DEVELOPMENT OF ENVIRONMENTAL FACTORS IN CLASSROOM DESIGN RECOMMENDATION FOR CHILDREN WITH AUTISM SPECTRUM DISORDER

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by

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TABLE OF CONTENTS

ACKNOWLEDGEMENT ..... **ii**

TABLE OF CONTENTS ..... **iii**

LIST OF TABLES ..... **ix**

LIST OF FIGURES ..... **xiii**

LIST OF ABBREVIATIONS ..... **xvi**

LIST OF APPENDICES ..... **xvii**

ABSTRAK ..... **xviii**

ABSTRACT ..... **xx**

CHAPTER 1 INTRODUCTION **1**

1.1 Background 1
1.2 Problem Statements 4
1.3 Purpose of the Study 5
1.4 Objective 6
1.5 Hypothesis 7
1.6 Scope and limitations 7
1.7 Procedures 8
1.8 The Significance of the Study 9
1.9 Thesis Outline 10

CHAPTER 2 LITERATURE REVIEW **12**

2.1 Overview 12
2.2 Characteristics of Children with Autism Spectrum Disorder (ASD) 12
2.3 The Learning Environment for Children with ASD 17
2.4 Sound Decibel in the Classroom Background 20
2.5 Sound Frequency in the Classroom Background 23
2.6 Intensity of Light in the Classroom Background 24
2.7 Colour in the Classroom Background 26
2.8 A Temperature in the Classroom Background 28

2.9 Method of Analysis 30
2.9.1 Qualitative 31
2.9.2 Quantitative 32

CHAPTER 3 METHODOLOGY 34

3.1 Introduction 34
3.2 The Process Flow 35
3.3 Data Collection 36
3.3.1 Qualitative Approach (Preliminary Data) 37
3.3.1(a) Interview 37
3.3.1(b) Classroom Observation for the Current Learning Environment 39
3.3.2 Developing the Experiment 41
3.3.2(a) Current Classroom Environment 42
3.3.2(b) Sound Decibel 43
3.3.2(c) Sound Frequency 45
3.3.2(d) Intensity of the light 46
3.3.2(e) Type of Colour 47
3.3.2(f) Classroom Temperature 48
3.3.3 Participant Observation during the Task 49

CHAPTER 4 RESULTS 51

4.1 Introduction 51
4.2 Qualitative (Preliminary Results) 51
4.2.1 Interview 51
4.2.2 Classroom Observation 53
4.3 Quantitative 56
4.3.1 Current Classroom Environment 57
4.3.2 Sound Decibel 58
4.3.3 Sound Frequency 59
4.3.4 Intensity of Light 61
4.3.5 Type of Colour 63
4.3.6 Classroom Temperature 64

CHAPTER 5 ANALYSIS 66

5.1 Introduction 66
5.2 Overall Process Flow 67
5.3 Qualitative Preliminary Analysis 68
5.3.1 Analysis of Interview Data 68
5.3.1(a) Analysis of the Impact of Sound Decibel Theme 68
5.3.1(b) Analysis of the Impact of Sound Frequency 70
5.3.1(c) Analysis of the Impact of Intensity of the Light 70
5.3.1(d) Analysis of the Impact of Type of Colour 71
5.3.1(e) Analysis of the Impact of Temperature 72
5.3.2 Classroom Observation 73
5.4 Experiment on the Impact of the Sound Decibel in the Classroom 78
5.4.1 Quantitative Analysis 78
5.4.1(a) Response to the Instruction for Overall Data 84
5.4.1(b) Time to Complete the Task for Overall Data 86
5.4.1(c) Analysis of Response to Instruction and time to Complete the Task for Overall Data (Paired Samples T-Test, Pearson Correlation And Linear Regression) 87
5.4.1(d) The Range of Decibel for Response to the Instruction (Without Headphone) 91
5.4.1(e) The Range of Decibel for Time to Complete the Task (Without Headphone) 93
5.4.1(f) Comparison Children with ASD and Normal Children 94
5.4.2 Qualitative Analysis 95
5.5 Experiment onthe Impact of the Sound Frequency in the Classroom 98
5.5.1 Quantitative Analysis 98
5.5.1(a) Response to the Instruction for Overall Data 103
5.5.1(b) Time to Complete the Task for Overall Data 104
5.5.1(c) Analysis of Response to Instruction and Time to Complete the Task for Overall Data (Paired Samples T-Test, Pearson Correlation And Linear Regression) 105
5.5.1(d) The Range of the Sound Frequency for Response to the Instruction (Without Headphone) 109

