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MAKING MUSEUMS ACCESSIBLE FOR VISUALLY IMPAIRED CHILDREN

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รุ่งรัตน์ ล้วนวรวัฒน์ : การพัฒนาพิพิธภัณฑ์เพื่อเด็กที่มีความบกพร่องทางการมองเห็น. (MAKING MUSEUMS ACCESSIBLE FOR VISUALLY IMPAIRED CHILDREN) อ. ที่ปรึกษาวิทยานิพนธ์หลัก: รศ.ดร.ศุภกรณ์ ดิษฐพันธุ์ , อ.ที่ปรึกษาวิทยานิพนธ์ร่วม: ผศ. ดร. ธนวรรณ แสงสุวรรณ, 169 หน้า.

การวิจัยเรื่องนี้มีวัตถุประสงค์ในการแสวงหาแนวทางในการปรับปรุงพัฒนาพิพิธภัณฑ์ในประเทศไทย เพื่อให้เด็กที่มีความบกพร่องทางการมองเห็นสามารถเข้าถึงและใช้ประโยชน์ได้ ทั้งนี้มีแรงจูงใจและปัญหามาจากการขาดแคลนแหล่งเรียนรู้สำหรับเด็กกลุ่มดังกล่าว การวิจัยนี้มุ่งค้นหาลักษณะองค์ประกอบสำคัญของพิพิธภัณฑ์ที่ตอบสนองความต้องการพิเศษของเด็กที่มีความบกพร่องทางการมองเห็น โดยนำข้อเสนอจากองค์กรนานาชาติในด้านลักษณะอาคารและสื่อที่เอื้อต่อผู้ที่มีความบกพร่องทางการมองเห็นมาปรับประยุกต์ใช้ เป็นแนวทางในการศึกษา กลุ่มตัวอย่างที่ใช้ในการศึกษา คือนักเรียนที่มีความบกพร่องทางการมองเห็นที่ปราศจากการพิการซ้ำซ้อนทั้งสิ้นแปดคน ระดับประถม 5คนและระดับมัธยม 3คนจากโครงการ เรียนร่วม พิพิธภัณฑ์ที่ใช้ในการดำเนินวิจัยภาคสนามมีทั้งสิ้นจำนวนสี่พิพิธภัณฑ์ ที่มีความแตกต่างกันในด้านเนื้อหาและการจัดแสดง ได้แก่ พิพิธภัณฑ์บางกอก พิพิธภัณฑ์สยาม พิพิธภัณฑ์เด็ก และสวนงู การดำเนินการวิจัยใช้วิธีการศึกษาจากการออกภาคสนามจำนวนสิบครั้ง การออกภาคสนามไปศึกษาพิพิธภัณฑ์แต่ละครั้งมีกลุ่มตัวอย่างเข้าร่วมสองถึงสี่คน โดยสรุปแต่ละคนมีการออกภาคสนามไปพิพิธภัณฑ์สามแห่ง วิธีรวบรวมข้อมูล โดยการสังเกตุ สัมภาษณ์ก่อน ระหว่างและหลังการเยี่ยมชมพิพิธภัณฑ์แต่ละครั้งเพื่อตรวจสอบความเที่ยงตรงของข้อมูล ผลการวิจัยพบว่าสภาพการมองเห็น วิถีชีวิต และพฤติกรรมการเดินทาง ของกลุ่มตัวอย่างมีผลโดยตรงต่อแนวคิดเกี่ยวกับการเข้าถึงพิพิธภัณฑ์ นอกจากนี้ยังพบว่าโอกาสในการสัมผัสสิ่งที่นำมาจัดแสดงและการได้ยินคำอธิบายรวมทั้งปัจจัยทางกายภาพที่เกี่ยวเนื่องกับ ความปลอดภัยในการชมพิพิธภัณฑ์เป็นองค์ประกอบที่สำคัญอย่างยิ่งที่กลุ่มเป้าหมายต้องการ เมื่อพิจารณาข้อจำกัดโดยรวมแล้ว การวิจัยนี้ได้เสนอแนะให้เจ้าหน้าที่นำชมพิพิธภัณฑ์เป็นกุญแจสำคัญที่เอื้ออำนวยให้เด็กที่มีความบกพร่องทางการมองเห็นสามารถเข้าถึงพิพิธภัณฑ์ได้

สาขาวิชาการจัดการทางวัฒนธรรม ลายมือชื่อนิสิต.....

ปีการศึกษา 2552 ลายมือชื่ออ.ที่ปรึกษาวิทยานิพนธ์หลัก .....

ลายมือชื่ออ.ที่ปรึกษาวิทยานิพนธ์ร่วม.....

5187567420: MAJOR CULTURAL MANAGEMENT
KEYWORDS: ACCESSIBILITY/ MUSEUM/ VISUALLY IMPAIRED
RUNGRAT LUANWARAWAT: MAKING MUSEUMS ACCESSIBLE FOR VISUALLY IMPAIRED CHILDREN. THESIS ADVISOR: ASSOC. PROF. SUPPAKORN DISATAPUNAHU, Ph.D. THESIS CO-ADVISOR: ASSIST. PROF. THANAWAN SANGSUWAN, Ph.D. 169 pp.

This study aims to investigate what could be done to improve accessibility of museums in Thailand for visually impaired children, so that they can be used as supporting learning venues given the restricted academic resources available in the country. The study seeks to discover fundamental characteristics of accessible museums corresponding to the Thai visually impaired children's needs, using international visually impaired organizations' recommendations on physical and intellectual characteristics facilitating visually impaired people as guidelines. Ten field researches were performed in four museums with eight visually impaired young volunteers. The four museums varying in their collections and the way they exhibit their collections are Bangkokian Museum, Museum of Siam, Bangkok Children Discovery Museum and Snake Farm. Divided into small groups, each group was taken to three different museums. Observation, structured and unstructured interviews were conducted before, during and after the field research to gather their opinions, observe their actual practices, and cross-examine if the two are in line with each other. The study finds the participants' visual conditions, way of life, and traveling behaviors fundamentally influence their views toward the concept of accessibility. Touch and hearing are established as the core elements of intellectual access, and safety attributes are identified as most significant to physical access. Having taken all circumstances into account, the study eventually suggests that guides and docents be the key in making a museum accessible for visually impaired children.

Field of Study : Cultural Management Student's Signature .....
Academic Year : 2009 Advisor's Signature .....
Co-Advisor's Signature .....

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This study was originally inspired by the Thailand National Museum Volunteers' Touch Tour project, initiated by Susan Barry. I am fortunate to learn from her how I can help, in my capacity, contribute to a better living of the local disadvantaged. I am most grateful to the Bangkok School for the Blind, all teachers and children there as well as all scholars and museum professionals involved in this project. Their kind and understanding cooperation was highly encouraging and helped smooth progress of the study. Lastly, I would like to thank my thesis adviser, Assoc. Prof. Dr. Suppakorn Disatapunahu, for his helpful guidance and benevolent support.

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CHAPTER 1

INTRODUCTION

1.1. Significance of the Study

In the middle of 2008, the visually impaired came into the limelight when they were guided around the National Museum Bangkok touching displayed objects. This historic event was possibly the first of its kind offered to people with visual impairment in Thailand. The project was initiated by Susy Barry and the National Museum Volunteers (NMV) with the aim of making the National Museum Bangkok more accessible to visitors with disabilities. A group of Thai children, aged between 7-12 years, from the Bangkok School for the Blind participated in the pilot Touch Program. They enthusiastically explored the skeletons, inscriptions and ceramic shards. The curators guided the children's hands over tactile models of Ban Chiang decorative motifs before working with them to make their own pots. Feedback on the program from the children was highly encouraging (Barry, 2008: 24), demonstrating their existing demands for alike programs.

NMV's Touch Tour is a step forward in elevating the quality of life of the disabled in Thailand and a move towards changing the traditional museum model in which touching is forbidden and direct involvement is rare. Originally, museums' objectives were mainly to conserve and exhibit the heritage of humanity. Audiences, as a result, were not able to do much more than view objects through glass windows and passively receive information by reading labels. Such practices, which require vision alone, are obviously not beneficial to people with visual impairment. They need non-visual sensory channels to gain access to exhibitions.

NMV's pilot program allows visually impaired children to actively engage in the exhibits by means of tactile examination. The concept is in accordance with the progressive learning theory Fiona McLean (1997) drew from Hooper-Greenhill

(1991) that people learn while they are involved, committed and enjoying themselves. The theory clearly supports the idea of engaging museums in which participation and involvement from the audience are encouraged. A well-known learning theory, Constructivism, is often associated with approaches that promote active learning or hands-on experience whereby learners learn by experimentation rather than being told what will happen. Constructivism refers to the idea that learners construct knowledge for themselves; each learner individually (and socially) constructs meaning, as he or she learns (Hein, 1991).

Most museum educators have now accepted the idea that learners need to be active, that in order to participate in learning they need to be engaged in doing something, in hands-on involvement, in participatory exhibits and programs (Hein, 1991). Lowenfield (1973), referenced by Friend (2005), stipulated the importance of learning by involvement and suggested that teachers provide opportunities for students with visual impairments to learn skills by actually doing and practicing those skills. Field trips and activity centers would be the hallmarks of these classrooms (Friend, 2005).

There is little awareness of and very limited access to hands-on approaches in museums for Thai visually impaired children as attested by their reaction during the pilot Touch Tour program. Despite the presence of positive feedback, the displayed touchable objects were put away thereafter. Nonetheless, the National Museum and the NMV are working on providing regular exhibitions or activities for the visually impaired audience. While many museums in Bangkok are still in the traditional museum model phase, ones that allow hands-on involvement do exist. Some are in the form of science museums (such as National Science Museum and Museum of Sciences and Planetarium) and at least one is in the form of a children's museum (Bangkok Children Discovery Museum). Museum of Siam: Discovery Museum is an exception given that it is neither a science museum nor a children's museum but a learning centre on ethnology, anthropology, and other fields related to Thai society. The museum is in the forefront in adopting the interactive concept to historical and cultural exhibitions, a move that effectively brings its name before the public.

Interactive museums, which require input of the audience, generally allow visually impaired people more opportunity to get involved in the exhibits than traditional collection-based museums, which demand vision alone in viewing the exhibits. To maximize the disabled audience involvement, museums must be fully accessible. Physical accessibility is also referred to as one of the attributes of a well managed museum (Weil and Cheit, 1994).

Taking this into consideration, this study intends to discover how to make museums accessible to the visually impaired children so that they can truly get involved in the exhibits. Accessibility facilitating involvement and learning experience is not limited to only physical and sensory but also intellectual. The study's emphasis is on investigating elements essential to accessibility namely museums' exhibits (design, contents, labels), public spaces and facilities such as Braille, audio or verbal description, parking, entrance, lavatories, signage, lifts, restaurants, seating, surface, color, lighting and texture contrast.

This study will look into several recognized resources as guidelines in investigating access in museums. The key resources are the Art Beyond Sight Resource Guide to Art, Creativity and Visually Impaired (2003)'s learning tools list, the Smithsonian's Guidelines for Accessible Exhibition Design, the Specific Aspects of Accessible Design created by Vision Australia, Blindness and Low Vision Services, as well as the British Community in Thailand's Foundation For the Needy's Guidelines for Assisting the Visually Impaired.

The Art Beyond Sight Guide, co-published by Art Education for the Blind, Inc. (AEB) and AFB Press of the American Foundation for the Blind, is an expansive book illustrating the international collaborative work of academics, museums, educational professionals and visually impaired volunteers. The guide's learning tools list includes large-print and Braille brochures, three-dimensional models, tactile diagrams, verbal descriptions and touchable design subjects. Exemplary museums well-equipped with proper learning tools for the visually impaired mentioned in the

guide include the Museum of Modern Art in New York, the Tate Modern in London, and the Museo Tiflológico in Madrid (Art Beyond Sight, 2003).

The Smithsonian Guidelines for Accessible Exhibition Design is a product of the Smithsonian Institution, the world's largest museum complex and research organization composed of 19 museums, 9 research centers and the US National Zoo. Its extensive guidelines, covering physical and intellectual concerns, are primarily for people with various types of disabilities.

The Specific Aspects of Accessible Design created by Vision Australia, Blindness and Low Vision Services, as the name suggests, is particularly designed for visually impaired. Its emphasis is on physical accessibility in general buildings. The accessible design mentioned here includes layout, lighting, contrast, parking, pathway, floor, ceiling, stairways, signage, etc. Vision Australia is a partnership between people who are blind, sighted or have low vision. The non-profit organization has an aim of promoting accessibility for people who are blind or have low vision.

The Guidelines for Assisting the Visually Impaired, produced by the British Community in Thailand's Foundation for the Needy is a concise and easy reading book. Its advice on how to arrange a place to facilitate the mobility of the visually impaired is straightforward and could be easily implemented.

All of the mentioned tools will be explored and compared. Core characteristics that are particularly applicable to the visually impaired in museums will be utilized in the research.

How many visually impaired are there precisely in Thailand? The answer to this question cannot be confirmed since statistics from different sources show significant discrepancies. The number of persons with disabilities surveyed by the National Statistics Office (2007) stands at 1,319,832, significantly lower than the United Nations Development Programme (UNDP) figure, which estimates about 10%

of the world's population has disabilities. UNDP statistics (2007) also show that 80% of persons with disabilities live in developing countries.

The National Statistics Office's research (2007) shows that, out of the total 548,331 visually impaired people, 13.3% are blind in one eye, 7.1% blind in both eyes, 25% have low vision in one eye, and 53.6% have low vision in both eyes. For the age range of 7-14 years, there are 1,103 people blind in one eye, 455 people blind in both eyes, 1,118 people with low vision in one eye and 828 people with low vision in both eyes. From the total number of 548,331 visually impaired, only 98,960 people use aids in daily life; 42,453 people use magnifying glasses, 42,425 people use special tailor-made glasses, 9,560 people use magnifying lenses, 238 people use binoculars and 4,284 people use canes. These figures show that the majority of the visually impaired are people with low vision and only a fragment is completely blind.

It is also worthy of note to look into the number of special education facilitates available in Thailand. So far, there are only two schools for the visually impaired under control of the Bureau of Special Education Administration. The two schools, in Suratthani and in Chiangmai, accommodate 351 students. Nationwide, there are approximately ten more schools under NGOs administration. While the exact capacity and standard of these schools cannot be verified objectively, there are strong indications that the supply is behind the demand. Budget constraint is another critical issue. As Napaporn Kamthong, a teacher at Phrae Santhi Jinthana School for the Blind told the Bangkok Post (10-01-2009), the school is in need of financial support to help visually impaired children further their study into vocational or higher educational institutions.

Monetary deficiency is a powerful barrier to achievement for all types of organizations, let alone the special education for the disabled. While striving to earn more, other efforts to improve the quality of life of people with disabilities begins to bear fruit, as evident in the 2007 constitution. Several new or adjusted articles benefiting disabled people were added to help them be more independent. New public places are generally required to provide accessibility to people with disabilities. The

Support and Development for People with Disabilities Act 2007 and the Education Management for People with Disabilities Act 2008 emphasize integrated education and career opportunities for the disabled.

Legislation without effective enforcement and compliance is pointless. Thus, Thailand has yet to wait and see how and to what extent the long-awaited law will bring results. It should be noted here that this study is not intended to propose to museums how to make their sites and programs handicap accessible as required by law. Partly, it is because the law is not specifically meant for the visually impaired alone, but for people with all types of disabilities. Also, by not strictly adhering to the content of the Thai law but more to the practical standpoint, the findings of this study could be beneficial to interested museums from other countries as well. By making museums more accessible to the visually impaired, their exhibitions can be better utilized as an additional educational venue.

The significance of this study lies in the benefits of learning by involvement in a social setting beyond the classroom, given the constraints of special education and other resources essential to the education of the visually impaired.

1.2. Research Questions

1. What are the characteristics of accessible museums according to visually impaired children?
2. How accessible are museums to visually impaired children?
3. What can be done to make museums more accessible to visually impaired children?

1.3. Purpose of the Study

1. To identify the characteristics of accessible museums as stated by visually impaired children
2. To investigate museums' accessibility for visually impaired children.

3. To identify fundamental elements which make museums more accessible to visually impaired children.

1.4. Scope of the Study & Limitations

Scope of the Study: The study will confine itself to an approach to making museums accessible for visually impaired children.

Limitations: Research on the visually impaired is generally limited to psychological, social and classroom learning development. Adapting museums to facilitate people with visual disabilities is a pioneering concept in Thailand. This ground breaking study may pose a challenge to the findings. In addition, the visually impaired children who are subjects of study are clustered at one school; the Bangkok School for the Blind, the only special educational facility at primary level in Bangkok. Their behavior could be influenced by the school setting, causing their outlook to differ from other visually impaired children. This reason, together with the small numbers of subjects of study may decrease the generalization value of the findings. Provided that there is only one special primary school for the visually impaired, cooperation from the school is vital to the accomplishment of the study.

1.5. Research Procedures

Below is a general outline of the procedures used in conducting the research for this study. Details of the procedures are presented and explained in Chapter 3 - Methodology.

1. Design the research approach. Since the research questions concentrate on discovering the fundamental elements which make museums more accessible to visually impaired children, qualitative research is deemed practical.
2. Consider and decide on criteria for selecting participants and sites of study (visually impaired children and museums).
3. Select sampling type that best suits the quality research method

4. Interview key informants who can provide a better insight into the visually impaired children and their learning and who are knowledgeable about the museums under study.
5. Select research methods. In accordance with the qualitative research approach, research methods used in this study are naturalistic inquiry, participant observation, interview and field research.
6. Prepare Data Recording tools and techniques that correspond with the research methods.
7. Collect data.
8. Process and analyze data.
9. From the analyzed data, identify key attributes of accessible museums for the visually impaired children.

1.6. Expected Outcomes

1. The characteristics of accessible museums, in the visually impaired children's views, are identified.
2. The museums' accessibility for visually impaired children is evaluated.
3. Important elements making museum more accessible to visually impaired children are discovered.

1.7. Definition of Terms

Key words of this research are shown below. It is important to note here that definitions of the following terms may be described differently in other sources.

1.7.1. Visually impaired:

The United Kingdom's Royal National Institute of Blind People gives definitions of a visually impaired person, as stated in its Copyright (Visually Impaired Persons) Act 2002, as a person

a) who is blind;

b) who has an impairment of visual function which cannot be improved, by the use of corrective lenses, to a level that would

normally be acceptable for reading without a special level or kind of light;

c) who is unable, through physical disability, to hold or manipulate a book; or

d) who is unable, through physical disability, to focus or move his eyes to the extent that would normally be acceptable for reading.

1.7.2. Museum:

A museum is a permanent institution in the service of society and its development, open to the public, which acquires, conserves, researches, communicates and exhibits the tangible and intangible heritage of humanity and its environment for the purposes of education, study and enjoyment (International Council of Museums, 2007).

1.7.3. Accessibility:

There are different definitions of what accessibility is and whom it is intended to serve. One camp defines accessibility as a strict interpretation of legal requirements and international standards, intended to make content available to persons with sensory and motor disabilities; the other camp embraces accessibility as a practice of universal design, applying the fundamental concepts of access for all (Constantine, 2007).

The term used in this study focuses on museums' accessible design for children with visual impairment. This study does not adhere to legal requirements and does not completely adhere to international standards given that some of these standards may not be feasible in Thailand. However, it looks into both international and local resources as guidelines in investigation.

1.7.4. Engage, Engaging:

Engage, in this study, means to involve and commit in an understanding, to keep occupied, attract and hold fast a person's

attention. From the New Shorter Oxford English Dictionary (1993), ‘engaging’ means winning and attractive. According to Black (2005), an engaging museum is a museum which encourages visitor involvement.

1.7.5. Interactive:

In Merriam-Webster Online Dictionary, interactive means

a) mutually or reciprocally active
b) involving the actions or input of a user; especially : of, relating to, or being a two-way electronic communication system that involves a user's orders or responses

1.7.6. Person with Disabilities:

Thailand’s definition of a person with disabilities means an individual who is limited by function and/or ability to conduct activities in daily living and to participate in society through methods used by persons without disabilities due to visual, hearing, mobility, communication, psychological, emotional, behavioral, intellectual or learning impairment, and has special needs in order to live and participate in society as to others, (Asia-Pacific Development Center on Disability, 2008).

CHAPTER 2

LITERATURE REVIEW

A number of researches on developing accessibility for people with visual disabilities have been conducted; many are directed towards the design of online user-friendliness and access to general public buildings. Studies on visually impaired people's access to museums are relatively minimal and predominantly limited to museums in the United States of America and a few countries in Europe. This chapter will explore various relevant studies and practices that can contribute to answering the research questions outlined in Chapter 1. The first part of this chapter focuses on visually impaired children. The second part reviews major findings on the relationship between museums and children. The final part looks at museums for visually impaired. The two variables: visually impaired children and accessible museums are extensively explored so as to build a sound foundation for this study.

2.1. Visually Impaired People

For long, stories about visually impaired people's gifted auditory and tactile acuities as a compensation for the absence of sight have been heard far and wide. The alleged hearing gift, believed to aid in the development of artistic talents, can be exemplified by world famous visually impaired musicians and singers, such as Steven Wonder and Ray Charles. While researchers continue studying visually impaired people's skills and development, the myths about their natural abilities remain.

What does 'visually impaired' mean exactly? Many people often refer to people with visual impairments as blind, and misperceive that they possess no faculty of seeing, experiencing only darkness. The common misunderstanding has extended without surprise given that various online and printed dictionaries also define 'blind' as 'being unable to see'. In fact, the term 'blind', which will be discussed below, also includes people with limited sight. After the definitions are laid out, literature on the

characteristics of people with visual impairments and visually impaired children in Thailand will be reviewed, followed by the topic on empowering visually impaired children.

2.1.1. Definitions of Visual Impairments

Definitions of visual impairments are mainly divided into two categories: functional and clinical. The United States of America's Individuals with Disabilities Education Act, using a functional criterion, refers to visual impairment as impairment in vision that, even with correction, adversely affects a child's educational performance. The clinical definition is based on visual acuity, the clarity and sharpness of vision, or visual field, the range in which objects can be seen centrally or peripherally (Friend, 2005).

Two clinical subcategories are generally recognized: low vision (partially sighted) and blindness. Blindness refers to a person with central visual acuity of 20/200 or less in the better eye with corrective glasses, or central visual acuity of more than 20/200 if there is a visual defect in which the peripheral field is contracted to such an extent that the widest diameter of the visual field subtends an angular distance no greater than 20 degrees in each eye (Koestler, 1976 quoted in Friend, 2005). People with acuity of 20/200 can see at 20 feet what those with 'normal' vision can see at 200 feet (Jacobson, 1993).

Low vision refers to a person with central visual acuity of 20/70 to 20/200 in the better eye with correction or a visual view of 20 to 40 degrees or less in the better eye with correction (Brilliant & Braboyes, 1999 quoted in Friend, 2005).

In Thailand, the terms are defined similarly to the aforementioned, except for the visual field. Office of the Basic Education Commission states the visual field of blindness at less than 20 degrees and low vision at less than 30 degrees while ophthalmologists would refer blindness'

visual field at less than 5 degrees, and low vision less than 30 degrees (Thailand Association of the Blind, 2003).

2.1.2. Characteristics of Individuals with Visual Impairments

2.1.2.1. Cognitive characteristics:

Lowenfeld (1973) divided the cognitive characteristics into three areas: range and variety of experience, ability to move around and interaction with environment. By this description, the visually impaired people's cognitive development is behind the sighted given that the remaining senses such as touch and hearing, cannot entirely compensate for the quick and holistic information, for example, size, color and spatial relationships provided by vision. Besides, the restriction of the visually impaired people in moving around freely limits their opportunities for experiences, direct control of environment and affects social relationships (Friend, 2005).

In general, research on people with visual impairment has so far yielded diverse results. Some conclude that visually impaired people's developmental skills are poorer than the sighted, some disagree. Ferrell, Shaw, & Dietz (1998) claim that, from recent studies it is evident that blind people's overall developmental skills, except for language, are affected by vision loss (Friend, 2005). Other studies go even further in suggesting that visual impairments also impact language development.

A review of literature on visual impairments' effect on cognitive development and behavior presented by Gunaratne (2002) states that severe and early impairments are likely to affect the language development of affected children. The differences are in part due to limited access to the environment and to differences in verbal feedback from people around them. Fuengfoo (2008), a developmental behavioral pediatrician at the Queen Sirikit National Institute of Child Health,

Thailand, also sees that vision is central to infants' development. Provided that infants are too young to learn by other means, their learning happens visually through the things they see. Thus, their learning process will be incomplete if their eyes are imperfect (Bangkok Post, 2008-12-31).

Some studies also find that, compared to normal sighted children, the language of visual impaired children, is more self-oriented and the word meanings are more limited (Anderson et al, 1984 quoted in Gunaratne, 2002). In addition, a child may misinterpret the meaning for the language and use overly dramatic statements that carry their own personal meaning (Gunaratne, 2002).

Gomulicki (1961), Cambridge University in England, conducted experiments to measure the efficiency with which blind and sighted children of various ages exercise non-visual perceptual skills, and the way in which this efficiency improves with increasing age. The subjects selected were 163 children blind from birth or shortly thereafter, and 170 sighted children to serve as a control group. The children were between 5 and 16 years old. The research demonstrates that at the age of 5, the blind child was at a distinct disadvantage when compared to the sighted one, but the further progress of sighted children from 5 onwards is, in general, slower than that of the blind, who, over a period varying from about 4 to 10 years or more, manage to draw approximately level. In line with Gomulicki (1961)'s research is Allport (1980)'s investigation on the ability of blind and sighted subjects to judge personal characteristics by voice alone. The result shows that the blind were less accurate in their judgments than were the sighted (Jose ed., p. 47). In playing, Tait' s 1973 study concludes that blind children from 4 to 9 years old play less imaginatively than sighted children (Hughes, 1995).

Studies which suggest visually impaired people's non-visual perceptual skills are inferior to those of the sighted by and large state that their skills will eventually draw level with their sighted counterparts. There is growing evidence that those who have been totally blind from birth need more support initially, but that adverse learning conditions can be improved by supplying, at an early stage, information that becomes otherwise hard for this group to access (Linda Pring & Alison Eardley, 2003).

Research conducted by Morton A. Heller and Paul Gabias, quoted in the Art Beyond Sight Guide (2003), show contradicting results to the aforementioned studies. Heller's research on picture perception and spatial cognition in blind people found that many blind people possess superior tactile skills. However, he highlighted that the visually impaired should be regarded as individuals, who vary in their tactile, spatial, cognitive and intellectual skills. In line with Heller's findings, Gabias (2003), an associate professor of Psychology and visually impaired himself, conducted a study to compare the performance of the visually impaired and the sighted in a variety of perceptual tasks. He discovered that people differ in various capacities and the presence or absence of vision was found to be insignificant. Gabias (2003) then concluded performance arises from curiosity, desire, a zest for life and accomplishment rather than vision loss.

The studies above are particularly aimed at visually impaired children; however, with or without vision, they are still in their youth, when cognitive characteristics are not yet fully developed. Since this research aims to study children at school age, whose imperfection is only vision, it is noteworthy to review their general development as well.
Berk (2006), Illinois State University, wrote that children between the ages of 7 to 11 years have, to a certain degree, organized, logical fashion about concrete information. Their hierarchical classification and

understanding of quantitative dimensions, such as length or weight are advancing. Spatial reasoning improves, as their ability to give directions reveals. Children have difficulty reasoning about abstract ideas. They cannot sort out evidence that bears on three or more variables at once and do not grasp the logical necessity of propositional reasoning. By age 9, a child should be able to focus attention for about an hour (Mannheim, 2008). Adolescents reason abstractly in situations that offer many opportunities for hypothetical-deductive reasoning and propositional thought. When faced with a problem, they think of all possibilities including ones that are not obvious and test them systematically. They are likely to think abstractly in situations in which they have had extensive experience. They often fall back on less demanding, intuitive judgments instead of using formal operational reasoning (Berk, 2006).

2.1.2.2. Academic Characteristics:

The impact of visual impairments on cognitive development likewise affects academic skills, particularly in the areas of reading and writing. The visually impaired are found to be slower readers than their sighted counterparts (Heinze, 1986 & Wetzel & Knowlton, 2000 cited in Friend, 2005). Although current research on Braille reading is sparse, a rate of about 100-125 words per minute is considered typical for students in high school, compared to sighted adolescents' printed reading rate of 140 to 150 words per minute (Friend, 2005).

What do visually impaired children learn from schools and how competent are they? Wolffe (2000)'s list on Career Education, published in 'Foundations of education: Instructional strategy for teaching children and youths with visual impairments' (Koening & Holbrook eds., 2000) referred to by Friend (2005), provides informative illustrations on the childrens' competencies in relation to their school levels. Wolffe (2000) describes that elementary school children are learning to solve problems

and follow more complex directions, be responsible for actions and understand the rewards of work. They are developing good communication skills and can identify different work roles and assume them in fantasy. Middle and high school children are able to meet increased demands and begin to investigate identified areas of interest.

2.1.2.3. Social and Emotional Characteristics:

In parallel with the literature on cognitive characteristics, studies on social and emotional characteristics of the visually impaired are still open to question. Sacks & Silberman (2000) view that as social behavior develops by observing social events and customs and imitating them, students with visual impairments often have difficulties demonstrating socially appropriate behaviors (Friend, 2005).

Studies on the emotional difference between the partially sighted and the blind were conducted by Bateman (1962) and Bauman (1964). Bateman (1962) concluded that partially sighted children pity themselves more and are less able to accept their visual limitations than those whose handicaps are more severe. Bauman (1964), using the Adolescence Emotional Factors Inventory, found that partially sighted students showed a significantly higher level of anxiety and insecurity and a greater sense of loneliness and were less well adjusted to their handicap than were blind students (Jose ed., 1983, pp. 48-49).

