



**UNIVERSITI PUTRA MALAYSIA**

***IMPACT OF FURNITURE ARRANGEMENT ON SITTING MOVEMENT  
PATTERN AMONG PRE-AND PRIMARY SCHOOL CHILDREN***

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**FRSB 2015 9**



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PATTERN AMONG PRE-AND PRIMARY SCHOOL CHILDREN**

By

**MAHKAMEH VALIKHANI**

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in  
Fulfilment of the Requirements for the Degree of  
Master of Science**

**December 2015**

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the Degree of Master of Science

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**December 2015**

**Chairman : Prof. Hajah Rahinah Ibrahim ,PhD**  
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Pre-schools and primary schools are influential parts with prominent role in life of children. On top of that, at the start of this section of their life, reading and writing would begin. Studies found that there are relationships between school performance and furniture in the classroom. This study found considerable body of research addressing the role of school furniture on children's health, performance and seating behavior. The study found how to design the arrangement of furniture in the classroom environment is an important parameter. Scholars confirmed that there is a connection between furniture arrangement and children's verbal interaction and cooperation in classroom. However, its impacts on seating behavior and movement pattern have received fairly insufficient attention in literature. Hence, this study was carried out to know the impacts of seating arrangement on children's sitting movements and sitting position. For this purpose, a classroom in a governmental primary school was selected. A functional model seating arrangement was designed for testing the hypothesis. With an experimental research design, the study gathered numerical data via passive observation assessment about seating postures. The obtained results demonstrated that appropriate furniture arrangement has critical impact on the way that children sit and move in the classroom.

**Key words:** Seating arrangement, School children, School furniture, Seating movement, Ergonomic design, Integrated design.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Master Sains

**PENILAIAN KEKERAPAN DAN JENIS CORAK PERGERAKAN DUDUK  
DALAM KALANGAN MURID-MURID SEKOLAH BAGI REKA BENTUK  
SUSUN ATUR PERABOT YANG BERBEZA**

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Pra-persekolahan dan persekolahan rendah merupakan bahagian berpengaruh dan berperanan dalam kehidupan kanak-kanak. Selain itu, pada peringkat permulaan kehidupan mereka, membaca dan menulis akan bermula. Kajian mendapati bahawa terdapat hubungan antara prestasi sekolah dan perabot di dalam bilik darjah. Kajian ini mendapati sebahagian besar penyelidikan telah menangani isu peranan perabot sekolah kepada kesihatan, prestasi dan tingkah laku murid di tempat duduk. Kajian mendapati bagaimana reka bentuk susun atur perabot dalam persekitaran bilik darjah adalah satu parameter terpenting. Para penyelidik mengesahkan bahawa terdapat hubungan di antara susun atur perabot dan interaksi pertuturan dan kerjasama di dalam bilik darjah. Walau bagaimanapun, impak tersebut ke atas perlakuan duduk dan corak pergerakan hanya mendapat begitu sedikit perhatian di dalam literature. Justru, kajian ini dicadangkan bagi mengetahui impak susun atur tempat duduk ke atas perlakuan dan posisi duduk oleh murid. Bagi tujuan ini, sebuah bilik darjah di sebuah sekolah rendah kerajaan telah dipilih untuk diadakan kajian. Kajian telah mereka susun atur model baharu pengaturan tempat duduk yang berfungsi untuk menguji hipotesis kajian. Hasil kajian melalui penilaian pemerhatian pasif mengenai postur duduk murid-murid mendapati susun atur perabot sekolah memberikan impak kritikal ke atas perlakuan duduk dan bergerak oleh murid-murid semasa proses pendidikan berjalan di bilik darjah.

**Kata Kunci:** Susun Atur Duduk, Murid-murid Sekolah, Perabot Sekolah, Pergerakan Duduk, Reka Bentuk Ergonomik, Reka Bentuk Berintegrasi

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This thesis was submitted to the Senate of the Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Doctor of Master of Science. The members of the Supervisory Committee were as follows:

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## TABLE OF CONTENTS

	Page
<b>ABSTRACT</b>	i
<b>ABSTRAK</b>	ii
<b>ACKNOWLEDGEMENT</b>	iii
<b>APPROVAL</b>	iv
<b>DECLARATION</b>	vi
<b>LIST OF TABLES</b>	x
<b>LIST OF FIGURES</b>	xii
 <b>CHAPTER</b>	
 <b>1 INTRODUCTION</b>	 1
1.1 Introduction:	1
1.1.1 Design of Primary school	2
1.1.2 History of Primary school	2
1.1.3 Primary schools and educational system in Malaysia	4
1.2 Background of study	5
1.3 Problem statement	6
1.4 Significant of study	9
1.5 Research questions	9
1.6 Research objectives and variable	9
1.7 Scope and limitation of study	10
1.8 Theoretical Framework	10
1.9 Research methodology	10
1.10 Research design	11
1.11 Organization of Thesis	13
 <b>2 LITRATURE REVIEW</b>	 14
2.1 Introduction	14
2.2 Section 1: Furniture and seating arrangement at primary school	14
2.2.1 Children's furniture at primary school	14
2.2.2 Seating arrangement	22
2.3 Section 2: Children's Ethology at educational center	30
2.3.1 Psychological structure of school children	30
2.3.2 Connection between children's behavior and learning environment	31
2.3.3 Children's differences in terms of age and gender	34
2.4 Section 3: sitting movement	35
2.5 Summary	37
2.5.1 The answer of Research Sub-Question 1	39
2.5.2 The answer of Research Sub-Question 2	39
 <b>3 RESEARCH METHODOLOGY</b>	 41
3.1 Introduction	41
3.2 Decide about type of research methodology, identify the variables	41
3.2.1 Research characteristics	41
3.2.2 Applied Research Methodology	43

