INCLUSIVE EDUCATIONAL ENVIRONMENT FOR CHILDREN WITH AUTISM IN MALAYSIAN PRIMARY SCHOOLS: ADDRESSING THE ISSUES OF WAYFINDING

BY

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ABSTRACT

Inclusion of children with autism in the mainstream school falls under a regulation in Malaysia. However, existing school buildings still lack in providing enabling environment for children with autism. Moreover, current building standards and policies fail to address the wayfinding design requirements of these children in mainstream educational settings. The present research implies that wayfinding performance of children with autism can be improved by providing an appropriate environment design. This research employs both qualitative and quantitative research methods based on environment and behavior studies. Objectives of this study are (1) to identify different architectural elements that impact on the wayfinding of children with autism and able bodied children, (2) to investigate the existing condition of the primary school buildings in Malaysia in terms of inclusive wayfinding design and finally (3)to suggest a model as a set of tools for design practice that would ensure an appropriate and inclusive learning environment for children with autism, in the context of Malaysia. This research is conducted in five stages. First, through a rigorous literature review on autism and architecture for autism, five design aspects for an enabling environment for autismare identified. At the second stage, based on existing knowledge on wayfinding and school design, twenty wayfinding design parameters are developed that are directly related to these design aspects for an enabling environment for autism. In the third stage, three evaluation tools; Wayfinding Design Parameter Rating Scale (WDPRS), Environmental Assessment (EA) and Performance measure for Children (PMC)are developed and methodology is designed. In the fourth stage, previously identified twenty wayfinding design parameters are further evaluated by the teachers and experts for their relevance using WDPRS. Then an empirical study is carried out in both special and inclusive schools to investigate the performance of children (PMC) in the presence of the twenty wayfinding design parameters as environmental assessment (EA). Finally, based on the findings, design model with a set of tools for wayfinding in inclusive educational spaces is developed to aid the architects and designers. The empirical study shows that there is a strong association between wayfinding design parameters and wayfinding performance of children. The experts' recommendations of the wayfinding design parameters show that these twenty wayfinding design parameters are beneficial for all children, with or without autism.

خلاصة البحث

قررت الحكومة ماالشديد أن الحكومة لا تهتم ببناء المبنى الخاص لهؤلاء الطلاب مع أن المبنى الموجودة الآن لا يناسب و لايتوائم بمبنى المقترح لمتطلبات هؤلاء الأطفال. قد أكدت الدراسات السابقة بأن مسارات الحركة يمكن أن تكون جيدة بتجهيز البيئة الابداعية والصالحة في تعليم وتعلم الأطفال الذاتويون. وهذه الدراسة تستخدم منهج الكمي والنوعي متلائما بمنهج الدرسة البيئية والسلوكية. والهدف لهذه الدراسة هو: (1) التعرف بالفروق بين أسس الهنسدة المعمارية التي تثير إلى الأطفال التوحد أو الذاتيون والأطفال العادي.(2) كشف المبانى الواقعية الموجودة في المدارس الابتدائية بماليزيا وأخيرا الاقتراح بالمبنى الملائمة بهؤلاء اللأطفال الذاتويون من ناحية الأجهزة والبيئة الصالحة لهم خاصة في ماليزيا. هذه الدراسة تقام على خمسة خطوات، أولا الدراسات حول الأطفال التوحد أو الذاتيون والمعيار الخاص في بناء المبنى لتلك الأطفال. ثم الاتيان بخمسة جوانب التصميم للبيئة تمكينية المحددة. والمرحلة الثانية، استنادا إلى المعلومات القائمة على العثور يتم العشرين المعلمات التي ترتبط مباشرة إلى هذه الجوانب فوران تصميم بيئة مواتية للأطفال الذاتيون. وفي المرحلة الثالثة، تم تصميم أدوات التقييم المنهجية الثلاثة: وهي آلة استكشاف مسارات الحركة (WDPRS)، آلة التقييم البيئي (EA) ومقياس الأداء للأطفال (PMC) .في المرحلة الرابعة، يتم تقييم مزيد من المعلمات التي سبق تحديدهليزيا في تسجيل طلاب التوحد (الأطفال الذاتوتيون) لمرحلة الابتدائية حاليا. ولكن من الأسف ا والعشرين من قبل المعلمين والخبراء لأهميتها باستخدام WDPRS. وبعد ذلك تم القيام بالتجربة في كل المدارس الخاصة والعامة للتحقيق أداء الأطفال (PMC) مستخدما عشرين عثور التصميم والتقييم البيئي (EA). وأخيرا ، تم تطوير نموذج تصميم مستندا للنتائج مع مجموعة من الأدوات لاستكشاف مسارات الحركة في مساحات تعليمية شاملة لمساعدة المهندسين المعماريين والمصممين .أكدت الدراسات بأن هناك التطابق بين المعيار مسارات الحركة وبين تطورات الأطفال الذاتيون في التنمية. أما الاقتراحات من الخبراء تشير إلى أن تجهيز عشرون مسارات الحركة فيكون مفيدا لكل الأطفل الذاتيون والعادين من الأطفال.