Jervis (1959) and the University of Rochester group conducted studies to determine if the self-concept of blind adolescents differed significantly from that of their sighted peers. Their findings are quite the opposite of Bateman (1962) and Bauman (1964). They found no significant differences between the blind and the sighted (Jose ed., 1983). Meighan (1971), using the Tennessee Self-Concept Scale also found no significant differences between the blind and partially sighted (Jose ed., 1983, pp. 48-49).

In comparison to emotional development of children in general between the ages of 7 to 11 years, Berk (2006) demonstrates that their self-conscious emotions become integrated with inner standards of excellence and good behavior. The characteristic shifts adaptively between problem-centered and emotion-centered coping. They are aware that people can have mixed feelings and that their expressions may not reflect their true feelings. During adolescence, individual differences in self esteem become increasingly stable and correlated with everyday behaviors. Generally positive self-esteem profiles are associated with positive adjustment, and low self-regard in all areas is associated with a wide array of adjustment difficulties.

2.1.2.4. Behavior Characteristics:

Many studies point out that visual impairment alone does not cause a person to have significant behavioral problems or disorders, although it does generally have some subtle influences on behavior. Problems occur when visually impaired people are viewed as less capable of taking care of daily needs, thus others tend to do things for them. When this happens, they can become even more passive and may develop demonstrative stereotypic behavior such as flicking hands or fingers, rocking, spinning, body swaying, twirling and tapping (Jan et al, 1977 cited in Gunaratne, 2002). A variety of theories exist as to why students with visual impairments sometimes develop these behaviors. They may be a sign of loss of interest in the current activity or the absence of sensory stimulation, restricted activity and movement in the environment, and social deprivation (School, 1987 cited in Friend, 2005).

2.1.3. The Visually Impaired in Thailand

Thailand's reports on development of children with disabilities often refer to Dr. Phadung Arayawinyu, whose study coincided with many in finding congenital visually impaired children having slower perceptual development. Language, orientation and mobilization skills are evidently behind, especially at the beginning of school age (Arayawinyu,1980).

Arayawinyu (1980), Elliott, Kratochwill, Cook and Travers (2000), claim that the negative attitude from society is a more important hindrance to their social development than the impairment itself.
In Thai society, where Buddhism plays a central role in life, karma is usually held accountable for creatures born handicapped. Thais believe and stoically accept disabilities in their children as manifestation of their own wrongful deeds either in this life or in the previous cycles of incarnation. By attributing their children's disabilities to karma, they may refuse to try harder to fulfill or enrich their children's lives. The statement can be affirmed by Thongjerm (1997)'s thesis research on the visually impaired children's self concept, which illustrates that the children hold karma accountable for their disabilities (Athawathii, 2004). Besides, they also have a strong believe in superstition and Buddhism.

Corresponding to Thongjerm's finding, the Primary Education Council, the Prime Minister Office (1985)'s research on educational opportunities for the handicapped demonstrates that most parents of handicapped children blame karma for their children's disabilities. This study also reveals a connection between parents' characteristics and their disabled children's performance. Handicapped children whose parents have a positive attitude towards the children produce better academic results than their less supported counterparts. Parents of handicapped children living in Bangkok, as well as parents with high education acknowledge the significance of special education more than their counterparts.

Parents also play a key role in the visually impaired child's self-esteem, as presented in Fangsa-ard (2002)'s quantitative research conducted at the Bangkok School for the Blind. Using The Coopersmith Self-Esteem Inventories, Thai version, translated by Anurak Bunditchart for 53 students aged 9 to 18 years, the findings demonstrate that students whose parents stay together have higher esteem than whose parents separated.

The parents' age, job, and educational level are found to have relations with the children's self-esteem. Students whose parents work in the agricultural field are found to generally have lower self-esteem. The research yields no difference in self-esteem level between the totally blind and partially sighted.

Aside from special education, many studies were also conducted in integrated schools or so called mainstreaming, where disabled children are placed in a regular school setting. Thailand has long ago introduced the mainstreaming approach but the scheme still appears to be off course. A report from the Office of the National Education Council attached to the Prime Minister Office (2002) shows that many teachers in schools where mainstreaming was applied have no prior experience in teaching handicapped children. Those who are familiar with teaching handicapped children average less than two years of such experience. Furthermore, the investigated schools which are attached to the Office of the Primary Education Council do not provide appropriate special education (like sensory trainings to substitute the impairment, etc.) to pre-equip the children for the challenge.

The Bangkok School for the Blind has been integrating blind students into regular schools since 1956. The school now runs two parallel systems: kindergarten and primary level are conducted at the Bangkok School for the Blind, secondary level is integrated into regular schools (Kamphu Na Ayuthaya ed., 1999). The school follows the same primary education curriculum as the regular schools but adapts some subjects to suit the special abilities of visually impaired students. In kindergarten, students learn about physical movements and activities used in daily living. At the primary level, students learn to use a cane to navigate their way to different places in the Orientation and Mobility (O & M) classes. At this level, they begin to study academic subjects and the Braille

system, starting from reading and writing the Thai Braille alphabet, numbers, then the English Braille system. In math class, equipment used in a regular classroom, such as rulers or measuring tapes, is modified to have raised numerical marks. Besides traditional learning tools and materials, new media technologies such as computers, the Internet, MP3 players and translation software have been employed enabling the students to study independently (Nimkannon, 2007).

2.1.4. Empowering the Visually Impaired Children

As demonstrated earlier, research findings on visually impaired people have varied so far. This is partly because researchers neglected to take the subjects' prior experience into account. In Thailand, while special education is plagued with resource and personnel deficiencies, many findings reveal that a major obstacle to the success of people with disabilities lies in the cultural background. Yet, it should be noted here that visually impaired individuals are all very different. The degree of impairment, personality, intelligence, background, additional disabilities, the time when the impairment occurs, education, environment, religion, geographic location, family income, parents' profession, adaptation skills, etc. altogether contribute to a visually impaired person's characteristics and abilities. Given this diversity, it is important to keep in mind that each child needs to be viewed and supported as an individual with unique needs. Nevertheless, in spite of the variety, they all have one thing in common: a visual impairment. So far, studies on strengthening their capacity tend to move in the same direction, by making the most use of the remaining senses.

Friend (2005) quotes Lowenfeld (1973)'s three principles of special methods that help overcome the limitations imposed by visual impairment. First is the need for concrete experiences. Teachers need to provide early and ongoing opportunities for students to learn about their

environments through tactile exploration of real objects and situations as well as through other available senses, (Lowenfeld, 1973 cited in Friend, 2005). According to Hill & Blasch (1980), understanding objects help visually impaired people move through surroundings effectively and efficiently. Objects can be recognized according to their shapes, temperature, texture and location (Jacobson, 1993). These are some core concepts people with visual disabilities must know. In Yaemiam (1999: 200-201)'s visually impaired children must-know list, he added topics on body image, directions, colors and measurements. Some people may find the topic of colors out of place, but the author explained that the concepts of colors help visually impaired children keep up with other sighted people.

A variety of learning tools are also found to be more effective than a single means. Research from Ondee (1993) cited in Athawathii (2004) discovers that visually impaired students who studied with raised pictures produced better results than those who studied with Braille alone. However, one must avoid using abstract forms in demonstrated objects since people with visual impairments may not have a firm understanding of spatial and environmental concepts, causing their mobility and concept development to be limited (Jacobson, 1993). Concept development is the process by which people learn to understand the various characteristics of objects and their relationships to one another and to themselves in the environment. Because concept development depends mainly on visual input, visually impaired people have greater difficulty understanding concepts in their abstract forms. Although models, maps and pictures help people gain a better understanding of the characteristics of such objects as the moon, sun and stars without the aid of the visual sense, it is difficult to understand the depth and scope of the galaxy, the universe and the vast distance among and between stars and planets.

For students with low vision, the use of non-visual tools is supplemented but not replaced by visual exploration. In fact, low- vision students are encouraged to exercise their remaining vision to the greatest extent so that print can be used as their primary literacy medium. Corn (2002)'s study on low-vision students' print reading rates discovered that appropriate tools could help double the speed of their reading. His investigation on185 fifth grade students with low vision in Tennessee compared the students' reading skills in the fall when low-vision devices were not used, with their reading skills in the spring after instruction in the use of low-vision devices was provided (Friend, 2005). When all of the students' reading rates were included, regardless of their level of comprehension, the average silent reading rate was 45.5 words per minute in the fall and 107.4 words per minute in the spring. One of the low-vision devices that is easy to carry around and inexpensive to make are magnifiers.

The magnifiers encourage children to use their low vision to the full, thereby increasing visual stimulus and helping the children's development. The magnifiers promote literacy by increasing access to printed material for educational purposes and private reading. It is also more cost effective to provide children with optical devices enabling them to use standard books than to provide large print books which are expensive and heavy to carry (Ager, 1998; 11(27): 38–40.).
There are some limitations in providing magnifiers. Using a magnifier may make a child's visual disability more noticeable, causing the child to feel different from other children. The human and financial resources available to provide the magnifiers may be limited. The child needs to be taught carefully how to use the magnifier as the restricted field of view can prevent a child from perceiving the overall pattern of words or sentences on a page (Ager, 1998; 11(27): 38–40.).

Apart from magnifiers, other learning media currently used are presented hereafter.

a) Microcapsule or Swell paper: This type of paper has a coating of 'microcapsules', or very small beads of plastic, which expand in width & height when exposed to heat. It is recommended that the paper should not be larger than 11x17 in., otherwise it's difficult to understand through touch how the different parts of a picture fit together to form a complete image. This tool is inexpensive, quick & easy but not durable, gets dirty easily, and cannot be cleaned (Kardoulias, 2003).

b) Silk-screening: Silkscreen employs a transparent plastic ink to produce relief images. First the tactile image is printed using black ink, but is not raised. The image is then silkscreened, with the transparent plastic ink directly laid onto the image printed in black ink. The page passes through a heating machine that fuses the plastic ink underneath the transparent ink making the lines and patterns in relief look black. The paper used is heavy in weight and has a smooth surface. The silkscreen is much more durable than the swell paper, though silkscreen does not give the variation of height in the relief (Kardoulias, 2003).

c) Thermoform method: A process using heat to copy tactile materials, the plastic thermoform sheets used in the process & the thermoform itself. There are two steps in the Thermoform process; the first is to prepare the master & the second is to make copies of the master. A master usually consists of a piece of heavy Braille paper or thin tag board onto which are glued various materials to make the tactile image. The collage with graduated heights & depths is the result. The second step is the copying on the Thermoform machine. Education institutions use them to produce high-definition geometric shapes for math problems, simple maps & charts & graphs (Kardoulias, 2003).

d) Art making materials & techniques: Materials and techniques recommended include drawing on aluminum foil with pencils and crayons (make a simple outline drawing with a ballpoint pen on aluminum foil that is spread out underneath a sheet of paper), drawing with tapes, paint (mixed with sand), sculpture, and other three-dimensional objects such as clay, corks, toothpicks and cardboards (Levent, 2003).

e) Assistive high technology devices: Countries in the First World, such as the United States of America have a variety of high-technological tools available for their visually impaired people. Friend (2005) demonstrates Spungin (2002)'s overview of assistive technology devices for visually impaired students in three categories: auditory tools, visual tools and tactile tools. Synthetic speech, an auditory tool, converts words into spoken language and produces sound. Optical character recognition (OCR) with speech and scanner converts text into electronic files that users can access in Braille and synthetic speech. CCTV is a visual tool that uses a video camera to project an image onto a screen. Students can use CCTV to read regular-print books at greatly enlarged sizes. Braille translation software converts print into Braille and vice versa. Refreshable Braille displays have software that convert the characters from the computer into Braille. Other tactile tools include Braille printers, electronic Braille writers and tactile graphic makers.

Besides appropriate tools and materials, professionals such as teachers are obviously central to the development of the visually impaired children, particularly in the area of academic achievement. Loescharataramdee (2002)'s thesis on program management for visually impaired students in the primary demonstration Rajahbat Institute Duansunandha, demonstrates that academic performance of visually

impaired students varies in accordance with the teachers' standards. Parents' commitment and collaboration are also of great importance in ensuring that students with visual impairments experience success in general education settings (Sall & Mar, 1999 cited in Friend, 2005).

The second principle of special methods Lowenfeld (1973) described is the need for unifying experiences. Because a visual impairment limits the ability to perceive the wholeness of objects and events, Lowenfeld (1973) suggested visually impaired children are provided with opportunities to integrate parts into wholes. One way is by the use of study units, where connections among academic subjects and real-life experiences can be enhanced (Friend, 2005).

The third principle is the need for learning by doing (Lowenfeld, 1973 cited in Friend, 2005). Debord (retrieved 2009), a child development specialist, wrote that children learn best if they are active while they are learning. For example, children will learn more effectively about traffic safety by moving cars, blocks, and toy figures rather than sitting and listening to an adult explaining the rules. For students with visual impairments, the use of a concrete activity-oriented approach is a necessity, not a luxury, i.e., the value of teaching a student to bowl by actually going to a bowling alley (Lowenfeld, 1973 cited in Friend, 2005).

Learning by doing may require visually impaired people to go beyond their usual places. To explore unfamiliar sites effectively, they need to master environmental concepts to maintain their orientation. Linear concepts, cues and clues are among the fundamental components to help them stay on course. Jacobson (1993) explains cues as critical objects or the sounds emitted from those objects that trigger instant recognition of one's location, and clues as secondary objects or sounds emitted by those objects that help a visually impaired person piece together his or her

exact location. In addition to learning to find cues and clues, individuals with visual impairments must learn to walk in straight lines to understand the true relationships of objects in the space around them. Straight lines can be combined at one or more points to form different configurations. These configurations help the traveler better visualize the shape of the route (Jacobson, 1993).

Various studies exemplify show how teachers can apply fundamental methods in helping visually impaired children overcome their shortcomings, but with some adaptation to meet individual's needs. Friend (2005) cited Holbrook & Koening (2000)'s suggestions on specialized instruction for teaching children and youths with visual impairments are basically meant for school teachers in a school setting. Some ideas that could be applied in a museum environment are as follows.

1. Provide printed materials in accessible media and discuss the field trip with the children in advance to determine the types of adaptation or modification that will be needed.
2. Say everything aloud and encourage the children to ask for clarification.
3. Allow the children to participate in the demonstration, if possible.
4. Try to reduce glare and visual confusion by moving away from windows to an uncluttered wall.
5. Allow the children with low vision to stand close to the demonstration and to use low-vision devices if appropriate, talking them through the steps of the activity.
6. Allow the children to touch your hands as you model the activity, providing physical guidance to allow the children to move through the steps of the activity being modeled.

2.2. Museums and Children

In developed countries, museums' orientation towards visitor experiences is leading to the creation of a different museum concept, causing the traditional explanatory tours to move into the direction of a less-structured, question-and-answer method, which increases the involvement of the audience, by the provision of 'hands-on' activities (Gee, 1979:68). New approaches to display techniques based on new technologies are explored; interactive exhibits are used to involve visitors in active participation in exhibitions; special events are organized using theatre or drama (Hooper-Greenhill, 1991). As attention shifts from the accumulation of objects to the use of existing collections, the educational role of museums is expanding on all fronts (Hooper-Greenhill, 1991). Outreach programs to schools are carried out, not only because demand for museum programs outnumbers the museum staff's capacity, but also because the classroom teacher knows the students and curriculum being studied best. The museums offer programs to teachers through open houses at the museum, and workshops held either in the museum or during teachers conventions (Gee, 1979:70-71).

The educational role of museums and their outreach programs have obviously brought a successful result. American Association of Museums (1984:66) reported a survey on levels of use, characteristics of the visits, of the visitors, and publicity information that most children visit museums for the first time with a school group, and those experiences have a profound effect on their attitudes toward museums (Mc Lean, 1997).

The survey coincides with a survey examining children as an audience for museums and galleries, carried out on behalf of the UK Arts Council and Museums and Galleries Commission (1997) and based on interviews with children aged between 7 and 11 and their parents suggesting that children who have been to the site on a school trip like to come back to show their families. Seeing museum visits as an opportunity to learn as well as have fun, they enjoy interactive exhibits, computers, creative activities, and competitions – all active elements which they can touch and do

(Black, 2005). The report also highlighted the children's low boredom threshold keeping them away from reading long texts, and causing them to be easily frustrated when encountering disappointment. These findings correspond with Doering (1999)'s four types of satisfying experiences (Black, 2005). First is the experience that allows the children to see valuable things, seeing the real items. Second is the cognitive experience enriching their understanding and knowledge. Third is the introspective experience that reflects on the audience's prior experience, feeling a spiritual connection or a sense of connectedness. Fourth is the social experience which allows them to spend time with friends and family.

Since children's museum experiences have a profound effect on their attitudes toward museums (Mc Lean, 1997), it is interesting to explore how teachers can best prepare for a museum trip. Research from the United States of America suggests that when school children are taken to a new place, their reaction to the novelty of the environment is such that it is necessary to design tasks to encourage exploration (Falk, Martin and Balling 1978; Falk and Balling 1980 cited in Hooper-Greenhill, 1991). Most field trips to museums, gallery sites and nature centers are to stimulate settings that are unfamiliar to the children; the disorientation the children experience in such an environment needs to be assuaged by exploration.

This need to explore the space before feeling comfortable can interfere with knowledge-based tasks, unless tasks can be carried out in an exploratory mode (Hooper-Greenhill, 1991). However, teachers may not expect a museum visit to effectively enhance students' academic knowledge; a highly-structured assessment of a school visit to the Franklin Institute Science Museum in America came to the conclusion that although interactive science exhibits can teach science, the strength of the museum visit is in the affective rather than the cognitive domain. The study concluded that the significance is the attitudinal change during a visit that has an effect on learning and remembering (Hooper-Greenhill, 1991).

In Thailand, Thienthai (2008) conducted a research at Museum of Siam – Discover Museum, using participant observation and focus groups methods on

various groups of visitors. Young visitors at primary school level are found to be fond of 'having fun' using a trial and error approach when trying interactive tools. They appear to have no interest in text presentation. The research does not mention if learning takes place when the children are hopping around from one activity to another. However, it does point out that the museum's challenge is to hold the balance on the children's enjoyment and learning. Some doubts about the relationship of fun to the learning of scientific concepts have, however, been raised (Shortland, 1987 cited in Hooper-Greenhill, 1991). After visiting museums on a school trip, as mentioned earlier, children like to revisit with their parents. The Australian Museum Audience Research Center (2003) conducted research on parents and found that parents want exhibitions which are interactive, placed at an appropriate height, allow children to touch and experiment, have minimal reading, cater for a range of ages and abilities and keep parents entertained as well (Black, 2005).

The success of the interactive exhibits used in science centers has demonstrated that people enjoy active physical involvement, and are enthusiastic about becoming involved, either singly or in groups, with investigation and experiment. Informal and structured learning, based on the event of the moment and the visitors' reaction to it, can occur (Hooper-Greenhill, 1991). To engage visitors in museums, Black (2005) suggests that museums should first provide stimulus to visit, and then provide a sense of welcome and belonging, together with motivation and support to have children engaged directly with the site and collection. Black (2005)'s Engaging Museum literature also presents the 21st century museum model using a holistic approach to the visitor experience, listing the areas modern museums need to address.

The list is divided into four categories: core product, underpinning ethos, tangible and intangible elements. The core product refers to collections and buildings. The underpinning ethos mainly refers to community relationships. The tangible elements are all interpretative media while the intangible elements are image and atmosphere.

2.3. Museums for Visually Impaired

As discussed earlier, museums are increasingly turning into leisure educational venues. In order to gain and keep the audience's attention, museums need to employ more interactive displays and programs that require the audience's active involvement. The fact that 80% of education is presented through the visual sense (Pagliano, 1994 cited in Seidman, 2003), the development towards hands-on exhibits undoubtedly opens opportunities for visually impaired people to gain access into new learning resources.

Review on accessibility will basically be divided into two parts: physical and intellectual. The physical element includes all tangible elements that facilitate visually impaired audience orientation and mobility such as pathway, elevators, toilets, signage, etc. The intellectual element here refers to exhibits, which consist of three basic elements: objects, media and text information. Objects are the concrete things provided in exhibits. Media are ways to present text information. Text information conveys messages (Bitgood, 1993:134). Literature on accessible buildings and exhibits will be discussed further in 2.3.1. and 2.3.2.

Environment is by all means not less important than accessible facilities and exhibits. McLean (1997) asserted that the fundamental barrier to access in museums is psychological access, where certain sectors of the population or a number of the public feel disenfranchised, because of a sense of alienation from the dominating societal discourse of the museum. Black (2005)'s list of potential contents of a communications strategy also includes environmental friendliness such as a safe, welcoming, informal and supportive atmosphere that encourages visitors to connect with each other and to participate wherever possible and in a variety of ways.

Other visitors and museum staff can also have a major influence on visitors' experience. Besides, staff can play an integral role in the museum (McLean, 1997), connecting the audience with the exhibits. In this regards, staff are an important tool

in constructing effective interpretation. Interpretation is the process of communicating the significance of a place or object. Sally Rousham (1995:92-95) explains interpretation as a means of making connections between exhibits and people. It might take the form of text panels, exhibit labels and captions, interactive devices, live demonstrations or performances, and publications.

Onatola (2007) placed staff training and education as being the most important issue in the integration of disabled people into mainstream library services. At times, staff attitude is a major problem in inhibiting arrivals of the disabled. According to Deines-Jones (2007), the most negative attitudes hindering service are attributable to three main fears; first, that the person with a disability may present a threat to the worker's health or safety, second, that it will take a long time to help, and third, that worker will not know how to help. To remove the fear barrier, the Group for Education in Museums and the Miles Report (Miles 1986: 62) recommend that Museum and gallery staff should be well trained and experienced teachers (Hooper-Greenhill, 1991).

2.3.1. The physical element

There are many resources available on universal design, the design that facilitates all types of visitors. In the view of Junoisuwan (1996), the design of buildings for visually impaired people should encourage the usage of remaining senses. Deines-Jones (2007)'s emphasis was on improving service for people with disabilities at minimal cost. His suggestions, which can be applied to museums aiming to improve access for the visually impaired, emphasize improvement of the physical facility by removing barriers in all directions (up, down, left, and right). On signage, he highlighted hazardous areas such as changes in elevation and wet floor, which should be clearly marked.

Helping people with visual disabilities to a specific place, Deines-Jones (2007) recommended the staff should provide specific, detailed instructions that include approximate distances, the location of stairs,

change in terrain and other obstacles as precisely as possible. Should there be Braille signs available; the visually impaired must be informed of the signs' exact location. He also demonstrates how to offer assistance to people with visual disability, and how to lead a visually impaired around the place. Some visually impaired people are skillful in orientation and mobilization, some are not. Many visually impaired people in Thailand, especially those who did not attend any schools for the blind, are not familiar with O & M training. Many are trained during the age of 16-20 or older (Prachanukul, 2003).

Jacobson (1993)'s literature demonstrates that when guiding more than one person at a time, the guide should do so in a chainlike manner. That is, the second person to be guided holds on to the first student's free arm in the proper sighted guide position, the next person holds on to the second individual's free arm, and so on. Details of how to treat the blind, as shown in the Appendix part, are provided by the Christian Foundation for the Blind in Thailand under the Royal Patronage of H.M. The King.

Just like other visitors, disabled visitors should be able to enter a building and move easily between different areas of a site, such as buildings, car parking and outdoor activity spaces. Many organizations including Smithsonian and Vision Australia have extensive guidelines on accessible design. The guidelines share common general information and are summarized as follows (Vision Australia & Smithsonian, retrieved 2009).

a) A logical layout: Keep the design logical, simple and practical given that people with visual impairments rely much on their memory to navigate around a building. Large open areas should be broken down to provide more 'landmarks' (walls & furniture) and security for visually impaired people.

b) Lighting: People with visual impairments generally require two to three times the amount of light the sighted need. Brighter lighting should be

provided at entrances (for adjustment of the eyes from outdoor to indoor), displays, labels, reading areas, etc. The use of natural light without glare is recommended. Spot or task lighting can be used for small specific areas and should not shine directly into the eyes. Lighting should be evenly distributed.

c) Use of Contrast: Luminance contrast should be used together with color and texture contrast. The contrast should highlight potential hazards such as edges of steps, of window glass, roadway or poles. According to Jintanaphakan (unknown year cited in Attawathii, 2004), red, yellow and white colors are better identified by the visually impaired.

d) Internal acoustics: Intrusive levels of background noise should be limited so that visually impaired audience can focus on important information.

e) Pathways: All pathways should have a minimum vertical clearance of 2 meters. Obstacles should be put away or clearly identifiable or blockaded. Contrasting edges of pathways and handrails assist people in maintaining a straight direction.

f) Main entrances: Auditory cues and a tactile indicator should be placed in front of the door to the reception area. A reception counter should be placed near the front entrance. Junoisuwan (1996) suggests that entrance and exit should be one way.

g) Floor surface & covering, walls, ceilings and doors: A matt and slip-resistant surface is suggested, with a change of floor textures at strategic points. Luminance contrast between floor and wall surface helps orientation. Floor patterns should not be busy or colorful. Floor to ceiling glass walls and glazed doors should be clearly identified by the use of contrasting strips or marks that have contrast in color with the background colors behind the glass. Recommended are dark colors for lower wall sections and light colors for higher parts (Junoisuwan, 1996). Doors should be either fully opened or closed.

h) Stairways, ramps & other hazards: Should be easy to find and well lit with slip resistant surfaces. Handrails should be on both sides and contrasting to the background they are fixed to. Top and bottom steps should not intrude on circulation routes.

i) Lifts: Apply Braille and raised number stickers. All buttons should be large and clear. Audible floor level announcements are suggested. The Emergency Stop button should be clearly identified.

j) Signage: Well-lit signs should be obviously identifiable and placed in strategic points and should be fixed at eye level with easy access for close viewing but should not cause obstruction. Contents should be simple, short, clear and consistent. People with low vision can see better if light colored lettering is set on a dark background. When using tactile signs, they should be easily reachable.

The information above is consulted when designing a checklist for recording the museums accessibility before and during the field research. It is not the researcher's intent to scrutinize the museums' designs but rather to investigate if and how those 'accessible' features are significant to the visually impaired children in Thailand. The research methodology's details are explained in the next chapter.

2.3.2. The intellectual element

Three basic elements of exhibits are objects, media and text information. The characteristics of the objects such as size, motion, color and value are important in determining whether or not the visitor will become aware of the exhibit and will judge it as worthy of further attention (Bitgood, 1993: 134). Media can also affect visitor awareness, cognitive appraisal and attention. Text information conveys the message of the exhibit through language. Text can be analyzed by its physical characteristics (e.g. size and length) and meaning and structure (e.g. vocabulary, style, sentence complexity) (Bitgood, 1993: 134).

For the visually impaired audience, tactile and audio exploration can compensate for limitations in their visual ability. For children who are

born blind, Linda Pring & Alison Eardley (2003), psychologists involved in research on museum learning through tactile perception, think that early experience of tactile displays, in terms of objects or drawings, provides a knowledge base that permits people to derive spatial information, allowing a child to predict the shapes of objects.

However, touching and hearing cannot entirely make up for seeing. Vision allows, at a distance, for the immediate preview and appreciation of an object's position or layout of an environment and constantly updates and unifies information, allowing for the whole to be absorbed in almost an instant. Tactile exploration, aided by other senses, takes time and is available only in sequential pieces that must be organized and associated mentally into a whole (Kelly, Sanspree & Davidson, 2000 cited by Seidman, 2003). Besides, tactile media may not be effective for all people without visual sensory. Many visually impaired people have never learnt Braille and only had limited exposure to raised pictures. Following is a remark from Castellano, a parent of a blind child, cited in Art Beyond Sight (2003).

> I have seen blind children who are not interested at all in raised pictures, but I think this is because they had little or no introduction to drawings when they were young. I believe that, in general, in order for blind children to appreciate pictures in their classes, they need to be exposed to well-made raised images and trained in how to approach these images when they are young.

Pearson (2003), a museum educator by profession, encountered a situation demonstrating that, for some visually impaired people who turned blind later in life, the learning and appreciating process goes on primarily through the visual imagination rather than touch. Instead, they may benefit from stimuli to their visual memory, which can be done very well with carefully chosen words.

Verbal Description is a way of using non-visual language to convey the visual world. It can navigate a visitor through the museum and orient a listener to the exhibition. Still, some research has indicated that not all

verbal labels enhance the imagery experience (Linda Pring & Alison Eardley, 2003). Describing an object to a blind to be able to ‘see’ is not a simple task. Art Education for the Blind (AEB) has consequently issued 16 guidelines for verbal description, demonstrated at the Appendix part. The guidelines are especially helpful when conducting guided tours in art museums and galleries.

However, touch and verbal description without taking the audience’s prior experience and culture into consideration may not bring a satisfactory result. Prior knowledge determines how students process information, and provides them with a framework for orienting the material and linking it to what they already know Kalyuga (2005:333). Housen and DeSantis (2003) conducted a research to assess the effectiveness of the tactile diagrams and verbal descriptions. The samples were divided into 3 groups. Group 1 received verbal descriptions and tactile diagrams of images before a regularly scheduled gallery talk and could take the tactile diagrams on the tour. Group 2 had no treatment while group 3 received only verbal descriptions before the talk. Each group had equal percentages of congenitally blind, late blind and severely visually impaired individuals. After the tour, a recall interview was conducted and the result showed that the verbal descriptions and tactile diagrams had no measurable effect on the participant’s recall.