5.5.1(e) The Range of Sound Frequency for Time to Complete the Task(Without Headphone) 110
5.5.1(f) Comparison Children with ASD and Normal Children 111
5.5.2 Qualitative Analysis 112
5.6 Experiment on the Impact of the Intensityof the Light in the Classroom 114
5.6.1 Quantitative Analysis 114
5.6.1(a) Respond to the Instruction 117
5.6.1(b) Time to Complete the Task 119
5.6.1(c) Analysis of Response to Instruction and Time to Complete the Task (Pearson Correlation and Linear Regression) 120
5.6.1(d) The Range of Illuminance for Respond to the Instruction 121
5.6.1(e) The Range of Illuminance for Time to Complete the Task 122
5.6.1(f) Comparison Children with ASD and Normal Children 124
5.6.2 Qualitative Analysis on Impact of the Intensity of the Light in the Classroom 125
5.7 Experiment on the Impact of the Type of Colour in the Classroom 127
5.7.1 Quantitative Analysis 127
5.7.1(a) Respond to the Instruction 129
5.7.1(b) Time to Complete the Task 131
5.7.1(c) Analysis of Respond to the Instruction and Time to Complete the Task (Pearson Correlation and Regression) 132
5.7.1(d) The Range of Brightness for Respond to the Instruction ... 133
5.7.1(e) The Range of the Brightness for Time to Complete the Task 134
5.7.1(f) Comparison Children with ASD and Normal Children 135
5.7.2 Qualitative Analysis 136
5.8 Experiment on the Impact of the Classroom Temperature 139
5.8.1 Quantitative Analysis 139
5.8.1(a) Respond to the Instruction 141
5.8.1(b) Time to Complete the Task 142

5.8.1(c) Analysis of Respond to the Instruction and Time to Complete the Task (Pearson Correlation and Regression) 143
5.8.1(d) The Range of Temperature of Respond to the Instruction 144
5.8.1(e) The Range of the Temperature for Time to Complete the Task 145
5.8.1(f) Comparison Children with ASD and Normal Children 146
5.8.2 Qualitative Analysis 147

CHAPTER 6 DISCUSSION AND DEVELOPMENT OF ERGONOMIC DESIGN GUIDELINE 150

6.1 Introduction 150
6.2 Acceptable Characteristic of the Physical Environment Element to the Children with ASD 150
6.2.1 The Loudness of Sound (Measured in Decibel) 151
6.2.1(a) Understanding Instruction with 60 dB of Classroom Background Loudness 153
6.2.1(b) Significance of Loudness Developed Linear Equationon Instruction and Attention 154
6.2.1(c) Impact of the Loudness on Children'sPsychosocial Characteristic 154
6.2.2 The Limit of Sound Frequency 156
6.2.2(a) Significance of Frequency Developed Linear Equation on Instruction and Attention 158
6.2.2(b) Impact of the Frequency on Children's Psychosocial Characteristic 159
6.2.3 Intensity of the Light 160
6.2.3(a) Significance of Intensity of the Light Developed Linear Equation on Instruction and Attention 161
6.2.3(b) Impact of the Intensity of the Light on Children's Psychosocial Characteristic 161
6.2.4 Classroom Colour Choice 162

6.2.4(a) Significance of Colour Developed Linear Equation on Instruction and Attention 163
6.2.4(b) Impact of Type of the Colour on Children's Psychosocial Characteristic 164
6.2.5 Temperature in the Classroom 165
6.2.5(a) Significance of Temperature Developed Linear Equation on Instruction and Attention 166
6.2.5(b) Impact of Classroom Temperature on Children's Psychosocial Characteristic 167
6.2.6 Comparison of Performance Between Children with ASD and Normal Children 168
6.3 Development of Ergonomic Design Recommendation of Learning Environment 170
6.3.1 Pre-Requisite for Using the Recommendation 171