APPROVAL PAGE

I certify that I have supervised and read this study and that in my opinion, it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a thesis for the degree of Master of Science in Built Environment

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I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a thesis for the degree of Master of Science in Built Environment.

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Dean, Kulliyyah of Architecture and Environment Design

DECLARATION

I hereby declare that this thesis is the result of my own investigation, except where otherwise stated. I also declare that it has not been previously or concurrently submitted as a whole for any other degrees at IIUM or other institutions.

Farjana Rahaman

Signature……. Date……..

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Affirmed by FarjanaRahaman

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Signature Date

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Farjana Rahaman

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE

INTRODUCTION

1.1 INTRODUCTION

This research investigates the effect of physical environment on the wayfinding performance of children with autism in educational spaces to understand their wayfinding and accessibility design requirements. This chapter presents the background study, research problems, research objectives, research questions, research methodology and scope of this study. This chapter ends with a brief note on the significance of the research.

1.2 BACKGROUND

Autism is a developmental disability that significantly affects a person's verbal and nonverbal communication and social interaction. This condition is usually evident before the age of three and adversely affects a child's educational performance. Other characteristics often associated with autism are engaging in repetitive activities and stereotyped movements, resistance to environmental change or change in daily routines, and unusual responses to sensory experiences (American Psychiatric Association APA, 2000). Children with autism were used to be considered as beyond any possible improvement and cure. The only option for them was to be institutionalized. However, recent research showed that early diagnosis and appropriate intervention can cause tremendous difference in their life and access to autism friendly learning environment can improve their performance and wellbeing (Mostafa, 2008; Mullick & Khare, 2008). Evidences have shown that inclusion

benefits both group of children whether with ability or disability. According to the Salamanca statement (1994), *"*schools should accommodate all children regardless of their physical, intellectual, emotional, social, linguistic or other conditions (6)". It also mentioned, "regular schools with this inclusive orientation are the most effective means of combating discriminatory attitudes, creating welcoming communities, building an inclusive society and achieving education for all (ix)."

From this statement emerge the need for inclusion of this special group in the mainstream setting. While inclusive educational space requires inclusion of children with all types of disabilities, current building codes and standards only address physical access to wheelchair bound, vision impaired and hearing impaired people but overlooked the need of people with autism. This research investigates the existing school environment and wayfinding performance of children with autism and able-bodied children to understand their wayfinding design requirements for inclusive school design.

The current studies on children with autism and the impact of built environment on their learning seem to be divided in two groups. First group focuses on different architectural element in a learning space exclusively for children with autism. Thus, does not consider the idea of inclusive and universal design (e.g. Magda, 2008 and Vogel, 2008). Whether this is suitable for all types of user, or not is uncertain. However, these studies have explored different architectural elements that influenced the learning environment most and have suggested detailed design guidelines for classroom design for autistic children. Second group studies different aspects of school design for children with autism as well as able bodied children and have suggested several design parameters to be adopted for universal design (e.g. Khare, 2010). For example, Khare (2010) has suggested 18 design parameters in her

research. However, the suggested criteria/parameters are offered for site planning, building design, classroom design and landscaping only and yet to offer any tangible guideline or design criteria in detail for wayfindingin school environment. Hence there is scope for future studies to elaborate effects of wayfinding parameters on performance of children with autism to create enabling learning environment for all.

This study tries to combine the two approaches of the above mentioned groups to overcome the gaps that are there in each of them. This study specifically focuses and elaborates on the aspect of accessibility and wayfinding of children with autism in mainstream school complex to suggest a model as a tool for inclusive wayfinding design as an end product of this study.