3.3	Experimental design and Research hypothesis	44
3.3.1	Control over extraneous variable	45
3.4	Instrumentation and Materials	45
3.4.1	Observation assessment	45
3.4.2	Participants	48
3.4.3	Sampling	48
3.4.4	Research location	48
3.4.5	Furniture and seating arrangement	51
3.5	Data collection procedures	56
3.5.1	Frist stage of observation (before renovation)	56
3.5.2	Second stage of observation (after renovation)	59
3.6	Summary	61
<b>4</b>	<b>RESULTS AND ANALYSIS</b>	62
4.1	Introduction	62
4.2	Results	63
4.2.1	Results and analysis for one participant	63
4.2.2	Results and analysis for all participants	69
4.3	Summary	76
<b>5</b>	<b>CONCLUSION AND RECOMMENDATION</b>	78
5.1	Introduction	78
5.2	Major findings of the study	78
5.3	Benefits of study	80
5.4	Impacts of study	81
5.5	Recommendation for future studies	82
	<b>REFERENCES</b>	83
	<b>APPENDICES</b>	93
	<b>BIODATA OF STUDENT</b>	122

## LIST OF TABLES

Table		Page
1	Prominent features of furniture arrangement	29
2	The comparison of two theories by Schroder (1997) and Domljan et al. (2010)	37
3	Observation assessment by Domljan et al. (2010)	46
4	Finalized observation assessment (*position which was added by author)	47
5	The check list for furniture arrangement inside the classroom	54
6	The number of movements for each subsidiary movement and posture, P2f (participant 2, female)	63
7	The number of movements, posttest (after intervention), P2f, time interval: 2 minutes	66
8	The number of movements, pretest (before intervention), P2f	66
9	The number of movements, pretest (before intervention), P1m	93
10	The number of movements, posttest (after intervention), P1m	93
11	The number of movements, pretest (before intervention), P3f	94
12	The number of movements, posttest (after intervention), P3f	94
13	The number of movements, pretest (before intervention), P4f	95
14	The number of movements, posttest (after intervention), P4f	95
15	The number of movements, pretest (before intervention), P5f	96
16	The number of movements, posttest (after intervention), P5f	96
17	The number of movements, pretest (before intervention), P6f	97
18	The number of movements, posttest (after intervention), P6f	97
19	The number of movements, pretest (before intervention), P7m	98
20	The number of movements, posttest (after intervention), P7m	98
21	The number of movements, pretest (before intervention), P8m	99

22	The number of movements, posttest (after intervention), P8m	99
23	The number of movements, pretest (before intervention), P9f	100
24	The number of movements, posttest (after intervention), P9f	100
25	The number of movements, pretest (before intervention), P10f	101
26	The number of movements, posttest (after intervention), P10f	101



## LIST OF FIGURES

Figure	Page
1 Problem statement	12
2 Bodyfurn® (Kane et al., 2006)	19
3 Chair 2000 (Knight & Noyes, 1999)	19
4 Saddle furniture (Lea Saarni et al., 2009)	19
5 Mobipresc 3.6 (Paschoarelli & da Silva, 2000)	20
6 Mandal furniture (Mandal, 2009)	20
7 U shape design (Bonus & Riordan, 1998)	24
8 Cluster design (Bonus & Riordan, 1998)	24
9 Row design (Bonus & Riordan, 1998)	25
10 Row design (Bonus & Riordan, 1998)	25
11 Seating arrangement by Krzysztof (1990)	27
12 Seating arrangement by Krzysztof (1990)	27
13 Seating arrangements and action zones by Marx et al. (2000)	28
14 The interaction between children and learning environment	32
15 Development of points of departure	40
16 Characteristics of experimental research design	44
17 One or both hands leaning on the back seat	46
18 School location in Google map	49
19 School plan in Google map	49
20 School main entrance	50
21 Rancangan primary school	50
22 School court yard	50
23 School chair	51
24 Chair dimension	51

