--|----------|---|---|
|   |                     | A  | School B | C |   |
| 1   | Stairs              | Are there continuous handrails?  | 0        | 1 | 1 |
|   |                     | Are the steps edge a different colour?   | 0        | 0 | 0 |
|   |                     | Are there warning blocks at the beginning and the end of the stairways?  | 0        | 0 | 0 |
|   |                     | Are the emergency stairways clearly identified?  | 0        | 0 | 0 |
| 2   | Corridors           | Can sightless person with a cane detect all protruding objects within the corridor?  | 0        | 0 | 0 |
|   |                     | Can people with low vision identify all obstacles in the corridor?   | 0        | 0 | 0 |
| 3   | Signage             | Are there directional signs indicating location of facilities?   | 1        | 1 | 1 |
|   |                     | Are the directional signs of a lower height for low vision students to see clearly?  | 0        | 0 | 0 |
| 4   | Floors              | Are complex-coloured patterns avoided?   | 1        | 1 | 1 |
|   |                     | Are there any floor patterns clearly defined and are not mistaken as steps?  | 0        | 1 | 1 |
| 5   | Sidewalk            | Have tactile blocks on the floor for a person with VI?   | 0        | 0 | 0 |
|   |                     | Have clearly defined coloured edges?   | 0        | 1 | 0 |
|   |                     | Are there no obstacles along the pathway   | 1        | 1 | 1 |
| 6   | Lighting            | Are bright light sources in risky infrastructure (such as stairways)?  | 0        | 0 | 1 |
|   |                     | Option to alter classroom brightness?  | 1        | 1 | 0 |
| 7   | Classroom furniture | Do their tables and chairs in the classroom avoid straining the neck and back of students (especially those with visual impairment who may bend down more to write and read materials) | 0        | 0 | 0 |
| Total score                                       |                     |  | 4        | 7 | 6 |

*Uncovered Drains.* As mentioned by one of the students, the drains alongside walkways in the schools tend to be uncovered by metal grills and he had some experiences falling into the drains. Another student reported that he disliked waiting in the rain and since he used a cane to walk, he



needed extra effort as he had to listen more to know where he was. This became an issue for him when it rained, as it is hard for him to listen properly to his surroundings which eventually led him to fall into a drain.

*Stairways.* Stairways in schools can also be challenging for students with VI. This is especially true for students with low vision who was impacted by the lack of contrasts in the colours of the stairways. Another student also reported frustration that it was difficult to differentiate the steps in terms of the colours. In addition to that, the students also stated that the stairways should have had hand-railings on both sides in order to eliminate the anxiety to figure out which side of the stairs had the railing to ease the problem in switching sides in case of no railing. These are common needs for people with visual impairment in terms of the ideal stairway design for them to use functionally with minimal difficulty.

*Insensible Floors.* The absence of tactile indicators on the floors also can be challenging to students with VI. This situation could be made worse in the presence of rainy weather, wherein raindrops could hinder the hearing of students with VI, and without tactile indicators, accidents could occur.

*Discomfort School Furniture.* Two of the students expressed discomfort towards the school furniture upon doing schoolwork such as reading and writing. This is because both students having low vision, would have to look at their papers quite closely and this forced them to bend down further than a student with regular sight. The following is an excerpt from the interviews:

*“It would be better if the table is a bit higher, that way I don’t have to bend down as much and it hurts” and “It gets sore, especially at the back of the neck.”*

One of the students also mentioned during computer classes, there are moments where she had to stand up from her seat in order to be able to see the monitor screen clearly because the chairs were too low whilst the desktops monitor on the table being too high. These indicated that table to chair ratio is often not suitable for students with VI and should be adjusted appropriately in order to improve comfort during lessons. The words “hurts” and “sore” indicate the discomfort these two students felt when they did schoolwork which in turn required more time for task completion.

### 3.1.3 Auditory barriers

Auditory barriers also serve as one of the obstacles faced by the students with VI. This is evident when two out of the four students stated that they had to rely on their auditory senses to maneuver and study within school grounds. Both students were diagnosed with blindness and thus their sense of hearing was a big part of their life and anything influencing that could affect their experience significantly. One of the students said walking around in the rain caused some issues for him where the raindrops had made sounds that limited his hearing of his surroundings such as not being able to hear people talking and footsteps. Due to this reason, he had fallen into a drain in school as mentioned before where he went off track as he lost his orientation due to the sound of the raindrops. Another

student mentioned that hearing could be difficult for her within the classroom due to the noises other students made that affected her focus in listening to the teacher teaching during lessons. The last of the four respondents remarked that although he did not mention facing any auditory difficulties, he did address that due to his low vision, he could not see what had been written on the whiteboard and had to rely extensively on what the teacher had to say.

