Proceeding Book

GO GREEN2015
INTERNATIONAL POSTGRADUATE CONFERENCE ON GLOBAL GREEN ISSUES

"Incorporating Green Approaches for Resilient Future"

7 - 8 OCTOBER 2015 | Dewan Kuliah Al-Khawarizmi

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9789675741357

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ISBN 978 – 967 -5741-35-7
eISBN 978 – 967 -5741-36-4

ORGANISED BY

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Environmental Psychology: An Analysis on Lighting Efficiency of the Architecture Studio in UiTM Perak

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Abstract

Lighting is one of the key elements in any space and building infrastructure. Good design for a space in the building requires sufficient light that contribute to the efficiency of an activity. The correct method allows natural light to transmit, reduce heat and glare in providing a conducive learning environment. Light plays a significant influence to the quality of space and contribute focus of the students in an architecture studio. Previous research has shown that emotions, behavior and mood of the students were also controlled by the effect of light. The operations of artificial lighting that have been used most of the time in an architecture studio during day and night may create lavishness and inadequacy at the same time. Therefore, this paper focuses to identify the quality of lighting of the architecture studio in UiTM Seri Iskandar, in order to instill a creative learning environment. The methodology of this analysis is providing lighting measurement by using the equipment named LM-8100, using a questionnaire in gauging the lighting comfort level from students' perspective. Findings from the analysis will determine the level of lighting settings in accordance to the Malaysian Code of Practice on Indoor Air Quality standards. The result will identify the students' creative performance on the learning activities in their studio.

Keywords: Lighting, Architecture, Architecture Studio, Indoor environmental quality, creative learning

1.0 Introduction

Studio is a place where student spend most of the time of a day in order to complete a design project. Studio is the most important space in architecture education where student interacts, struggling on projects, sharing information and learning from peers (Ban, 2015). Studio learning involves task lighting which provide high illumination for a specific work such as drawing and detailing. A long hour's work need better task lighting to avoid physical discomfort such as fatigue and learning inefficiency (M.Winterbottom&M.Wilkins, 2009).

Council of Architectural Education Malaysia (CAEM) was formed under the supports LembagaArkitek Malaysia (LAM) to regulate all matters relating to architectural education (LAM, 2015). The CAEM mission is to ensure excellence in architecture education in accordance to the world standard. Under Policy and Procedure for Accreditation of Architectural Programmes, CAEM advises allarchitecture schools to have an allocation of 2.5 sqm work space per student in studio. Apart from the private work space, institutions shall also provide space & facilities for presentation & exhibition of student's works, laboratories, model making workshop, facilities for research, information and data exchange for new technologies to support effective learning environment (LAM, 2015). In 2012 and 2014 respectively, architecture program in UiTM Perak has successfully been accredited to be a recognized architecture school in Malaysia and theUK(RIBA,2015). However, on a lighting issue, there is no requirement on the illuminance level for a studio space. Based on previous study, insufficient lighting setting in an architecture studio can affect student ability to perceive visual stimuli in a short term and vision impair in a long run (A.Che-Ani, N.Tawil&A.Musa, 2012).

1.1.Mood and Performances

As the students spend most of their time in the studio than a classroom, the lighting must be designed to fulfill not only thevisual task activities but also to meet the other interpersonal and physiological needs as far as possible. This is in agreement with a pervious study that higher illuminance during daytime can led to a greater alertness (J.Phipps-Nelson, J.Redman, &D.Dijk, 2003). Althoughan individual's mood and performance can be increased

in naturally lit environment (Z.Gou,S.Lau, &F.Qian, 2013), an optimal indoor environment with higher illuminance level, lighting uniformity, absent of glare and lighting ambience can contribute to high performance and motivate workers (J.Veitch&J.Geerts, 2005). Study done by Liberman (1994) also stated that light is one of main factor in maintaining health and poor lighting condition can influence a person's mood and energy. Lighting also has an important role in revealing the form of an interior, especially in buildings of high architectural merit (Bean. R, 2004). The amount of light required for a particular task may vary from individual to individual, depending on upon their visual capacity. For the example, age or eyesight, it is possible to determine a lighting level that will meet the requirements of the most people.