In science and children museums, where they aim to explain rather than collect, communication is vital. Given that interpretations of objects are rarely constant, varying according to the time, space, background, opinions and degree of knowledge of the interpreter (Hooper-Greenhill, 1991), text information must work as intended. In a recent study Klahr and Nigam (2004) found that carefully designed directive instruction may be much more effective than pure discovery where students are left alone without any form of support (Jong, 2005:220). While many studies

tend to support the concept of guided instruction, questions are raised. Kalyuga's (2005:333)'s argument to the guided discovery learning theory was that instructional designs do not always allow high-knowledge learners to take advantage of their knowledge base. Kalyuga's (2005:333) quoted Mayer (1989)'s note that the prior knowledge that a learner brings to the learning situation is a major factor in the construction of a conceptual model for the to-be-learned material: more knowledgeable learners already have and use their sophisticated models that may conflict with models presented in instructional materials.

Directive instruction can be constructed in many forms such as text, maps, diagrams, etc. For the visually impaired audience, it may be presented in large prints, Braille text, raised pictures or verbal description conveyed by the museum staff. Written messages must be active, conveying ideas, not just facts (Black, 2005), easy-reading font size, clear, concise, relevant, straightforward vocabulary and sentence structure and friendly style. Contrast colors and questions are found to be attractive to readers as well (Bitgood, 1993: 138). Verbal communications must be relevant and organized and carefully timed. Factors to be considered include the capacity of recipients, their intellectual level, their willingness to receive the message (Fopp, 1997). Besides, their interaction with the contents of the museum must allow them to connect what they see with what they already know, to understand and acknowledge, the new must be able to be incorporated into the old (Hein, 1998). Many educators including Hein (1998) and Black (2005) suggest 'layered text' designed for various categories or visitors, so that expert knowledge, information for lay visitors and information for children can all be available. The general strategy for tailoring instructions to levels of learner expertise is to gradually replace high-structured instructional procedures and formats with low-structured instructions as knowledge levels increase (Kalyuga's (2005:334).

In museums, apart from large prints, Braille, verbal description using audio devices or guides to explain, other multi-sensory learning tools include: guided touch tours, self-guided touch tours, tactile diagrams with verbal guidance of the hands, handling sessions and other tactile experiences, three-dimensional models, replicas,, and props, three-dimensional interpretations and relief sculptures, contemporary artworks made to be touched, sound and drama (The Museum of Modern Art and Art Education for the Blind, 2003). Axel and Levent (2003) compiled the following list of museums throughout the world which have access for visually impaired people: Birmingham Museum ALA, Cummer Museum of Art & Garden - FLA, Finnish National Gallery, the Jewish Museum - NY, Metropolitan Museum of Art - NY, Museo Omero - Italy, Museo Tiflogico – Madrid, Museum of Fine Arts – Boston, Museum of Modern Art – NY, The National Gallery – London, Philadephia Museum of Art, Queen's Museum of Art – NY and Tate Modern – London. The museums apply a variety of multi-sensory tools as presented by Art Beyond Sight (2003).

For touch tours, some museums require the visually impaired audience to wear gloves, some do not. Some museums also organize activities for families with visually impaired members. Noteworthy information on these museums regarding their services for visually impaired visitors are summarized as follows (Art Beyond Sight, 2003).

a) At Birmingham Museum of Art in Alabama, a docent leads tours of no more than four visually impaired visitors and is assisted by one volunteer.

b) Finnish National Gallery in Helsinki finds the feedback on the relief pictures has been positive from those who can or once could see while people who were born blind felt they could have been better served by raised representations that were more three-dimensional.

c) Metropolitan Museum of Art in New York City offered a photography course for blind and visually impaired high-school students in summer 2001.

d) Museo Tiflologico in Madrid, mainly intended for blind and visually impaired, is free of architectural barriers and allows freedom of movement and easy access to contents. The museum has elevators that give audio information, a system of photoelectric cells installed at the main door and at the entrance to each hall, relief map. Color and lighting are incorporated to help visitors recognize spatial boundaries and find their way around the museum.

e) Museum of Fine Arts in Boston has a monthly program of staff training for gallery instructors (docents) taking place from October to May. Those who have had this training are the guides for the Feeling for Form touch tours. The museum also offer self-guided materials with mobility instructions and verbal descriptions of the museum's interiors and artworks to be used by teenagers and adults or by younger children with an adult family member or companion.

f) Museum of Modern Art in New York also offers self-guided tactile displays accompanied by texts on audiotape focusing on selected exhibitions.

g) The National Gallery in London focuses on fewer displays but more verbal description and discussion. A team of verbal describers were developed to provide a variety of styles and approaches. Here, two leaders are provided for each session: one to lead the verbal description and the other to facilitate moving visitors through the gallery and to hand out resource materials.

To start programs for the visually impaired audience, Art Education for the Blind recommends museums form an advisory board which includes people with visually impairments. For conducting tours for a visually impaired audience, AEB's advice is to keep museum-tour groups small in order to guarantee individual

attention. To meet different needs, AEB suggests that the tours should be flexible and allow each person enough time to ask questions and to explore the tactile examples (Art Beyond Sight, 2003).

CHAPTER 3

METHODOLOGY

3.1. Research Approach

In order to obtain answers to the three research questions as identified in Chapter 1 (1. What are the characteristics of accessible museums according to visually impaired children? 2. How accessible are museums to visually impaired children? 3. What can be done to make museums more accessible to visually impaired children?), qualitative research is viewed as a suitable approach, due to the fact that the findings cannot be put in numbers and are best taken in a museum setting.

Qualitative research, using an interactive and humanistic approach, is recognized as a study method to gain insights into a phenomenon in a natural setting. It is commonly employed when there are multiple layers of reality, when data are presented in words and when the researcher is highly involved in actual experiences of the participants. Since the research questions aim at seeking the key attributes of accessible museums for the visually impaired children and investigating how they react to the museum environments and exhibitions, qualitative research methods such as interview with open-ended questions, together with observation, are considered a better approach than quantitative research.

Interviews with open-ended questions allow the participants or key informants to express their feelings more comprehensively than could ever be possible in writing. The technique allows the researcher to constantly adjust the questions according to the responses of the participants. Communication then becomes more effective. It also permits the researcher to observe non-verbal communication such as facial expression and the participants' gestures.

3.2. Participants and Sites of Study

3.2.1. Visually impaired children:

The Bangkok School for the Blind is the only primary level special education for students with visual impairment in Bangkok. There are approximately 200 students studying here, aged around 6-18 years. The school has two year classes in kindergarten level and 6 year classes in primary level. The average age of students here is higher than at ordinary schools of the same level for several reasons. Some students enter school late and some have minor additional disabilities causing them to fall behind others. The school has students without sight as well as students with limited sight, and both are taught to read Braille. The school also accommodates approximately 35 visually impaired students currently studying in integrated (regular) secondary schools.

Approximately 70% of students reside at school in term-time. Taking the students out for field research requires much preparation, coordination, time and funds. On account of these constraints, the number of participants must be controlled but still representative and likely to provide adequate data which will lead to saturation. Visually impaired students participating in the field research should have general development comparable to people without disabilities of the same age. This is an attempt to minimize variables and to clarify typical samplings. Extensive variables could result in diverse data, which is impractical to determine themes or categories.

Each participant will be taken to three museums to allow comparison, ensure reliability and allow the researcher prolonged engagement and persistent observations. After discussing with several experts on visually impaired children's various behavioral aspects, performing preliminary observations and interviews with some visually impaired children, together with taking into account other circumstances such as

the number of available voluntary participants which match the criteria, the number of eight participants is deemed adequate and realistic for conducting and monitoring the field research and could achieve informational redundancy.

3.2.2. Museums:

Criteria of museums under study are as follows:

a) The museums should be reasonably easily reached from school for the convenience of the participants and the school's teachers who are assigned to come along. Location is considered significant not only for the benefits of the study alone but taking into account the practicality and probability of the participants travelling to the museums on their own, with volunteers or with the school. Most trips start out from the school.

b) The museums should have interactive exhibits, programs or activities that allow other sensory channels apart from vision.

c) The museums' target audience should be school-age students.

d) The museums should vary, to cover a wide range of presentations, themes and activities. Museums with diverse exhibits and characteristics could pave the way for generalization.

The number of museums will be minimal to allow in-depth study but adequate for achieving an insight into the participants' general views and actions in various situations, as well as for presenting profound analysis on each museum and attaining valid comparison on every participant visiting each museums under study. Taking these criteria and the number of participants into account, four museums of different categories are deemed manageable and justifiable to permit saturation.

3.3. Purposive Samplings

3.3.1. Visually impaired children:

Due to the limited number of available participants, Typical Case Sampling will be applied. Volunteer participants are selected by the school and the researcher in accordance with the criteria set out in 3.2.1. (Visually impaired students participating in the field research should have general development comparable to people without disabilities of the same age.) The eight participants, four low vision students and four blind students, are between the ages of ten and seventeen years from primary level and secondary level students, the main target audience of museums under study.

3.3.2. Museums:

In line with the criteria, four diverse museums are selected to meet a variety of visually impaired children's interest. They vary in size, in their collections, in the way they exhibit their collections, in lighting and in the number of multi-sensory media. The museums are in the following categories: children's museum, zoological garden, historic house and anthropology/history. Findings from these museums could be applied to museums of similar characteristics. The museums are as follows.

a) Bangkokian Museum: The museum, formerly a privately owned house, demonstrates a wealthy family's lifestyle, is in the center of Bangkok. Furniture and utensils displayed in the museum, were used by residents when they lived here. A large number of items kept and shown here can be explored closely by other sensory channels besides vision. This quiet home-like museum is a convenient place for people with visual impairment to explore.

b) Museum of Siam: A new museum clearly presenting itself as an interactive museum using new technology in presenting historical

and cultural affairs. Located near Pak Klong Talad area, the museum has school aged children as one of its core audiences.

c) Bangkok Children Discovery Museum: The museum is the only children's museum in Bangkok. Its primary market is young children aged 2-12 years. It is easily reached, has a variety of interactive displays and programs which are accessible to children with visual impairment.

d) Snake Farm: Snake farm is located right in the center of Bangkok, accessible by all types of transports. Its exhibitions and shows are found to be appealing to children. The shows allow audience to participate by touching tamed snakes. It is a safe place where visually impaired children can learn about snakes, the hazard of their bites, precautions and first aid. Besides, they get to touch a living snake. A few media designs here are touchable, some by hearing. Though many exhibits require vision to access, the contents are interesting and straightforward.

3.4. Key Informants

Key informants are required to meet at least one of the following qualifications or positions: policy makers, curators, managers, trained and well versed persons in handling people with visual impairments. In keeping with the criteria, the key informants can be divided into two groups. The first group comprises people who are actively involved in projects for the blind. The other comprises authorized persons from the four museums. Data derived from the key informants could provide an insight into the visually impaired children and the museums under study, which will in part lead to the research questions' answers.

a) Mr. Disapong Netlomwong, the Bangkok National Museum's curator. A veteran in museum work, Disapong is actively involved in the Touch Tour program and has noteworthy experience in organizing activities for people with visual impairment.

b) Ms. Nuchanard Todee from the Academic Support Services, Blind section, Ratchasuda College, Mahidol University. Ratchasuda College is one of only a few colleges in Thailand that specializes in studies on disabilities. The Blind section is responsible for academic services for the blind, providing different types of services ranging from counseling for the newly blind, Braille instruction, orientation and mobility training, basic computer training, aids and media for low vision persons, and Braille production services.
c) Ms. Malee Sinnok, an experienced teacher at the Bangkok School for the Blind and a supervisor at the school's administration and academic offices. Malee has been appointed to facilitate the study and help select visually impaired students to participate in the research program.
d) Mr. Samart Ratanasakorn, a government official from the Special Education department, Ministry of Education. A regular visitor and at times caretaker at the School for the Blind, Samart is well-known among people with visual impairment in Thailand, and has been a guest speaker for the National Museum Volunteers' special project for the visually impaired audience.
e) Curators or authorized managers in education & program development (with experience in servicing or working with visually impaired audience) from the four museums.

3.5. Research Methods

The researcher will conduct ten field researches in four museums with eight visually impaired children, with the researcher accompanying the participants throughout the museums. In eight field researches (two x four museums), the number of participants will be limited to two per time to allow the researcher to have full concentration when conducting observations, while at the same time representing realistic museum visit behavior as a museum visit usually comprises at least two persons. The children will be paired strategically that it allows the researcher to observe if a co-traveler plays a big role in their museum experience. In two of the

field researches, the number of participants will increase to four per time so as to explore the challenges of conducting tours for larger groups and seek effective solutions to any problems encountered. Investigating the participants during different museum visits helps to cross-check the reliability of the findings. The technique of studying participants in a different place and point in time in order to ensure the reliability of the obtained data is referred to as data triangulation (Suphang, 2002).

In conclusion, the field research plans to take each child to three different museums. During the museum visits, a teacher from the Bangkok School of the Blind will accompany the participants and help leading them around the museums. The following self-designed diagram, initiated by taking data triangulation into account, outlines the field research. For practical and ethical reasons, each participant will be coded into A-H.

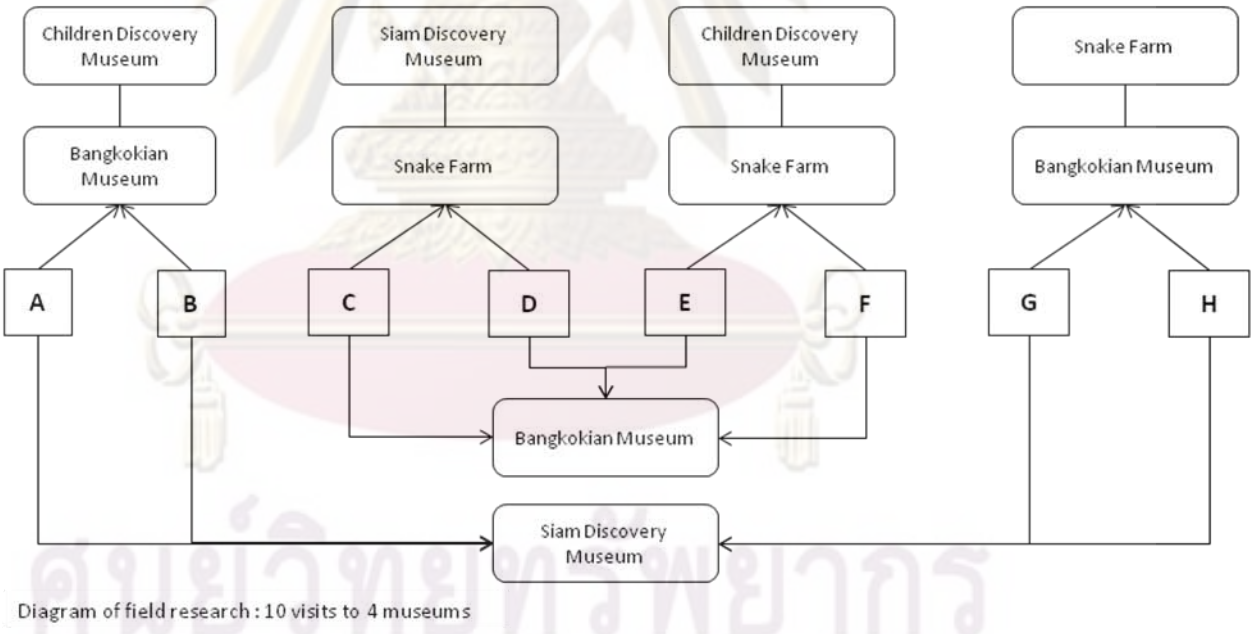


Figure 3.1. Field research plan: 10 visits to 4 museums

3.5.1. Before bringing the participants to the sites:

a) Participants: Participant observation with naturalistic inquiry technique will be employed to gain insight into the visually impaired. A common method used to study children, naturalistic

observations, gathered in children's everyday environments, permits researchers to see directly the everyday behaviors (Berk, 2006). Before conducting field research, the researcher will spend time with visually impaired children at the Bangkok School for the Blind outside their school hours. The purpose is to become acquainted to the visually impaired children's behavior. After the voluntary participants are chosen, the researcher will conduct an unstructured interview to familiarize herself with them. Questions asked during the informal interview include their vision, orientation and mobility, general personal information and prior museum experience.

b) Sites: Investigate the museums' buildings and exhibits if they are more or less in line with the practices used or recommended by recognized international organizations. The investigation is divided into two areas as follows.

- Buildings and facilities (easily identified and accessed)
- Exhibits' designs, media, contents design (provision of more than one sensory channel) and contents' styles and language (easy to understand)

Interview authorized persons from the museums (key informants) to hear about their policy toward and services for the visually impaired.

c) Others: Content analysis of documents related to the visually impaired and the museums under study. Key words to be examined include visually impaired, blind, disabled, disability, children development, learning, museum, accessibility, etc.

3.5.2. With the participants at the sites:

a) Just prior to the tour, unfolded interview with prepared open-ended questions will be conducted. Same questions will be asked to all of the visually impaired children to investigate similarity and otherwise.

The questions to be asked here emphasize on their general views about accessible museums.

b) Participant-Observation and short interview during the museum tours. Short questions during the tours allow the researcher to get specific answers which observation alone cannot provide.

c) Right after the tour, unfolded interview with prepared open-ended questions will be conducted in the museums. Same questions will be asked to all of the visually impaired children to investigate similarity and otherwise. The questions to be asked here emphasize on their general views about the tour.

3.6. Data Recording Devices

Data recording devices to be used during the research are as follows. Examples of the recording devices described in sections are shown in the Appendix part.

3.6.1. Before bringing the participants to the sites:

a) Note-books for recording visually impaired children's behavior. This tool is used during the ice-breaking period.

b) A tailor-made checklist for recording the museums accessibility as described by the recognized resources; Art Beyond Sight by AEB, and Tips for Specific Aspects of Accessible Design by Vision Australia, Blindness and Low Vision Services, the Smithsonian Guidelines for Accessible Exhibition Design by the Smithsonian and the Guidelines for Assisting the Visually Impaired by the British Community in Thailand.

c) Portfolios with prepared questions for interviewing informants.

3.6.2. With the participants at the sites:

a) Portfolios with prepared questions for interviewing visually impaired children are to be used at the beginning and at the end of the field research.

b) A behavior checklist, an adaptation of Gammon's practical guide for museum evaluators by Gammon (2003) will be used when the visually impaired children tour the museums. Gammon's guide demonstrates indicators if learning is taking place in museum settings. The guide is mainly based on the principle of learning by engagement and involvement. The original lengthy version of Gammon's guide is modified into a checklist aiming at investigating the participants' involvement and the sites' accessibility.

c) Photo camera.

3.7. Data Collection

3.7.1. Before bringing the participants to the sites:

a) During the ice-breaking period, the researcher will take a participant observation approach, and at times, simply observe and take notes on significant data relevant to the study. In fact, the ice-breaking period can be taken as preliminary research, before the field research, to obtain background information on the visually impaired children.

b) The museums' accessibility is to be investigated using the device as described in 3.6.1.b (tailor-made checklist).

c) Key informants from the sites will be interviewed unfolded using the device as described in 3.6.1.c (portfolios with prepared questions).

3.7.2. With the participants at the sites:

a) At the beginning of each tour, the participants will be interviewed with open-ended questions in a natural setting. The aim is to find out what accessible museums are like in their views. Recording

device 3.6.2.a. (portfolios with prepared questions) will be used here, perhaps, together with a photo camera to record noteworthy phenomena.

b) During the tours, the researcher acts as a tour leader accompanying and guiding the participants through the museums. Participant-observation, interviews with short questions that emerge out of constant observation and verbal description technique will be utilized and recorded. Should there be a museum guide present on site, he or she will be asked to introduce the exhibits which are under his or her area of responsibility, while the researcher will focus on observation and taking notes of the phenomenon. Questions will concern their understanding and enjoyment during the tour. Data collection is done by the application of the modified practical guide for museum evaluators from Gammon as described in 3.6.2.b.(behavior checklist), and a notebook.

c) At the end of each visit, the participants, all together, will be asked more open-ended questions to check their feedback on the museum tour. Questions are prepared but the interview continues unfolded using device 3.6.2.a. (portfolios with prepared questions). Here, the participants will also be asked to comment on the items listed in device 3.6.1.b. (tailor-made checklist). This is to find out if those elements are essential and practicable to them.

3.8. Data Analysis

Obtained data is to be processed and analyzed, by the application of constant comparison and a coding system. In the field research, there will be constant comparison of information derived from each museum visit. Member checking technique will be regularly used during and after the field research. Data triangulation

techniques will be utilized to ensure reliability. Here, the researcher will compare each child's response between his/her visits to the three museums and compare the feedback from four children who go to the same museum (eight participants in the case of Siam Discovery Museum and Bangkokian Museum). In case there are discrepancies of information derived from the same participant; the researcher will conduct another unstructured interview to ensure the accuracy of the information. At last, an external auditor, who was involved in a museum project for blind children, will be invited to review the whole project.

3.9. Conclusion

This chapter explored the steps in conducting qualitative research. First, participants and sites of study were identified, followed by the research methods in detail. The table below is a summary demonstrating the research methods in comparison to Research Purposes and Questions of this study.

Purpose No. 1	To identify the characteristics of accessible museums as stated by visually impaired children.
Question No.1	What are the characteristics of accessible museums, according to visually impaired children?
Research Method	Unstructured interviews. At the field research, participants will be asked, before and after the visit, open-ended questions (some questions in Device 3.6.1. c). Participants will be asked if items in device 3.6.2.a. are essential to their access.
Participants/Sites/Key Informants	Participants: 8 Visually Impaired children from the Bangkok School for the Blind. Sites: Bangkok Children Discovery Museum, Bangkokian Museum, Snake Farm, Siam Discovery Museum

Purpose No. 2	To investigate museums' accessibility for visually impaired children.
Question No.2	How accessible are museums for visually impaired children?
Research Method	Participant-observation, unstructured interviews with short questions, some questions in device 3.6.2.a., and checklist device 3.6.2.b.
Participants/Sites/Key Informants	Participants: 8 Visually Impaired children from the Bangkok School for the Blind. Sites: Bangkok Children Discovery Museum, Bangkokian Museum, Snake Farm, Siam Discovery Museum

Purpose No. 3	To discover fundamental elements which make museums more accessible to visually impaired children.
Question No.3	What can be done to make museums more accessible to visually impaired children?
Research Method	Interview informants (device 3.6.1.c), Content Analysis of documents and of data derived from questions 1 &2. The answer to this question is the incorporation of all data and answers.
Participants/Sites/Key Informants	All

Table 3.1. A summary demonstrating the research methods in comparison to Research Purposes and Questions of this study

CHAPTER 4

ANALYSIS

This chapter discusses analysis of data derived from several qualitative methods applied in the study namely observation, interviews and field research. After the process of collection and transcription, data are categorized (see Figure 4.1.) into four headings with several sub-headings. The four headings are the visually impaired children, the visually impaired children & museums, accessibility of the museums under study, and making museums accessible for visually impaired children, respectively. Categorization of the headings and sub-headings is driven by the research questions and shaped by data that emerged during the study with emphasis on the visually impaired students (participants), the four museums (sites of study) and connections between the two parties.

The research questions are stated in chapter 1 and 3 and shown here again for readers' convenience: 1. What are the characteristics of accessible museums according to visually impaired children? 2. How accessible are museums to visually impaired children? 3. What can be done to make museums more accessible to visually impaired children?

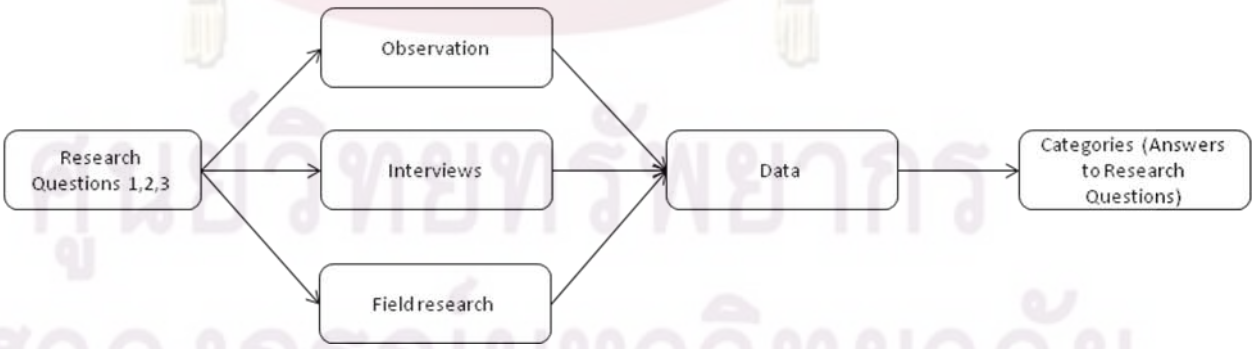


Figure 4.1. The process of data analysis

The headings and sub-headings are designed in an orderly fashion that is similar to the Literature Reviews chapter's headings so that the two main targets of

study (participants and sites) and their core elements such as settings, characteristics, practices and experiences are clearly described. The first analysis part focuses on the visually impaired children, followed by their experiences in museum visits and their views on accessible museums then on the four museums under study and their accessibility to visually impaired children.

The answers to the first research question, the visually impaired participants' opinions on the concept of accessibility, is demonstrated in the second heading. The data are also used as a base for comparing with the answers to the second research question, accessibility of the museums under study, demonstrated in the third heading. The comparison is a cross-check attempt to detect resemblances and conflicts and to uncover supporting arguments.

These arguments, together with all information presented in the first three headings are used as a fundamental principle for the answers to the last and most important research question, demonstrated in the forth heading. The answers to the third research question, how to make museums accessible to the visually impaired children, are therefore the outcomes of data interpretation and synthesization of this study.

4.1. The Visually impaired children

Data derived from observation and interviews to participants and informants concurringly demonstrate while the visually impaired children differ in characteristics and behaviors, they do have something in common. The attributes that they share are guidance to the answers of the research questions. Analysis on the visually impaired children is divided into 5 parts: vision, reading skills, tactile skills, travelling skills and learning.

4.1.1. Vision:

Visually impaired people have a diverse degree of impairments causing their vision to vary. However, the study finds some common supportive elements which can help them see better. As illustrated in the earlier chapter, there are eight visually impaired children participating in this study. From the eight visually impaired participants, four are blind (B, D, E, F) and the other four (A, C, G, H) have low vision. While the visibility of visual impairments differs in person, it does not signify the degree of impairments. Taking participant F as an example, his visual impairments are hardly noticeable causing people to mistake him as a sighted one. The blind participants have no remaining eyesight but are able to distinguish light and darkness. This attribute suggests, to a certain extent, their abilities to identify some building structures and locations such as indoor and outdoor areas, open doors and open windows, with their remaining visual sense alone.

Akin to the blind participants, the low vision participants' visual impairments varied. All have prescribed optical glasses but prefer not to wear them because of the impracticality of the bulky glasses and the side-effect such as headache causing them to be more trouble than support. In fact, no students at the Bangkok School for the Blind were seen with optical glasses. "Between using the glasses to read text and reading Braille, I choose the latter", participant H said. Their refusals to use these assistive

visual tools demonstrate their denials to trade the mentioned troubles with opportunities to see more by using the remaining visual sense. It also implies their preference to ‘see’ by other unproblematic senses such as touch.

The low vision participants have different visual acuities and sensitivities to glare. Despite the fact of their varieties in visual limitations, the study finds there are common external elements that could help them to see better, namely, the large size of a target object, the minimal distance between the viewer and a target object and the contrast of colors between background and a target object.

The size of a target object is most viewed as an attribute having an effect on the low vision participants’ discernment. Larger things are generally more noticeable than small ones. All said they are able to see big objects vaguely but unable to capture detail. From observation, participants occasionally collide with relatively big items on the floor or above the head. This visual restriction implies large objects placed above or below eye level could be missed and detail is not obtainable by sight.

Distance between the viewer and the target item is found to affect one’s ability in seeing. Participant H was tested by a series of different colors on 6x6 inches papers, he was able to identify almost all correctly, at 12 inches distance from his eyes. His vision is lessening in acuity when the colored papers were moved further away. This finding can also be applied with large objects such as automobiles. Participant H was asked to look at a red car, he was not able to identify the color when he was about 5 meters away; the color became more and more distinct when he moved half way closer. In another event where participant C was asked to identify colors on a Southeast Asia map, she then moved her eyes closer until they were literally against the map. She took at least 30 seconds to recognize yellow and light green colors which are adjacent to each other.

The weak contrast in colors was referred to as a barrier to her discernment. Participant A concurs that a contrast in colors can help enhance her vision: “The higher contrast is the better”. The term ‘contrast’ here refers to the visual distinction between a background and a target item such as a door as a background and a doorknob as a target item, or a panel as a background and control buttons as target items. It should also be noted here that low vision people’s different visual conditions can lead to a difference in perception of colors. Thus it is impossible to clarify how much contrast is good enough for all. In a worsening visual case, a low vision person who is turning blind may not be able to distinguish colors or discern large objects at a short distance.

Another noteworthy finding from this study shows that bright light is not found to be beneficial to all participants. Participants C, G and H generally see more during the day while participant A sees better at night. However, all agree their abilities to see are easily aggravated by glare. The phenomena demonstrate that while each of the visually impaired participants has his or her own visual conditions causing them to resolve detail differently in varying degrees, general shared attributes supportive to their vision do exist. The findings reveal that some blind people are able to distinguish light and darkness and visibility can be enhanced, to benefit low vision people, by the application of large size objects, minimal distance, high color contrast and glare controlled environment.

4.1.2. Reading skills:

Braille is the main learning tool used in the Bangkok School for the Blind, which means all students here are required to read Braille. Written scripts are taught in low vision classes having supportive visual tools such as enlarged computer screen in an effort to reinforce the student’s remaining vision. However, having script reading skills does not necessary signify or lead to enjoyment.