25	Desk dimension	51
26	School chair and desk	51
27	Classroom plan with existing seating arrangement (unit: meter)/ model A	52
28	Classroom plan with new seating arrangement (unit: meter)/ model B	53
29	Schematic plan of the estimated angle of head rotation to see board and teacher	54
30	School furniture	55
31	School furniture arrangement	55
32	Current seating arrangement	56
33	Children's placement in first stage of observation	57
34	Classroom photo in model A seating arrangement	58
35	Classroom photo in model A seating arrangement	58
36	Children's placement in second stage of observation	59
37	Classroom photo in model B seating arrangement	60
38	Classroom photo in model B seating arrangement	60
39	The line chart from table 7, pretest (model A of seating arrangement), P2f	67
40	The line chart from table 8, posttest (model B of seating arrangement), P2f	67
41	Comparison between average number of each posture category in pretest and posttest, P2f	68
42	The average number of all movement in each interval time, pretest (before intervention) and posttest (after intervention)	68
43	The average number of movement for each category among 10 participants	70
44	The percentage of frequency of movement among 10 participants	70
45	The average number of movement for each interval time among 10 participants	71

46	Comparison between the scores for upper body movement in pretest and posttest	72
47	Comparison between lower body movement in pretest and posttest	72
48	Comparison between whole body movement in pretest and posttest	72
49	Comparison between occasional movement in pretest and posttest	73
50	Numbers of considered postures for upper body movement, comparison between Model A and B	
51	Numbers of considered postures for downer body movement, comparison between Model A and B	74
52	Numbers of considered postures for whole body movement, comparison between Model A and B	75
53	Numbers of considered postures for occasional movement, comparison between Model A and B	75



## CHAPTER 1

### INTRODUCTION

#### 1.1 Introduction:

School is the dominant force in life of children. First experience of being alone in a different environment than home typically happens at school. This experience can have positive or negative effects on children's psychology and health. Providing legible spaces for children may contribute to their psychological well-being (Helvacioğlu & Olguntürk, 2011). Every year large amounts of money are allocated in transforming traditional classrooms into technology-equipped learning environments with the assumption that both student engagement and learning outcomes will improve. The problem is the lack of data available to support this contention. It is clear that studies should be done to discover what is improved with changing environment to innovative physical space.

Furniture is one of the primitive facilities inside of classroom. School children spend 30% of their waking hours at school (Linton, Heilsing, & Halme, 1994). Many researchers got involved with the principles for the design of chairs and desks in the workplace. However, little interest has been shown in design of the spatial arrangement of furniture inside the classroom which is used by children for prolonged periods of their school time. In fact children are the main stakeholders of primary schools, although they are mostly passive in making decision about design of furniture and seating arrangement. In the other word, with no choices children are recipients of adults' solutions.

Researchers jointly confirmed that chairs and desks used by children should fulfill a variety of different demands, such as ergonomic, anthropometric, durability, etc. and it has to be designed very carefully. But the matter is how these designs should be placed in classrooms? Scholars also looked at this issue. How to arrange the seating in a classroom and to what ends are questions that many teachers now answer for themselves. Around three decades ago researchers begun a systematic exploration about the possibilities and impacts of seating arrangement (e.g., Koneya, 1976). Among scholars this fact is accepted that the arrangement of furniture has dramatic impacts on children's behavior. There are several evidence that confirmed seating arrangement is an influential factor in pupils academic achievement (Carol S Weinstein, 1992), verbal participation (Koneya, 1976), social interaction, question asking (Marx, Fuhrer, & Hartig, 2000) and on/off-task behavior (Anderson, 2009; Gill & Remedios, 2012; Rosenfield, Lambert, & Black, 1985). These factors are common issues which researchers have investigated in relation to seating arrangement.

On the other hand, the evidence prove this fact that children in elementary schools are not genetically structured to sit in orderly way. Their movement pattern is something that few numbers of researchers have been worked on it. There is a demand to know how furniture can be arranged to decrease children's unnecessary movement and

communicate the message of better sitting attitude directly or indirectly. In this research it is aimed to illustrate that with rearranging the furniture, can we expect to see any changes positively or negatively in children sitting behavior and movement pattern or not.

#### **1.1.1 History of Primary school:**

In the history of creation and development of primary school, England is the prior country. Initially, politicians in the United Kingdom decided to the necessity and demand of the existence of primary education. So, the author reviewed the history of primary school in United Kingdom. Briefly, a primary school, or elementary school, is a school in which children receive primary or elementary education between the ages of about five to eleven, coming before secondary school and after preschool which is typically compulsory in most countries. Until Elementary schools were established by Elementary Education Act 1870, the only options available to parents were private schooling at home the tuition was expensive , or be accepted for free in charitable schools such as Ragged schools, which did not charge for attendance. Initially offering an education to local children up to the 10, was changed to the 14 in the Education Act of 1944.

Totally, it was defined that elementary schools should prepare children to receive manual training and elementary instruction. They provided a restricted curriculum with the emphasis on reading, writing and arithmetic. The schools operated on a 'monitorial' system, whereby one teacher supervised a large class with the assistance of a team of monitors, who were quite often older pupils (Gillard, 2009).

Before 1944 around 80 per cent of the school population attended elementary schools through to the age of 14. The remainder transferred either to secondary school or junior technical school at age 11. The school system was changed with the introduction of the Education Act 1944. Education was restructured into three progressive stages which were known as primary education, secondary education and further education. This structure has not been changed and now same classification still exist.