1.2 Indoor Environmental Quality

Previous experimental investigation on indoor environmental quality of the architecture studio in UKM by A.Che-Ani, N.Tawil&A.Musa, (2012) has shown the lighting setting is not within the range of Malaysian Standard MS1525:2007. This research is to study with reference to the earlier work concerning the lighting performance of the architecture studio in UiTMPerak.It is necessary to investigate does the lighting provided in the year three UiTM Seri Iskandar architecture studio are within the scope of Malaysian Code of Practice on Indoor Air Quality.Since each student in the studio is well equipped with a drawing and a working table, main activity happen in the studio will involved reading, writing and drawing. Based on the Malaysian Code of Practice on Indoor Air Quality (Figure 1.1), the nearest luminaire reference to architecture studio will be drawing office which the luminaire level is at the range of 300-400lux.

Task and examples of applications	Illuminance [Lux]
Lighting to infrequently used areas	
Minium service illuminance	20
Interiror walkway and car-park	50
Hotel bedroom	100
LIft interior	100
Corridor, passageways, stairs	100
Escalator, travellator	150
Entrance and exit	100
Staff changing room, cloak room, lavatories, stores	100
Entrance hall, lobbies, waiting room	100
Inquiry desk	300
Gate house	200
Lighting for working interiors	
Inrequent reading and writing	200
General offices, shops and stores, reading and writing	300 - 400
Drawing office	300 – 400
Restaurant, cafeteria	200
Kitchen	150 – 300
Lounge	150
Bathroom	150
Toilet	100
Bedroom	100
Classroom, library	300 – 500
Shop, supermarket, department store	200 – 750
Museum and gallery	300
Localised lighting for exacting task	
Proof reading	500
Exacting drawing	1000
Detailed and precise work	2000

Figures 1.1 Malaysian Standard (MS) 1525: 2007 "Code of Practice on Energy Efficiency and Use of Renewable Energy for Non-Residential Building

2.0 Tools and Methods

The experiment was conducted by collecting the lighting data at the third year (semester 5) architecture studio located at ground floor, JabatanSenibina Annex 1 building, UiTM Perak. The studio is 11.85 meter x 11.85 meter with 140.422sqm that accommodate approximately 30 students for that particular semester. The lighting level reading is measured by using equipment named LM-8100. Lighting reading is taken at 9 specific location located as shown in figure 2.1 and the reading taken for eight hours for two consecutive days. Based on the reflective ceiling plan, there are 17 units of typical fluorescent with reflector with each unit contains two fluorescent lamps.

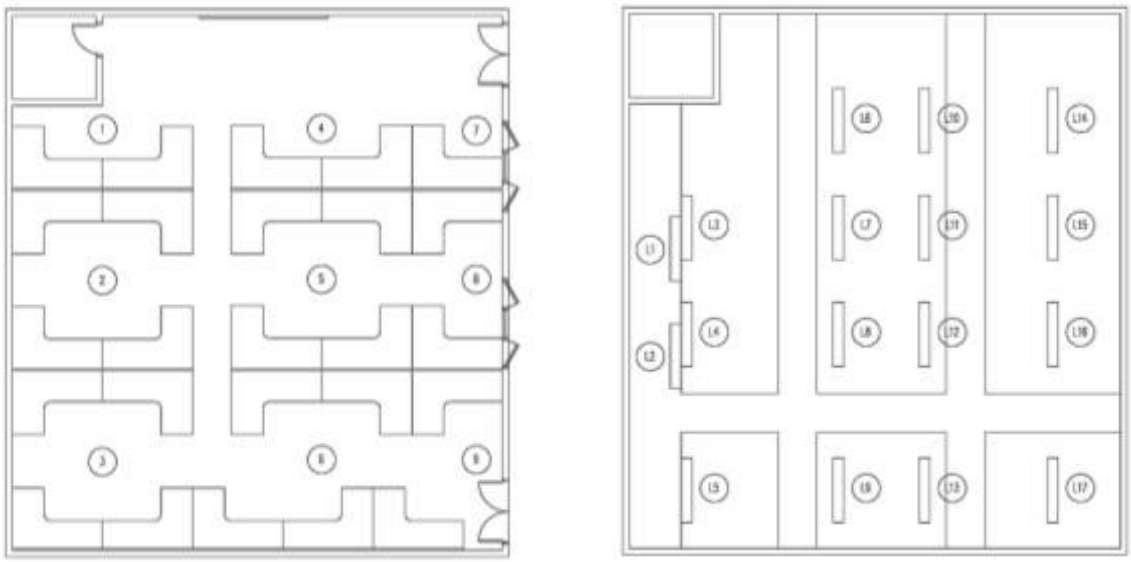

Figure 2.1 Floor plan(left) and reflected ceiling plan (right) of the year three architecture studio in UiTM Seri Iskandar