All low vision participants except G admitted that they prefer and are faster at reading Braille. Participant G, whose vision is by far the best, said he spent time reading text and Braille approximately equally. The phenomena manifest that large text is not always effective for all low vision people particularly the ones with deteriorating eyesight, and that other sensorial media such as audio programs should produce a higher coverage for all visually impaired audience in general.

4.1.3. Tactile skills:

Sighted people often believe that visually impaired people possess superb tactile skills as compensations for the lack of vision. In reality, they gain these skills from experience, with great expenditure of time and effort, by a more effective use of the remaining senses (Gomulicki 1961). Data from interviews demonstrate the participants have little to medium exposure to tactile experiences. They rate their tactile skills varyingly from very limited to medium. Their abilities in distinguishing textures are found to be better than in three-dimensional objects and in raised pictures respectively. The raised pictures are ranked last because of their minimal exposure to this particular media, which are used limitedly at the Bangkok School for the Blind, confirmed by participants and school teachers. With limited understanding of raised pictures, the participants appeared to be hesitant when answering if they wish to have this media in museums. “If there is a raised picture, I think there should be explanation in Braille too. Otherwise I would not understand”, said participant A. “I don’t like it because I don’t understand”, said participant B. “I think it is better and clearer for me to have big clear visual picture”, said participant G.

The immature tactile skills of visually impaired students are recognized by many scholars including Nutchanard Todee, instructor at blind section, Ratchasuda College, Mahidol University who expressed her disappointment and held the students’ limited exposure to tactile media accountable for their poor skills: “Teachers should encourage children to explore more, by frequently using raised images. “Thailand has enough materials available

but only a few are utilized". Her criticism on the minimal utilization of raised media at special schools are in line with Withit Sapsakorn's study referred to by Atthawathi (2004), which indicates that the school teachers had no skills in producing and in teaching raised pictures.

Tactile skills are not natural skills but are mastered by learning. Frequent exposure will potentially result in a better comprehension. At present, it is obvious that visually impaired children are still at novice stage in understanding raised pictures; therefore, applying this particular medium in museums may not be highly effective.

4.1.4. Travel skills:

Travel behaviors and skills vary according to many factors including age, orientation and mobility (O&M) skills, vision and necessity. The secondary school level participants appear to have better travelling skills than the younger ones, partly because the necessity to travel independently by public bus between their integrated schools and the Bangkok School for the Blind. In this regard, vision is found to have causal relationship with the travelling skills. Participant G and H, who can see better than the others, are able to go to unfamiliar places independently. Participant A, a secondary level student whose eyesight is the worst among the three appears to be more dependent during the field research. She is able to go to the integrated school but has never been to unfamiliar places alone.

Unlike the high school level participants, primary level participants, both blind (B, D, E, F) and low vision (C), have never travelled to unusual places alone but with a sighted leader. This kind of dependent travel behavior is in some way understandable when taking Thailand's poor infrastructure into consideration. Devastative pathways are at times used as driving lanes. Braille blocks floors are very limited and at times even lead to danger, as said by participant A. These are only a few but adequate arguments why their needs to have a sighted companion to be their eyes is

lucid. Scenes of a visually impaired person being led by a sighted person, or a blind person being led by a low vision person, are by no means uncommon here. In a collective and protective society such as Thailand, where social welfare is still in its early stages, the sighted companion is usually a family member: father, mother, husband, wife, etc., depending on several factors including age and status. This is in contrast with the Western world, where individualistic nature rules (and pathways are highly organized), and trained dogs are commonly seen as a visually impaired person's companion.

When going out, a visually impaired would hold on to the sighted leader's arm and go behind him. If there are more than one visually impaired person but one sighted leader, the second visually impaired will hold on to the first visually impaired in a chain like manner. This way of walking, although recommended by several scholars including teachers at the Bangkok School for the Blind, can unavoidably cause inconvenience to the visually impaired themselves and to other passersby. The dependent travel behavior clearly points out the significant role of sighted companions, who are metaphorically their eyes.

Starting from the fourth year in primary level, all blind students (low vision is not included) are taught O & M at the Bangkok School for the Blind. 'All blind students should be able to travel independently when they complete primary school study', claimed by an O& M instructor. Surprisingly, all participants were never been seen using a cane. This important tool for travelling independently is found to be unnecessary and at times even a burden, concurred by all participants. Common reasons why they avoid using a cane include their fear of causing discomfort to other passersby, damages to their belongings as well as inconvenience in bringing it along and putting it away during travelling. In familiar environments such as school and home, all students are seen to be able to walk around independently without a cane and without harm.

Participants in secondary level having a necessity to travel to their integrated schools independently by public bus also travel with no cane. According to participant A, G and H, cane is not necessary because their remaining visions still allow them to see vague images of pedestrians and cars on the street. Insecurity along a trip is usually eased by slow walk, the use of pedestrian bridges, crossways and familiar routes. Passersby are said to be helpful especially to read the number of the approaching buses. Travelling independently with limited vision and without a mobility aid can undoubtedly cause them to stumble and collide especially in the disabled unfriendly Bangkok where available Braille pattern floors sometimes preposterously lead to an accident. “Once I followed the Braille path on a walkway and I ended up hitting a telephone pole”, said participant A.

The cane-less travel behaviors are unquestionably unconstructive as it restricts freedom and self exploration, at the same time, demands excessive human resources to lead the way. The O& M course taught at the Bangkok School for the Blind also implies only those who attend the course will acquire the skills and those who do not go to school are likely to be unaware of this independent travelling concept. The phenomena suggest their museum visits and exhibit viewing are strongly depended upon their sighted companion.

4.1.5. Learning:

Many teachers who work directly with visually impaired children including Malee Sinnok, head of academic department, the Bangkok School for the Blind and Samart Ratanasakorn, special school department, Ministry of Education concur that the visually impaired students’ learning performances are relatively behind the sighted counterpart. The lack of visual sense undeniably put these children in a disadvantage position given that most teaching and learning means are done through vision. However, both believe the visually impaired students’ inferiority can be overcome if they are able to gain access to the experiences equally or similarly to which

the sighted students have. According to Samart, this can be achieved by the visually impaired people maximizing the usage of other senses and by the school providing suitable environment, curriculum, materials and appropriate teaching methods. Media with sound such as computers with audio programs and three dimensions are quoted by Samart and Malee as effective and favored by students.

Ironically, it will be long before such ideal environment can be realized in Thailand given that multi-sensory learning environment remains highly limited here, mainly due to insufficient financial and human resources. This argument can be verified by the limited practice of raised pictures as a learning tool at the Bangkok School for the Blind. According to Malee, the usage of this particular tool consumes a lot of time and resources, the two important elements that the school lacks.

The situation is seemingly worse for visually impaired students in integrated schools where almost all students are sighted. Participants A, G and H, students of integrated schools in Bangkok, reveal that listening to teachers is their main channel of learning in the classroom environment. While other sighted students have paper-based examinations, the visually impaired students have to go through much more challenging method: oral examinations. The visually impaired students' limited access to learning and relatively more demanding examination means naturally lead to a poorer academic performance.

The external limitations the visually impaired students are encountering as discussed before together with the internal restrictions of visual impairments indisputably intensify their challenge in learning; however, those limitations do not signify their intelligence level. Their visits to museums may be lengthy, perhaps due to their tactile exploration which take time to make sense of a whole picture, not necessarily because of the lack of ability to comprehend.

4.2. The visually impaired children & museums

This part reports the participants' experience and notions relating to museums. Descriptions shown in 4.2.1. Prior experience in museum visits and 4.2.2. Expectation from a museum visit, clarify some aspects of relationships between the participants and museums. The demonstrated data act as an introduction or groundwork before the answers to the first research question is presented in 4.2.3. Characteristics of accessible museums. Data presentation and analysis in 4.2.3. are derived from interviews before, during and after each museum visit. Before the field research took place, participants were asked to identify what accessible museums are like; during the field research, short questions to pinpoint their comprehension were raised; and after the field research, they were asked to conclude if the museums are accessible and for what reasons. The aim is to cross-check the consistency of their reactions, and to allow the participants to recall and recognize characteristics they forgot or have not discovered before.

It should be noted that this part of report mainly focuses on the visually impaired participants' reflection on the characteristics of accessible museums. Data presentation and analysis on their actual practices at the four museums under study, which are key answers to the second research question, will be explained in 4.3. Accessibility of the museums under study.

4.2.1. Prior experience in museum visits:

Out of the eight participants, seven have been to museums before. They value the visits as a joyful learning experience and link enjoyment with activities they participated. The visits that required passive participation such as listening alone were less mentioned than the ones that demand active participation such as tactile exploration and making things by hand. Participant E clearly and repeatedly expressed his enthusiasm toward a touch tour experience organized by the National Museum Volunteers in 2008: "I really enjoy making pottery during the visit". Their positive attitudes toward museum visits are affirmed by the head of academic department of the Bangkok School for the Blind, Malee Sinnok. Children

welcome opportunities to go out to a new environment with friends, according to Malee. The encouraging responses from the participants and informant could infer the visually impaired children's interest in learning outside classroom settings.

Data from interviews demonstrate while most of their prior museum visits were organized through school, none of the blind participants visited museums with family before. Participant B's mother, a middle class white collar worker, ascribed her unawareness of museums to the phenomenon. The study also finds that the museum school trips were more initiated by the museums than by the school itself, thus a museum trip could be seen as an acceptance to the museum's invitation rather than a resource augmenting school learning.

4.2.2. Expectation from a museum visit:

Almost all participants including participant B who had never visited a museum revealed before the field research taking place that they expect to learn and have fun from a museum visit. Participant A who has visited museums with family, on the other hand, does not set any expectation from a visit: "If there is anything interesting I can learn, I will learn and if there are something I can touch, I will touch". The remarks reflect her prior experience in some way. Before the field research, she had never joined a guided tour and never had a museum staff to explain to her about the exhibitions.

She viewed the museums' objects through her family members' verbal description, mostly on visual characteristics of the display.
Information on the exhibits available on boards was not much read to her. The limited interpretation availed during participant A's museum visits could be viewed as a cause, at least to some extent, of her indifferent view towards expectation from a museum visit.

4.2.3. Characteristics of accessible museums:

Before the museum visits started, the participants were asked to identify the meaning of accessible museums; their replies are geared towards intellectual over physical access. They emphatically point to opportunities to exercise their non visual sense particularly touch and hearing. Seven out of eight participants spontaneously mentioned touchable objects and/or sound explanations as museums' core accessible elements for visually impaired people. Physical access is obviously treated as less important here due to two main reasons: firstly they do not consider themselves having a mobility problem but a lack of visual sense, and secondly as illustrated in 4.1.4., most participants always travel with sighted companions, as a result, their concerns about moving around safely and in the right course are easily overpowered by their desire to perceive information through the remaining senses. As one participant puts it: "our mobility is fine, what we lack is the sight."

Participant G, who has the best vision among others and occasionally travels independently to unusual places, on the other hand, mentioned a structured design with clear pathways as a priority. For a self-reliant visually impaired person, physical access is obviously a museum's significant element. The participants' initial views on the characteristics of accessible museums, hence, are mainly driven by their vision and their travel behavior.

After the museum visits, their outlooks on accessibility expand, are more refined, specific and prioritized. Some items that they responded positively become less important or overlooked. The following listing describes the major characteristics of accessible museums, which were compiled and screened from the beginning until the end of the field research. Some characteristics were cited instinctively by the visually impaired participants, some were evoked by questions, and some were discovered during the museum visits.

a). Exhibitions must be presented through multi-sensory channels including visual:

When asked to identify their preference on particular media in a tailored intellectual access list developed out of recommendations from several visually impaired organizations, the participants' answers are analogous to their spontaneous answers; they welcome all media that allow touch and hearing. Visual media or tools especially designed or prepared to facilitate low vision people such as large text and hand-held magnifiers are also welcome owing to the fact that there are some visually impaired people who still have a degree of remaining visual sense. Participant A, who has low vision, by and large agrees to the importance of visual media but clarifies its viability, is only limited to people who have mild low vision. Such phenomena indicate that large/enlarged visual displays and text information are practicable to some low vision audience, but non-visual required displays are accessible to all visually impaired audience.

b) Touch and hearing are the two key sensory means to intellectual access:

"I can 'see' objects through touch much better than vision", said participant H. The significance of touch is echoed by Hooper-Greenhill (1991:103) as a way to increase motivation to learn about the objects. Touching can reveal temperature and lifting can demonstrate weight, from this further conclusions can be drawn about the nature of the material. Hearing can be in any forms of media including audio programs, audio-visual programs and guides. From the table 4.1, 3-dimensional objects, museum guides/docents, audio programs/audio-visual programs and Braille are found to be the most desirable by the participants. Although some admitted they do not fancy reading Braille in museums, they clearly see the effectiveness of Braille as a learning medium for the visually impaired audience.

Before the museum visits, all participants were asked to respond to a list of physical and intellectual access facilities.(Device 3.6.2. Accessibility Checklist). This tailor-made checklist comprises key elements suggested by recognized resources including Art Beyond Sight by AEB, and Tips for Specific Aspects of Accessible Design by Vision Australia, Blindness and Low Vision Services, the Smithsonian Guidelines for Accessible Exhibition Design by the Smithsonian and the Guidelines for Assisting the Visually Impaired by the British Community in Thailand. The data are summarized and demonstrated in table 4.1. and 4.2. The illustrations do not denote the participants' preference or skills but only straightforward responses to the availability of each item. Thus, it could be expected that almost all items, particularly the interpretative facilities, are welcome by the participants.

The mark ✓ signifies the participants' agreement to the benefits of each interpretative facility available in museums. The ? sign indicates the participants' doubt and the ✗ shows disagreement. Undoubtedly, visual facilities are nothing for the blind participants.

Interpretative Facilities	Participants							
	A Low Vision	B Blind	C Low Vision	D Blind	E Blind	F Blind	G Low Vision	H Low Vision
Touchable objects	✓	✓	✓	✓	✓	✓	✓	✓
Braille in Museum	✓	✓	✓	✓	✓	✓	✓	✓
Braille Brochure	?	✓	✓	✓	✓	✓	✓	✓
Guided tours/docents	✓	✓	✓	✓	✓	✓	✓	✓
Audio programs	✓	✓	✓	✓	✓	✓	✓	✓
Raised pictures	?	✗	✓	✓	✓	✓	✓	✓
Handheld Magnifier	?	✗	✓	✗	✗	✗	✓	✗
Large text	✓	✗	✓	✗	✗	✗	✓	✓
Workshops/activities	✓	✗	✓	✓	✓	✓	✗	✓

Table 4.1. Participants' responses to interpretative facilities

Though some may prefer to listen than to read Braille in museums, Braille brochures are viewed by most participants as a good reinforcement to their understanding owing to the characteristics that allow readers to read and review information anytime and in any place. "I like Braille brochures

because I can bring them home and read", a common remark said by many participants. However, participant A was doubtful about the practicality of the Braille brochure, saying it is easy to get wrinkle and then become difficult to read.

c) Guides are considered as a most accessible interpretative tool:

From the interviews and observation, guides emerge as the most favorite interpretative tool, followed by audio programs and Braille. Some excerpts of reasons behind the preferences are shown as follows. "Guides have proficient skills. They know best about the museum and its exhibits". "I can ask guides when I don't understand something". "I just don't feel like reading in museums". Their keenness towards guides can be explained by Fopp (1997):

> Communicating using the spoken words enables you and those with whom you are communicating to read one another's non verbal communication through gestures and facial expressions, and in so doing you will be able to compare one another's ideas and feelings. The spoken word allows you to express your feelings more comprehensively than could ever be possible on the paper and, at the same time, allows you to tailor your remarks to the responses of those with whom you are communicating and therefore put your message across more effectively.

The participants displayed more positive expressions to a warm and understanding guide than a pushy or laid-back one. "I like guides that make the atmosphere comfortable", said participant H. However, the study also finds the participants' partiality can fluctuate according to their experience. Participants C and D turns to like guides and docents more after the field research. Participant B initially said she preferred guides/docents than other media but after the third tour, her view changed. "There were a few moments that I was not really interested in listening to the docent any longer but I had to stay on to keep her happy. On the other hand, I wish I could have been able to spend more time with the exhibits I like", said participant B. Untrained guides may fail to be aware of what the visually

impaired audiences need such as the need for a reasonable amount of time to view an exhibit by touch and then try to make sense out of it. Such phenomena infer quality of interpretation has also an impact on intellectual accessibility.

d) One guide/docent for the least number of visually impaired audiences works best:

The majority of participations prefer to have one guide for one visually impaired audience so that the audience can get most information out of the guide in a shorter time, and that the guide would not be overwhelmed by similar questions repeatedly from several audiences. Participant A favors one guide for one visually impaired audience but for a different reason. Her concern points towards the other sighted audiences. “You know, they need to use the pathways too. If we have to walk after one another like a train to follow a guide or a leader, we may cause inconvenience to other passers-by”. Participant F & C prefer one guide for two visually impaired children. “With two children, I have a friend to hold on to, so I don’t get lost easily”, participant F demonstrated his reason. Participant C explained that the answers to the questions from one visually impaired person could be useful to the other visually impaired audience as well.

Informant Samart Ratanasakorn, a scholar in special school field believes the best ratio should be one to one. The one-to-one basis is practiced in Metropolitan Museum of Art in New York City owing to the range of degree and types of visual impairments (Axel & Levent, 2003:456). Birmingham Museum of Art in Alabama has a docent leading tours of no more than about four visually impaired visitors and is assisted by one volunteer (Axel & Levent, 2003:446). In view of the fact that touch is a primary learning sense for visually impaired people, the one-to-one basis is thus most effective particularly if each exhibit has only one of a kind touchable object.

e) Guides and audio programs must provide sufficient verbal description:

Verbal description on the exhibits' exterior is as important as their functions/actions. The verbal description on the exhibits' appearance is informative for people who cannot or can hardly see, and is particularly useful when the exhibits cannot be touched. A set of pottery locked in a glass showcase presented in the Bangkokian Museum is one example which participants want to know how they look and what they were for. The study also finds that descriptions on environment, especially an atypical one, help enhance the visually impaired participants' overall picture and even stir their interest. "I like what you told me about a bird enjoying a leisure walk on cut bushes lining the park as if the bushes are his pathways", participant E recalled. However description on environment should be generally minimized to only the basics. "I think the environment in many places is more or less similar, so it's better to focus on the exhibits", said one participant.

f) Interpretation should be presented through easy-to-understand media:

Data from the intellectual access list demonstrate a doubt and a disagreement to raised pictures. While most welcome the ideas, they are also uncertain of their own skills. "If there are raised pictures, there should also be explanations in Braille, otherwise I might not understand", participant A said. "I don't know what's wrong with me. I just don't understand raised pictures", expressed participant B.
Activities/workshop received mixed feedback; some view them as 'nice' things to have in museums. Workshop that requires making things by hand is popular among participants. Participant E repeatedly emphasized during the preliminary interview, before the field research took place, how much he enjoyed the workshop at the Pranakorn National Museum. "I like the workshop there very much. It was very creative. They let us investigate pottery by touch and asked us to craft one ourselves", he referred to the Touch Tour program which was organized by the National Museum Volunteers in mid 2008.

g) A variety of interpretative tools encourage exploration:

The participants' response during the field research demonstrates they took pleasure in the diversity of interpretative tools. They appeared to be more enthusiastic and wanted to try all. Interestingly, they pointed out that the variety does not have to be redundant: "If an exhibit is equipped with an audio program, then Braille is not necessary", participant C explained. "I think it would be nice to have magnifiers in museums, but if the museums already have large text, it is not necessary to have magnifiers", said participant G. Their views towards redundancy suggest they are fully satisfied if understanding of one thing can be acquired by one means. They preferred diversity of interpretation as stated before refers to a different tool used in a different exhibit or zone.

h) Well maintained exhibits, clear message and identifiable user instructions/controls are crucial to understanding:

These particular findings emerged from observation and short interviews during the museum visits in which all museums were found to have a different degree of maintenance problems. Inoperative and deteriorating displays were commonly seen at interactive programs while minor hygiene problems such as dusty exhibits were seen at less visited area. The broken objects have caused an extent of disappointment to the participants and the dirty objects have deterred some participants from investigating them by touch. Preferred characteristics of messages, brought up by participants, include attractiveness, straightforwardness and conciseness.

Young participants enjoy quizzes while older ones look for insight. Short and uncomplicated messages are easily grasped. If a long content is needed to create deeper knowledge, it should be direct and not redundant. "I am not so happy with the information presented at the Museum of Siam", said participant H. Messages with unfamiliar technical terms as well as terms that require vision or action to a better understanding such as complicated forms, shapes and movements are found to be ineffective, particularly to the

congenital blind. Colloquial language is clearly more welcome than academic approach is.

Their views correspond to Bitgood (1993)'s guidelines for meaning and structure of text used in museums which illustrate that simple vocabulary and sentence structure, friendly style, clarity and non-redundancy are among critical variables in audience comprehension. Such qualities are also practicable to content applied in other media such as audio programs. As Fopp (1997) put it, the right media should come along with the right presentation. Communication would be less effective with the right media but with poor presentation.

User instructions/controls here refer mostly to interactive programs. Experience from the field research shows that many programs' controls are not easy to locate, either they are hidden or their presence is not easily detected by people with visual impairments. The unidentifiable user controls at time caused the audience to be hesitant and awkward. Data from observation also demonstrate that a control button can be detected easier than a touch system.

i) Safety attributes are most significant for physical access:

When asked to identify the significance of each item in a tailored physical access list shown below, the participants' opinions bear a close analogy. As table 4.2. demonstrates, features which all participants find important are clear pathways (horizontal and vertical), railed stairs and identifiable marks for hazard areas. The fact that all participants concurringly see the importance of the said features clearly illustrates their prioritization in safety above convenience such as special parking, uncomplicated layouts and elevators.

Their needs for safety can be characterized by the renowned Maslow's hierarchy of needs theory; according to, Maslow, the needs for security and

freedom from fear are second after basic needs such as food, drink and shelter (Statt, 1997:98).

Physical Facilities		Participants							
		A Low Vision	B Blind	C Low Vision	D Blind	E Blind	F Blind	G Low Vision	H Low Vision
Special parking		✗	✗	✗	✗	✗	✗	✗	✗
Simple layout		✗	✗	✗	✗	✗	✗	✗	✗
Clear pathways		✓	✓	✓	✓	✓	✓	✓	✓
Railed stairways		✓	✓	✓	✓	✓	✓	✓	✓
Identifiable hazard area		✓	✓	✓	✓	✓	✓	✓	✓
Sufficient lighting		✗	✗	✓	✗	✗	✗	✓	✓
Visual Contrast		✓	✗	✓	✗	✗	✗	✓	✓
Tactile contrast		✓	✗	✓	✗	✗	✗	✓	✓
Tactile maps & signs		?	✗	✓	----	✓	✓	✗	✓
Resting areas		✓	✓	✓	✓	✓	✓	✗	✓
Restaurants		✓	✓	✗	✓	✓	✓	✗	✓
Elevators with Braille/floor announcement	High-rises	✓	✓	✓	✓	✓	✓	✓	✓
	Low-rises	✗	✗	✗	✗	✗	✗	✗	✗
Toilets for the disabled		✗	✗	✗	✗	✗	✗	✗	✗

Table 4.2. Participants' responses to physical facilities

The mark ✓ signifies the participants' agreement to the benefits of each interpretative facility available in museums. The ? sign indicates the participants' doubt, the ✗ shows disagreement (undoubtedly, visual facilities are nothing for the blind participants), and ---- means indifference.

j) Tactile & visual facilities enhancing orientation and facilities relieving basic needs (such as food, drink and rest) are desirable:

Majority of participants welcome tactile maps & signs. Contrast in colors is found to be important for low vision participants while textile contrast on strategic points such as at the door receives different responses. Sufficient lighting is favored by most low vision participants (except for participant A, who can see better in the dark) but is insignificant for the blind. Handheld magnifiers receive a mix response from some low vision participants.

Participant A thinks that the tool's benefits would be limited to only people with mild low vision. Participant H regards the tool as impractical for reading. Most participants want to have sufficient resting areas and restaurants, without special demands on particular types of seating. Toilets should be western standard (flush), not the traditional type. Interestingly, no participant mentioned the need for a special toilet for the disabled. However, from observation, it appeared that toilets for the disabled that situate separately are less demanding for their orientation. Participant E is apparently aware of the challenge; he prefers to have a raised map and explanation in the restroom area so that he can easily identify what is where.

From table 4.2., elements which are found to be unimportant are designated parking for visually impaired people, buildings' simplified layouts, and elevators for low-rise buildings. Parking is not found to be essential simply because most participants do not have a private car; those who have, said they can walk from wherever the car is parked. Their fond of walking also explain why elevators are seen inessential for low-rises. A complicated layout is not considered as a barrier on account of having a sighted companion along. Their undemanding responses are demonstratively in line with the study of Junoisuwan (1996) referred to by Atthawathii (2004)

which downplays the provision of unnecessary attributes but promotes the design that maximizes the remaining senses.

The minimal demands on physical facilities as described above again reflect the participations' expectable travel practice, which rests on sighted companions. Given that most participants have never been out to unusual places alone, they do not wish to visit a museum alone. They were not and are not confident in independence. Fears for their own safety, for the safety of passers-by and of the exhibits have apparently besieged them.

Though many participants welcome the idea of self-guided museums, they also feel rather insecure. "Even if there were rails, I could never be sure what to expect beyond a curved rail, or the end of the rail." participant A asserted. "I really don't want to get lost and break things", said participant D. The remarks evidently demonstrate their distrust in infrastructure and facilities in public buildings. These doubts rightfully reflect the poor quality and maintenance of public services in Thailand. In intellectual access perspective, the role of sight companions is mainly limited to transferring information from text information, not creating comprehension. The characteristics of accessible museums in the views of participants therefore are centrally pointed to intellectual accessibility, the means that allow them to gain access to knowledge independently.

It should also be highlighted here that the visually impaired children's concept of an accessible museum does not necessarily has to be identical to a preferred museum. Participant B is keen on nature; she fancies her museum to be like a forest with a waterfall. A museum of participant G's dreams is full of IT equipment inside a building but surrounded by nature. More strikingly, the study also finds that a museum that a visually impaired person enjoys may actually not be highly accessible. This is evident in the case of participants C, E, F and G who were so thrilled by an opportunity to touch a living snake at the Snake Farm during a live show.

The museum itself does not have much she could touch apart from two pieces of snake skin and a mock up room with a human sized doll for practicing first-aid. There are no Braille signs, no guides, limited audio programs and extensive text on boards, but still she prefers the Snake Farm visit over a visit to the Museum of Siam which has many more touchable objects and audio programs.

The phenomena reveal accessibility and appeal are two different entities but could have causal relationship to each other. For example, a museum that has only visual presentation could become more interesting with a presence of multi-sensory exhibits. Participant A and B prefer Museum of Siam than Children Discovery Museum and the Bangkokian Museum because of its diverse high quality exhibits which can be accessed by non-visual senses. Another finding worth mentioning at the very end of this part is the need to belong in the sighted society of the visually impaired participations.
All participants want the museum visits to be 'normal' visits in which they mingle with other general sighted audience. They prefer the opportunities to integrate than to be among people with visual impairments only. This notion reflects a need to belong in the society well demonstrated in Maslow theory's third needs after basic needs and safety needs (Statt, 1997: 98). As participant E put it: "It is more real. We have to learn to live in the real society with other people who can see."

4.3. Accessibility of the museums under study

This part describes answers to the second research question: how accessible are museums to the visually impaired children? Data presented here is mostly derived from the field research: ten visits to four museums with eight visually impaired participants. As illustrate in chapter 3, the original plan was to bring a pair of participants at a time for eight times and four participants at a time for two times to the museums under study. However, in actuality, the plan to bring four participants to the museums did not realize due to unexpected circumstances, only two could join in one time and three in the other. Besides, participant D became ill for a long period causing him to be unable to participate after the first museum visit; a replacement whose qualifications are similar to him was called in and took his place in one visit.

To get a clear picture of the museums' accessibility, data and analysis will be presented one museum at a time. Each museum is presented with four sub topics: a) physical access, b) intellectual access, c) a comparison between the characteristics of accessible museums, the museum' features and the participants' actual practices in the museum, and lastly d) the museum' services for the visually impaired audience.

To elucidate the museums' characteristics, the physical access (a) and intellectual access (b) parts begin with data on the museums' attributes, with tables illustrating overviews of physical and intellectual access summarized from data recorded in device 3.6.1.b. The tailor-made device includes elements described by several recognized resources as significant to accessibility. After the museums' attributes are laid out, analysis follows. A comparison between the characteristics of accessible museums, the museum' features and the participants' actual practices in the museum (c), is illustrated to assess if the visually impaired participants' responses at the museums are in accordance with the museums' attributes and their views on the characteristics of accessible museums given during the interviews before the visits. Data on the museums' features are taken from records on device 3.6.1.b. (Accessibility Checklist) and notes from observation while data on the participants' actual practices in the museums are taken from device 3.6.2.a. (Interview Questions) and device 3.6.2.b. (Behavior Checklist).

Data described in the museum' services for the visually impaired audience (d) are mostly derived from interviews with key informants and observation during the field research. The findings reflect the museums' current practice and their possible future plans, which can help or hinder the museums' accessibility for the visually impaired audience. The data shown in this part will be referred to, examined and exploited again in the next part in order to seek an answer to the last research question: How to make museums accessible to visually impaired children?