#### **1.1.2 Design of Primary school:**

Historically, the physical presence of the schoolhouse has been the symbol of the success of grassroots delivery of national education policy worldwide. Uduku in 2015 proposed a holistic study about designing primary schools which evaluated five case studies from poor country to developed country (Uduku, 2015). In Uduku's research it was revealed that today schools, and particularly classroom buildings, retain their symbolic connection with top level policy plans as education ministries. Moreover, international aid and finance organizations have supported the expansion of national school building programs in order to meet the Millennium Development Goal of universal primary school access for all children. For most low-income countries, school planning and design standards originate directly from international bodies such as the United Nations Education, Science and Culture Organization, UNESCO.

There are some distinctive features of the generic “UNESCO standard” classroom. Uduku (2015) explained about some example of this kind of schools. Classrooms sizes were generally between 35 m<sup>2</sup> and 40 m<sup>2</sup>, for almost 35 students. Most were designed as individual rooms, with few having flexible back- or side-walls to allow for double-sized or semi-outdoor classroom areas respectively. The classroom blocks were mostly low with single-story structures. However there were some distinctions in urban areas. Classroom blocks mostly were built as part of a series of three to four connected rooms, with an outdoor corridor to one side that runs the length of the classroom block. The corridor is where the doors are placed, for access to each classroom. Window openings were also placed on the classroom walls facing the corridor and on the long walls on the opposite side of the classroom.

Most classroom walls were made from locally made cement blocks, and occasionally clay or mud brick. In rural and poorer neighborhoods, school walls have no rendered or paint finish, whilst schools in higher income neighborhoods have rendered and painted walls. Similarly basic flooring involving a finish of cement screed is typical in most rural schools, and in poor to middle income urban neighborhoods. However in some medium- income countries, such as South Africa and Malaysia, schools might have PVC or linoleum floor finishes, and occasionally partial carpeting in pre- and early-primary classrooms. Classroom roofing and ceilings also show little variation.

There are now a number of contemporary international examples of the re-interpretation of educational space that diverge from the conventional UNESCO-inspired design standards. This has resulted in the child-scaled design of classroom elements such as windows and learning spaces, which are designed at a more intimate scale. Furthermore the placement of child-sized furniture in groups for collaborative learning. The most recent driver of school design innovation has been the need to respond to new sustainability in building design and energy consumption criteria. Since the mid-1990s in some high- income countries, such as the United Kingdom, and the USA, all public structures including schools now have to have a sustainability building design audit, to ensure that schools do not contribute to the depletion of local resources in their design and methods of using renewable energy and natural thermal control, reduce dependence on non-renewable energy sources (Brown, 2005; Scott, 2010)

In the EdQual project (Uduku, 2011), designing School Buildings as Development Hubs for Learning, the researchers sought to understand what effect school design had on children’s learning experiences and what additional development ‘value’ the school offered its surrounding community. The key aspects of school design that had the most effect on students’ learning were identified as having experience across the fifteen schools. These factors are:

- a. Classroom size
- b. School adaptability to incorporate different school activities including
- c. Designed facilities for school-feeding programs
- d. Designed facilities Library/ICT provision
- e. Sanitation
- f. Encourage local community outreach

### 1.1.3 Primary schools and educational system in Malaysia:

The participants of this research would be Malaysian primary school children. In order to be familiar with the scope of this research, first of all it is necessary to have a look at the background of Malaysian educational system. Generally, Malaysia is a country with 18.2 million populations in 1995. Malaysia is a society divided by race, language, religion, culture, and to some extent by occupational and regional differences. There are different ethnics who are living together in Malaysia. Based on the announcement of Ministry of Finance in 1986, the Malaysian ethnics include 55% of Bumiputra, 34% Chinese, 10% Indian, and 1% "others" (which include Sri Lankans, Eurasians, and other communities). Age distribution overall is such that nearly 50 per cent of the population are under the age of 19. Almost 60 per cent of the population live in rural areas (Mukherjee & Sarjit Singh, 1983). Today the literacy rate of the country is 74%, the enrolment rates for primary level, lower secondary level and upper secondary level are 97.92%, 83.43% and 48.56% respectively (Ministry of Education, 1991).

In Malaysia, basic education system comes in 11 years study which is divided to 6 years of primary education, 3 years of lower secondary education, and 2 years of upper secondary education. There are two levels of primary education, Level One (Tahap Satu) years 1 to 3, Level Two (Tahap Dua) years 4 to 6. At the end of primary school students should pass the primary school achievement test.

From the late eighteenth century the Malay States were subject to British rule as Crown Colonies and Protectorates until 1957. In 1963 the Federation of Malaysia was formed; today it comprises two regions - West Malaysia, on the Malay Peninsular, and East Malaysia, consisting of the territories of Sarawak and Sabah on the island of Borneo. For the greater part of the 'British period', a four-stream education system existed catering for the different ethnic groups, with English education serving primarily the British administration, the Malay elite and urban Indians and Chinese. The rest depended on the respective vernacular systems. Since 1957, the major focused on creating national education system. The use of Malay language was one of the outstanding features. However Vernacular Chinese and Tamil primary schools are permitted but all secondary education has slowly been converted to using Malay. At this level, the controlling force is the public examination system, which is conducted in the Malay language (Mukherjee & Sarjit Singh, 1983).

