How Do Artificial Lighting Affects Students In Studying Environment? : A Case Study of the Design Studio, Housing Building and Planning, Universiti Sains Malaysia

Safial Aqbar Zakaria and Azizi Bahauddin
School of Housing, Building and Planning, Universiti Sains Malaysia

ARTICLE INFO
Article history: Received 12 October 2014
Received in revised form 26 December 2014
Accepted 1 January 2015
Available online 17 February 2015

Keywords:
Lighting, artificial lighting, natural, Lighting, design students' performance

ABSTRACT
Light is essential in aiding students to perform and accomplish his or her task. Different colour, temperature, and level of brightness in lighting incur varying effects positively and negatively on students’ ability to function in a learning environment. A number of studies have been conducted to prove the relation on lightings and its effects on students' achievements and their cognitive abilities under specific lighting condition. This research studies and analyse the effects of different types of lightings in the design studio of the Housing, Building and Planning, Universiti Sains Malaysia, Penang. This study utilised visual data, and providing an overview from previous research and observation to attain data. This particular area of study is vital because the results derived from these researches will provide students with a better, improved and more pleasing learning environment for all students. Moreover, installing poor lighting would affect students' health due to the long exposure under said poor lighting. These studies have been performed in order to create an environment that will contribute in ameliorating the learning space. Correlatively, this would assist students in their task performance and overall achievements. This study revealed the cool white fluorescent lighting used in all the design studio affects students' capabilities to learn. It was based on the literature and research that has been done previously. This research has discovered that the most appropriate lighting to enhance students' learning aptitude is natural lighting. It is recommended that luminance level be fine-tuned; adjust the colour temperature of the lighting to simulate daylighting in the studio that are not able to install proper orientation of windows; and reducing the use of the bright and cool white fluorescent lighting.

INTRODUCTION
Mott has analysed that an artificial lighting system set under four different settings devised for the classroom environment have different impact on students. The settings involved were 'Focus' (6000K), 'Energy' (12000K), 'Calm' (2900K), and 'Normal' (3500K) [1]. A subsequent object of the study is to assess the effect the lighting system under 'Focus' setting has on students’ concentration and motivation. The findings of this study proved that increasing the quality of artificial light affected students’ Oral Reading Fluency (ORF) achievement in a positive manner. [1] The use of focus lighting system as part of an instructional technology enhanced the learning experience and reading performance of the experimental group compared to the control group. As for the levels of motivation and concentration, it increased for the experimental group and decreased for the control group. Tanner made a comparison between student achievement with three school design classifications, which includes movement and circulation, day lighting and views to investigate the effects of school design on student outcomes [2]. The aim was to identify and examine school designs that might affect student results. A secondary purpose to this study was to produce a forthright method of research that could be simulated by students in the field of educational planning and architecture [2]. After studying the patterns of day lighting, Tanner stated that rooms should face south to allow exposure of the natural light in the exception of the art rooms which should face north to ensure consistent natural light entry [2]. This is due to a conclusive study conducted by the Heschong Mahone Group, which ascertained that natural lighting cause a substantial boost in
student achievement [3]. In a study by Kuller and Lindsten in 1992, medical doctors stated a need for window for the study [4]. Contrary to popular belief that windows are a distraction and disrupt the learning process, they prove to be a necessary relief for students. This form of relief activity is known as window gazing and requires less focus and attention compared to drawing or doodling [4]. Thus it is easier to refocus students’ attention back on the on-going lecture.

The finding of this study proved that day lighting, quality of lighting and color temperature significantly proved to influence students reading vocabulary, reading comprehension, Language Arts, Mathematics, and Science. Varying settings of artificial in classrooms with different effects begs the question of how designers and constituents in the area of education choose lighting for the best experience in teaching and learning. It is valuable to educational leaders who may use the findings to assess their current school facilities and decide which area of the school requires improvements [5]. These findings are also vital in helping planners guide architects in the design and construction of new educational facilities.