4.3.1. Bangkokian Museum:

Number of visit: 3 visits on different days

Participants: A & B, C & F, G & H

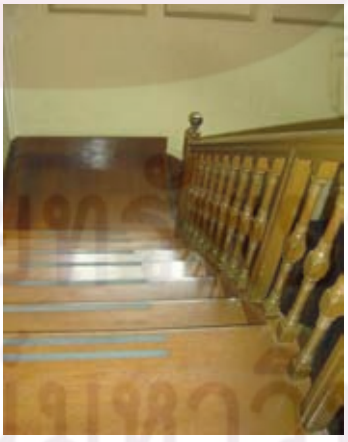
Sighted companions: The researcher, a teacher from Bangkok School for the Blind, and participant B's parent (accompanying participant B)

Bangkokian Museum used to be a private home owned by Ms. Waraporn Surawadee. The house was donated to the Bangkok Metropolitan Administration to function as a museum. There are four buildings in the compound covering approximately half an acre, three of which are turned into exhibition areas while the other is used as the museum's office and also remains as Waraporn Surawadee's private residence. The buildings and displayed objects represent the home and lifestyle of a wealthy middle class Thai family. See Picture 4.1., 4.2., and 4.3. The first building, constructed in 1937 and extended twenty-three years later, has two stories, comprising bedrooms, a dining room, a living room and bathroom. Most furniture and decorations are kept the way they were to cherish the authenticity value, the rest are adjusted to fit in a museum setting.

The second building is a smaller scale rebuilt of the original due to the compound's limited area. The original house, located in Sathon area, used to be a clinic of Waraporn's relative. Many exhibits displayed here are items including the original large-sized land title deed, house registration

Picture 4.1. Bangkokian Museum: Front area

Picture 4.2. Bangkokian Museum: Kitchen room



Picture 4.3. Bangkokian Museum: Stairway

paper and identification card. Other objects shown are traditional kitchen utensils, old luggage, farm tools and children's toys. The second floor houses BMA's bilingual exhibition on the history of Bangrak district. The first two buildings are not equipped with air conditioners while the third one is.

a) Physical access:

As illustrated in Table 4.3., the museum's layout is comparable to a house's plan. Stairways, paths, lights, doors, toilets, other structures and facilities are akin to an ordinary traditional house, thus many attributes contributing to physical access recommended by international organizations for the blind such as designated parking, simple layout, contrast, tactile indicators and sufficient lighting are not present here.

In fact, the museum has no private parking; visitors who arrive with a private car have to park along the road. The museum's front gate which is always closed for security reason will be opened when visitors ring the bell. Behind the gate is a garden and after the garden are the houses. The garden's path is relatively smaller with less than one meter wide, just enough for one person to walk. The path is surrounded by vegetation, with tree branches extending over some parts of the pathway. Walkways in the houses are basically spaces that are unoccupied by furniture. Its width varies depending upon the room's size, amount and the size of furniture present in there. Stairs are railed but relatively narrow, for one person to walk at a time. A room in the first building can accommodate comfortably 4-5 people including a guide. An open pavilion behind the first building filled with long tables and benches is used as a resting area. There are two unisex toilets, one traditional type placed under stairs in the third building and the other semi-flush system outdoor.

Despite the absence of many facilitating attributes, participants who visited the museum (A, B, C, F, G, H) generally showed no difficulty in following

the sighted companions around, although concerns were expressed by participant A and F during walking along the garden's walkways. Participant C and F who had to avoid a pile of trash temporary placed in the middle of a small bridge in the garden area concurringly demonstrated their fear of falling in the waterway below the bridge. The comments reflect concerns for their own safety, which at the same time substantiates their views on safety attribute as a core characteristic of physical access. Narrow un-steep stairs were not brought up as a barrier mainly because they are able to walk independently by holding on to the rail. Railed stairs are mentioned by all participants as significant to physical access. The museum's traditional toilets, the type of which is not preferred by participants, particularly the one located underneath a stair, are not

Physical Access	Yes/No/Comments
1. Layout: simple, few changes of directions, least obstructions	Like a house's layout. Three houses in the compound. Some rooms have two doors. Obstructions are the furniture, decorations.
2. Lighting: sufficient lighting at entrance, pathway, displays	Like a normal house. Sunlight is the main source since almost all windows and doors are open. Electric lights are not always on.
3. Contrast: color, texture	Limited
4. Acoustics: background noise	The museum is relatively quiet.
5. Parking: designated	No
6. Pathway: no obstacles, handrails	Some obstacles are found in the garden area. No contrasting edges and no handrails along pathways.
7. Entrance: glazed/automatic door	No
8. Floor surface: non-gloss/slip, plain patterns, Change of floor texture at strategic points	Wooden floor. No change of texture or contrast.
9. Wall, door: contrast & bright doorframes, handles	Limited. Doors inside the houses are always open.
10. Stairways, ramps: well lit, contrasting to wall, placed against wall, handrails both sides	Stairways are against the wall with a handrail on one side. Stairways are well lit from sunlight. No ramp.
11. Tactile Ground Surface Indicators: for any obstacles	No
12. Highlight on controls, facilities	No
13. Toilets	Traditional styles, no special toilet for the disabled.
14. Restaurants	No
15. Resting area	Not in the houses but in the compound.
16. Lifts: handrails, Braille, large & clear buttons, floor announcement	No
17. Signage: clearly identifiable & Not cause obstruction Tactile signs & maps	Minimal signs, small font size. No tactile signs & maps

Table 4.3.Physical access checklist: Bangkokian Museum

mentioned as a barrier to their physical access, simply because they did not need to use the service.

Since sunlight is the main source illuminating the indoor areas, inner parts which are far from windows or of which windows are half open are found to be under light by participants C and H. The house does not have high contrast in colors to help enhance visibility; nevertheless, the study finds that the low vision participants do not wish to trade the traditional design of the house with clear contrast in colors just to enhance their abilities to see. Their preference reveals that, for them, authenticity is more important than abilities to gain access independently. Besides, they do not need and are not yet prepared for independence owing to their being accustomed to having a sighted companion around in unfamiliar places.

The fact that each room in the houses is relatively small in size, thus it could be easily over-crowded when another group arrives. Apart from density that could affect the museum's physical accessibility, the lack of facilities like restaurants or refreshment shops together with environmental factors such as heat (the museum's main building does not have air-conditioners) obviously exhausted participant A. Besides, unexpected factor such as animals or pets residing in the museum appeared to cause different degrees of discomfort to participants. Participant B was so frightened by the presence of a museum dog that his bark totally stopped her from moving around. This incident again highlights the visually impaired children's seek for safety. The heat and thirst may slow down the tour but fear for own safety can entirely cease the visit.

The participants' needs in holding on to a sighted companion during the visits vary according to their visual conditions and personal prior experiences. Participants A, B, C and F needed to hold on to her companion, participant G was able to follow closely without holding on to a companion while participant H was able to follow independently but under the sighted companion's close watch. The latter two participants who could walk on their own noticed large furniture such as tables, chairs, and big

shelves but missed small objects such as decorations on the tables, shelves above head, etc. They were able to escape accidents, largely because of the warnings from sighted companions. The phenomena insinuate their needs for being accompanied in this particular kind of museum settings, by an attentive museum guide or a sighted companion, with or without holding on to the sighted leader, in order to have a wider coverage on exhibits as well as to prevent them from possible mishaps. For general visually impaired people who use a cane regularly will not find the tool practical in this environment given that low glass showcases are placed all over.

With all the barriers mentioned before, the participants still think the museum is physically accessible. For participants who can travel to unfamiliar places independently, the accessibility is contributed to the large size of objects and barriers they can detect visually. For participants who cannot travel to unfamiliar places independently, the accessibility is contributed to the convenience, safety and security in walking around with the sighted companions.

b) Intellectual access:

Table 4.4. illustrates the exhibits are the real furniture and decorations, and the core interpretative tool is museum guides. There are five guides working here. Given the small numbers of visitors, the museum can still provide a guide for each group of visitors, regardless the size of a group. Inside the houses, particularly the first building, there are a few sign stands explaining the history of the house presented with small sized print on a transparent board. The sign is proven not to be useful to low vision participants; sunlight glaring off the transparent board makes it difficult even for the sighted audience to read. Most of the objects displayed in the museums are original and can be touched. Breakable and fragile items such as pottery and old documents are kept in locked glass showcases. The minimal selection of interpretative media unavoidably underlines the role of museum guides, which means the audience's satisfaction and comprehension basically depend upon the guides' performance.

Guide is an interpretative medium that can stimulate attention, monitor interest, and constantly get feedback from audiences. A good guide is therefore a highly effective tool to make museums intellectually accessible. Several participants have exploited the guides by non-stop questions and discussion while some participants preferred to listen attentively to everything the guides said. All participants touch everything they could and at times, tried to use the remaining vision to investigate what the objects are. See Picture 4.4. and 4.5. Once in a while, some participants also use nose to smell displayed objects. The presence of many touchable objects and museum guides well corresponds to the characteristics of accessible museums viewed by all participants.

As illustrated in 4.2.3. b) touch and hearing are the two key sensory means to intellectual access and in c) guides are considered as the most accessible interpretative tool. The displayed objects and guides' explanation evidently connected some participants to their personal interest or prior experience and knowledge. "I like the design of the house, it made me realize old houses do not always have to be on poles", participant A said, "it also reminded me of my grandmother's house in the village". "I like the garden and the shady environment. I have never heard about a museum with garden before", participant B said. More interesting, the study finds that a visually impaired person's preferred exhibits may not be physically or sensory accessible. Participant H revealed his favorite items were small old coins kept in a locked glass showcase. He got enthusiastic when hearing about the selection even though he could hardly see them. This incident suggests that promoting touch alone is not the way forward, as Pearson (2003) experienced during leading a tour at the Metropolitan Museum in the United States:

> For some, the learning and appreciating process goes on primarily through the visual imagination rather than touch. Instead, they may benefit from stimuli to their visual memory, which can be done very well with carefully chosen words.

Intellectual Access	Yes/No/Comment
1. hand-held magnifier	No
2. text enlargeable by IT tools	No
3. Braille description	No
4. Braille brochures	No
5. Raised text and pictorial symbols	No
6. 3-dimensional objects	Most displayed items are real. Touching is permitted.
7. Multi-sensory books	No
8. Verbal description	By museum guides, with varying extents
9. Docent presence	Museum guide
10. Audio guide	No
11. Guided tour	Yes
12. Sound	No
13. Workshop /activities	No
14. Displays Quality/text information	Real items but limited text information

Table 4.4.Intellectual Access checklist: Bangkokian Museum

Picture 4.4. Participants investigating a record player

Picture 4.5. A participant investigating a plant in the front garden

A

As explained before, here, museum guides are central to the audience's experience. Three pairs of participants were brought to the museum on a different day. Each group had a different guide to show them around. Needless to say, the guide who explained the most, with friendly, attentive, passionate and relaxed style has successfully placed the most impression on the participants. The neglectful guide who even at time failed to realize the audience's visual impairments also fails to build connections and

impression. With the latter kind of guides, participants might be able to understand here and there and the museum may be found to be somewhat accessible due to the touch and hearing being made possible. However, when attention and interest were not successfully built, the museum consequently became less appealing to some participants. The quality of the guides undoubtedly leads to intellectual accessibility. For this reason, to make the museum intellectually accessible, the guides themselves must be accessible.

Participant H is so impressed by the visit and the guide at Bangkokian Museum that it becomes his favorite museum among the three he has visited during the field research. (The other two museums are Snake Farm and Museum of Siam.) Though he has nothing to complain about the museum, he suggests an audio-visual program explaining the history and overall picture of the house before the tour starts would effectively refine the museum's interpretation. The idea of having another interpretative tool convincingly indicates his desire to have more variety in communication.

Participant G, a visually impaired companion of participant H, is generally content with the visit but wish to be able to gain access by one way or another to the items kept in locked glass showcases. His desire to gain access to all items concurs with others such as participant C who said she wanted every exhibit to be accessible. Touching, if not allowed, could be replaced by verbal explanation. Participant G also made a noteworthy comment on some dusty objects. His concern of hygiene accentuates the necessity to keep the exhibits clean given that the visually impaired audience's one main channel of learning is through touch. What is more, some even use nose to assess objects.

c) The characteristics of accessible museums in comparison with the Bangkokian Museum' features and the participants' actual practices in the museum:

This part is meant to evaluate how the museum's attributes correspond to the characteristics of accessible museums; furthermore, how the participants react to the absence of the features (if any). Table 4.5. demonstrates the museum has many features corresponding to the characteristics of accessible museums. The museum's core attributes, touchable objects and guides, receive well responses from the participants.

The absence of various interpretative tools (g) is unobjectionable because of the high number of touchable objects and the presence of the guide throughout the visit. A minor inconvenience caused by blocked pathways in the garden (i), the lack of tactile & visual facilities enhancing orientation (j), are allowable largely because of the presence and/or warning of sighted companions. For participants who are always escorted by a sighted companion to unusual places, their need for a sighted companion in the museum is consequently not viewed as a result of the museum's inaccessibility. The guides' verbal description skills (e) are varied, resulting in varied responses from the participants. The fact that the museum has a large number of touchable familiar objects, verbal description on the objects' look then becomes less important than information on the functions. This explains why participants still view the oblivious guide as being mediocre rather than unsatisfactory.

Obviously, the characteristics of accessible museums listed in 4.2.3., are not fixed but flexible according to individual museum. The list includes many elements constituting to accessibility, including the availability of touchable objects, a variety of multi sensory media channels, guides, verbal description, etc. Museums which have less selection of touchable objects may need to have more variety of non-visual interpretative media and museums that have more touchable objects may not require to have a well

trained guide compared to visual art museums, for example. The true central characteristics of intellectual access therefore are primarily pointed to touch and hearing.

Characteristics of accessible museums:	Availability at the Bangkokian Museum	The participants' responses.
a) multi-sensory channels presented exhibition:	Yes.	Positive
b) Touch and hearing:	Most exhibits are touchable. Guided tours are provided.	They touched everything they could. They listened to the guides attentively.
c) Guides/docents:	Yes. Guided tours	Varied, but positive.
d) Ratio of guide to visually impaired audiences:	1 guide per group	Positive, because there were two visually impaired in one group.
e) Verbal description skills (ex.: on the exhibits' exterior is as important as their functions/actions)	Varied	Varied according to the guides' skills.
f) Interpretation through easy-to-understand media:	Yes, through touch on real objects and colloquial language used by the guides	Positive
g) Various interpretative tools:	No. Objects and guides are the two non-visual media.	Varied, but positive
h) Quality of exhibits, message and user instructions/controls.	Real old objects with features almost complete. Some areas are dusty. Information conveyed by guides.	Generally positive with minor complaint.
i) Safety attributes (pathways, railed stairs)	Pathways have barriers in some parts. Stairs are railed.	Generally positive with minor complaint.
j) Tactile & visual facilities enhancing orientation and facilities relieving basic needs (such as food, drink and rest)	No tactile or contrast facilities and no restaurant.	Acceptable with minor complaint.

Table 4.5. The characteristics of accessible museums in comparison with the Bangkokian Museum' features and the participants' actual practices in the museum

Participants C, F and H value the Bangkokian Museum more accessible than the other two museums they visited. (Participant C's the other two visited museums are Museum of Siam and Snake Farm, participant F's are Children Discovery Museum and Snake Farm, participant H's are Museum

of Siam and Snake Farm.). Opportunities to touch and listening to the guides' explanation are the main reasons for their judgment. However, the museum they like the most does not always have to be the most accessible. Participant C&F's favorite museum is the Snake Farm while participant H's favorite is the Bangkokian Museum. Participants C & F are strongly attracted by the show and the experience of touching real snakes and have a python around their necks. Participant H's preference, as explained by him, is contributed to his personal interest rather than accessibility.

d) The museum's services for the visually impaired audience:
Before the field research, the Bangkokian museum had never been visited by visitors with visual impairments. Their first reaction to the participants' visits was a combination of surprise, welcome and indetermination. Guides there have never had trainings on how to handle the disabled including visually impaired audience. Besides, the museum's physical features are not made to serve the needs of people without sight. All in all, the museum does not have any services for the visually impaired audience, but its welcoming environment together with the presence of essential elements makes the visually impaired children consider the museum accessible. The phenomena emphasize the visually impaired participants' judgment on viewing intellectual access over physical access.

4.3.2. Museum of Siam:

Number of visit: 2 visits on different days

Participants: C & D, A & B & H

Sighted companions: The researcher, a teacher from Bangkok School for the Blind

Museum of Siam is one of the newest museums in Bangkok, located in the vicinity of the Chao Phraya River bank. The museum, housed in the old Ministry of Commerce building, focuses on the history and anthropology of Siam and Thailand, using technology as a key presentation tool. See Picture 4.6. The museum occupies 3 floors and each floor is partitioned into many rooms. Audiences are asked to start their visits by watching a VDO at the Immersive Theatre on the ground floor, followed by the Typical Thai room on the same floor (see Picture 4.7.), and then continue on the third floor followed by the second floor. The third floor exhibitions include an introduction to the Ancient Suvarnabhumi Land, Buddhism, the Founding of Ayutthaya, Siam and The War Room. The second floor includes The Map Room, Bangkok – New Ayutthaya, Village Life, Change, Politics & Communication, Thailand and the World, Thailand Today, Thailand tomorrow.

Picture 4.6. Museum of Siam: Front area

Picture 4.7. The Typical Thai room

a) Physical access:

Table 4.6. illustrates many physical attributes in the museum are not in reference to the international organizations' recommendations such as complicated layout, non-designated parking for the disabled, limited contrast, etc. Dim lighting, the museum's distinctive attribute, is also not in favor of some low vision participants who need sufficient light to see. All windows are closed and blinded, electric lights then become the main source of illumination. See Picture 4.8. Contrast in colors is unavoidably weakened by the shadowy atmosphere. The museum's layout is more complicated than a straight line or a simple curved line that heads into one direction.

Picture 4.8. Museum of Siam's dark interior

However, pathways are generally wide enough for other visitors to pass, except for a few small areas where popular interactive exhibits are placed, at which audiences bumping into each other may not be avoidable.

Physical Access	Yes/No/Comment
1. Layout: simple, few changes of directions, least obstructions	Many changes of direction, exhibits are placed in all directions.
2. Lighting: Sufficient lighting at entrance, pathway, displays	Dim lighting overall.
3. Contrast: color, texture	Limited
4. Acoustics: background noise	Sounds from different audio programs may be activated at the same time in the same small room.
5. Parking: designated	No
6. Pathway: no obstacles, handrails	Varied. Some are wider than others. Decorations and exhibits placed on the floor are usually enclosed by a bar.
7. Entrance: glazed/automatic door	No
8. Floor surface: non-gloss, non-slip, plain patterns, Change of floor texture at strategic points	Different floor textures in some rooms.
9. Wall, door: contrast & bright doorframes, handles	Walls are decorated by displays, lit with spot or task lights. No clear contrast on entrance doors. No doors between rooms on the same floor.
10. Stairways, ramps: well lit, contrasting to wall, placed against wall, handrails both sides	Stairways are on the outer part with enough sunlight, placed against the wall with handrails.
11. Tactile Ground Surface Indicators: for any obstacles	No
12. Highlight on controls, facilities	Limited. Difficult to locate in some exhibits.
13. Toilets	Every floor has flush toilets. A toilet for the disabled is placed far away from the main exhibition area.
14. Restaurants	A/C restaurant (Black Canyon) is behind the main exhibition building. Small coffee shop is on the ground floor in front of a souvenir shop.
15. Resting area	Only present in a few rooms. Sometimes, it's not clear if they are seats for resting or for decoration only.
16. Lifts: handrails, Braille, large & clear buttons, floor announcement	There is one reserved lift for the disabled but entrance is blocked by a bar.
17. Signage: clearly identifiable & Not cause obstruction, Tactile signs & maps	Not clearly identifiable but not cause obstruction. No Tactile signs and maps

Table 4.6.Physical access Checklist: Museum of Siam

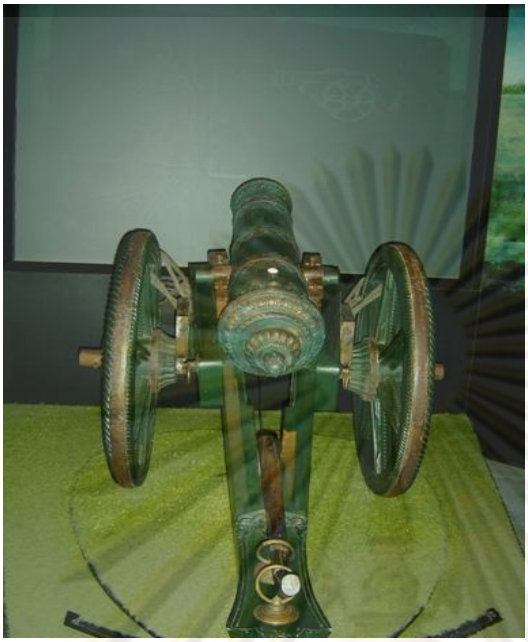
The museum's railed stairways, located adjacent to the exhibition area are almost two-meter wide and are well lit with sunlight through windows and entrances from the ground floor. The museum also has an elevator located in the exhibition area reserved for the elderly and the disabled; however, a bar placed against the elevator's entrance makes it look as if it is inoperative. The elevator does not have special features for visually impaired people, such as Braille signs, floor announcement, etc. A change of floor textures is

present in many rooms; however, this feature was not much detectable by the visually impaired participants.

The low vision participants' needs in holding on to a sighted companion were evident during the visits; even for participant H who is generally able to travel independently to unfamiliar places disclosed he would not be able to walk unaided here, mainly because of the badly lit environment. Those who are used to be led at all time unsurprisingly find holding on to a sighted leader, in the museum with safe pathways and railed stairways, a simple task. The dim lighting inevitably obliges the participants to be reliant on the sighted companion, not only for moving around but also on locating and handling exhibits of all sizes. Considering the museum's physical design as explained before, the museum is certainly not a place for visually impaired people to visit alone.

b) Intellectual access:

The museum's main message is to explain Thai people's origin, culture and development using interactive programs, audio programs, audio-visual programs, short movies, 3-dimentional models and text to convey information. See Picture 4.9. and 4.10. Many interactive media require vision to accomplish required tasks, others have simpler instructions which can be activated by touch on control buttons to see an image or a movie and/or listen to an audio description. Instructions on how to use the devices are minimal and unclear on some exhibits. Simple symbols used to demonstrate user's instructions of many programs are activated by touch. During the field research, none of the low vision participants could see the touch system controls. Buttons are found to be more favorable than the touch system. The participants often use their hands in exploring interactive exhibits; buttons are detectable through hand exploration while the touch system controls are not.



Picture 4.9. and 4.10. Interactive displays used in the Museum of Siam

A series of movies under the same theme, showing how Thais were in the past compared to these days, are presented through a big screen (on the first floor) and several small screens (on the third floor). The movies, lasting about 5 minutes, switch back and forth between the present life and a past life of the same actors using many effects to present the stories. The simple and straightforward language used by the actors, together with interesting story line appeared to draw the participants' attention from the beginning until the end of the movies. However, the fact that movies and other audio-visual programs are located near each other, having them activated at the same time by different users can naturally create unwanted interference. During the visits, while participants were listening to one audio program, another program was operated, accompanied by loud noises from other audiences. When this happened, it drew the participants' attention toward the distracting stimuli. Nevertheless, according to the participants, they were actually not much disturbed by the acoustics. "I am used to hearing many noises at the same time", said participant F. The phenomenon conceivably suggests the participants' high auditory distraction threshold or, perhaps, high abilities to select attention. Though they seem not to be easily distracted by surrounding noises (if they know what the noises are and where they

come from), young male participants seem to have lower boredom threshold. Participant D happened to be uneasy after a few minutes of standing still and listening to an audio program he found uninteresting. His non-verbal expression suggests a program should not be long; Bitgood (1993)'s guidelines for communication media states that audio-visuals' running time should be short and if programs last more than a couple of minutes, seating should be provided.

In fact, the museum does not have any seating installed at any of the audio-visual programs. Sometimes, participants were seen crouching on the floor. Inadequate resting areas are brought up by participant A as one of the downsides. One way to remove noise interference is by utilizing headsets. However, a disadvantage is the limit of its usage; one headset can be used by one person at a time. Introduction to Suvarnabhumi room has an interactive VDO called 'A Chat with an archeologist' with two headsets provided.

The limited number of headsets did interrupt the smoothness of the tour given that there were once three visually impaired participants present in the museum. Another way to reduce auditory distraction is by lessen the area of hearing with a clear partition. Bangkok: New Ayutthaya room has closets installed on the wall showing typical products from neighboring countries of Thailand. Recorded voices of Thai speaking persons (with different accents) explaining their lives in Bangkok begins when a visitor presses the control button located in the closets. The soft audio requires the audience to stand close to the closet. A drawback of this means is similar to the headset's, only one audience can access at a time. See Picture 4.11.

Picture 4.11. A closet showing typical products from one of a neighboring country

Intellectual Access	Yes/No/Comment
1. hand-held magnifier	No
2. text enlargeable by IT tools	No
3. Braille description	No
4. Braille brochures	No
5. Raised text and pictorial symbols	No raised text, a few raised images
6. 3-dimensional objects	Yes, replicas and real small objects
7. Verbal description	No
8. Docent presence	Yes, not in every room
9. Audio/VDO programs	VDO presentations
10. Guided tour	No
11. Sound	Yes, background sound corresponding to a room's topic or theme
12. Workshop/activities	Yes, one room provides traditional costumes to wear for taking pictures (with own camera)
13. Displays Quality /text information	Generally in good conditions, some texts are found to be difficult and some too superfluous.

Table 4.7. Intellectual Access checklist: Museum of Siam

Apart from movies and interactive programs, the participants demonstrated their interest in touchable 3-dimentional objects which are present in most exhibition areas such as a real size Tuk Tuk, a scale model Ferris wheel decorated with colorful lights (seen in temple fairs), a food pushcart, a real sized half-cut car. One of the most popular exhibits for the visually impaired participants is the 3-dimentional real size models of warriors and weapons. The quality of this matchless exhibit and the well blend of real and reproduction elements, investigable by touch, are main reasons why the War room is one of their favorites.

Some real items presented here are traditional toys made out of thin wood and simple natural materials. The museum incorporates ambient sound corresponding to each room theme, for example, the sound of street peddlers and traffic in the Typical Thai room and the sound of insects in the Village Life room. Other tactile displays include raised images of ancient people almost as big as a real sized people and a stand-up cut-picture chart illustrating important structures from different periods of time such as a Roman temple, a Burmese Temple, a Pyramid, etc. All participants appeared to be attentive in exploring this stand-up chart and wanted to know the names of the places. Their attentions on this particular display indicate a certain level of interest and comprehension. The medium's characteristics, which require low budget and less effort to make and can still create understanding via touch make it a noteworthy learning tool for visually impaired children.

Text descriptions on boards and docents are another two interpretative means presented here. The vocabulary, writing styles, length of information and the level of complexity vary according to topics. The language written in Dharma room is found to be difficult for participants. Some parts are presented with Bali & Sanskrit, the obsolete languages regularly used in Buddhism. The small sizes of the text print, low contrast of colors together with dim lighting do not in actuality facilitate low vision participants' seeing and counter to the characteristics of accessible museums demonstrated in 4.2.3.

Docents are standby in some rooms. Their roles are more to help when needed than to explain. They use less academic language to explain; some appeared to know not more than what written on board. During the research field, it became clear that they were not trained to handle visually impaired audience, considering by the words they used and the way they interacted with the participants. In fact, participant H reckons the language used here superfluous and lack of insight. Table 4.7. demonstrates an outline of intellectual access in the Museum of Siam.

Another interesting finding from the field research is the low vision participants' desire to exercise their remaining visual senses to see objects of their interest, particularly the objects that can provide a new experience. This is evident when participant C was investigating a map of Southeast Asia. She spent a long time trying to differentiate colors on a wall map, with her eyes almost touching the wall. She was eventually able to see the distinction of some colors. "I like the map more than other exhibits here because I have never seen one before", said participant C.

c) The characteristics of accessible museums in comparison with the Museum of Siam's features and the participants' actual practices in the museum:

This part is meant to evaluate how the museum's attributes correspond to the characteristics of accessible museums; furthermore, how the participants react to the absence of the features (if any). Table 4.8. demonstrates the museum has many features corresponding to the characteristics of accessible museums.

The museum's core attributes, interactive programs and a variety of interpretative tools, receive well responses from the participants. The absence of guides (c) is unobjectionable because of the high number of touchable objects and audio programs, the presence of the docents and the sighted companions. The docents' limited verbal descriptions were not brought up as a barrier owing to the fact that the museum has a large number of touchable objects; verbal description on the objects' look thus can be clarified by touch. Despite some complaints on text information (read to them by the researcher) and unidentifiable controls on interactive programs, the participants still
consider Museum of Siam comparatively intellectually accessible, largely due to the variety of non-visual sensory presentation.

Characteristics of accessible museums:	Availability at the Museum of Siam	The participants' responses.
a) multi-sensory channels presented exhibition:	Yes	Positive
b) Touch and hearing:	Most exhibits are touchable. Many audio, audio-visual programs.	They touched everything they could. They listened to all audio, audio-visual programs.
c) Guides/docents:	No guides but docents standby in almost every room	They don't miss guides because there are audio programs, docents and sighted companions.
d) Ratio of guide to visually impaired audiences:	No	-
e) Verbal description skills (ex.: on the exhibits' exterior is as important as their functions/actions)	Limited by docents	Varied according to the docents' skills
f) Interpretation through easy-to-understand media	Yes	Positive
g) Various interpretative tools	Yes.	Positive
h) Quality of exhibits, message and user instructions/controls	Exhibits are in good condition. Some messages use difficult language. Some user instructions are not clear.	Positive to displays but varied to message presentation.
i) Safety attributes (pathways, railed stairs)	Clear pathways but badly lit. Stairs are railed.	Generally Positive except for dim lighting.
j) Tactile & visual facilities enhancing orientation and facilities relieving basic needs (such as food, drink and rest)	Different floor tactile in some rooms. No facilities enhancing vision. Have refreshment shop and restaurant. Rest areas are limited. Only one big couch in the whole exhibition area.	Different floors are hardly noticeable. Low lighting mentioned as a barrier to seeing. Minor complaint on limited rest areas.

