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PERCEIVED OF INDOOR ENVIRONMENTAL QUALITY IN MISSIONARY SCHOOL

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Abstract:
Indoor environmental quality (IEQ) is defined as a quality of building's environment in relation to health and wellbeing of those who occupy space within it such as in the office, library and school building. The quality of the interior building environment of the school is important because based on previous studies the IEQ can affect the performance, comfort and health of the students. The age of the building also plays important criteria in contributing a good IEQ in a building. In Malaysia, missionary school building that is more than 100 years still play their rules serving as a primary and secondary school. As a starting point for knowledge dissemination, schools need to provide a conducive environment to produce excellent students. The aim of this study is to determine the student's perception of indoor environmental quality at three (3) missionary in Perak that consists of four (4) main criteria. The result of the study shows that overall students were satisfied with the comfort level and lighting system in their schools. The schools need an improvement of privacy and noise level in order to increase the overall satisfaction of students in the school. Lastly, the results also show that there are 3 major health problems towards students which are stress, itch and dry skin.

Keywords: Indoor environmental quality; Perceived of indoor environmental quality; Missionary school

1.0 INTRODUCTION

A *missionary school* is a religious *school* originally developed and run by Christian *missionaries* and was commonly used in the colonial era for the purposes of Westernization of local people where this can be clarified that the school already existed for a long time. Thus, the level of IEQ of missionary school has to be identified whether it has achieved the satisfaction of the occupier or need to be improved. In addition, school aged children spend 30% of daytime at school and about 75% of this time is spent in classrooms (Fromme, 2007). Thus, there is a need to investigate the condition of this school.

2.0 LITERATURE REVIEW

Indoor environmental quality encompasses the conditions inside a building such as air quality, lighting, thermal comfort, noise, acoustic and their effects on the occupants or residents. Strategies for addressing IEQ include those that protect human health, improve quality of life, and reduce stress and potential injuries. Better indoor environmental quality can enhance the lives of building occupants, increase the resale value of the building, and reduce liability for building owners (NIOSH, 2013). Many studies have signified occupants that work in good environmental condition improved the productivity and comfort, and how ventilation rates can reduce occupants' attention, concentration, and reducing memory (Bako-Biro et al., 2012). Aside from performance, indoor environmental quality can also affect the health condition of the occupants. In addition, lighting has a deep impact on human psychological and physiological (Valeria et al., 2012).

IEQ is important because poor IEQ adversely affects the health of building occupants where this is particularly true for individuals with asthma, allergies and medically fragile students that can lead to increase absenteeism, may directly impact staff performance and job satisfaction, and of course, student's achievement. Secondly, a lot of people spend their days in schools where 20 percent of the U.S.

population spends their days in elementary and secondary schools, according to the EPA, with an estimation of around 55 million people. Most people spend 90 percent of their time indoors. Finally, the developing bodies of children might be more susceptible to environmental exposures than those of adults. Children breathe more air, eat more food and drink more liquid in proportion to their body weight than adults. Therefore, air quality in schools is of particular concern.

3.0 METHODOLOGY

The study used a set of questionnaire containing three sections of questions that have been distributed to three (3) types of school in Taiping, Perak. Section A is a demographic profile, Section B is a perception towards IEQ in the classroom and lastly, section C is IEQ criteria that need to be improved. The questionnaires were distributed to SMK King Edward VII, SMK Convent and SMK St. George. The total respondents are 90 students. SMK King Edward VII is a premier secondary school for boys (and girls, in Sixth Form), located on Jalan Muzium Hulu, in Taiping, Malaysia. Formerly known as Central School, it is one of the oldest schools in Malaysia. The history of King Edward VII School goes back to the founding of Central School in July 1883.SMK Convent is all girls' school located at Convent Lane, Kota, Taiping. This secondary school is one of the 30 Convent secondary schools in Malaysia. The school was founded by Rev. Father Clement Charles Grenier from Penang in 1898. SMK St. George is a public all boys school and is also one of the oldest schools in Taiping. The school was completed in 1915 and located at Station Road, 34000 Taiping Perak.

4.0 ANALYSIS AND FINDINGS

Table 1: Socio Demographic (SMK King Edward)

Characteristic		Percentage
Gender	Male	43%
	Female	57%
Age	16 – 18 Years old	100%
Race	Malay	74%
	Chinese	3%
	Indian	20%
	Others	3%
Age studying at the school	Less than 1 year	57%
	1-3 years	3%
	4-6 years	40%

Table 2: Socio Demographic (SMK Convent)

Characteristic		Percentage
Gender	Male	0%
	Female	100%
Age	16 – 18 Years old	100%
Race	Malay	80%
	Chinese	7%
	Indian	13%
	Others	0%
Age studying at the school	Less than 1 year	3%
	1-3 years	20%
	4-6 years	77%

Table 3: Socio Demographic (SMK St. George)