1.3 RESEARCH PROBLEM

There are 436,317 People with Disabilities (PWD) registered with the department of social welfare, Malaysia till December, 2012 (Jabatan KebajikanMasyarakat[JKM] Malaysia, 2012). Registration is voluntary in Malaysia. The actual number of PWD is much higher as many of them do not register. Of the total number registered, 37.3% are persons with learning disabilities (autism is a part of them), which is the highest percentage among all. Whereas, 33.4% are physically disabled; 12% are hearing impaired; 9% are visually impaired; 0.4% have speech disability; 3.3% are mentally disabled; and the remaining 4.6% comprises of other type of disabilities (Jabatan Kebajikan Masyarakat[JKM] Malaysia, 2012).

Autism falls in the category of learning disabilities. There is no current data available on prevalence rate of autism in Malaysia. However, Kassim, Othman, Guatand Yusoff (2009) mentioned that prevalence of autism in Malaysia was 1.6 per 1000 among children aged 18th months to 3 years in 2006. They also mentioned that

annually a total of 1500-1800 new cases of disabilities were diagnosed among children less than 7 years and more than 50% of them were intellectually challenged.

According to Special Education Department, Ministry of Malaysia, education for children with a learning disability should be provided and integrated in the main stream school under the special education programs (Mohd. Nor, 2007). Integrated special education system provides special classes. Students are to be confined to special classrooms, however, should have access to the shared facilities with other able bodied children in the school (Mohd. Nor, 2007). This special education system provides access to children with a learning disability to the mainstream education. However, it does not address their need for special learning environment which will enhance their performance.

Moreover, while policies and standards for PWD such as MS 1184, MS 1331, MS 1183, have served to encourage building codes that ensure physical access to and within public settings for people with disability, but have done little to ensure access for intellectually disabled persons. Thus, these policies and standards do not address the requirements of a wide range of sensory and cognitive disabilities. Therefore, children with cognitive disabilities like autism often stay out of the picture.

The concept of universal design is emerging these days (Khare, 2010). Universal access is an inseparable part of universal design and considers more than addressing physical barriers. To uncover the hidden barriers to universal access, one has to look beyond physical barrier in the built environment (Salmi, 2007). For example, one of these hidden barriers, to universal access in a school building, is insufficient and unsuitable wayfinding information for all users including children with autism.

Wayfinding is the process of action one has to take to navigate in a space. It is an integral part of everyday life. Wayfinding and cognitive mapping are indivisible. The cognitive map refers to a person's internal spatial representation of points, lines, areas, and surfaces that are learned, experienced, and recorded in quantitative and qualitative forms which helps to spatially orient oneself (Golledge, 1999). Without the development of cognitive mapping and subsequent process of decision making, people would need to re-absorb wayfinding information about a building each time they visited it.

School building is a complex structure with numerous corridors, classrooms, library, computer room, cafeteria, washrooms and space for many more supporting facilities. Design of a school building should, therefore, be such that offers a robust cognitive map for its users. This is crucial for the students as they have to revisit the place almost every day.

Cognitive maps are also essential to children with autism as they often become easily confused. These types of children strictly follow a specific routine and are not able to accept any change. For example, a child with autism may follow the same route to go to his classroom every day and any change to that may lead to an adverse reaction from him. Many children with autism have difficulty following environmental cues. Many of them could not distinguish normal visual cues such as restroom or 'no entry' sign. Yet careful attention to wayfinding and places of transition is crucial to their successful use of environment.

1.4 RESEARCH OBJECTIVES

This study intends,

1. To identify different architectural elements that impact on the wayfinding of children with autism and able bodied children.
2. To investigate the existing condition of the primary school buildings in Malaysia in terms of inclusive wayfinding design.
3. To suggesta model as a set of tools for design practice that would ensure an appropriate and inclusive learning environment for the children with Autism, in the context of Malaysia.

1.5 RESEARCH QUESTIONS

In order to achieve the research objectives mentioned in section 1.3, this research raises following research questions given in Table 1.1.