Table 4.8. The characteristics of accessible museums in comparison with the Museum of Siam's features and the participants' actual practices in the museum

As for physical attributes, the museum has relatively clear pathways and railed stairs but low lighting, making it demanding or even impossible for low vision participants to regain orientation and negotiate independently through the museum. The different tactile floors, though exists, is meant to suit each room's theme rather than to communicate to visually impaired audience. The characteristics, which do not facilitate independent visits, make participant H, who are used to travel alone, not so convinced the museum is accessible overall. He actually ranks Museum Siam the least accessible museum behind Bangkokian Museum and Snake Farm.

On the contrary, participants A and B, who went to Museum of Siam with participant H consider Museum of Siam the most accessible. It should be noted here that participants A and B have never been to unfamiliar places alone. Holding on to a sighted companion, thus, is not deemed as a result of the museum's inaccessibility. It is becoming clear that the concept of accessibility is variedly judged among the visually impaired. Factors influencing their judgments include vision, experience, lifestyle, interest, etc.

d) The museum's services for the visually impaired audience:

Before the field research, the Museum of Siam had one or two visually impaired visitors who came with their sighted companions. According to M.L. Orn-Umpai Phananuratana, the museum's manager, the museum does not have a special service offered to the disabled. Interestingly, the study finds that contrary to the fairly well responses towards the museum's interpretation from the visually impaired participants, Orn-Umpai believes the museum is not well equipped for the visually impaired audience's learning experience as it was not made to serve their needs. Apart from a waived entrance fee, special toilet and an elevator for people with disabilities, the museum does not yet have other special services for the disabled. For her, the concept of accessibility is focused on intellectual access such as Braille, raised pictures, more 3-dimensional models, bigger space, trained staff, etc. rather than physical access. "I don't think physical access is a problem since they have sighted companions to direct them around. It is not possible for the visually impaired to walk around here by themselves". Her remark reflects, in some way, her notion about a blind with dependent travel behavior and her unacquaintedness to visitors with low vision.

Orn-Umpai agrees with the idea of promoting the museum to the disabled, saying the museum should be for everyone. However, making the museum accessible for people with disabilities take time and tremendous resources, thus the plan to improve the museum for this particular audience will take

years before it is realized. She also pointed out that the visually impaired visitors themselves must be ready for all kinds of non-visual tools: “What benefits would it bring if we have raised pictures available but the visually impaired themselves are not familiar with these media?” The views of the museum’s manager well manifest the sighted people’s general impression of the visually impaired people. People usually think about visually people as blind and even refer to them as blind.

Low vision people are usually overlooked; as a result, attempts to improve intellectual access are directed towards tactile media rather than visual enhancing means. Another interesting finding emerged out of the interview with Orn-Umpai is her opinion on the museum as not yet a place for visually impaired audience due to the lack of Braille and raised pictures. Again, her view reveals how general people strongly connect Braille with people with visual impairment. In fact, only people who go to special school get to learn Braille, and only a handful of visually impaired people go to special school. In addition, those who go to special school do not necessary know raised pictures well, as demonstrated earlier in this study.

4.3.3. Children Discovery Museum:

Number of visit: 2 visits on different days

Participants: A & B, E & F

Sighted companions: The researcher, a teacher from Bangkok School for the Blind, and participant B's parent (accompanying participant B)

Children Discovery Museum's exhibitions are designed especially for children at kindergarten and primary school levels. The museum has four buildings in its compound. Its main building has many exhibits concerning science, technology and culture. The second building, meant for kindergarten children, has models of a kitchen, a clinic, and a shop with many plastic toys in the shapes of fruits, vegetables and various house appliances. The third building presents natural disasters, and the fourth, which used to be Disney Learning Town, was closed for renovation, during the field research. The center of the museum's compound is a playground with a large spider web-like structure for children to climb on. The museum, attached to the Bangkok Metropolitan Administration (BMA), is managed by Rakluke Foundation, which is also the main sponsor. Students from youth centers and schools under BMA, are granted to use the service without charge.

Adjacent to the museum inside the Sirikit Park is an area, not owned by the museum but developed by the Rakluke Foundation, devoted especially for the visually impaired children's exploration. The area is equipped with Braille print and an automatic audio program operated by sensor, describing characteristics and benefits of vegetation in the vicinity. The pathway is railed on both sides along various kinds of plants, a setting aiming to stimulate sense of smell. See Picture 4.12. After the plants section is a so-called 'sound architecture', assorted displays for promoting audio sensory such as a procession of hanging bamboos are presented. The end of the path is a big pillar with raised pictures of animals for promoting touch. All

facilities in the area were running down during the field research; however, renovation will be taking place soon, according to the foundation's staff.

Picture 4.12 Railed pathway with Braille and audio explanations

a) Physical access:

Table 4.9. illustrates the museum's physical attributes are to serve the needs of young children. Simple layout, well-lit environment, railed stairways with corners buffered, reasonably clear pathways and non-slip floor are among attributes promoting safety and are in line with the international organizations' recommendations. Strong colors are incorporated but not necessary to give a contrast that facilitates some low vision visitors. As discussed before in the beginning of this chapter, due to the visually impaired people's diverse visual conditions, the application of visual contrast may work differently on different people. Participant A who is a low vision participant was unable to identify the strong purple color on the wall but other people with low vision may be able to notice it.

The museum does not have designated parking spots for the disabled, moreover, to get into the museum from the parking, visitors are required to cross the inside road.

Physical Access	Yes/No/Comment
1. Layout: simple, few changes of directions, least obstructions	Reasonably simple layout with a few big poles and some exhibits on the pathways.
2. Lighting: Sufficient lighting at entrance, pathway, displays	No extra lighting at the entrance door to the building. Pathway and displays are well lit.
3. Contrast: color, texture	Strong colors in some parts but no contrast in texture.
4. Acoustics: background noise	Noise interference from some displays and from other young audiences.
5. Parking: designated	No
6. Pathway: no obstacles, handrails	The pathway's is reasonably safe. However, there are many exhibits in various forms standing in all directions. No handrails.
7. Entrance: glazed/automatic door	Non-glazed push door.
8. Floor surface: non-gloss, non-slip, plain patterns, change of floor texture at strategic points	Non slip floor but no change of texture at strategic points.
9. Wall, door: contrast & bright doorframes, handles	Walls are colorful. Not many doors inside the main exhibition building. No contrast in colors on door frames.
10. Stairways, ramps: well lit, contrasting to wall, placed against wall, handrails both sides	Stairways are with handrails, well lit.
11. Tactile Ground Surface Indicators: for any obstacles	No
12. Highlight on controls, facilities	No
13. Toilets	Regular toilets are in every building. Toilets for the disabled are in Building 2.
14. Restaurants	Situated outside the exhibition area. The restaurant area is filled with a few food stands with plenty of simple chairs and long tables.
15. Resting area	Located all over the area.
16. Lifts: handrails, Braille, large & clear buttons, floor announcement	There is a lift for the disabled inside the main exhibition building. No special attributes for visually impaired people.
17. Signage: clearly identifiable & Not cause obstruction Tactile signs & maps	Not many signs are installed and the sizes used are regular. Not causing obstruction. No tactile signs & maps.

Table 4.9.Physical access checklist: Children Discovery Museum

This, however, did not seem to give the participants cause for concern, by reason of having a sighted companion to hold on to. The museum's pathways are reasonably clear; in some parts where exhibits line in parallel with the wall, some more adventurous participants were found to make an attempt to explore independently in the vicinity on their own initiatives.

This phenomenon reveals that well placed displays can minimize dependence and encourage self exploration. All participants showed no signs of problems in following around throughout the museum's compound although with a minor concern about steps and stairs. In some areas, visitors are required to enter without shoes. This appeared to be effortless for visually impaired participants. Their abilities to handle this kind of situation are evident; they looked for a further away place where no other people's shoes are around and put their shoes there. All participants tried many activities that require physical movements including going a modeled train, crawling into a model snow house, ducking into a model Indian tent, and pedaling on a fixed bike, etc. See Picture 4.13.

Picture 4.13. An Indian tent model demonstrated in the Children Discovery Museum

Participant E and F even went up and climbed on the spider-web structure independently from one side to the other. The floor underneath this structure is covered by sand, thus, a certain degree of safety is secured. See Picture 4.14. Participant B, who is anxious by nature, also showed an attempt to

explore everything she found safe. Again, this phenomenon demonstrates visually impaired children's self exploration can be stimulated when fear is minimized and the need for safety is fulfilled. Most participants downplay the importance of special toilets for the disabled, and want to adhere to ordinary toilets with flush system. However, when there was a need to use the service, they found themselves being rather awkward in a restroom area. A special toilet for the disabled is proven to be quite handy for people who cannot see or who can hardly see, not to facilitate their mobility but to regain orientation given that its location is always separated from other regular restrooms. Participant E was the only one who brought up an idea of having a Braille map showing the location of sink, toilets, papers, etc.

Picture 4.14. The Children Discovery Museum's outdoor area

The museum has an elevator reserved for the elderly and the disabled but has no special attributes for the visually impaired people. The elevator was found to be unnecessary and not being used by participants during the field research, mainly because they preferred to walk.

Data emerged from the field research reflect a relationship between perception and awareness. If a participant sees or touches something, that thing exists and if he fails to see or touch, he may believe it does not exist. Participant A complained at the end of the tour about limited resting areas available in the museum. In fact, there are many seats in every floor but she simply did not notice them and also was not notified by anyone. The incident highlights the role of sighted companions and/or museum guides (if any). Description of the facilities present in the surroundings is hence helpful to the people with visual disabilities.

b) Intellectual access:

Though there are four buildings in the museum, one aims at toddlers, one emphasizes on visual presentation, one was closed down during the field research, the study will only concentrate on the main building which has permanent exhibitions. The museum's main building has many interesting activities/exhibits that stimulate learning by using a variety of senses. Programs are designed to allow children's participation by doing, touching, hearing and seeing. The most important interpretative tools in the building are the exhibits themselves and text explanations.

Exhibits accessible by non-visual senses are such as speaking through a pipe, sending letters through a windpipe (children sitting at each end of the pipe), sensory boxes, staying inside a reproduction of mom's stomach, a treadmill measuring heart beat, listening to various languages through headphones, dressing up in traditional costumes, staying in a model of an Igloo Eskimo home, Red Indian tent, Japanese home, listening to international music in a big modified oil barrel, listening to different musical instruments through headphones, playing with drums and traditional musical instruments made from bamboo tubes, investigating ancient axes, and stone weapons by touch, exploring a modeled train and a village life, enacting a newsreader "on air", sitting behind the wheel of a car model, etc. See picture 4.15. & 4.16.

Picture 4.15. A participant is speaking through a pipe

Picture 4.16. Visitors can listen to international music in modified barrels

Table 4.10. shows that the museum has many important interpretative attributes accessible by non-visual senses. Information in Braille print can also be found, though limitedly. Explanations, if not by self-discovery through doing, are also explained in text. Some exhibits have clearer text explanations than others and some have audio explanations. The text language is conversational and the style is playful, obviously meant for young children at primary school level. The letter sizes are relatively bigger than at other museums in general.

Intellectual Access	Yes/No/Comment
1. hand-held magnifier	No
2. text enlargeable by IT tools	No
3. Braille description	Yes. There are about seven Braille signs.
4. Braille brochures	No
5. Raised text and pictorial symbols	No
6. 3-dimensional objects	Many reproductions. Touching is permitted.
7. Verbal description	Depending on docents (if any), limited
8. Docent presence	Yes, limited
9. Audio/VDO programs	Yes, some
10. Guided tour	Yes, for big groups only (student groups)
11. Sound	Background sound (such as music) in some parts
12. Workshop/activities	Cooking (at certain time)
13. Displays Quality/text information	There are many exhibits children can touch, try and hear. Many need maintenance.

Table 4.10.Intellectual access checklist: Children Discovery Museum

Quiz is incorporated to stimulate curiosity, with a question on one side of a flap and its answer on the other side. Docents are available but very limited, thus hard to be found. Since the museum's concept is to let children discover knowledge by themselves, the presence of docents is more to help when needed than to explain. During the field research, all participants expressed their excitement and looked forward to seeing and trying all the exhibits. See Picture 4.17. The combination of learning by doing various things that vision is not required, with the exhibits that seem like games evidently gave them an enjoyable experience, although about 30% of interactive exhibits were out of function during the visits, causing disappointment to the participants.

The participants positively responded to Braille print, one read and the other listened, they took turn on the next Braille sign. The exhibits that have no Braille explanations are made clear to them by listening to audio programs or to the sighted companions. Quiz is found to be popular; they participated until the last question and took their pride when got all correct answers. Though they agree the language used here is easy to understand, they did miss museum guides or docents when the sighted companions failed to clear their doubts. Their needs for real comprehension in the learning environment

heighten the role of museum guides and docents, even in the setting where self-learning is promoted.

Picture 4.17. Participants in action

There are many reasons why museum guides or docents are needed in the museum like Children Discovery Museum. Though the museum's target group is the primary school level, children from the lower primary class cannot be expected to have the same level of understanding as the older ones, particularly in science. In fact, many studies on discovery learning conclude that unguided scientific discovery generally is not a very effective and efficient way of learning, certainly not for students with little prior knowledge, (De Jong, 2005:220). The need for guides or docents to explain in science exhibitions is even evident in the case of people with visual impairments, given that the instructions to carry out a task and the performance's result often require vision to perceive.

As for the case of Bangkok Children Discovery Museum, since there are some interactive programs which operating instructions are not clearly explained, and broken interactive programs are left without notice, users can easily feel helpless when they fail to start the programs. The exhibits' diversity, which involves participants in doing various things to accomplish the tasks, also reflects the degree of capabilities and skills of each participant.

Participant B did not know how to cycle when she tried to work on an exhibit; participation E did not succeed in putting on a fireman suit, etc. In these situations, museum guides, docents or the sighted companions can help making their attempts achieved.

Each participant has his or her own favorite exhibit. Girls mentioned they like enacting as a presenter on the radio in the museum's studio room. Boys mentioned they like the exhibits that require active movements and show immediate results such as sending a letter through a pipe, an exhibit that requires them to sit opposite each other and pump up the chairs to create wind energy. Boys also appeared to have a lower boredom threshold than girls. They apparently stayed more focused when listening to audio programs than to the sighted companions reading for them, possibly due to the characteristics of audio programs which are full of captivating sound effect. Besides, they could simply sit on the floor with their ears close to the speaker and listen. This behavior and reaction show that seating not only offer comfort but can also enhance the audience's concentration.

The field research at the Children Discovery Museum lasted longer than the other museums. Having a lunch break in the middle of each tour is one reason (given the convenient location of the food stalls); another reason is a stopover at the adjacent park to view the area the Rakluke Foundation has developed especially for the visually impaired children. The two visits to this museum took about four and a half hours, not too long according to the participants, given that they got to view and try a variety of things. The participants revealed that they had no problems in understanding the language communicated through audio programs, text (read by sighted companions) and a docent who came shortly. The main barriers to learning are insufficient interpretation in some exhibits and a number of broken exhibits left unattended in the exhibition area.

c) The characteristics of accessible museums in comparison with the Children Discovery Museum's features and the participants' actual practices in the museum:

This part is meant to evaluate how the museum's attributes correspond to the characteristics of accessible museums; furthermore, how the participants react to the absence of the features (if any). Table 4.11. demonstrates the museum has many features corresponding to the characteristics of accessible museums.

Characteristics of accessible museums:	Availability at the Children Discovery	The participants' responses.
a) multi-sensory channels presented exhibition	Yes, but many are broken.	Positive, but not for the broken ones
b) Touch and hearing	Most exhibits are touchable. Audio programs are provided.	They touched everything they could. They listened to all audio programs.
c) Guides/docents	Docents but very limited Guided tours are for big groups only	Varied, but positive.
d) Ratio of guide to visually impaired audiences	No guided tours for visually impaired children	--
e) Verbal description skills (ex.: on the exhibits' exterior is as important as their functions/actions)	Depending on docents, but rather limited.	Varied according to the docents' skills.
f) Interpretation through easy-to-understand media	Yes. Interactive exhibits, Braille, 3-dimentional objects.	Positive, some exhibits show immediate results after activated. Comprehension arise with more explanation. Not by doing alone.
g) Various interpretative tools	Yes: Interactive exhibits, Braille, 3-dimentional objects.	Positive
h) Quality of exhibits, message and user instructions/controls	Exhibits need maintenance. Braille and text message are easy to understand. User instructions' qualities vary.	Generally Positive but not on broken exhibits.
i) Safety attributes (pathways, railed stairs)	Pathways are generally clear though some exhibits may cause obstruction. Stairs are railed.	Generally Positive with minor complaint.
j) Tactile & visual facilities enhancing orientation and facilities relieving basic needs (such as food, drink and rest)	No tactile contrast, strong colors are used, well lit. Food & drink stalls are in the compound.	Acceptable with minor complaint.

Table 4.11. The characteristics of accessible museums in comparison with the Children Discovery Museum's features and the participants' actual practices in the museum

The museum has almost all features matching with the characteristics of accessible museums in the participants' views. However, the availability does not signify quality.Quality of exhibits, as illustrated in h) is therefore a significant attribute that can change the overall level of accessibility. The participants' responses more or less correspond to the availability and quality of the museum's attributes. At first glance, the museum should have been a 'great' place for visually impaired children. It has a variety of multi sensory entertaining presentation in a colorful setting; however, the large number of inoperative exhibits and unseen docents to come and help when needed clearly bring down the museum's charm and accessibility.

The broken exhibits limit the participants to touch and try while the nonattendances of docents, particularly in the area where other kinds of interpretation are absent, restrict their understanding. Though the museum is viewed as accessible in a whole picture, the mentioned intellectual barriers are the reasons why participants A and B rank Children Discovery Museum less accessible than Museum of Siam (even though there is no Braille information in Museum of Siam). Participant F ranks Children Discovery Museum less accessible than Bangkokian Museum (even though there are neither audio programs nor Braille at Bangkokian Museum). Participant E is the only one who went to two museums instead of three, due to his illness. He ranks Children Discover Museum's accessibility ahead of Snake Farm.

d) The museum's services for the visually impaired audience:

The museum has no special services for the disabled including the visually impaired audience and has no exact future plan to develop the museum to serve the needs of this particular disabled. Audience with visually impaired or other kinds of disabilities will be treated the same way by the museum's staff, revealed by Pornchan Sawatdipat, the museum's project development director and Srithong Ruaythamroj, the head of learning department. 'Equality among children' is referred to as the museum's principle and

practice. It seems that the concept of equality from the museum's point of view is how the museum treats its audiences, not how the audiences gain access to its exhibitions.

However, children with disabilities are allowed to gain access to the museum without charge; docents are trained on how to handle disabled children in general, not specifically visually impaired. According to Pornchan and Srithong, many special schools with various types of disabilities have occasionally visited the museum, but a visit from special schools for the blind was uncommon. As, they recalled, there were once or twice that Bangkok School for the Blind came, by the museum's invitation, to visit the park area devoted especially to children with visual impairments. After the visit, they have never come back and the park became underutilized. In their views, having the students here take a lot of efforts. Although the visits are free, the school has to arrange own transport and many extra human resources, which are the burdens they have to shoulder.

Besides, the children themselves are also busy with various kinds of activities, given that Bangkok School for the blind is the only charity special primary school for the blind in Bangkok. Their remarks lead to an interesting finding; the school visits to the museum were an act of accepting invitation rather than to advance children's learning experience.

Srithong agrees with the idea of promoting museums for the visually impaired audience on the principle that everyone should have the right to learn. Nevertheless, the museum does not have an exact plan to develop the museum for the visually impaired children, for the most part, due to financial constraint: "We have a commitment with Bangkok Metropolitan Administration to allow 200,000 students from schools under the umbrella of BMA a year to visit the museum for free of charge. This includes the disabled children. Financially, we have been striving to survive on our own. Even though the museum belongs to BMA, we don't get any subsidy". The

phenomena indicate the museum's door is widely open for the visually impaired audience, although without a concrete plan to invest further for this particular group. This may be because of budget constraints and perhaps by the low responses to the park the museum management created for the visually impaired children. To gain access to this particular museum setting without special services offered by the museum staff, a sighted companion is the key.

4.3.4. Snake Farm:

Number of visit: 3 visits on different days

Participants: C & D, E & F, G & H

Sighted companions: The researcher, a teacher from Bangkok School for the Blind

The Queen Saovabha Memorial Institute, commonly known as The Snake Farm, is open for tourists every day. Here, visitors can see the extraction of the venom shown inside the newly renovated three-storey Simaseng Building. The building's second floor houses an exhibition of the snake including its physiology, anatomy, life cycle, as well as symptoms and risks of a venomous snake bite and what to do when someone is bitten by a snake. Many kinds of snakes are preserved in long glass tubes standing in a row in the center of the room. The first floor is decorated similar to a snake zoo with many kinds of living snakes detained in glass walls. See Picture 4.18. In front of the building, there are demonstrations on how to catch snakes in the outdoor area, after which visitors are invited to touch a tame python, and even wrap it around the neck for photo taking. During weekends and public holidays, the show is limited to snake catching in the morning only.

Picture 4.18. Snakes in glass wall

Since there are many foreigners here, the presenter switches between English and Thai. The outdoor area's central part also shows many kinds of snakes kept in separate cages along the railed pathways.

a) Physical access:

As shown in Table 4.12, the exhibition building has limited visual-enhancing facilities. The contrast of colors is not evident; lighting is also on the low side. Though part of the exhibition room on the second floor is reachable by limited natural light, the main source of illumination comes from electric lights, which are not fully on. The difference of floor texture is not detectable. However, the place has the most important physical attributes, in the views of visually impaired participants, which are clear pathways and railed stairways. The pathways here are big enough for three persons to pass each other. An interview with participant E reveals one interesting point about the clear pathway attribute. He thinks the pathways at the exhibition area are too big. Big pathways can cause him to be anxious about losing his way. Obviously, empty space disconnected him from cues, bringing his orientation to a standstill. Participant E's point of view demonstrates that people who are blind may not necessary enjoy the attribute of big empty space in the same way as people with low vision do.

The exhibition area's layout is simple with most exhibits are placed against wall. See Picture 4.19. Exhibits which are not next to the wall are large and visible to participant G and H, who have low vision and are used to travel independently. However, the first floor design is not as facilitating to people with low vision as the second floor since it is kept rather dark with a small part of the entrance area designed to imitate a cave-like atmosphere. The low ceiling at this part, together with the dim lighting over the area could pose a threat to visually impaired audiences' safety.

Physical Access	Yes/No/Comment
1. Layout: simple, few changes of directions, least obstructions	Few changes of direction, a few obstructions because some displays are placed on the pathway area.
2. Lighting: Sufficient lighting at entrance, pathways, displays	Low lighting at entrance. On the second floor, displays have lights. Pathway is lit by some lights from the ceiling. The area is not too dark but a little dim. The first floor is decorated like a zoo, no natural light source, only task lights on the signs. The use of limited light makes the area dark.
3. Contrast: color, texture	No
4. Acoustics: background noise	Sounds from different audio programs may be activated at the same time in the vicinity.
5. Parking: designated	No
6. Pathway: no obstacles locatable, handrails	Apart from the entrance area on the first floor, vertical clearance is more or less clear. Obstructions are the displays placed along the pathway, most locatable with cane. No handrails.
7. Entrance: glazed/automatic door	Automatic glass door, with stickers on it.
8. Floor surface: non-gloss, non-slip, plain patterns, change of floor texture at strategic points,	Non-slip floor, plain pattern No difference in floor texture.
9. Wall, door: contrast & bright doorframes, handles	Most displays are against the wall. Glass doors.
10. Stairways, ramps: well lit, contrasting to wall, placed against wall, handrails both sides	Stairways are on the outer part with enough light from natural source, against the wall with handrails.
11. Tactile Ground Surface Indicators: for any obstacles	No
12. Highlight on controls, facilities	Not good enough. Some are not lit.
13. Toilets	A toilet for the disabled is on the first floor at the outer part of the main exhibition area.
14. Restaurants	Non A/C simple restaurant outside the main exhibition building, closed in the weekend.
15. Resting area	Located in one corner on the second floor. One VDO presentation room has seating.
16. Lifts: handrails, Braille, large & clear buttons, floor announcement	There is one lift reserved for the disabled, located at the back of the building, not visible from the entrance.
17. Signage: clearly identifiable & Not cause obstruction Tactile signs & maps	Not clearly identifiable but not exactly causing obstruction. No Tactile signs and maps

Table 4.12.Physical access checklist: Snake Farm

Picture 4.19. Snake Farm's exhibition area

The museum has some facilities for the disabled such as an elevator, special toilet and ramp. Despite the availability of the elevator, visitors in need may not be aware of its presence given its hidden location from the exhibition area. However, the participants did not appear to recognize its significance, they walked up and down the railed stairways effortlessly. Seating is available in one corner of the exhibition area and in one VDO presentation room. The other two audio/VDO presentation rooms have no seats provided. Owing to the fairly long presentation, the absence of seating obviously caused many participants to be uneasy and less concentrated. See Picture 4.20.

Picture 4.20. Participants' uncomfortable gestures during listening to a long audio program

The phenomena demonstrate the deficiency of appropriate physical attributes could hinder intellectual access. Nevertheless, there is probably no answer to what amount of seats should be sufficient. Some people like to keep walking and some like to rest often. Participant C, who prefers to keep moving, made a comment there are too many seats at the snake farm. In fact, apart from the show, she only sat briefly once in one of the VDO presentation rooms. Participant G, whose vision is far better than the other participants, also complained about the seating at the show area that only allows the front row to see much better than the back rows: "I like the show but could not see well because people in front of me blocked my view".

b) Intellectual access:

The non-visual interpretative tools used here are very limited, as shown in Table 4.13. Besides, the small sizes of letters on boards and signs, the positions of the signs, together with low lighting make all written information indecipherable for all low vision participants. There are four audio and VDO programs but only three programs work. Each lasts about 5-8 minutes. Only one room is equipped with seats. Participations generally seemed to be more appeased in this room than the others.

Intellectual Access	Yes/No/Comment
1. hand-held magnifier	No
2. text enlargeable by IT tools	No
3. Braille description	No
4. Braille brochures	No
5. Raised text and pictorial symbols	No
6. 3-dimensional objects	A life-size dummy laying in a hospital-like bed
7. Verbal description	No
8. Docent presence	No
9. Audio/VDO programs	Yes
10. Guided tour	No
11. Ambient Sound	No
12. Workshop/activities	There are some bandages next to the dummy. Audience can practice simple first aid here.
13. Displays Quality/text information	Good, however, most are based on sight.

Table 4.13.Intellectual access checklist: Snake Farm

Picture 4.21. A model of a man bitten by a snake

Inside one of the VDO program room, there is a model of a real sized person on a bed, simulating a man bitten by a snake. There are bandages provided here so that visitors can practice first aid. The presentation received positive responses from all participants. See Picture 4.21. Apart from the enactment activity mentioned above, the only touchable objects are two very large pieces of real python skin. About 80% of interpretation requires visual sense to access. Reactions to the limited variety of interpretation vary between the younger and older participants. Participants from primary school level wish to see more varieties in non-visual presentation, such as Braille and three-dimensional reproduction, or even tamed life snakes to be touched. Older participants from secondary school level are apparently fairly understandable and satisfied with the presentation. “I don’t think there is much they can improve here. It is not possible to have real snakes here for visitors to touch”, said participant G. However, he said a selection of a snake’s eggs or models would add some value to the museum. He also suggests a guided tour would make up for what he would miss from written text if he is here alone. Participant H’s desire is not on the variety of the presentations but more on the knowledge he can gain access independently: “I would like the museum to have a VDO presentation on snakes hunting their prey”.

The language explained through text and audio programs is found to be effortlessly comprehensible for the older participants. For younger ones, their comprehensions vary upon the topics. The topics that they are not familiar with or have no prior knowledge are less understandable. However, all participants appeared to be interested in most information presented. Boys seemed to be more selective than girls. Quiz, which is also incorporated here, could obviously draw young participants' attention. On the contrary, participant G and H, who are in secondary school level, paid no interest in these series of questions.

The spoken language used during the show is graspable by all. During the presentation, the presenter involves the audience into answering questions about snakes. Questions like 'what is the most poisonous snake?' and 'what is the biggest snake?' are thrown to the audience throughout the show. When his assistant brings a snake to the audience, he explains the nature of that snake, its size, colors, patterns, movement and food. He explains the danger of snakes' poisons and, at the same time, the benefits of the snake existence in the ecological system.

c) The characteristics of accessible museums in comparison with the Snake Farm's features and the participants' actual practices in the museum:

This part is meant to evaluate how the place's attributes correspond to the characteristics of accessible museums; furthermore, how the participants react to the absence of the features (if any). Table 4.14. demonstrates the Snake Farm has relatively less interpretative features corresponding to the characteristics of accessible museums in comparison to the other three museums. Almost all participants who went here rank Snake Farm the least accessible, largely due to limited number of touchable objects. Participant H ranks Snake Farm more accessible than Museum of Siam but less than Bangkokian Museum; brighter lighting and better explained content are the core features contributed to his judgment.