CHAPTER 7 CONCLUSION AND RECOMMENDATION 173

7.1 Conclusion 173
7.2 Recommendation 175

REFERENCES 176

APPENDICES

LIST OF TABLES

		Page
Table 3.1	Centre information	37
Table 3.2	General participant's information on ASD children	37
Table 3.3	Question for interview	38
Table 3.4	Classroom observation for physical environment sheet	40
Table 3.5	Classroom observation for learning environment sheet	40
Table 3.6	Current classroom environment	42
Table 3.7	Setting decibel for the experiment	43
Table 3.8	Frequency (Hertz)	45
Table 3.9	Intensity of light	46
Table 3.10	Colour	47
Table 3.11	Temperature	48
Table 3.12	Codes assigned to on-task behaviour observation	50
Table 4.1	Response from the teacher	52
Table 4.2	Descriptive statistic on observation of the physical environment (Observer1)	54
Table 4.3	Descriptive statistic on observation of the physical environment (Observer2)	54
Table 4.4	Descriptive statistic on observation of the learning process (Observer1)	55
Table 4.5	Descriptive statistic on observation of the learning process (Observer2)	56
Table 4.6	Descriptive statistics of response to instruction and focused attention for typical children in the current classroom environment	57
Table 4.7	Descriptive statistics of emotional and behavioural for current classroom environment	57
Table 4.8	Descriptive statistic for the time taken for a response to instruction with and without headphone for decibel	58
Table 4.9	Descriptive statistic for time to complete the task with and without headphone for decibel	58

Table 4.10	Descriptive statistic for behaviour response during the task without and with the headphone for decibel	59
Table 4.11	Descriptive statistic for time to respond to instruction with and without headphone for frequency	60
Table 4.12	Descriptive statistic for time to complete the task with and without headphone for frequency	60
Table 4.13	Descriptive statistic for behaviour response without and with the headphone for frequency	61
Table 4.14	Descriptive statistics average time taken of response to instruction and focused attention for tested conditions	62
Table 4.15	Descriptive statistics of emotional and behavioural for tested conditions	62
Table 4.16	Descriptive statistics time taken of response to instruction and focused attention for tested colour	63
Table 4.17	Descriptive statistics of emotional and behavioural for tested colours	64
Table 4.18	Descriptive statistics of response to instruction and focused attention for tested temperature	65
Table 4.19	Descriptive statistics of emotional and behavioural for tested temperatures	65
Table 5.1	Thematic analysis on the impact of sound decibel	69
Table 5.2	Thematic analysis on the impact of sound frequency	70
Table 5.3	Thematic analysis on the impact of intensity of the light	71
Table 5.4	Thematic analysis on the impact of the type of colour	71
Table 5.5	Thematic analysis on the impact of temperature	72
Table 5.6	Agreement between two observers on the physical environment	73
Table 5.7	Agreement between two observers on the learning environment	74
Table 5.8	Thematic analysis of classroom observation for the physical environment	76
Table 5.9	Thematic analysis of classroom observation for the learning environment	77
Table 5.10	Normality test of response to an instruction for each decibel without headphone	91

Table 5.11	Normality test of time to complete the task for each decibel without headphone	93
Table 5.12	Comparison of the performance in sound decibel for children with ASD and normal children	95
Table 5.13	Response of positive behaviour during the task without and with a headphone for sound loudness	95
Table 5.14	Response of negative behaviour during the task without and with a headphone for decibel	97
Table 5.15	Normality test of response totheinstruction for each sound frequency without headphone	109
Table 5.16	Normality test of time to complete the task for each sound frequency without headphone	110
Table 5.17	Comparison of the performance in sound frequency for children with ASD and normal children	111
Table 5.18	Response of positive behaviour during the task without and with a headphone for sound frequency	112
Table 5.19	Response of negative behaviour during the task without and with a headphone for sound frequency	113
Table 5.20	Identification of distribution of respond to the instruction for each condition	117
Table 5.21	Identification of distribution of the time to complete the task for each condition	119
Table 5.22	Normality test of response to the instruction for each illuminance	121
Table 5.23	Normality test of time to complete the task for each illuminance	122
Table 5.24	Comparison of the performance in the intensity of light for children with ASD and normal children	124
Table 5.25	Response of positive behaviour during the task fortheintensity of the light	125
Table 5.26	Response of negative behaviour during the task for the intensity of the light	126
Table 5.27	Identification of distribution of responding to the instruction for each condition	130
Table 5.29	Identification of distribution of time to complete the task for each type of colour	131