Table 1.1 Research Objectives and Research Questions

Research Objectives	Research Questions
1. To identify different architectural elements that impact on the wayfinding of children with autism and able bodied children.	1. What are the essential design aspects for autism friendly environment? What are the wayfinding design parameters related to these essential design aspects that might have positive impact on the wayfinding of children with autism and able-bodied children in educational settings?
2. To investigate the existing condition of the primary school buildings in Malaysia in terms of inclusive wayfinding design.	2. What are the expert opinions on optimum environment for inclusive educational settings that facilitate the wayfinding performance for all types of user?
	3. How does the wayfinding design parameters in existing schools facilitate wayfinding task of the children with autism and able-bodied children?
	4. What are the existing wayfinding facilities in Malaysian primary schools?
3. To suggest a model as aset of tools for design practice that would ensure an appropriate and inclusive learning environment for the children with Autism, in the context of Malaysia.	5. What are the architectural implications of the identified design aspects that could be used as a model to design autism friendly inclusive educational space in terms of wayfinding?

Note: Answers to all five research questions raised by this research have been obtained at the end of this research and given in chapter seven (7).#

1.6 RESEARCH METHODOLOGY

The methodology implemented for this research is predominantly adopted from the research work of Rachana Khare (2010) in her doctoral study on "Designing Inclusive Educational Space for Autism", and environment-behaviour research methods (Zeisel, 2006; Preiser, 2001; Steinfeld &Danford, 1999; Cherulnik, 1993). In her research, Kharefirst established autistic users need through literature review and preliminary field study. Then she developed environmental design considerations to address these needs which later translated as eighteen design parameter and validated by using three evaluation tools; environment audit, performance measure and design parameter rating scale. However, her research work only studied the learning environment for children with autism but no light was cast on the accessibility and wayfinding need of this special group. This research preliminary followed Khare's methodology but focused on the wayfinding issues and developed innovative wayfinding design parameters which are proved to be beneficial for children with or without autism.

The research embarks with an extensive literature survey to build the background knowledge on autism. With the knowledge from previous studies, five design aspects are initially recognized to be essential for children with autism. After studying school design for children and wayfinding, these design aspects are further developed into twenty wayfinding design parameters expected to affect behavior of children with autism and able-bodied children in terms of wayfinding.

Three evaluation tools; Wayfinding Design Parameter Rating Scale (WDPRS), Performance Measure for Children (PMC) and Environmental Assessment (EA) are developed to validate the identified twenty wayfinding design parameters. Though these tools are initially based on the tools used by Khare (2010), questionnaire and indicators are improvised to meet the objective of the study emphasising the issue of

wayfinding. Interview from professionals and special education experts of children with autism as well as regular education experts of able-bodied children are taken to identify the most influential architectural elements on behavior of children using Wayfinding Parameter Rating Scale (WDPRS). Feedback from these experts validates the identified twenty wayfinding design parameters.

To study the impact of environment on learning process of the children with autism, Performance Measure for Children (PMC) in form of questionnaire survey against the identified wayfinding design parameters as well as Environmental Assessment (EA) in form of observation checklist are conducted in the selected schools in Malaysia in their natural settings as shown in Table 1.2.

Table 1.2 Sample size

Evaluation Tools	**No of Special Education Experts**	**No of Regular Education Experts**	**Total**
WDPRS	49	71	120
PMC	49	71	120
EA	No of Special School for Autism	No of Inclusive Mainstream School	8
	4	4	

The findings are then evaluated and examined through triangulation method. Wayfinding Parameter Rating Scale (WDPRS) is used to establish the importance of the twenty design parameters for wayfinding of children. Performance Measure for Children (PMC) and Environmental Assessment (EA) data are analyzed to determine the environment and performance relationship of children in educational settings. Based on the findings, finally a set of tangible design guidelines/criteria is established for the design professionals to design inclusive learning environment where children with autism as well as able bodied children will perform their best. The proposed

study can be divided into five major phases as described in the following diagram, Figure 1.1.