In Malaysia pre-schooling is privately organized and funded and is as a consequence usually only available to the children of middle and upper-middle class families (Mukherjee & Sarjit Singh, 1983). Primary schooling divided to three types of primary school: Public Primary School, Private Primary School and International Primary School. Public schools in Malaysia have the tuition fees are low as most are supported by the government. Many public schools run on a two-session system - morning and afternoon sessions. This is to accommodate the high number of students. Facilities in public schools are adequate and have the basic items needed for education and student to teacher ratios can be quite high, with 40 to 50 students in a class. Private Primary School: There are a number of good private schools in Malaysia, but they are known to be expensive. International Primary School: Enrolment in an international school in

Malaysia is the most expensive option and it is not affordable for most of families. As with the public schools, private schools and international schools follow the guidelines and rules set by the Malaysian Ministry of Education, but the most prominent international schools adhere to the British National Curriculum.

The national Curriculum Development Centre (CDC) set up in 1973 to meet fundamental problems. The New Primary School Curriculum, often referred to as KBSR (in local acronyms), was implemented in 1982 because of dissatisfaction with the old primary curriculum which was thought to be too subject content-biased, emphasize too much rote-learning, to be too examination-oriented and excessively dependent on textbooks (Lee, 1999). The new curriculum is intended to introduce new emphases in the objectives and content, new teaching styles and new types of instructional materials, all of which are aimed at improving the quality of primary education (Lee, 1999).

Because the researcher desired to apply a research in public primary school in Malaysia, from this part of the research, focus is only on this type of elementary school. In general, Public primary schools in Malaysia are divided into two categories based on the medium of instruction:

- Malay-medium National Schools (*Sekolah Kebangsaan*, SK)
- non-Malay-medium National-type Schools (*Sekolah Jenis Kebangsaan*, SJK), also known as "vernacular schools", further divided into
  - National-type School (Chinese) (*Sekolah Jenis Kebangsaan (Cina)*, SJK(C)), Mandarin-medium and simplified Chinese writing
  - National-type School (Tamil) (*Sekolah Jenis Kebangsaan (Tamil)*, SJK(T)), Tamil-medium

All schools admit students regardless of racial and language background. Bahasa Malaysia and English are compulsory subjects in all schools. All schools use the same syllabus for non-language subjects regardless of the medium of instruction. The teaching of the Chinese language is compulsory in SJK(C), and Tamil language is compulsory in SJK(T). Additionally, a National School must provide the teaching of Chinese or Tamil language, as well as indigenous languages wherever practical, if the parents of at least 15 students in the school request that the particular language to be taught.

## **1.2 Background of study:**

A significant number of researches talked about the role of the physical environment of educational settings in child development. Some researchers have examined the effects of noise and density (Ehrenberg, Brewer, Gamoran, & Willms, 2001; Maxwell & Evans, 2000) others worked on influence of temperature, lighting, air quality and acoustics (Higgins et al, 2005) researchers also addressed the effects of overall school building quality (Moore & Lackney, 1993). Based on several evidence this fact is



accepted that school setting can effect on children's behavior and outcomes. Furthermore, the notable body of researches evaluated the different aspects of primary school furniture. Researchers worked on the impacts of school furniture on sitting position and comfort (Knight & Noyes, 1999; Linton et al., 1994), movement pattern (Schroder, 1997), back pain and posture problem (Troussier et al., 1999; Saarni et al., 2009; Mandal, 2009), hand writing (Ryan, Rigby, & Campbell, 2010), and the processes of teaching and learning (Urwick & Junaidu, 1991).

Student performance includes student results, attendance and learning, social development and so on (Mendell & Heath, 2005). This fact is accepted that there are connections between the facility and utility of the classroom and students' attendance and learning performance (Lyons, 2001; Syakima M.Y, Sapri, & A.R Shahril, 2011). So with poor classroom facilities it is expected to see downfall in student's performance. In additions, schools with low quality level and inadequate facilities can decrease teachers' efficiency and performance (Earthman, 2002). Meanwhile, there are a direct relation between teachers' performance and student performance, so directly and indirectly poor school facilities have negative impacts on students learning. Furthermore, Widely it has been investigated that the classroom environment has critical impact on students' attitudes as well as their success in attending and learning (Earthman, 2002; Leung & Fung, 2005; Lyons, 2001).

Previous paragraphs demonstrated the importance of classroom facilities and its influences on student's efficiency and learning process. In these days with so many available attractions in outdoor activities and the improvements of technology in all aspects of human's life, it has become more controversial to provide a suitable atmosphere for children. Conditions has been changed from past and designers and authorities in educational centers should be more smart to keep children interested in school's atmosphere in order to rise their academic performances and also make children ready for such this complicated world. To be more familiar with the gaps and lack of research in the field of classroom facility next step is investigating about the condition of Malaysian primary school and what have been done by other researchers in this field in Malaysia and other countries as well.