Table 5.30	Normality test of response to the instruction for each type of colour	133
Table 5.31	Normality test of time to complete the task for each type of colour	134
Table 5.32	Comparison of the performance in colour with ASD and normal children	136
Table 5.33	Response of positive behaviour during the task forthetype of colour	136
Table 5.34	Response of negative behaviour during the task for the type of colour	137
Table 5.35	Identification of distribution of responding to the instruction for each temperature	141
Table 5.36	Identification of distribution of time to complete the task for each temperature	142
Table 5.37	Normality test of response to an instruction for each temperature	144
Table 5.38	Normality test of time to complete the task for each temperature	145
Table 5.39	Comparison of the performance in colour with ASD and normal children	147
Table 5.40	Response of positive behaviour during the task for each temperature	147
Table 5.41	Response of negative behaviour during the task for each temperature	148
Table 6.1	Ergonomic design guideline for classroom	170

LIST OF FIGURES

		Page
Figure 3.1	Process flow of the methodology	35
Figure 3.2	Illustration of the classroom for experimental work	42
Figure 3.3	Illustration of the classroom for the experimental work. X represents positions of signal sound emitted from the speaker in dB. Star represents the position of the participant. Plus represent the position of the radio to emit the background noise. Triangle represents the camera to record the activity	45
Figure 3.4	Illustration of the classroom for experimental work. X represents positions to place the whiteboard. Triangle represents the camera to record the activity	47
Figure 5.1	Analysis data process flow	67
Figure 5.2	Similarity distributions of the response to the instruction without headphone at 40dB of background sound decibel	79
Figure 5.3	Similarity distributions of the response to the instruction with headphone at 40dB of background sound decibel	80
Figure 5.4	Similarity distributions to complete the task without headphone at 40dB of background sound decibel	81
Figure 5.5	Similarity distributions to complete the task with headphone at 40dB of background sound decibel	82
Figure 5.6	Data distribution for the time taken for a response to the instruction without and with a headphone for all decibels	83
Figure 5.7	Data distribution for the time to complete the task without and with a headphone for all decibels	84
Figure 5.16	Scatter plot for the relationship between response to the instruction and time to complete the task without headphone (decibel)	88
Figure 5.17	Scatter plot for the relationship between response to the instruction and time to complete the task attention with headphone	89
Figure 5.18	Similarity distributions of the response to instruction without headphone at 500Hz of background sound frequency	98

Figure 5.19	Similarity distributions of the response to instruction with headphone at 500Hz of background sound frequency	99
Figure 5.20	Similarity distributions to complete the task without headphone at 500Hz of background sound frequency	100
Figure 5.21	Similarity distributions to complete the task with headphone at 500Hz of background sound frequency.	100
Figure 5.22	Data distribution for the average time of response to instruction without and with a headphone for all sound frequency	102
Figure 5.23	Data distribution for the average time to complete the task without and with a headphone for all sound frequency	102
Figure 5.32	Scatter plot for the relationship between response to instruction and time to complete the task without headphone for sound frequency	106
Figure 5.33	Scatter plot for the relationship between response to instruction and time to complete the task withaheadphone for sound frequency	107
Figure 5.34	Similarity distributions respond to the instruction at the condition of 30lx	115
Figure 5.35	Similarity distributions time to complete the task at the condition of 30lx	115
Figure 5.36	Data distribution for the average time of response to the instruction and completion of the task for all intensity of light	117
Figure 5.37	Scatter plot for the relationship between response to instruction and time to complete the task at all light condition.	120
Figure 5.38	Similarity distributions of the response to the instruction at the white colour of classroom background	127
Figure 5.39	Similarity distributions time to complete the task at the condition of white colour	128
Figure 5.40	Data distribution for the average time of response to instruction and completion of the task for all colours	129
Figure 5.41	Scatter plot for the relationship between response to instruction and time to complete the task at all types of colour	132
Figure 5.42	Similarity distributions of the respond to the instructionat 20^0C	139
Figure 5.43	Similarity distributions time to complete the task at 20^0C	140

Figure 5.44 Data distribution for the average time of responding to the instruction and completion of the task for all temperatures 141
Figure 5.45 Scatter plot for the relationship between response to instruction and time to complete the task at all temperature 143