3.0 Results and Discussions

3.1 Lighting Analysis

Table 1 show the tabulate result of the lighting analysis result and figure 3.2 shows the chart illuminance in lux against time on day onewhilefigure3.3 shows on day two. The data which is highlighted with yellow color is recorded as the lowest reading during both day and the data which is highlighted with red color is recorded the highest illuminance reading at point 1which is 150. The lowest illuminance reading recorded is 110 lux on day one at time 1400. Meanwhile at point 8, the highest reading recorded is on day two which is 468 lux at 1600. The readings maintain in a range of 400+luxonboth dayfrom1400 until 1600,howeverdecreases after 1700. Meanwhile, reading at point 6 which is highlighted in orange color, maintain in the range of 300+ lux except for day one the reading is 217 at 2100.While the rest of the area, remain in general reading within the range 150 lux to 287 luxand the readings are below the recommended illuminance level set by Malaysian Standard as shown in figure 1.1.

From the findings, point 1 show the lowest illuminance reading. Based on the floor plans (figure 2.1), point 1 is located far from the windows and received the least of natural lighting. Moreover, there are no luminaire provided at this area (figure 2.1). As a result, point 1 area give insufficient lighting to the workstations provided. Points 8 however experience the highest reading from 1400 to 1600 since it is located near the window. Point 8 workstation benefits both naturally and artificial lit environments but the reading decreases significantly from the 1700 onwards as a matter of decrease source of daylight. At point 6, theoverallilluminance reading on both day achieved the appropriate range of illuminance level. The illuminance range is between 300 lux to 386 lux which has fulfill the requirement of ideal illuminance for studio space based on the Malaysian Standard in figure 1.1.

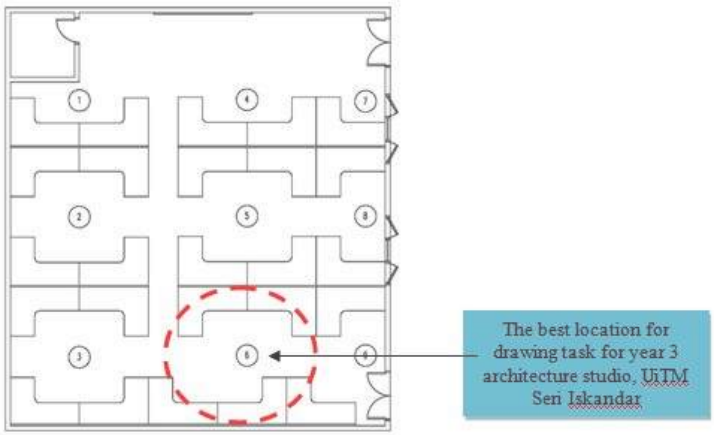

Figure 3.1The Best Position in the Studio (Point 6)

Time	Location	Illuminations		Time	Illuminations		Time	Illuminations		Time	Illuminations	
		Day 1	Day 2		Day 1	Day 2		Day 1	Day 2		Day 1	Day 2
1400	Point 1	***110***	129	1600	131	139	1800	138	***150***	2000	130	133
	Point 2	313	305		245	252		230	240		241	248
	Point 3	245	250		216	227		236	237		215	217
	Point 4	253	266		217	237		235	235		219	238
	Point 5	315	326		287	297		274	283		268	270
	Point 6	***395***	386		315	313		336	340		300	353
	Point 7	240	257		229	239		179	180		150	150
	Point 8	421	423		453	***468***		274	290		165	169
	Point 9	253	260		238	257		250	253		240	257
1500	Point 1	129	132	1700	129	129	1900	146	***150***	2100	129	120
	Point 2	251	250		272	281		243	240		232	226
	Point 3	233	255		220	227		228	233		210	236
	Point 4	245	252		237	238		220	223		220	223
	Point 5	273	295		283	289		270	276		257	257
	Point 6	344	344		347	359		300	***300***		217	***334***
	Point 7	213	224		209	215		158	158		148	148
	Point 8	400	***400***		302	***380***		187	190		160	177
	Point 9	263	267		230	246		250	252		236	251

Table 1:Lighting data on day one and day two.