Characteristics of accessible museums:	Availability at the Snake Farm	The participants' responses.
a) multi-sensory channels presented exhibition:	Yes, but limited	Acceptable
b) Touch and hearing:	Touch is very limited but touching a real-life snake is possible. Four audio programs but one out of function	They touched everything they could. Some wish there are more to touch. They listened to all audio programs and to presenter at the show.
c) Guides/docents:	No	Acceptable because the presence of a sighted companion and rather clear text. Some prefer to have a guided tour.
d) Ratio of guide to visually impaired audiences:	No	--
e) Verbal description skills (ex.: on the exhibits' exterior is as important as their functions/actions)	No	--
f) Interpretation through non-visual easy-to-understand media:	Yes. Audio programs. Show, enactment	Generally positive
g) Various interpretative tools:	Limited	Varied, some wish for more diversity
h) Quality of exhibits, message and user instructions/controls.	Generally good except one broken audio program. Text message are easy to understand. Some user controls are hidden.	Positive for secondary level participants but varied according to topics for primary school level participants
i) Safety attributes (pathways, railed stairs):	Pathways are generally clear though a few exhibits may cause obstruction. Stairs are railed.	Generally Positive with minor complaint.
j) Tactile & visual facilities enhancing orientation and facilities relieving basic needs (such as food, drink and rest):	No tactile /color contrast, lighting varies depending on location. Food & drink stalls are in the compound on weekdays.	Acceptable with minor complaint.

Table 4.14. The characteristics of accessible museums in comparison with the Snake Farm's features and the participants' actual practices in the museum

Even with limited interpretative tools, participants generally understand the exhibition well. Their learning experience in this place is by and large from the sighted companions' reading and describing. Understanding was established by interaction back and forth between the visually participants and the sighted companions. The understanding of the exhibition's content, the captivating and informative show, plus the chance to touch real snakes, even having it around their necks, make almost all participants who visited

this place rank it as their top favorite. See Picture 4.22. Again it shows that accessibility is not the same as attractiveness, thus it should not be treated in the same way.

Picture 4.22. Participants are thrilled by having a python around their necks

d) The museum's services for the visually impaired audience:

The Thai Red Cross Society who is in charge of the Snake Farm declined to give an interview to the researcher citing the organization is responsible for providing medical services and has no information on the topic under study to contribute to. However, the organization did waive the entrance fee for the researcher, the participations and another companion for all the three visits, in consequence of a formal request sent to them by Chulaongkorn University. According to an unofficial inquiry with a ticketing staff, there is no written policy to offer free entrance to the disabled. If no formal request is filed, it entirely depends on the ticket seller's judgment to allow free entrance or otherwise. Another informal discussion with the Snake Farm's staff reveals that the place does not have any special services for the visually impaired audience. Also, it has never been visited by a person with visual disabilities before. In fact, the Snake Farm's first reaction to the researcher's study was a

combination of astonishment and uncertainty: “What can they do here? How can they see the show and the exhibition if they are blind?”

The phenomena convincingly suggest the public’s lack of awareness of and understanding on the visually impaired people. The possibility of visually impaired people being allowed, by the ticket seller, to get in the compound without charge, reflects their sympathy to the ‘disadvantaged’ rather than understanding.

4.3.5. Conclusion:

The fact is that the visually impaired people have varied visual states, background, prior experience and lifestyle, these conditions oblige them to have different requisites in gaining access to museums. However, the data and findings expounded before reveal the major factors affecting their needs in physical access are their vision and travelling behaviors. Participants with low vision who are used to travel independently to unfamiliar places clearly have some different needs from the ones who always have a sighted companion to hold on to.

Table 4.15. simplifies the museums' accessibility by taking a most crucial factor: travelling behavior, into consideration. Most participants cannot travel independently to and around unfamiliar places; the only two participants who can travel unaided alone are low vision participant G and H. Since they do not use a cane in travelling, their orientation is mainly rested on their remaining visual sense. Museums' accessibility, for audience with low vision, is hence tightly connected with visibility. Lighting, size, and visual contrast are the key elements facilitating their vision. The field research at Museum of Siam with participant H is proven how low lighting affected his seeing; and how his 'affected' seeing had an effect on his orientation.

The dim light evidently and instantly changed a relatively independent low vision participant to be just like the others. When physical access is not made possible for participant H, it is also not possible to gain intellectual access independently. Even if there are objects he can touch and audio programs he can listen to, the questions are how he can reach to those non-visual interpretative facilities, operate them, move on to the next ones, and so on. This is a fraction of examples to attest how physical inaccessibility leads to intellectual inaccessibility.

For intellectual access, touch and hearing as agreed by all participants are the key channels to intellectual access, which means these two characteristics are prerequisites for an accessible museum. The presence of the two, the number

of the exhibits, their quality, and the variety of accessible media are among elements that help enhance accessibility. It is not easy to specify how many touchable objects and audio programs a museum has to provide to make its exhibitions accessible for visually impaired audiences. The children themselves, of course, view that the more is the better.

Likewise, it is also not simple to say how many broken exhibits should be permitted in an accessible museum; and how many different kinds of non-visual media should be adequate to effectively appeal to the intellect. Perhaps, the total number of working diverse non-visual exhibits can be used as one indicator. At the Children Discovery Museum, many displays were out of order; the broken pieces undeniably let the participants down, still they view the museum accessible due to a relatively large selection of multi sensory required displays.

Table 4.15. is designed to abridge all the complexity in order for readers to get the overall picture effortlessly. It does not identify degrees of accessibility and does not consider the presence of the dependent travelers' sighted leaders/companions as a result of the museum's inaccessibility. This is because, in the views of participants who have never travelled alone to unfamiliar places, being accompanied and helped locate or identify objects by a sighted person is considered to be a usual practice.

The table does not include blind children who travel independently to unfamiliar places, simply because there are no children of that characteristics participating in the study. Moreover, judging from the museums' overall features, visiting the museums alone without sight and unaided is unviable.

Museum	Accessibility	Participants' travelling behavior	The participation's justification
Bangkokian Museum	✓	Independently (low vision)	The museum is well lit and has large objects they can see, touch and avoid when walking. Have private guided tours throughout the museum.
	✓	Dependently (low vision & blind)	Many touchable objects. Have private guided tours throughout the museum.
Museum of Siam	X	Independently (low vision)	Too dark to see the pathways clearly and to avoid barriers. Some exhibits, user instructions and controls are not detectable.
	✓	Dependently (low vision & blind)	Many touchable objects and audio programs. Have a variety of media.
Children Discovery Museum	X	Independently (low vision)	Exhibits need doing and explanation. User instructions and controls are likely not to be detectable. Due to limit docents, help may not be there if needed.
	✓	Dependently (low vision & blind)	Many touchable objects and audio programs. Have a variety of media.
Snake Farm	X	Independently (low vision)	Limited audio programs and touchable objects. Information is mostly visual.
	X	Dependently (low vision & blind)	Limited audio programs and touchable objects. Information is mostly visual.

Table 4.15. Accessibility of the museums under study

4.4. Making museums accessible for visually impaired children

This part reveals the focal point of the study and the answer to the last research question: how to make museums accessible for the visually impaired children? The answer to this most important question is a synthesized work arising from the researcher's interpretation by incorporating core findings exposed before in section 4.1. (The visual impaired children), 4.2. (The visually impaired children & museums), and 4.3. (Accessibility of the museums under study).

The presentation on making museums accessible here is set out based on the visually impaired children' regular travel practices. It is not an intention of this study to put museums in charge of changing the visually impaired children's travel habits, but to learn their behaviors and find answers that fit their current ways of living. Most visually impaired children, particularly the blind and the 'almost' blind, always travel with a sighted companion; some low vision children with sufficient remaining sight travel alone. Blind children who travel independently are not included in this study due to several reasons. Firstly, the number of children with such characteristics is still very small, and secondly, museums would need to have a big revamp to serve their needs. Considering human resources and budget constraints, as told by museum professionals, making museums accessible for the 'independent' young blind is not in their plans.

Considering all data from the interviews with the participants and the key informants, together with data emerged out of observation during the field research, significant elements to accessibility are discovered and categorized into two areas: physical access and intellectual access. Facilitating atmosphere such as integration support from museums and free entrance offers to people with disabilities is also helpful to accessibility. During the field research, the museums' doors opened wide for the participants' visits, and reactions from the museums' staff and general audience were somewhat positive. Nevertheless, there are no guarantee discrimination will not occur. If it does, the museum would be inaccessible from the start. Thus, besides physical and intellectual access, welcoming atmosphere is another important intangible attribute that constitutes to accessibility, see figure 4.2.

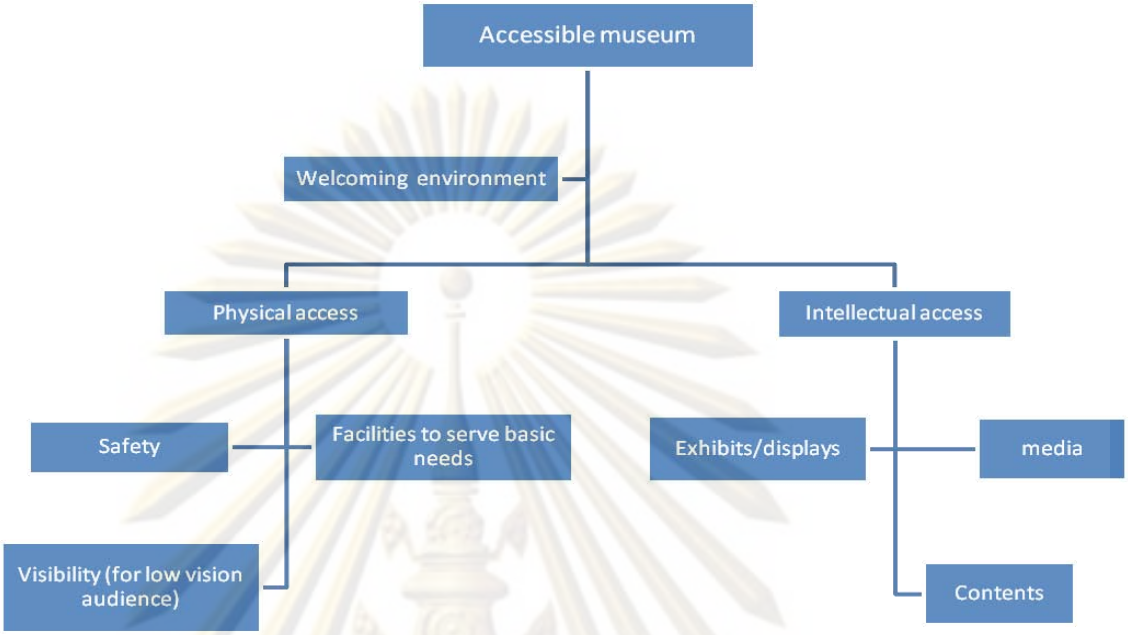


Figure 4.2. Core elements of accessible museums

4.4.1. Physical Access:

It is evident that the visually impaired children's main concern for physical access is safety, see figure 4.2 & 4.3. Pathways and stairways are the two key attributes brought up most during interviews and the field research. Other elements are treated less significant, particularly by dependent travelers, owing to their usual habits of having a sighted companion along. Pathways should be cleared of obstacles and hazard (including animals/pets which may roam around a museum's compound), vertically and horizontally. If they cannot be removed, the area should be bounded by materials that are easily detectable by multi senses.

Sometimes, the exhibits themselves are more or less in the middle of the pathways, if they cannot be moved to the side, a different tactile floor with clear texture may be used to place around the exhibits to 'signal' the visually impaired of their approaching to the displayed objects. Congenital blind such as participant E and F appear to be sensitive to tactile floor, or 'Braille blocks'.

Both also concur the incorporation of Braille blocks would help them identify the pathways.

According to some participants, the material used to indicate hazard area should be stable, not easily fall or get loose after a collision. Canvas, which is popularly seen in Thailand as a boundary indicator for construction sites, should be avoided because of a possibility of visually impaired people running into peril. The width of pathways should be big enough for a few people to pass comfortably. However, for some blind children, too big pathways can lead to insecurity.

Figure 4.3. Most wanted safety attributes

Facilities to serve basic needs such as proper toilets at strategic locations spreading throughout museums, sufficient resting areas and restaurants/drink shops help relieve nature's call, regaining the audience's strength and smooth continuation of a visit, see figure 4.4.

For the benefits of people with low vision, museums' physical structures should be highly visible. Sufficient ambient lighting with limited glare, visual contrast and large size can be altogether applied to enhance their vision. However, questions are how much lighting and visual contrast would be sufficient, and how big the size, for example, of a warning sign, would be good enough to facilitate the audience with low vision.

Figure 4.4. Facilities to serve basic needs

The Smithsonian actually has very extensive details on the levels of lighting and visual contrast; however, as the visual impaired people's visual conditions are so diverse, a degree that works for some, may not work for others. From observation, and short interviews, participant G was able to read a dark green notice sign with a white letter size around 4 cm x 6 cm on it, which is located at the eye level in an outdoor area. His ability to see a 'normal' sign indicates that when the sign is clear for the sighted, it is plausibly readable for some low vision audience. Very big letters and very bright light may enhance some visually impaired people's vision, but they are likely to be unwieldy to others including the sighted audience. Besides, excessive visual contrast may tune down the authentic atmosphere, see figure 4.5.

A low vision teacher of the Bangkok School for the Blind, Wimol Ongamphorn, who was asked to appraise the findings asserted museums' attributes should be 'as normal as possible' and at the same time, 'as facilitating as possible'. He mentioned about a park in the United State that has a separate pathway for visually impaired, an attribute he finds excessive and secluded. Taking all these into account, it is fair enough to conclude that museums should optimize their lighting, sizing and visual contrast by having the sighted audience as a benchmark. Optimization, not exaggeration should be prioritized for outreaching the visually impaired audience. This way, museums can retain their themes and authenticity, and at the same time, facilitate both the sighted and the visually impaired people.

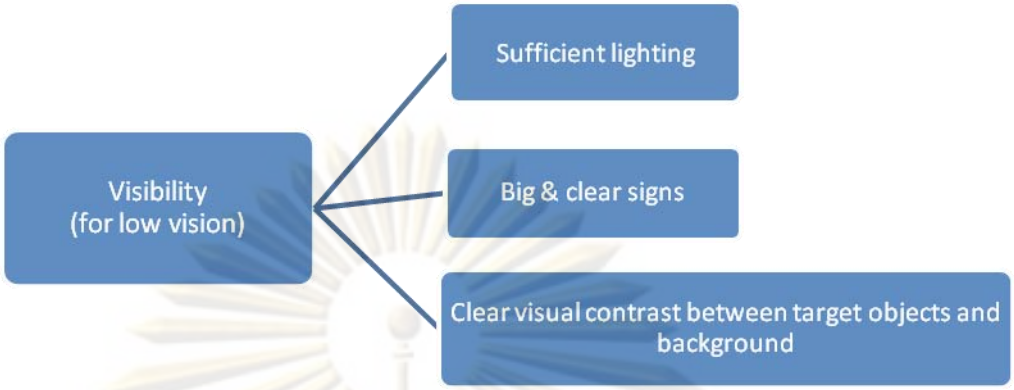


Figure 4.5. Elements facilitating visibility

Contrast here refers to a clear difference between the background color and the object's color. Signs to indicate physical access such as direction and warnings should be big and clear. The incorporation of visual contrast, as mentioned before, can help enhance visibility. Visibility is highly important for low vision audiences who visit museums alone. Not only it allows them to move independently, it also allows them to gain access to the museums' exhibitions. If the pathways are not visible, it is also impossible to reach the exhibits.

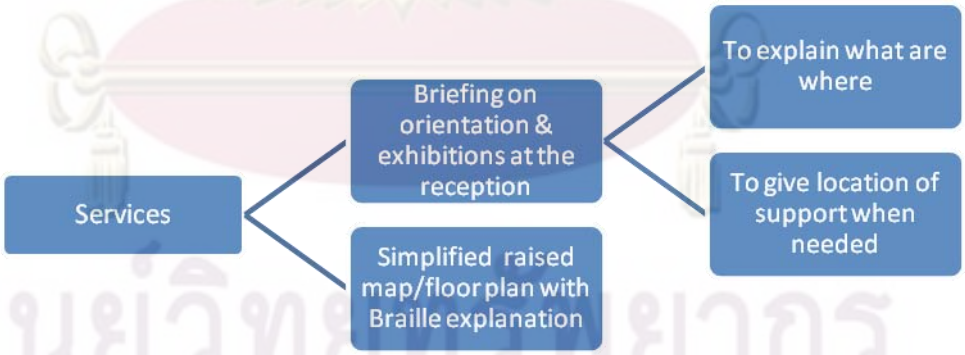


Figure 4.6. Services beneficial to orientation

From informal discussion, children with low vision time and again lost their way or missed their destinations,when they went to places they have never been to. The phenomena suggest their orientation is limited by their vision. An extra service that museums could offer, to faciltate the visually impaired audience's physical access, is a briefing on the exhibition area to establish

their orientation from the start. Information such as what is where, what can be touched, what can be accessed by non-visual sense and the location of staff support (if any), etc. is beneficial and costless, see figure 4.6.
Without an orientation briefing, a low vision audience who visits museums alone may miss many indistinct facilities and take it for granted that they are not there, as occurred to participant A when she visited the Children Discovery Museum. This is partcularly useful for people with low vision who visit the museums alone. If the budget allowed, a simplified raised map with Braille or audio explanation placed at the entrace of each exhibition room worths consideration.

4.4.2. Intellectual Access:
Comprehension or knowledge, as the participants said, is their expectation from a museum visit. Clearly, their focuses are on the intellectual access or the exhibitions. An exhibition's three main elements are the display, the media and the content. The displays or objects should be clearly visible and touchable. Touch provides connection between the visually impaired person and the exhibit. It is the main non-visual sense that is more practicable in the museum environment than other non-visual senses. Experiments and creative activities that require touch, doing and making things by hands and show results immediately are stimulating programs for children.
If touching the exhibits is not possible, museums may consider using 3-dimensional reproduction to facilitate their learning. The display's quality is also highly important; a broken display is by no means accessible.

Deteriorating displays reduces or even remove accessibility. Since the visually impaired children mainly explore things by touch, all objects should be kept clean. Display's location should be easily reached and the number of accessible displays should also be sufficient, see figure 4.7. The Snake Farm has three audio/VDO programs; its accessibility level is low in the view of the visually impaired participants.

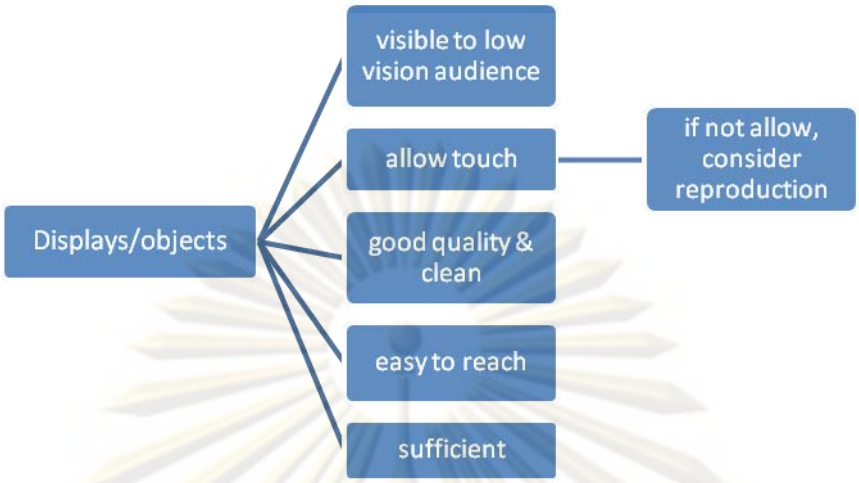


Figure 4.7. Core elements of displayed objects

Media present information on the exhibit and can be in various forms, see figure 4.8. For the visually impaired children, it is evident that explanations through audio, audio-visual programs, guides and docents are more desirable than through Braille and raised pictures. Guided tours, preferably one guide for the least number of visually impaired children, are proven to be the best interpretative tool for both blind and low vision participants. The special characteristics of this interpersonal interpretation that provides attentiveness, instant questions and answers do not exist in any other forms of media. Well maintained audio/VDO programs are interpretative tools featuring sound effects that could attract the visually impaired children well.

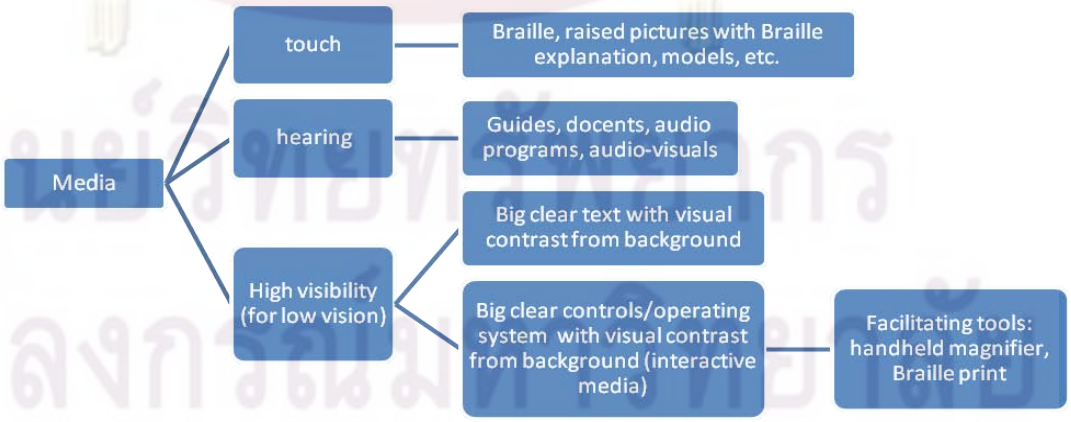


Figure 4.8. Core elements of media

However, audio programs have limitations in clarification. Audiences cannot ask questions as they can do to the guide, and cannot quickly go back to what they just missed as they can do in Brialle print. Though Braille is preferred less than guides and audio programs by most partcipants, the presence of a few Braille prints can add more variety and can instigate attention from the visually impaired audience.

When raised pictures are used, they should be accompanied with the Braille print, given the visually impaired children's limited tactile skills. A diversity of media, one of the characteristics of accessible museums as demonstrated before, is becoming even more important when the number of touchable objects is limited and the 'living' media such as guides and docents are absent. For low vision children, big clear text, particularly user instructions and controls (for interactive exhibits) should be present, perhaps accompanied by the Braille print. Strong handheld magnifiers can be useful; but because of the small size that allows only a small coverage on the target, they are not suitable for reading long print. For interactive exhibits, they may become handy for locating controls or user instructions.

Content is an element not less important than the others. Good content leads to comprehension, bad one results in confusion and even frustration. Attractive style of content presentation should be first considered given its power in drawing the participants' attention, see figure 4.9.

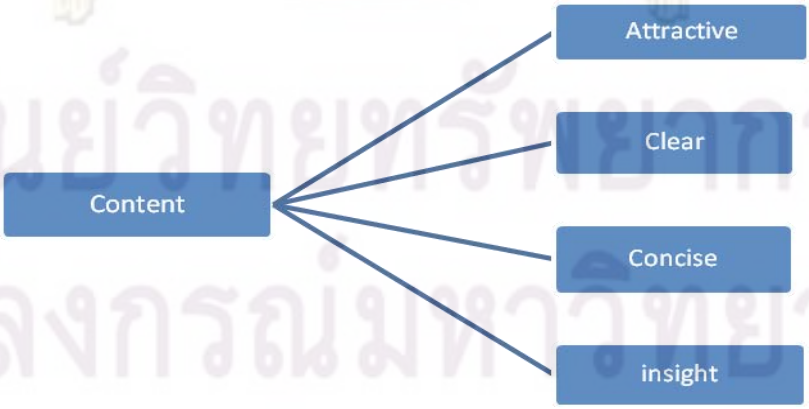


Figure 4.9. Core elements of content

Interrogative headlines are found to be appealing for all, while quizzes are more welcome by young participants. Verbal description explaining outer appearance of objects is necessary for untouchable exhibits. All participants like the message to be clear and concise, that allows them to connect to their prior knowledge and make sense out of it. In the Snake Farm, participant E complained about the story of a snake god with many diffficult names mentioned in an audio program. He said he did not understand the story because he does not have any background on the belief and the worship.

Children enjoy simple language, not academic style. The simplicity is easily comprehensible and not demanding. Older and motivated participant like participant H seems to take pleasure in the essence of the content. He demands a deep knowledge from exhibitions; an insight presented in a straightforward communicative means. During the field research, there were many times that assistance from the museums' staff was needed; may it be because of the unclear content, not working interactive displays, or unlocatable controls. The presence of staff is therefore helpful for the visually impaired children to gain access sucessfully, see figure 4.10.

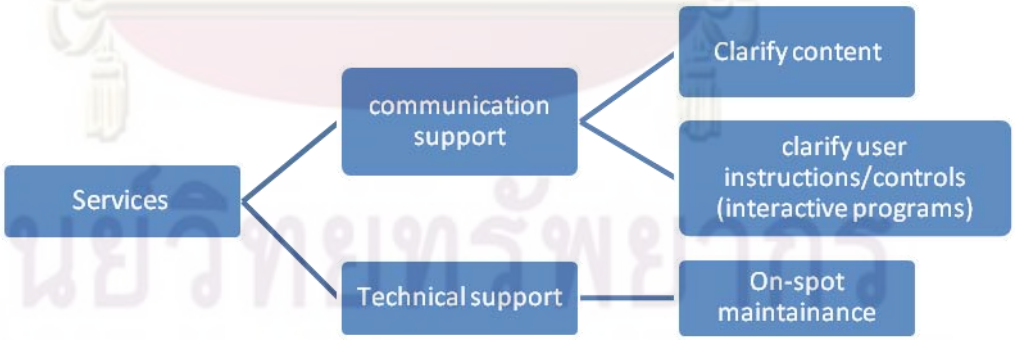


Figure 4.10. Services beneficial to communication

In fact, the study finds that personal services from guides and docents are highly effective to the visually impaired comprehension. They are flexible and can easily take charge of interpretation when other kinds of media are absent

or not working. Trained guides can trigger imagination and inspiration even in the situation that touch is not allowed, perhaps by the use of verbal description and simple model which are at hand. It is the best interpretation and most suitable for the country such as Thailand where labour cost is low and exhibits'maintanance is ignored. Their presence can also be helpful to the visually impaired children's orientation and mobility.

For a guided tour, the guide's movements help direct them to the right place. Therefore, if all other described attributes cannot be made possible because of resources constraints, this 'living' medium should be a viable solution to draw museums toward accessibility.

A concern about the effectiveness of guides and docents is raised by Wimol Ongamphorn, who reviews the findings of this study. Lack of understanding, pointed out as a major problem to ineffectiveness, discourages them to be voluntary-minded and could lead to unwelcoming environment. However, during the field research, responses from museum staff and the general audience to the visually impaired children's visits appeared to be positive. The phenomenon, perhaps, demonstrates their caring for children and sympathy towards the young disabled has overcome their ignorance. Thai people are famous for their friendliness and affection to young children. Such natural compassion, together with trainings to establish the right understanding and attitude, can help museums achieve accessibility.

Figure 4.11 demonstrates a summary of the study. Welcoming environment encourages the visually impaired audience to come, walk around the museum and explore its exhibitions. The figure also shows physical access contributing to intellectual access. This is because if a museum's physical elements are not accessible, intellectual access will be eventually impeded. The presence of physical access allows the visually impaired children to move around safely toward exhibits and gain intellectual access.

A combination of the right environment, physical and intellectual attributes leads to accessibility. Finally, their expectation from a museum visit: enjoyable learning experience is fulfilled.