#### 3.1.4 Lighting barriers

People with VI may be more sensitive to light (or lack thereof) and the degrees of brightness compared to the average student. Three out of the four respondents mentioned their experiences with lighting within the school. One of the students said that sunlight slightly bothered him, but was resolved by the teacher closing the classroom door to block out the sunlight. The measure was partially effective as the sunlight still entered the classroom through the windows and affecting his vision sensitivity. To overcome the lighting issue, the student stated that he would just close his eyes to block out the light. This statement can be reflected from what he said during an interview:

*“Sometimes, if it gets bright, I would just close my eyes, because I want my friends to see clearly when they study.”*

Another student also mentioned brightness becomes an issue when his eyes got tired. When the lighting started to irritate his eyes, he would notify his teacher who would then switch off the lights. One student emphasised that the classroom could not be too bright although she would feel nervous using any of the hallways in her school where it was too dark for her to see.

### 3.2 Discussion

#### 3.2.1 Nonconformity of Built Environment of Schools A, B and C with the concept of Universal Design for students with Visual Impairment (VI)

It is notable that Brunei still struggles in creating a school-based architectural environment that is accessible as well as one that follows the concept of UDE. This scenario can be found in a study conducted by Esfandfard, Wahab and Che Amat (2018) where a street was selected due to its regularity in use. The street had potholes and a non-uniform pavement and pedestrians such as the elderly and the visually impaired were seen to trip as a result. The street also did not have accessible UD features such as tactile paving, audible traffic alarms as well as signboards with proper contrast which could have been helpful for people with VI. The study shows that barriers and even hazards can arise from architectural designs that do not have the elements of UD implemented within them. Safety is one of the aspects that architects must consider, and Paul (2011) shows this by citing the National Safety Council (2011) which shows that in the case of the United States, annually there are about 1,900 deaths and 1,300,000 hospitalisations associated with stairway-related injuries.

The nonconformity of schools A, B and C is expected and is understandable, however as most public schools in Brunei were built a long time ago, before any accessible architectural policies. This

can be observed wherein School A, the oldest school of the three (built in 2007), appear to be the least accessible in terms of accessible design (score of 4 out of 15) such as only having hand railings on one side of the stairways, uncovered drains, narrow sidewalks and low contrast floor tile designs. School B (built-in 2015) and School C (built-in 2012) are relatively new compared to school A with a score of 7 out of 15 and 5 out of 15 respectively. This is evident as the higher scores do reflect the two schools having a more accessible design such as railings on both sides of the stairways and covered drains. School B, in addition, have wider walkways and clearly defined floor designs. The complex patterns of the library stairways in School B may also contribute to the newer and modern design choices that prioritise aesthetics over practicality. This situation mirrors a study conducted by the Australian Department of Education and Child Development in 2016 that observed 11 schools and how implementing aspects of UD has impacted said schools. The study found out that despite the schools having undergone renovations to implement UD, most schools still function in older buildings that were built before any accessible policies.

### 3.2.2 Students with Visual Impairments perceptions of their Built School Environment Design

The impression of students with VI regarding their school upon first entering is mostly negative as they expressed feelings of being “left out” and anxious. This finding reflects a similar emotional result from a study by Lourens and Swartz (2016) among students with VI. Students with VI were invited to walk around an unfamiliar campus and they expressed similar first impressions such as fear and worry. This study follows a similar vein with the problem of having to memorise a new environment as mentioned by the students with VI in Brunei. The sense of fear may be attributed to the potential hazards they may face in the infrastructure of the school layout, which unfortunately happened to one of the student respondents with VI. People with VI, therefore, tend to be intimidated to walk within built environments due to the possibility of accidents that could occur (Hussain & Tukiman, 2015). Similarly, some of the students with VI encountered a few mishaps during their walk around campus and reported instances of stepping into a pothole as well as being hit in the face by a low-lying branch that was not trimmed (Lourens & Swartz, 2016). Understandably, these discomforting emotions and fears among students with VI have placed them against various obstacles, especially in school. Ergo, these issues of emotional and psychological stress can stem from difficult and inaccessible built environments (Morrow, 2010).

The findings also revealed that although the students with VI belong to a spectrum of VI which determines the different intensities of the impairment, they still share similar experiences when it comes to the obstacles they faced in school. Understandably, the students with VI perceive physical barriers in schools such as uncovered drains, stairways, floors and school furniture, auditory barriers, lighting barriers and learning difficult subjects as ordeals they must face.

The students with VI claimed that the drains alongside walkways in the schools tend to be uncovered by metal grills and had some experiences falling into the drains. According to Riazi et al. (2016) uncovered drains and water canals are commonly found beside walkways in most urban settings and they found that nearly all their 20 participants reported accidents such as falling into

holes and pits. The students with VI stating that stairway hand-railings should be on both sides of stairways is consistent with Kim and Steinfeld (2016) who recommended railings should be on both sides of stairways as a practice to be implemented in stairway architecture. The struggle of identifying each step of stairways for students with VI due to low contrast is also in line with the study made by Den Otter, Hoogwerf and Van Der Woude (2011) who stated a significant aspect of stairway design is the treading edge being visible for people to identify the distance of each step. Stairways with high contrast colours are effective in identifying and perceiving the distance of each step (Templer, 1992). It should also be noted that low visual contrast of stairways constitutes the third most common cause of stairway accidents (Kim & Steinfeld, 2016). Likewise, the student with VI also stated that the absence of tactile floors in schools also poses some hurdles due to the lack of directional guidance tactile floors can provide. This finding mirrors a similar outcome in a study conducted by Athanasios, Konstantinos, Doxa and Eleni (2009) that highlighted one major difficulty faced by students with VI which was the lack of tactile paving on the floor that hindered their ability to navigate around the campus.