Characteristic		Percentage
Gender	Male	100%
	Female	0%
Age	16 – 18 Years old	100%
Race	Malay	7%
	Chinese	33%
	Indian	53%
	Others	7%
Age studying at the school	Less than 1 year	3%
	1-3 years	3%
	4-6 years	90%

For section A, SMK King Edward have 43% male and 57% female students, while SMK Covent is only female students with 100% and SMK ST George has only male students (100%) because it is all boys school. All these three schools have students of a range age between 16-18 years old, the race are mostly Malay and most of the students have been studying at the school for 4 to 6 years.
Section B: Perception towards indoor environmental quality at classroom

Table 4: Finding of IEQ result at SMK King Edward

No.	Items	Frequency of respondents					Average Index	Ranking No.
		1	2	3	4	5		
1	Thermal Comfort							
	- Indoor air temperature	2	6	18	2	2	2.86	3
2	Acoustical Comfort							
	-Indoor Noise Problem	5	10	10	3	2	2.56	7
	-Outdoor Noise Problem	4	12	8	3	3	2.63	5
3	Visual Comfort							
	-Daylight	2	2	17	8	0	2.96	1
	-Color Preference	5	6	10	7	2	2.83	4
4	Indoor Air Quality							
	-Natural Ventilation	5	6	13	6	0	2.67	6
	-Indoor Odor Problem	1	8	15	6	0	2.87	2

Table 5: Finding of IEQ result at SMK Convent

No.	Items	Frequency of respondents					Average Index	Ranking No.
		1	2	3	4	5		
1	Thermal Comfort							
	- Indoor air temperature	1	3	10	12	4	3.5	1
2	Acoustical Comfort							
	-Indoor Noise Problem	3	8	15	3	1	2.70	5
	-Outdoor Noise Problem	4	7	15	3	1	2.67	6
3	Visual Comfort							
	-Daylight	2	1	9	2	6	2.30	7
	-Color Preference	2	5	15	6	2	3.03	2
4	Indoor Air Quality							
	-Natural Ventilation	4	4	15	6	1	2.87	3
	-Indoor Odor Problem	0	14	7	9	0	2.83	4

Table 6: Finding of IEQ result at SMK ST George

No.	Items	Frequency of respondents					Average Index	Ranking No.
		1	2	3	4	5		
1	Thermal Comfort							
	- Indoor air temperature	1	6	8	8	7	3.47	4
2	Acoustical Comfort							
	-Indoor Noise Problem	8	12	8	2	0	2.13	7
	-Outdoor Noise Problem	4	15	10	1	8	3.60	3
3	Visual Comfort							
	-Daylight	3	5	16	5	1	2.87	6
	-Color Preference	3	6	18	2	8	3.90	2
4	Indoor Air Quality							
	-Natural Ventilation	2	4	15	8	1	3.07	5
	-Indoor Odor Problem	2	7	18	2	8	3.93	1

In section B, the survey is about student's perception towards indoor environmental quality. Seven leading issues in environmental quality context are presented in the table above using a 5-point of Likert scale with responses from 1 - very unsatisfied, 2 – unsatisfied. 3- fair, 4- satisfied and 5 – very satisfied. Based on the table above, it is shown that the highest rank is 2.96 on daylight by SMK King Edward and the lowest rank is 2.56 on their unsatisfactory for the indoor noise problem. Meanwhile, in SMK Convent they rank satisfied for indoor air temperature as the highest rank that is 3.50 and the lowest rank 2.30 is daylight. Lastly, for SMK ST George, the highest ranking 3.93 that is satisfied for indoor odor problem and the lowest ranking 2.13 is for unsatisfactory for indoor noise problem.