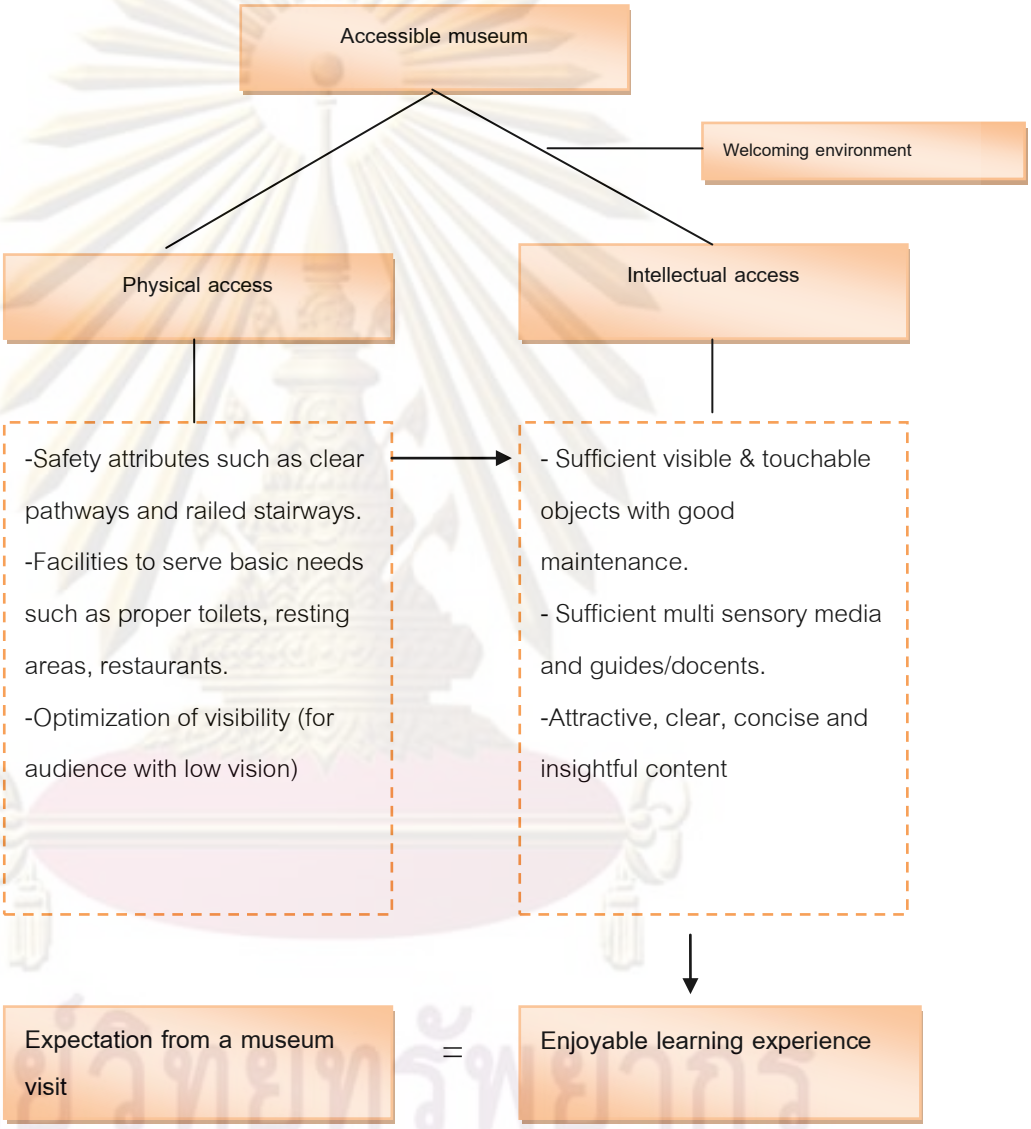


Figure 4.11. Accessibility fulfilling expectation

CHAPTER 5

CONCLUSION & DISCUSSION & SUGGESTIONS

5.1. Conclusion

This study was initiated with an aim to promote museums as informal learning venues for visually impaired children in Thailand, given the scarce number of special schools as well as the visually impaired children's emergent attentions to the hands-on museum experience organized by the National Museum Volunteers group in 2008. To achieve the objective, a progressive series of three research questions are designed to uncover how to make museums accessible for children with visual impairments.

1. What are the characteristics of accessible museums according to the visually impaired children?
2. How accessible are museums to visually impaired children?
3. What can be done to make museums more accessible to visually impaired children?

Before advancing to seek viable courses to accessibility, it is vital to attain an insight into the targets of study: visually impaired children and museums of various types. Hence, the answers to the first and the second research questions pave the way to the answer to the last research question. Qualitative research methods including structured and unstructured interviews, observation and field research were applied using self-designed data recording tools modified from several visually impaired organizations' recommendations.

Eight visually impaired children without additional disabilities from and attached to the Bangkok School for the Blind (four blind and four low-vision participants) as well as four museums of different characteristics (Bangkokian

Museum, Museum of Siam, Children Discovery Museum and Snake Farm) took part in the programs. Ten museum visits were conducted with each visually impaired participant partaking in three different museums. The design allows the researcher to make a comparison of each participant's views and practices in different museums in order to ensure the data's reliability. Key informants who are actively involved in projects for the blind and who are authorized persons from the four museums were interviewed to seek an insight into the visually impaired children and the museums under study, which will in part contribute to the answers to the research questions.

To answer the research questions systematically and orderly, data presentation and analysis are divided into four parts, akin to the sequence demonstrated in chapter 2: Literature Review. The first part illustrates the visually impaired children's fundamental characteristics which can have an effect on their museum experience: vision, reading skills, tactile skills, traveling skills and learning. The visually impaired children's visual conditions, particularly the low vision ones, vary to a great extent. This includes perception of the size, the color and lighting. The high degree of visual differences makes it impossible to specify the suitable size, the right color and the perfect level of lighting, which match every visually impaired person's needs. The data also reveals that though being adept at Braille reading, they are novices at raised pictures. Limited exposure to a variety of tactile media apparently restricts their opportunities to exercise this non-visual skill causing them to possess minimal to medium abilities in identifying objects by touch.

For travelling, most visually impaired children travel to unfamiliar places with a sighted companion; older ones with sufficient remaining vision occasionally travel to places they have never been to. For learning, it has been a controversial issue if the visually impaired people's learning capacity is at the same level as the sighted. While arguments continue, it appears that the visually impaired children's academic results are generally lower than the sighted. However, academic performance and learning ability are entirely different issues. During the field research, no irregularity was detected in the visually impaired children's understanding in general concepts. But,

terms denoting complicated or abstract shapes and unusual movements may lead to confusion.

The information above reflects fundamental characteristics of the visually impaired children and helps clarify the answers to the first research question (what are the characteristics of accessible museums according to visually impaired children) which are mainly derived from layers of interviews and observation before, during and after the field research. Some findings of the first research question principally support earlier studies while some present different aspects or essential details. The findings highlight that most visually impaired children considered intellectual access more important than physical access owing to their dependent travel behaviors which always rely on a sighted companion to lead the way.

For physical access, the visually impaired children's highest concern is safety, so attributes contributing to safety such as clear pathways and railed stairways are highlighted. Low vision participants who travel independently to new places looked at both physical and intellectual attributes more or less evenly; this is because, for them, intellectual access cannot be made possible without physical access. Thus, visibility is a key attribute toward accessibility.

The complete list of the characteristics of accessible museums, the answer to the first research question, is illustrated below.

a) Exhibitions must be presented through multi-sensory channels including visual.
b) Touch and hearing are the two key sensory means to intellectual access.
c) Guides are considered as a most accessible interpretative tool.
d) One guide/docent for the least number of visually impaired audiences works best.
e) Guides and audio programs must provide sufficient verbal description.
f) Interpretation should be presented through easy-to-understand media.
g) A variety of interpretative tools encourage exploration.
h) Well maintained exhibits, clear message and identifiable user instructions/controls are crucial to understanding.

i) Safety attributes are most significant for physical access.
j) Tactile & visual facilities enhancing orientation and facilities relieving basic needs (such as food, drink and rest) are desirable.

The second research question intends to discover accessibility of the four museums under study: Bangkokian Museum, Museum of Siam, Children Discovery Museum and Snake Farm. Here, emphasis is on the museums' physical and intellectual attributes that support or impede the visually impaired children's access. It also compares each museum's features with the visually impaired participants' views on the characteristics of accessible museums (a – j, as shown before) and their actual practices at the museums. This is to find out if the reality is in line with their outlook.

The study finds that museums do not need to have all of the listed characteristics to be accessible. If comprehension is achieved by one means, intellectual access is thus successfully gained. In fact, it is considered redundant to have another means if one is able to serve the purpose. For example, a museum that offers guided tours does not need to have audio programs to repeat the guide's explanation. On the other hand, without guides or docents, sufficient audio and/or audio-visual programs should be available.

Though the visually impaired children have a common stance on highlighting touch and hearing, their differences in age, background, experience, and individual characteristics particularly vision and travel behaviors give rise to a diverse detailed perspective, causing them to rank the museums' accessibility differently. Those who fancy a variety of media, regardless of dim lighting vote for Museum of Siam as the most accessible museum of the four. Those who need sufficient lighting to see and to navigate the museum independently view the Museum of Siam inaccessible largely due to its poor visibility. Bangkokian Museum's private guided tour is most favored by someone who looks for an insight by personal interpretation.

Children Discovery Museum is generally viewed accessible due to a variety of multi sensory exhibits but a large number of broken displays make the 'supposed-to-

be accessible' exhibits become inaccessible. Snake Farm is not deemed accessible due to its visual focused exhibition. However, the site has a captivating show which provides an opportunity for the audience to touch snakes and have a large python around one's neck, a performance that literally steals the show.

Here, it is evident that accessibility and affection are two different concepts but have causal relationship. A visually impaired child's favorite museum maybe generally inaccessible but has a highly motivating program, thus it gains popularity. On the other hand, Children Discovery Museum would be more interesting for the visually impaired children if all the broken exhibits are repaired. Interviews with the museum professionals reveal their lack of the right understanding about the visually impaired people and about how to treat them. It also shows that subsidy to realize the museums' full potential to accessibility is reined, particularly when the cost of investment far exceeds the level of use.

The answers to the last research question (What can be done to make museums more accessible to visually impaired children?) mainly driven by the researcher's interpretation demonstrates how to make museums accessible under the real current circumstances, resources constraints, taking into account the visually impaired children's usual travel practices. This part lists out fundamental features that ensure safety and foster learning. See figure 5.1. Cleared pathways and railed stairways are two key elements of physical access. For independent visitors with low vision, visibility is another crucial attribute contributing to their navigation as well as intellectual exploration. The incorporation of large size, visual contrast, sufficient lighting and orientation briefing from museums' staff upon their arrivals is pointed out as a well blend for visibility. An application of different tactile floor around each exhibit is also suggested to indicate the visually impaired audience approaching to a display area. For intellectual access, the study focuses on exhibits' three elements: displays/objects, media and content.

Permission to touch, well maintenance and hygiene are qualities a display should have. The reception of information through hearing, by audio programs or

museum staff, is suggested over Braille and raised pictures due to the latter being perceived as having less attractive qualities.

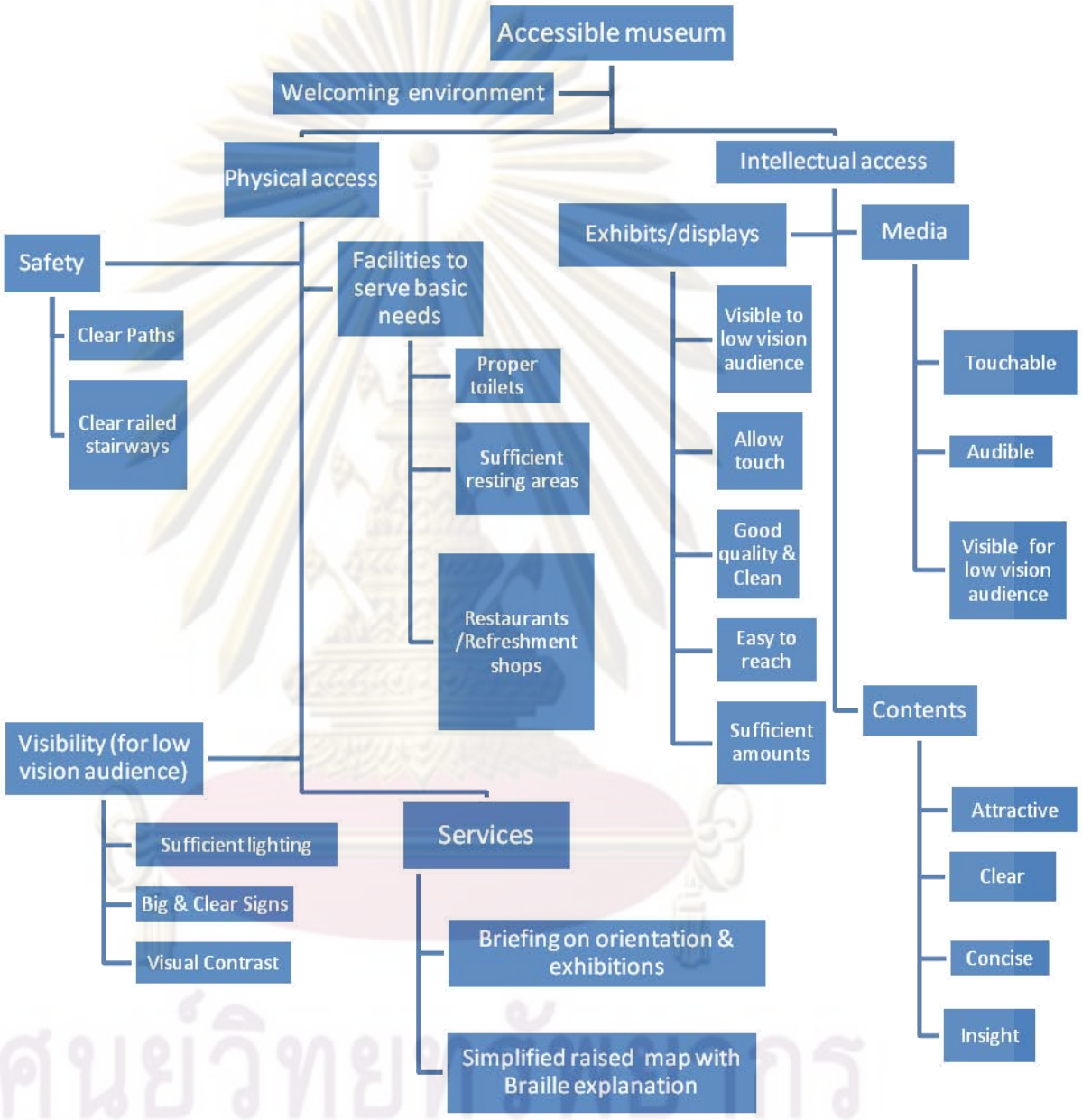


Figure 5.1. Core elements of accessible museums (Summary)

However, a presence of both tactile media in a small amount is able to diversify the museum's non-visual learning channels. Content should be clear, short, straightforward, and insightful. At the end, it suggests guides and docents as the key to accessibility, bearing in mind many major factors including the tight budget, a remote possibility of the museums providing extra facilities for a handful of the visually impaired audience, the unique characteristics of the guides and docents which allow high flexibility and instant tuning to serve the needs of each visually impaired individual.

The study also calls attention to the practicality of accessibility by using the sighted as a benchmark in development given the variety of the visually impaired people's visual conditions. Optimization of visibility, availability of touchable objects, diversity of multi sensory media, guided tours, clear pathways and railed stairways, etc., all of these attributes are valuable not only to people with visual impairments but also to the general audience.

5.2. Discussion

This study proceeded relatively smoothly owing to the cooperation of the visually impaired participants and the museums under study. Other audiences in the museums also appeared to embrace the visually impaired children's visits calmly and at times positively. The phenomena substantiate the viability of the initiative to make museums accessible for the visually impaired children.

According to the original plan, out of the ten museum visits, there should be two visually impaired participants in eight visits and four visually impaired participants in two visits. It turns out that one participant fell sick during a field research forcing him to be unable to partake the second and the third museum trips. Another visually impaired child with similar qualification was brought in to replace the ill participant on the second museum visit. Also, the four participants' visits could not be fully realized due to various reasons including the spread of H1N1 viral disease that has become one of the world's major concerns. Only two participants could

partake in one visit and three participants in the other. The plan to conduct two museum visits for four visually participants is mainly to seek ways to lead a bigger group. However, with three participants in one visit, it became clear that a group of three for one sighted leader is less efficient and effective than a group of two. Waiting in line to touch and/or to try limited displays are uninteresting and can even be frustrating for children who naturally hold a low boredom threshold.

From investigation on the four museums, observation and interviews during the field research, the findings and interpretation insinuates various museums in Thailand have potential to become accessible, given that there are things to touch and explanation to listen to. A major problem is therefore not the museums themselves but more on the incorrect attitude of the museum professionals, who often picture the visually impaired as people who cannot see; consequently, Braille is often thought to be the major or the only communication tool museums can use for them. In actuality, accessibility does not always have to engage Braille and raise pictures as many people envisage. On the contrary, these two tools are proven to be relatively less popular than real objects or reproduction. Touchable exhibits that are meant for the sighted audience are also suitable and beneficial to the visually impaired audience.

An extensive list of characteristics of accessible museums published by many international organizations is edifying but not easily realized in developing countries including Thailand. Besides, the country's different cultures, lifestyles and environment also play a role in the divergent concept of accessibility.

What the Thai visually impaired children need, that suit their challenging ways of living, therefore lean toward the fundamentals of life such as safety and opportunities to feel the surroundings through their remaining senses. These basic needs must be fulfilled before other 'luxury' could be anticipated. Their expectation from a museum is to gain an enjoyable learning experience, not a comfortable hangout, hence, their notions of accessibility are tied up with touch and hearing. Taking these two elements as a guideline in designing intellectual access, a creative-minded museum can always find simple touchable tools to communicate if the originals are too vulnerable to be touched. Simplicity is inexpensive and requires low maintenance, and if used imaginatively, it can augment accessibility.

Guides or docents can cater tailored data and adjust the presentation according to circumstances to interest diverse audiences. Training guides and docents on how to handle the visually impaired audience is not and should not be complicated. The fundamental thing is museums staff should always keep in mind the visually impaired people's lack of vision or of clear vision. Hence, verbal description is used to allow the visually impaired audience to absorb the information they visually miss. Various visually impaired organizations have published lists of how to treat and communicate to the visually impaired people. Museums can also seek consultations directly to minimize fear and raise confidence. Museums may take a step-by-step approach in realizing accessibility. Starting by making use of the current resources, particularly, guides and docents or museum staff, then, little by little, if the budget allows, the museums can add more multi-sensory media to enhance diversity and attractiveness.

For the case of the four museums under study, accessibility of the Bangkokian Museum solely depends on the museum guides. Educating guides on audiences with visual impairments is therefore an effective tool in create understanding. The Museum of Siam's dark ambiance and content are among the main barriers to accessibility. Brightening the lights will not be effective and has the atmosphere ruined. The fact is that the museum does not operate guided tours but has docents stationed at intervals. It may use these docents to explain the content of each section and pass the visually impaired audience on to the next docent in charge of the next exhibition.

The Museum of Siam should also look into improving its docents' insight in the exhibits as it showed that their limited knowledge is a barrier to the museum's accessibility. The Children Discovery Museum's poor maintenance and unclear instructions and explanations impede accessibility. Should the museum encounter financial constraints making it impossible to keep pace with repair; it should assign more docents and have them stationed in the vicinity of unclear exhibits. The Snake Farm's limited touchable objects may be easily overcome by having inexpensive three-dimensional models of snakes, eggs, skeleton, fangs, movement, etc.

While the study's highlights on what should be done to improve access are described, there is one external element which has a high effect on accessibility: the

sighted leader. The sight leader or co-traveler is highly influential particularly when there are no guides and docents present in the museum. With limited non-visual facilities and exhibits, the sighted leader or co-traveler is undeniably the key person in making a museum accessible. The fact that the sighted leader is an uncontrollable external factor that contributes to a museum's accessibility, if the museum wants to improve its access, it should focus on exploiting its controllable internal factors so that the role of the sighted leader is reduced to merely physically navigating the visually impaired through the museum. This is another rationale highlighting the role of guides and docents in the museum's intellectual accessibility.

It should be noted here that the findings of this study are to mainly serve visually impaired children without additional disabilities who have similar developments to their sighted counterparts. The answers to the research questions posed in this study may not be applicable to the visually impaired children who have different or additional handicaps. Also, the study's focus is on a small audience of 2-3 visually impaired children. Making museums accessible for a big group would need more research in other areas such as operation and visitor flow management.

Some committee members raised the point on generalization of this study, claiming the small numbers of participants and sites of study may not be justifiable. The goal of qualitative research is to increase understanding of a phenomenon as opposed to generalizing data. The rationales of the numbers were explained in the methodology and the results point in the same direction, which implies that saturation is achieved. Museums with similar characteristics to, or in the same categories as, the museums under study may apply the findings with some adjustments to suit their circumstances.

Special schools and organizations involved in development of visually impaired children can capitalize on this study by increasing the use of museums as supporting learning venues. The organizations can play a part in improving accessibility of museums by strengthening coordination and collaboration with the museums they plan to visit. A survey of the museum before a trip with visually impaired audiences could benefit both the organizations and the museums. The organizations can prepare the museums in advance of the visually impaired people's

needs and at the same time can prepare themselves about the topics, content and others. Due to the visually impaired audience's limitations which require extensive sighted leaders, keeping each visit small in number of participants would be most effective. Apart from school trips, the schools and related organizations should promote museum trips with volunteers. Having the visually impaired children spent time during weekends in museums is academically and socially beneficial.

5.3. Suggestions

The study reveals that visually impaired children enjoy learning in a museum setting among the general audience. Obviously, museums have elements contributing to social integration as well. It turns out that the benefits of having accessible museums are not only limited to the visually impaired children's learning but also their social life. Making museums accessible for visually impaired thus indirectly promotes equality among audiences. As a result, the value of this study is not restricted to a group of the disabled but a society as a whole.

Interested researchers may want to investigate other museums of different categories and characteristics so that all museum types are covered to facilitate the progress of generalization. This study's emphasis is on finding the means to make museum accessible; however, the fact that Thai visually people are still not much aware of museums and their value, seeking out the ways to bring the visually impaired children to museums is a worthwhile attempt for future studies. Findings of the future studies will consolidate the value of this study and accessibility will truly become useful.

In fact, studies on developing museums for the disadvantaged are still very limited in Thailand. Given the minimal learning venues and learning opportunities provided for this minority, future studies in this area, particularly on how to fully exploit the existing museums for the benefits of those who are in need are indisputably priceless for the society.

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APPENDICES

Appendix A
Device 3.6.1.b. Accessibility Checklist

Date: Time: Place:

Learning Tools: Content & Design (Sensory & Intellectual Focus)	Yes/No/Comment
1. hand-held magnifier	
2. text enlargeable by IT tools	
3. Braille description	
4. Braille brochures	
5. Raised text and pictorial symbols	
6. 3-dimensional objects	
7. Multi-sensory books	
8. Verbal description	
9. Docent presence	
10. Audio guide	
11. Guided tour	
12. Sound	
13. Re-enactment	
14. Workshop	
15. Displays Quality	
(Physical Focus)	
16. Layout: simple, few changes of directions, least obstructions	
17. Lighting: Bright at entrance, pathway, displays	
18. Contrast: luminance, color, texture	
19. Acoustics: background noise	
20. Parking: designated	
21. Pathway: vertical clearance ≥ 2 m., No obstacles Poles are buffered, base of obstacles locatable with cane Contrasting edges & Handrails	
22. Entrance: glazed/automatic door Different door surface to reception, reception near entrance	
23. Floor surface: non-gloss, non-slip, plain patterns Change of texture at strategic points, floor-wall contrast	
24. Wall, ceiling, door: contrast & bright doorframes, handles, skirting	
25. Stairways, ramps: well lit, contrasting to wall, placed against wall, locatable with cane, handrails both sides	
26. Tactile Ground Surface Indicators: for any obstacles	
27. Highlight on controls, facilities	
28. Toilets	
29. Restaurants	
30. Resting area	
31. Lifts: handrails, Braille, large & clear buttons, floor announcement	
32. Signage: clearly identifiable & Not cause obstruction Tactile signs & maps	

Device 3.6.1.c. Interview Questions for Key Informant (a)

Date: Time: Place:

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1. What was your role in the Touch Tour Program?
2. How did the visually impaired children who participated in the Touch Tour, respond to the program?
3. In your opinion, what could be done differently to enhance the visually impaired children's interest and enjoyment?
4. How did the visually impaired children move around the exhibition area? By holding on a leader's arm, with a cane, etc?
5. How many visually impaired children per one leader/guide would best suit their condition?
6. Did the visually impaired children encounter barriers to accessibility when participating in the tour? If so, what were they?

Device 3.6.1.c. Interview Questions for Key Informant (b)

Date: Time: Place:

1. What does the Blind Section at Ratchasuda College do?
2. What kinds of learning tools available in Thailand for the visually impaired?
3. Which ones are popular? Why?
4. Which ones are not popular? Why?
5. How do the visually impaired learn from these tools?
6. How much does it cost to produce each tool?
7. How long does it take to produce each tool?
8. How long can the tools last?

Device 3.6.1c. Interview Questions for Key Informants (c) & (d)

Date: Time: Place:

1. How would you rate the visually impaired children at the Bangkok School for the Blind in terms of general development?
2. What activities do they enjoy?
3. How are their learning skills?
4. How are their skills in moving around at school and in a new environment?
5. What learning tools the school is using?
6. Which tool is their favorite?
7. When bringing visually impaired children to a new environment, what is the best ratio of visually impaired children to a leader?
8. How to lead several visually impaired children at the same time through a new big place?
9. What should a leader be aware of when accompanying the visually impaired children to a new place?
10. How different are their behaviors in comparison to the sighted children?

Device 3.6.1.c. Interview Questions for Key Informants (e)

Date: Time: Place:

1. Who is the main audience?
2. How long does a visit last for each audience? (school students, families, etc.)
3. Do you have special policies toward the visually impaired audience? If so, what are they?
4. Do you have special service offered to the visually impaired audience? If so, what are they?
5. What is the entrance fee for a person with disability?
6. How do you handle the visually impaired audience?
7. Previously, how did the visually impaired audience tour the museum?
8. Do you provide a guided tour for them? If not, why not?
9. If so, what are the requirements for participating in a guided tour? How do you arrange it?
10. What is the fee for a visually impaired to join in a guided tour?
11. What is your experience in serving or witnessing the visually impaired audience in the museum?
12. In your opinion, what are the barriers for a visually impaired person to come and visit your museum?
13. How is your staff trained to serve the needs of the visually impaired?
14. How is your museum equipped with appropriate facilities and interpretative device or activities for the visually impaired audience? Specify facilities and device.
15. In your opinion, what is the best ways for the visually impaired audience to access your museum and exhibition?
16. How do you assign a docent or staff at each zone/exhibition?
17. What is your opinion on promoting museums for visually impaired audience?
18. From No. 17, why do you agree or disagree with the idea of promoting museums for the visually impaired audience?
19. In your opinion, what and how could your museum improve to meet the needs of the visually impaired audience?

Device 3.6.2.a. Interview Questions for Participants
(Before a Museum Visit)

Date: Time: Place:

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1. What was your prior experience on museum visits?
2. If you went to museums with your friends from school before, what did your friends think
   about the visit?
3. What do you want from a museum visit?
4. What do you like to do in a museum?
5. What do you think you can do in the museum?
6. What would the museum of your dreams be like? Please give realistic details.
7. What do accessible museums mean to you?
8. How would you like to visit a museum? With friends and teachers at school or with family or ?
9. If you visit a museum with school or with a volunteer, how would you like to be lead? Would you like one leader per one student or one leader per a group of students? How big a group should be? Why?
10. Which one do you prefer: Braille signage, an audio guide or a tour guide?
11. What do you think about a self-guided museum for visually impaired people? What should the museum be, in your opinion?
12. What do you think about using tactile pictures as a medium tool in museums? How are your tactile skills?
13. What do you think about the items in the checklist (3.6.2)? Which items do you like to have?

Device 3.6.2.a. Interview Questions for Participants
(After a Museum Visit)

Date: Time: Place:

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1. How is this museum visit is similar to or different from you first expected?
2. What do you like about the museum? What do you dislike most about the museum? What was interesting? What was not interesting?
3. What do you think about its facilities, walkway, toilets, resting areas, entrance-exit, elevator, stairways, colors, overall layout, exhibitions, activities, displayed objects and contents, signs, other learning tools and atmosphere?
4. Did you experience any barrier(s) to accessibility (such as the size of the text is too small, or the colors between the background and the text are too similar or the area is too dark, the exhibits are placed in a way that obstructs your mobility, etc.) If so, explain what barrier(s).
5. Which exhibit is your favorite? Why?
6. What did you learn from this museum visit? Did you learn anything new?
7. Have you learnt these subjects in school before? Does this visit enhance your understanding?
8. What do you think about being among the sighted audience in museums? Would you rather be among visually impaired people in museums?
9. What do you think about the time we spent at this museum? Too long, too short?
10. How would you like the museum to improve?
11. If possible, would you like to revisit the museum?

Device 3.6.2.b. Behavior Checklist

Date: Time: Place:

Involvement& Accessibility (Yes/No)	Indicator	Notes on VI Children behavior
	Stop & listen	
	Touching	
	Listen attentively	
	Ask Questions	
	Join in Activity	
	Express Interest	
	Describe the content of exhibit/activity shocking/surprising	
	Discuss with companion about the exhibit/activity	
	Share information	
	Complete activity	
	Repeat activity	
	Assess oneself and companion of how well he has done	
	Demonstrate they have improved skills	
	Answer questions	
	Demonstrated increased knowledge	
	Increase willingness to engage in activity	
	Increase willingness to engage in discussion	
	Verbal responses to exhibition	
	Non-verbal responses to exhibition	
Barrier	Verbal and non verbal responses to physically uncomfortable environment	
	Verbal and non-verbal responses to exhibits that require vision only	
	Verbal and non-verbal responses to exhibits that are physically difficult to operate	
	Verbal and non-verbal responses to exhibits that are not interesting or mundane	
	Verbal and non-verbal responses to exhibits that are difficult to understand	
	Experience or activities that allow one person to use at a time	
	Unfriendly, unhelpful staff	
	Activities poorly match to the abilities of the target audience	
	Activities where visitors feel unwelcome	

Appendix B
Art Education for the Blind (AEB)'s Guidelines for verbal description

1. Standard Information: Verbal description starts with the standard information found on a museum's object label: artist, nationality, title, date, mediums, dimensions and the custodian or location of the work.
2. General Overview: Subject, Form, color: A general overview of the subject matter and composition of the work. Generally, a coherent description should provide visual information in a sequence, allowing a blind person to assemble, piece by piece, an image of a highly complex work of art.
3. Orient the viewer with Directions to indicate the location of objects or figures in a work of art. A useful method is to refer to the positions of the numbers on a clock.
4. Describe the importance of the technique or medium
5. Focus on the style
6. Use specific words – clear and precise. No figurative language as the blind can take words very literally
7. Provide vivid details
8. Indicate where the curators have installed a work
9. Refer to other senses as analogues for vision – try to translate a visual experience into another sense
10. Explain Intangible concepts with analogies
11. Encourage understanding through reenactment
12. Provide information on the historical and social context
13. Incorporate sound in creative way
14. Allow people to touch artwork
15. Alternative touchable materials
16. Tactile illustration of artworks

VITA

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