In terms of school furniture, students with VI expressed feelings of discomfort and pain especially at the neck as a result of the disproportionate dimensions of the school furniture. Another study also suggested that the students with VI expressed sores and pain in the neck due to the tendency of VI students to bend their heads closer to the table to read (Lourens & Swartz, 2016). The imbalances between the physical properties of school furniture and the human body that cause discomfort in the sitting posture of students might affect their performance and learning experiences, resulting in demotivation (Hira, 1980).

Apart from physical barriers, the students with VI also claimed that they relied heavily on their hearing. This can be associated with them being visually impaired, thus having to listen to the lessons and when walking around the school. Although, external sounds such as heavy rain and loud sounds from surrounding students may affect their concentration. The use of other senses such as the sense of hearing is a key indicator for people with visual impairment. People with VI use other means such as auditory senses to perceive and interpret their surroundings (Vermeersch & Heylighen, 2012). On a side note, the Rathmalana blind school that focused on students with visual impairment are also in support of the statement that claimed the use of various senses to navigate around the school is significant (Fernando & Hettiarachchi, 2016).

Although the VI students in the study got distracted easily by background sounds, a study conducted by Sahin and Yorek (2009) has findings that demonstrate more depth in auditory perception of a VI student. In their study of blind students, they found that students with VI distinguished certain sounds as distractions. Their study in a school for the blind found that the VI students used talking computers and talking phones at the same time during classes which did not appear to distract them, attributing this ability to the considerable focus they cultivated and possessed over time. However, they also found that low-frequency humming sounds and florescent lights in the classroom distracted them despite the teacher not being able to hear them. Thus, a distinction can be

made between the unnecessary background sounds the VI students find distracting and the sounds that relate to the education itself such as the instructions given by a teacher during the lesson.

The present study also revealed that the sample of students with VI in Brunei also perceived lighting as a hindrance for them to study or linger in the school. This is because people with visual impairment are sensitive to light to a certain degree in comparison to the average student. The students have mentioned their experiences with too much light in classes and the school causing their eyes to become tired easily and sometimes to the extent of experiencing pain. Sunlight may be too intense for a person with VI due to their eyes being too sensitive to light and may irritate (Tuan, 1997). Similarly, students with VI also tend to feel nervous walking around the area with a lack of light. People with visual impairment feel more comfortable traversing in better lit places as compared to using poorly lit or darker paths (Fernando & Hettiarachchi, 2016).

#### **4. Conclusion**

The study found that the schools that were built recently (2012 and 2015) appear to be somewhat accessible and have UD features present. However, some features such as narrow walkways and stairways with complex patterns persist. The older school (built-in 2007) was the least accessible and this can be attributed to its age being built before an accessible physical school environment was made a priority in Brunei. The students, on the other hand, had negative impressions on their first day of school, mostly due to the anxiety of familiarizing themselves with a new school environment. The students with VI also faced barriers from the physical architecture of the school, and some have sustained injuries and experienced discomfort from it. Few lessons can be learned from this study if policy puts health and safety first in all schools. All physical facilities should subscribe to the following: all 'covered' drains are for the safety of all students and passersby; handrailing on stairways with contrast in steps is necessary for those low vision students; sensible floors that is not slippery and soundproof; and comfortable school furnitures that offer some adjustments for students with VI. Another worrying problem that might come out from this issue of a poorly designed physical environment for the students with VI is the impact on their learning opportunities. Some students with VI are sensitive to the level of noises (auditory) as well as lighting which could either be sources of distraction or instead facilitate learning of students with VI. This was reflected in the findings that revealed some respondents had to drop out from taking difficult subjects and were excluded from the associated lessons due to difficulties caused by the physical environment of the classroom.

Factors that are seen as limitations to the study are the sample size of the study of only studying three secondary schools as well as four students with VI. Larger sample size would benefit the study immensely where future research could look at other educational institutions such as private schools, colleges and even universities.

The implication of the study has contributed to the literature in Brunei by introducing an aspect of inclusive education that explores outside the classroom with regards to UDE in Brunei. The

educational experience of students does not only occur within the classroom during lessons, but also includes the outside physical school environment such as the sidewalks, stairways, parking areas and even the buildings themselves. The significance of the study serves as an eye opening reflection of the existing school environment that is farfetch from meeting the basic UD criteria. Integrating accessibility in schools benefits not only students but the entire community of the schools. It is high time for relevant stakeholders to revisit school environment and take measures to make their educational system inclusive for persons with disability. Future school building projects should consider the needs of students with disabilities in the beginning of the planning phase and accessibility features should not be included later upon the arrival of said students with disabilities.

## 5. References

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