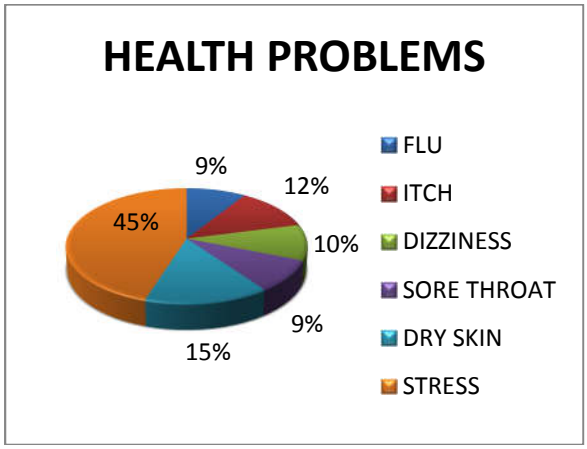

Figure 1: Health problems toward IEQ at SMK King Edward

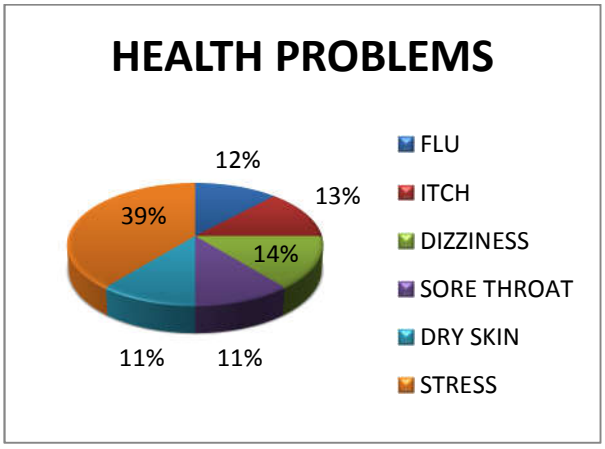

Figure 2: Health problems toward IEQ at SMK Convent

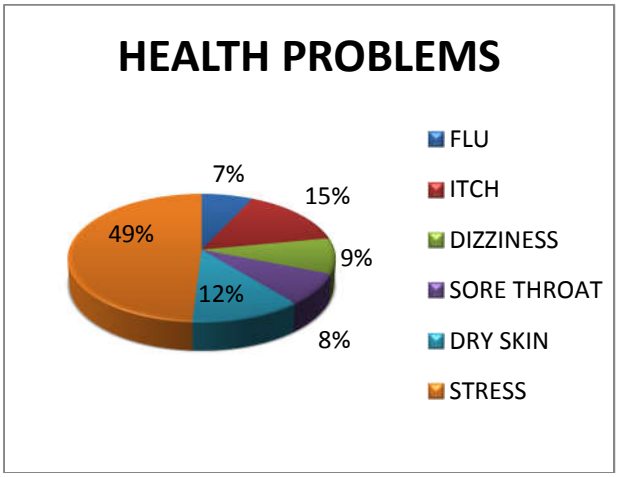

Figure 3: Health problems toward IEQ at SMK ST George

Section C provides the perception towards indoor environmental quality at classroom. Each colour in Figure 1, 2 and 3 represent different types of symptoms which is flu, itch, dizziness, sore throat, dry skin and stress. For SMK King Edward VII, the highest percentage that students faced is stress with 45% in orange colour and followed with the lowest symptoms is flu with 9% in blue colour. Next, for SMK Convent, the highest symptom is also stress in blue colour with 39% and the lowest is 11% respectively for dry skin in light blue colour and sore throat in purple. Lastly, the symptom that faced by SMK ST George the most is also the ssame with the other two school which is 49% for stress, followed with the lowest 9% in green colour for dizziness and 7% in dark blue colour for flu.

5.0 CONCLUSION AND RECOMMENDATIONS

The objective of this study is to discover the students' views with respect to achieving optimal comfort conditions in classroom. The comfort perception of students in the three case studies was obtained for indoor air quality, thermal comfort, visual comfort and acoustic comfort. In accordance with the survey data, the level of comfort score average index was voted within 2.13 (fair) to 3.93 (satisfied). Negative aspects are marked with bold characters. Below are several recommendations to improve the environment and classroom at the schools.

Acoustic: Acoustic of buildings is that part of the science of physics which deals with the control of sound in buildings. Noise from other people talking, telephones ringing, and other irregular sounds may create more annoyance and disturbance compared to the more continuous regular sounds (Veitch, 2001). To avoid this noise, a correct material should be perfectly choose with using a soundproofing materials. There are such as sound barrier materials, acoustic sound panel, noise absorber or soundproofing foam.

Thermal Comfort: There are several primary factors that directly affect thermal comfort which are natural ventilation, relative humidity andair speed. Normally, other buildings will using naturally ventilated and do not rely on such mechanical systems to provide their thermal comfort of the building. In suggestion, HVAC unit can help in controlling thermal comfort. According to de Dear and Brager (2002), they provide guidelines for centrally controlled HVAC, its board application in practice is hindering innovative efforts to develop more person centered strategies for climate control in naturally ventilated or mixed mode buildings.

Lighting: Lighting plays an important role to the student because high quality lighting can improve student moods, behavior, concentration, and therefore their learning. This design should be achieved as well as finding the right number, type, and location of light sources and adjusting their parameters.

Indoor air quality: There are two common strategies in building design that are employed to deal with the IAQ in a building. The first one is to improve the indoor air quality by increasing the ventilation rate, which in turn reduces air pollutant (Daisey, 2003). The second is by reducing the source of pollution within and outside the building in order to reduce the introduction of pollutants in the indoor air.

Survey analysis show that the perceptions of comfort for all threemissionary school building can be considered as satisfied. On the other hand, the survey findings indicated minor issues relating to indoor air quality, visual and acoustical discomfort. If optimal comfort conditions are provided, the students can be physically and psychologically healthy and focused in the school environment. Lastly, the problems related to health have been identified, where none of the occupants experienced serious health problem during occupying the room. The 3 major health problems are stress, itch and dry skin. This major health problem is experienced by the occupants during occupying the room which can be see that the probability on contribution of IEQ to poor health condition is high.

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