### **1.3 Problem statement:**

Classroom spatial arrangement is not a new concept to educators. Experienced educators understand its importance, and first year educators will understand the importance of classroom spatial arrangement after they have taught a few classes with a flawed spatial design. Several studies have been done concerning classroom seating and its effects on students' behavior and on students' learning. Around four decades ago researchers were interested about this issue (e.g. Koneya, 1976). In general, there are a considerable number of researches which have been worked on school furniture but few studies have been done concerning furniture arrangement and its effects on students' behavior and on students' learning. Tottaly, In relation to the seating arrangement there are some topics which scholars have investigated about them. These topics are, ecology of classroom, on-task behavior, verbal interaction and question asking. In addition, the spatial arrangement of the classroom can be effective to stimulate desirable behavior or contribute to students' misbehavior (Daniels, 1998).

Moreover, unlike other factors that also influence on behavior (e.g., individual student characteristics, social dynamics) seating arrangement is typically under teacher control.

Classroom arrangement significantly impacts on student behaviour and output, and there are evidences to confirm this issue. Sommer in 1967 worked on classroom ecology focused on seating arrangements. Koneya in 1976 conducted a study about the connection between verbal interactions and seating preferences in traditional seating arrangement. Rosenfield et al., (1985) conducted a study about the effects of desk arrangement on student's on-task behavior. Wannarka and Ruhl (2008) explored about the relation between seating arrangement and student's output. Weinstein in 1992 studied classroom design, as discussed in her presentation entitled Designing the Instructional Environment: Focus on Seating arrangements. Bonus and Riordan (1998) also conducted a research, about Increasing Student On-Task Behavior Through the use of Specific Seating Arrangements. These are some sample of scholarly work about this topic. Although these studies do not represent an exhaustive compilation of the research performed on classroom design, they do represent a significant overall embodiment of research in the field. Moreover, they all confirmed that seating arrangement is an important classroom setting events because it has the potential to help prevent problem behaviors that decrease student attention and diminish available instructional time. Among all previous researches, unfortunately in Malaysia there is no evidence that specifically explored about this topic.

Malaysia envisioned becoming a developed country by 2020, with the emphasis on both first-class infrastructures and first-class mentality. Already she has moved away from being just a Developing Nation and attained the Newly Industrialized Country (NIC) status in 2008 (Cheah, 2002). The most critical element identified towards the achievement of the national mission is on the quality of her human capital. That is why, quality human capital development is a key thrust in the 9th Malaysian Plan (9MP, 2006-2010), currently being implemented. In producing quality human capital development, the nation is currently focusing upon every level of education, starting from pre- schools. The emphasis is on the quality of education and training to be at par with international best practices (EPU, 2006, p. 237, 254).

Syakima M.Y et al. (2011) in a conference about classroom facility announced that in Malaysia the current quality of classroom facilities is still in its initial stages and few related studies have been done in this field (Syakima M.Y et al., 2011). Dr Frederico Gil Sander, senior economist for Malaysia, in the speech on 25<sup>th</sup> of March 2014 pointed to the poor quality of Malaysia's education system. He said the poor quality of Malaysia's education system is more worrying than the level of debt in its households, said a World Bank senior economist in Kuala Lumpur and Malaysians should be "alarmed" that the performance of children in Vietnam were better than their children, a country that is poorer than Malaysia (March 25, 2014). The research on school classroom facilities performance is also still needed more investigation (Syakima M.Y et al., 2011).

In October 2011, the Ministry of Education launched a comprehensive review of the education system in Malaysia in order to develop a new National Education Blueprint.

Every school in Malaysia, regardless of location, size, or type, will meet a set of minimum infrastructure requirements to create a safe, hygienic, and conducive environment for learning. This includes access to clean, treated water; at least 12-hours of electricity per day, along with sufficient toilets, classrooms, tables, and chairs for the student and teacher population. Once all schools have met basic infrastructure standards, the Ministry will proceed to invest in another wave of upgrades to meet baseline requirements for delivering the curriculum effectively such as Science laboratories and Living Skills workshops (*Malaysia Education Blueprint 2013-2025*, 2012).

In the Malaysian school education system generally, primary or secondary students spend an average of 5 hours in the classroom learning period. Children ages of 8 and 9 years spend more than 60 minutes in any 90 minutes period. In this situation, the aspect of comfort is important to the learning process. Therefore it is important to identify the level of user satisfaction on furniture arrangement use regarding this aspect. In the Malaysian scene, the problem relating to the placement of furniture in design considerations of classrooms is still unknown. In addition, however, there is lack of specific cultural information relating to these issues especially particular reference to Malaysian culture (Manaf, 2009).

The previous research into classroom facilities performance is too general and to date, most researchers have focused only on the relationship between classroom facilities performance and learning performance (Syakima M.Y et al., 2011). Particularly in Malaysia there are some body of researches about different aspects of school environment and classroom facilities. In this area, Abbas and Othman (2010) evaluated the impact of classroom design which was categorized into well defined, moderately defined, and poorly defined on children's Play/Social Behavior. Manaf and Nazif, Hani, Lee, & Rasdan investigated about secondary school furniture. Manaf (2009) conducted a study to determine the important factors of furniture design criteria and Nazif et al. (2011) examined science laboratory furniture both in Malaysian secondary schools. Nevertheless, there is no evidence in literature about furniture and seating arrangement of primary school in Malaysia. The impacts of furniture and seating arrangement as main facilities on children developmental cognition and behavior have been ignored in previous studies in Malaysia.