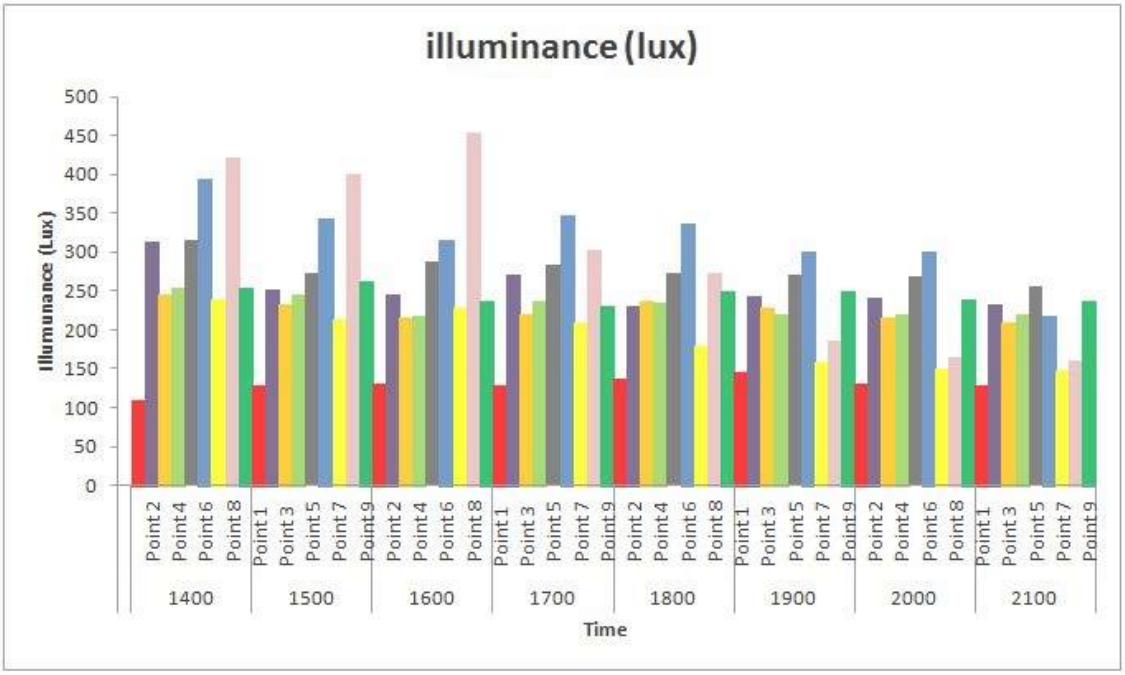

Figure 3.2Illuminance in lux against time (Day 1)

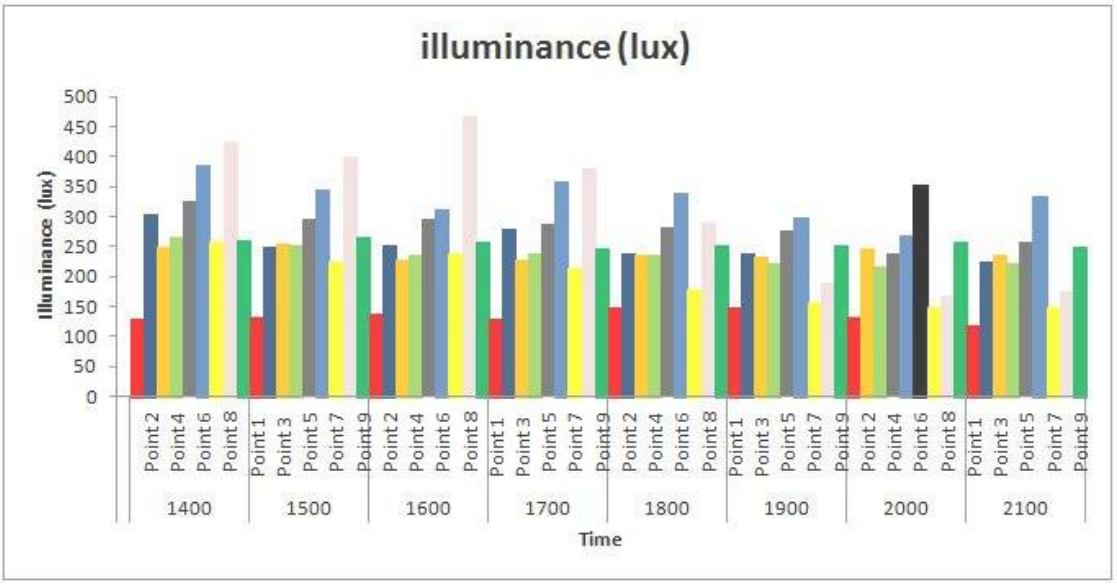

Figure 3.3Illuminance in lux against time (Day 2)