LIST OF ABBREVIATIONS

ASD	Autism spectrum disorder
FM	Frequency modulation
Q-Q	Quantile-quantile

LIST OF APPENDICES

Appendix 1	Sample of details information for mental age verification
Appendix 2	Equipment for experiment sound decibel
Appendix 3	Equipment for experiment intensity of light
Appendix 4	Setting the experiment for the type of colour environment
Appendix 5	Setting experiment in current classroom environment

CADANGAN PEMBANGUNAN FAKTOR-FAKTOR PERSEKITARAN DALAM REKA BENTUK BILIK DARJAH UNTUK KANAK-KANAK AUTISMA

ABSTRAK

Persekitaran pembelajaran di pusat kanak-kanak yang mempunyai gangguan autisma direka berdasarkan kanak-kanak tipikal yang sihat. Idealnya, persekitaran pembelajaran untuk kanak-kanak ini perlu mengambilkira keperluan berfungsi, emosi dan tingkah laku mereka yang unik. Reka bentuk yang tidak sesuai akan menjadikan pembelajaran kurang berkesan disebabkan oleh gangguan, keadaan yang tidak selesa dan berlakunya tingkah laku yang tidak menyenangkan. Oleh itu, intervensi ergonomik perlu diperkenalkan. Kajian ini mengkaji kesan lima faktor persekitaran fizikal bilik darjah terhadap pemahaman arahan dan juga tahap tumpuan kanak-kanak autism di dalam bilik darjah. Pemerhatian terhadap tingkah laku, emosi dan kognitif kanak-kanak autisma dijalankan untuk setiap faktor persekitaran fizikal bilik darjah. Mereka menjalani dua jenis eksperimen bagi setiap faktor persekitaran fizikal. Kaedah kualitatif dan kuantitatif digunakan bagi kajian ini. Dua eksperimen telah dijalankan untuk mengambil masa bagi tindakbalas terhadap arahan (ukuran bagi pemahaman) dan masa yang diambil untuk menyelesaikan tugas (ukuran tahap tumpuan). Eksperimen dijalankan dengan sebelas orang kanak-kanak autisma berumur di antara lima hingga sembilan tahun tetapi usia mental mereka adalah antara empat hingga lima tahun. Manakala kanak-kanak normal berusia empat hingga lima tahun digunakan sebagai kumpulan perbandingan bagi keputusan yang diperolehi. Faktor persekitaran fizikal yang dikaji adalah bunyi, frekuensi, keamatan cahaya, jenis-jenis

warna dan suhu dalam kelas. Bagi kanak-kanak autisma, lima tahap bagi setiap faktor dijalankan bagi setiap eksperimen. Pendekatan pra-ujikaji (keadaan semasa) dan pasca-ujikaji (keadaan intervensi) digunakan tetapi untuk faktor bunyi sahaja. Faktor-faktor fizikal yang lain diuji menggunakan kaedah eksperimen tipikal. Kaedah pemerhatian dijalankan untuk kesemua faktor-faktor fizikal bagi mengkaji tindak balas tingkah laku, emosi dan kognitif kanak-kanak autisma. Analisis dilakukan dengan menggunakan kaedah analisa statistik bagi mendapatkan kesan faktor-faktor persekitaran terhadap tindak balas arahan dan tahap tumpuan. Analisis kualitatif dilaksanakan untuk menilai tindak balas terhadap tingkah laku emosi dan kognitif. Keputusan kajian menunjukkan bahawa keadaan intervensi menyebabkan peningkatan yang ketara dalam tahap pemahaman dan tumpuan dalam melaksanakan tugas bagi kanak-kanak autisma berbanding dengan keadaan persekitaran semasa. Nilai optimum yang diperolehi ini dicadangkan dalam reka bentuk persekitaran pembelajaran khusus untuk kanak-kanak autisma di Malaysia.