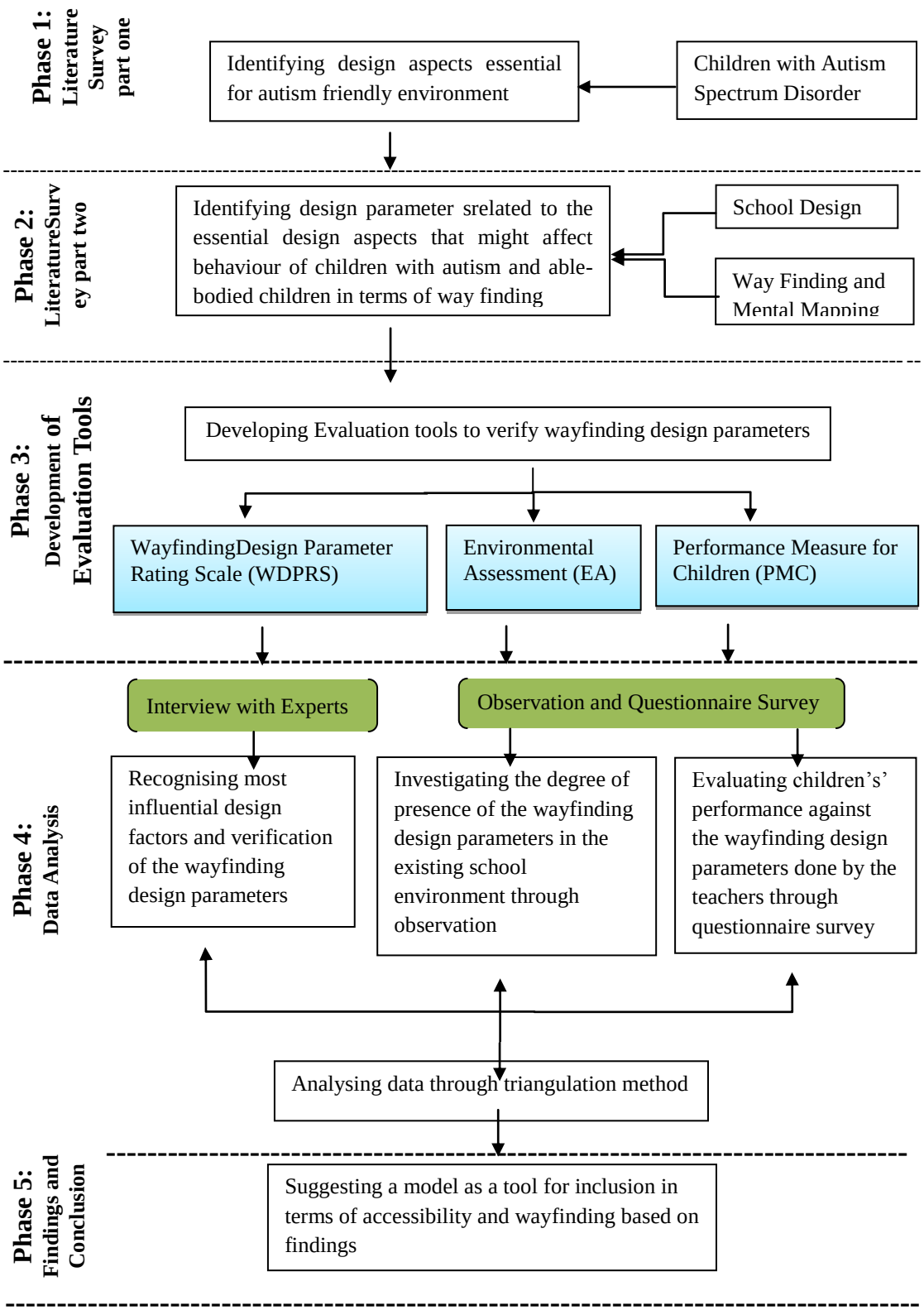

Figure 1.1 Research phases (adopted and modified from Khare, 2010)

1.7 STRUCTURE OF THE DISSERTATION

The first chapter starts with a background study and sequentially explains research problem, research objectives, research question and methodology adopted for this research. Significance of the research is also included in due course at the end of this chapter.

In the second chapter, literature on autism condition, education scenario in Malaysia, deficits and strengths of autism condition are studied. Based on the existing knowledge available, architectural considerations in form of five design aspects are developed. These five design aspects are identified to overcome the deficits of the condition and support the strengths of autism. The relationship of the identified design aspects, deficits and strengths of autism condition is presented in a matrix form at the end of this chapter.

The third chapter studies the literature available on wayfinding, its types and wayfinding design in school environment. After extensive diagnostic study of the approaches of wayfinding design in school environment, twenty wayfinding design parameters that enhance the wayfinding performance of children are identified. A relationship of these wayfinding design parameters with the previously identified five design aspects for children with autism are also established in this chapter and definitions of each of the twenty wayfinding design parameters are also provided in the third chapter.

The methodology that propels the research is discussed in the fourth chapter. The methodology adopted for this research is largely derived from the research work of Rachana Khare (2010), and base on from Environment-Behaviour research methods, discussed by Zeisel (2006), Preiser (2001), Steinfeld and Danford (1999) and Cherulnik (1993). Three evaluation tools; Wayfinding Design Parameter Rating