3.2Questionaire Survey

Questionnaire was distributed to measure the level of studio occupancy, condusive and visual comfort. The three parameters were used to identify student perspective on studio environment quality. These three criteria evaluate student's response whether current studio environment can instills critical thinking in order to produce better design project. Figure 3.4 shows from studio occupancy, most of the third year architecture student feel more comfortable to do their design drawings and assignments at home or hostel rather in the studio. Most of them find the studio is not very condusive and cozy to work with due to the internal layout and security purposes. Meanwhile, majority of the student feel the lighting level in the studio is acceptable and convenient.

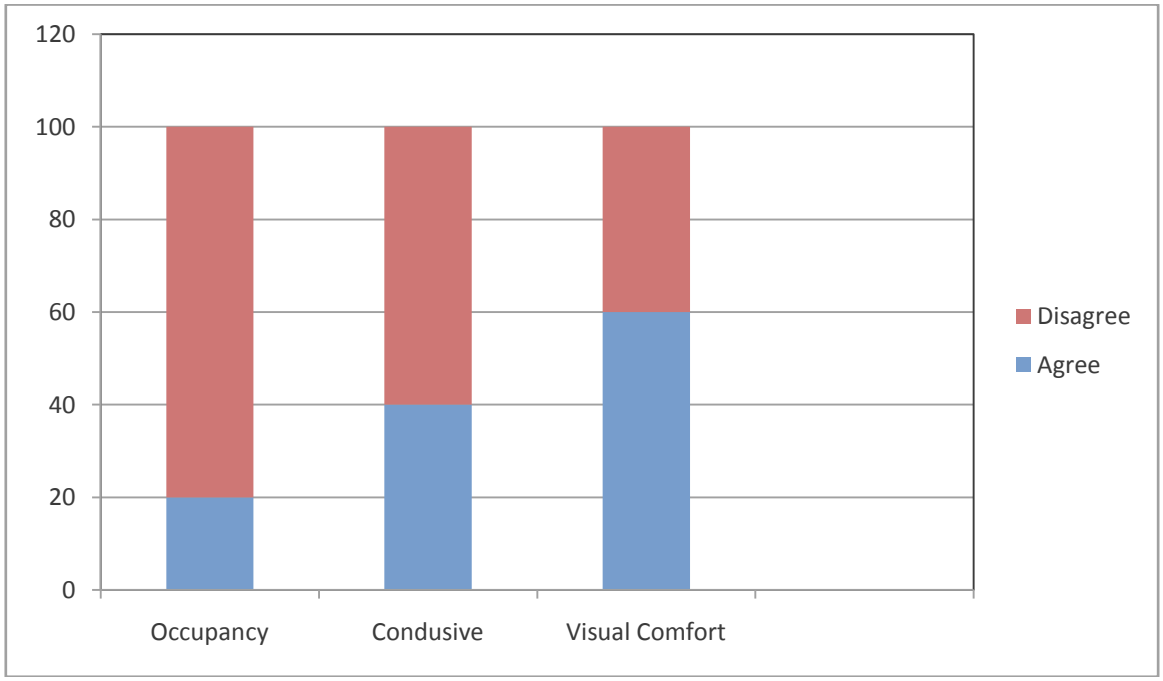

Figure 3.4Questionnairescores chart for third year architecture students

4.0 Conclusion and Recommendation

There is evidence that lighting is important in student's learning. From the research has shown that illuminance level in the architecture studio is insufficient and not in the range level as according to Malaysian:Standards 1525:2007. The finding shows that the lighting is not well-distributed to the whole studio. Most of the workstations in the studio are actually received insufficient amount of light which is not suitable for drafting task. According to the students responding, the current studio environment is not condusive and appears monotonous. Poor lighting may contribute to their lost of interest in working in the studio. The suitable lighting arrangement shall also be considered in designing future and upgrading current architecture studio.According to lumen method calculation, design of a uniform generallighting scheme in a space can determine the number of luminaires needed to realize the illuminance (lux) required in the room(P.Tregenze&D.Loe, 2004). This method can be applied only in square or rectangular rooms with a regular array of luminaires such as the current study of the architecture studio. With this method we can avoid lavishness and inadequacy in lighting design in the future.

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