On the other hands, when we talk about renovation most of the people think that renovation needs money. It means that in order to apply any renovation in an environment, we should spent money. Basically, it can be claimed that this picture is not a wrong picture, of course renovation mostly is a demand of money. But, without any cost we can still apply some changes to renew our living environment. Rearranging current stuff is the budget way in remodeling our surroundings. In the current research the author intent to examine one of these rearrangements in the classroom to illustrate how can make it possible especially for the teachers to change the current setting and see positive changes among children.



#### **1.4 Significant of study:**

In this research, it was attempted to illuminate the interaction between students and physical features in educational center. This exploration could contribute greatly to the enhancement of the knowledge of sitting equipment and seating arrangement in classroom specifically for children in primary school. The significance of this study is that the obtained result contribute to promote the awareness about choosing suitable sitting equipment for children in educational centers and also pay attention to apply better placement of furniture to match with the goal of the class. This can be influential not just for the body, to enhance the functionality of students, diminish irregularity among student while using furniture and ultimately increase the output of the classroom.

#### **1.5 Research questions**

According to research main question, three sub-questions were defined which are shown below.

- Main research question: what is the influence of seating arrangement in primary school on children's sitting behavior?
- Sub-RQ 1: what are the role and importance of furniture and seating arrangement in primary school?
- Sub-RQ 2: what are the main characteristics and prominent sitting behavior of school children at school?
- Sub-RQ 3: what is the relation between seating arrangement and sitting movement pattern among children?

In this research for two first sub-questions, literature review was used to identify the answer. Please refer to the chapter two, section 2.5 to see the summery of the answers. The last sub-question was answered based on the results which was obtained from current study. In chapter five there are more detail about this question.

#### **1.6 Research objectives and variable:**

- RO 1: identify role and importance of furniture and seating arrangement in primary school.
- RO 2: recognize the main characteristics and prominent sitting behavior of school children at school.
- RO 3: determine the relation between seating arrangement and sitting movement pattern among children.
- Variables:
  - Independent variable: furniture arrangement
  - Dependent variable: sitting behavior among school children.

### **1.7 Scope and limitation of study:**

This study is about the lack of standardized and suitable available facilities in public elementary school of Malaysia. So, specifically this study focused on the public primary school. Besides, these unsuitability of equipment have direct and indirect impact on school children. Therefore, public elementary school is distinguished as the case of study and children who are the students of public elementary school, are the subject of current research.

The main barrier of this research is time limitations, such a research should be done in long period. This research will have a more accurate result if we prolong the investment. As a result of time limitations number of children who will be under study would be limited and the study cannot be done for various students with different batches, groups and behavioral habits. Another restriction is limited nationalities here, we cannot generalize the result of this research to the people with different background and cultures.

### **1.8 Theoretical Framework:**

In this research it was aimed to work on interior design of children educational center and find its impact on the behavior of children. In section 1.3 which was about the problem statement, the research scope was resulted. Based on witnesses it was proved that the condition of governmental school in Malaysia is not well developed and even is not as well as the neighbors such as Thailand. On the other hand the influence of furniture arrangement has received less attention among scholars and there is no evidence about it in Malaysia. Moreover, the condition of seating equipment in most of public primary schools in Malaysia has not meet the minimum of standards and quality. Eventually, the researcher decided to work on furniture arrangement. However, it was not clear that which aspect of behavior among school children is related to seats arrangement. From previous researches it was emerged that children's physical movement when they are sited can be directly related to chairs and desks. So in this part the author investigated about this issue and understood that insufficient attention has been paid on this subject. Ultimately, according to these results the research question, research hypothesis and the variables were defined. Please refer to figure 16 in Chapter two to see the theoretical framework. This figure illustrates the development of points of departure which are the infrastructure of this study.