DEVELOPMENT OF ENVIRONMENTAL FACTORS IN CLASSOOM DESIGN RECOMMENDATION FOR CHILDREN WITH AUTISM SPECTRUM DISORDER

ABSTRACT

Typical learning environment at a centre for children with autism spectrum disorder (ASD) are designed based on healthy normal children. Ideally, the learning environment for these children should complement their unique functional, emotional and behavioural requirements as inappropriateness will cause distraction, uncomfortable condition and occurrence of undesirable behaviour. Hence ergonomic intervention needs to be introduced. This research study the impact of five different factors of the physical classroom environment on children understanding instructions and their attention span in the classroom. Observation on behaviour, emotion and cognitive of those children carried out for each physical classroom environment factor. They were subjected to two types of experiments for each physical environment factors. Qualitative and quantitative methods were carried out. Two experiments were conducted to measure individual's response time to instruction (speed of understanding) and time to complete a task (a measurement of attention span). The experiment deployed eleven children with ASD aged between five to nine years old. Their mental age is between four to five years. A control group with normal children age four to five years was also used for comparison. The physical environment factors being studied are sound decibel, sound frequency, the intensity of the light intensity, type of colour and temperature within the classroom. For the children with ASD, five different levels of each factor were set up for each

experiment. Pre-tests (current condition) and post-tests (intervention condition) approach are only applied for sound. The other physical factors were done using typical experimental techniques. Observation method was deployed in all physical factors to study the children with ASD behavioural, emotional and cognitive reaction. Statistical analysis tools are used to quantitatively evaluate the effect of environmental factors on the response time and attention span. Qualitative analysis tools were executed to assess the behavioural, emotional and cognitive reaction. The finding showed that ergonomic intervention caused significant improvement in the speed of understanding and attention span during task performing for the children with ASD compared to their current learning environment. Restlessness and uncomfortable behaviour had also decreased significantly within an optimum range of each physical factor. However, their performance is still slower than normal children. Those optimal values of the environmental factor are recommended in the design of the learning environment specifically for children with ASD in Malaysia.

CHAPTER 1

INTRODUCTION

1.1 Background

This chapter begins with the characteristics of the children with autism followed by appropriate physical and psychosocial learning environment in an existing learning centre for autism. These two factors stimulate the intention of conducting this research to develop the ergonomic guideline for a learning environment that fits with these special children.

Autism spectrum disorder (ASD) is first generally diagnosed in childhood and differs from one person to another in severity and combinations of symptoms. The specific symptoms and the severity are highly variable among different individuals because it has a spectrum, a capability or functionality and a wide range of conditions (Baird et al., 2003; Idris et al., 2014). There are three main symptoms of disabilities in children with ASD; issues with social interaction, problems with communication and repetitive behaviour and interests (Baird et al., 2003; Engeland & Buitelaar, 2000; Radunovich & Kochert, 2011). Children with ASD often faced these characteristics with some are mildly impaired by their symptoms, while others are severely disabled. Because of these characteristics, young ASD children show less interest and awareness of other peers while older children do not have the appropriate peers, isolated from the community and easily bullied. It also affects their learning process, especially in formal education.

A large amount of the student's time is spent sitting in a classroom during learning activities. This place is where they will learn various skills deemed necessary and proper for them to achieve success in a global society. Learning environments are

extremely important for students and also for teachers. It will affect the emotion, behaviour and how well a student receives the instruction and gives the attention. Also, it is a second teacher for any student and may provide a different concept of learning based on the first impression. Creating a positive and fit learning environment for the students is essential for success in the classroom. It requires a diligent effort to produce a good learning environment for students with special needs where the physical and psychophysical environments emphasized.

Classroom design often feels cramped and undersized cause the limitation of the movement and increased stress level and distractions (Arnaiz et al., 2011; McAllister & MaGuire, 2012; Miller & Cunningham, 2015). These distractions are due to lack of consideration in the physical environment for children with ASD. A distraction-free and structured environment is the most helpful strategies for children with ASD who can easily be distracted and overwhelmed by too much input and also have visual perceptual difficulties (Autism Queensland Inc, 2016).

A deeper awareness of physical environment characteristics must be acquired by designers or educators to create a good fit learning environment for children with ASD in the classroom (Woronko & Killoran, 2011). The background sound levels supply a significant impact to the learning since it will disturb in concentration, increase stress and causing undesirable behaviour due to sensory overload (Arnaiz et al., 2011; Woronko & Killoran, 2011). Lighting aspect also crucial because it involves the ability of student to see clearly in the learning activities (Amirul et al., 2013; Thahir, 2017; Winterbottom & Wilkins, 2009) while in the previous studies by Gaines & Curry, (2011) and Thahir, (2017) stated that colour affects the way student perceive a space and influences their psychological responses to include changes in mood and