Methodology:
This research studies and analyse the effects of artificial and natural lighting in the design studio (Interior Design Studio 200 and Studio 100) of the Housing, Building and Planning, Univerisiti Sains Malaysia, Penang. This study utilised visual data and personal observation and providing an overview from previous research. This particular area of study is vital because the findings derived from these researches will provide students with a better, improved and more pleasing learning environment for all students.

RESULTS AND DISCUSSIONS

Two classrooms at Univerisiti Sains Malaysia are used as the study site in this particular methodology. Interior Design Studio 200 (Figure 1) and Studio 100 are located beside the Conference Room Building. These two classrooms employ two different types of lightings. Interior Design Studio 200 has been installed with fluorescent lamp unit and the classroom is covered by curtains, whereas Studio 100 contains the presence of both fluorescent light and daylighting.

![Fig. 1: The use of curtains and cool white fluorescent lamp in Interior Design Studio 200.](image)

Interior Design Studio 200 is a comparatively smaller classroom than Studio 100. It solely uses cool white fluorescent lighting in the classroom without any presence of daylight. The use of fluorescent lighting in the classroom offers a cool colour temperature to the entire space. The cool white fluorescent lighting provides the room bright light that is typically presumed to be ideal for work or study settings. The lesson officially begun at 9.30 a.m. after the entire sample group has arrived and attendance has been taken. During the first hour, target population paid rapt attention to the lecture. The students were taking notes while listening to the lecturer. However, after the first hour, students were seen distracted from the lesson. Some of the students started conversing quietly with each other while a few were working on other works on their laptops and drawings. Halfway into the lesson, the students were given a 15 minutes break time. After the class resumes, majority of the students busied themselves with other activities and involved in various undertakings. These include conversing with each other, visiting social networks on their laptops or smartphones and snoozing. Throughout the observation session, the researcher found that the target population started to get distracted an hour into the
lesson. The cause of this could be due to the effects of fluorescent lighting. Cool white fluorescent lighting prompts bodily stress, hyperactivity, fatigue, irritability and attention deficits, which eventually lead to a decline in learning performance [6]. Most school, colleges and universities employ fluorescent lamps in the classrooms because of its brightness, and cost and energy efficiency. They believe the bright white light would better aid students in their learning endeavours. Alas, long period of exposure under the fluorescents may affect the students’ health [7].

In Studio 100, the faculty installed fluorescent lights. Likewise on the entire right and left side of the room, there are row of windows that permits the access of daylighting. This classroom offers the occupants of the space with more lighting options with its addition of daylighting and fluorescent light. Depending on the types of lecture that transpires in the classroom, the user can choose the type of lighting most appropriate for their discourse. The presence of daylighting enhances student performance and overall achievement as concluded by a study conducted by Heschong Mahone Group [3]. Most have always presumed that the presence of windows is a distraction to the students as their minds and sight may be attracted to the scenes occurring outside of the windows. However, window gazing is a necessary respite for students because it is easier to return students’ attention to the lecture compared to other activities; doodling or drawing. In addition, the activity of window gazing may help the students revitalize their mind so they can better absorb and understand the lessons [3].

The researcher discovered that cool white fluorescent lighting proves to be detrimental to the learning process of the students. The most apposite lighting, to improve students’ learning capabilities, would be natural lighting.

Summary:
The main objective of this research is to study and analyse the effects of various types of lighting in the studying environment. The researcher examined the types of lighting that might affect a students’ aptitude in learning in the classroom. The researcher also validated that different luminance level produces different effects on students. The lighting in the classrooms do not strain the eyes or affect the vision of the students. However, based on the previous research and personal observation students’ concentration to an on going lecture is affected under inappropriate lightings.

The following recommendations are offered as potential ways to improve the learning environment in the classroom.
1. It is highly recommended that the luminance level of the lighting in the classroom be adjusted to a setting that augment students’ learning proficiency.
2. Based on the observations, the researcher suggests that the classrooms should minimise the use of curtains or vertical blind. In the circumstance where windows are not a viable option, it is recommended that the colour temperature of the lighting in the classroom should be attuned to simulate daylighting.
3. It is recommended that the use of fluorescent lighting should be reduced, as it may have caused bodily stress and fatigue among other negative effects.

REFERENCES