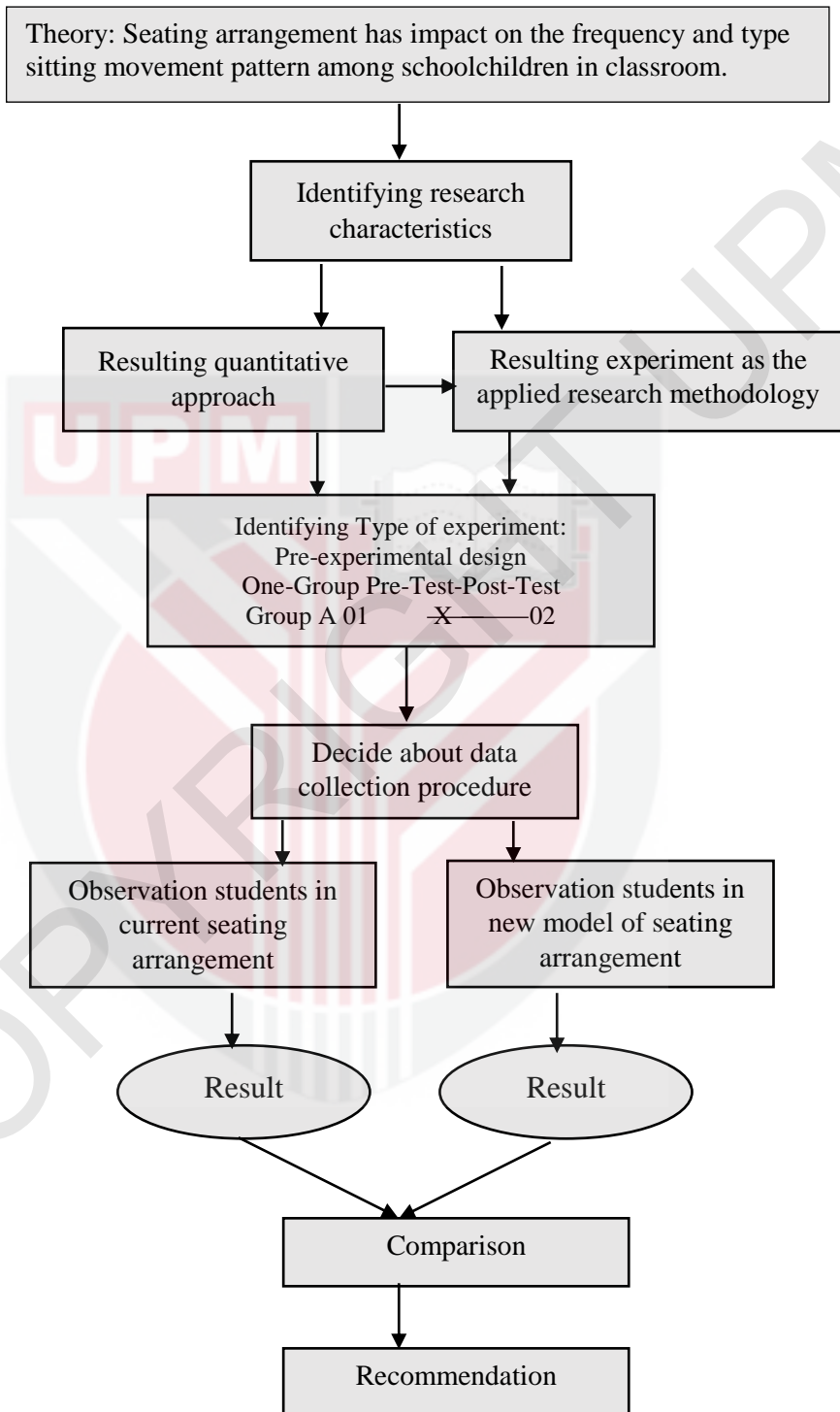
### **1.9 Research methodology:**

To find the answer for research sub-questions one and two, the researcher explored through previous studies. For the objective three, a quantitative methodology was the nearest approach to demonstrate the theory. Between survey and experiment which are two main categories of quantitate methodology, experimental design was the better approach to achieve the research goals. In order to prevent interfering other variables in output, pre-experimental design and beyond that One-Group Pre-Test-Post-Test was employed for this research. For data collection passive observation with camera tools was used. The observation was done in one full session for both tests and It was tried to set everything same for pretest and posttest except seating arrangement. Meaning that

the research carried out the study with same participants, in same place, same teacher and even same daytime.

#### **1.10 Research design:**

In this study a model of arrangement for seats applied to see how it was influential to reduce the unnecessary movements of children during class time. The model is called semi-circle arrangement. To evaluate the changes in children's movement behavior, children were observed two times. One time with the existing seating arrangement and another time in semi-circle design (designed model by the author). Movement pattern was divided to four main groups, upper body movement, downer body movement, whole body movement and occasional movement. In addition, each group has some subsets of movement which were figured out for each participant. Then, the results for pretest and posttest compared to see how the model worked. In this research Microsoft Excel was used to analyze and validate the row data.



**Figure 1: Research procedures**

### **1.11 Organization of Thesis:**

This thesis comprise five chapters, listed and briefly described below:

The first chapter brings some example to clarify the problem statement and discuss about background of this study in the literature. In this chapter the research objectives and questions are introduced. Moreover to know the work flow the diagram for theoretical framework and research design are presented. In general, the first chapter create an overall view about this study.

The second chapter is dedicated for investigation in previous researches. This chapter demonstrate the body of knowledge of this study. Briefly, the second chapter illustrates the way to achieve the answer of research question and how was shaped the theoretical framework of the current study.

The third chapter explicate the selected research methodology. In this chapter it was expound how the researcher approached the suitable research methodology. Besides, it is clarified the instrumentation and materials for this study while designing the procedure of data collection.

The results and charts are exposed in the fourth chapter. This chapter discusses bout how row data were analyzed and arranged to compare. In general, this chapter illustrates obtained results for both stages of data collection.

Lastly the fifth chapter present the major findings and benefits of this study. This chapter also provides recommendation for designers and those who are involved in children educational centers. There is also suggestion for future studies.

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