

# FLOOR PLAN-ANALYSIS, LIGHTING AND PHYSICAL ENVIRONMENT OF CLASSROOM DESIGN

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## ABSTRACT

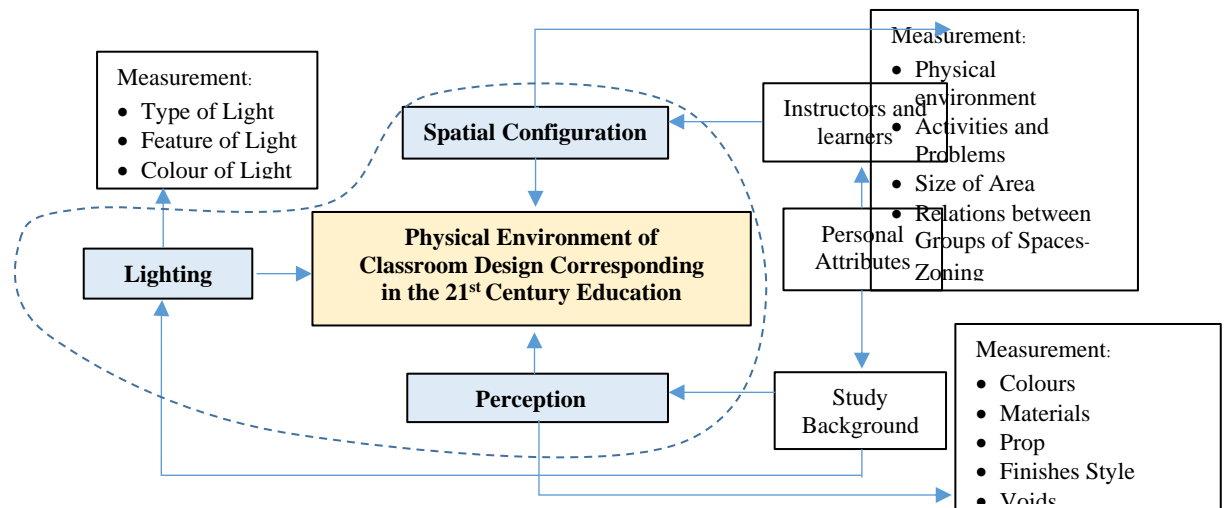
This research aims to study the determinant of physical components of the classroom, comparative floorplan-analysis, and lighting design that can enhance the learning of the different student groups. The research will guide the physical classroom design corresponding to the 21<sup>st</sup>-century education. The purpose of the design is improved to provide better function and usefulness, and more beauty to space. The interior elements comprise the spatial configuration and the ambient atmosphere of the physical environment which relations between man and the perception. Moreover, the cues are causing the perception to the physical environment associated with the design. The Classroom-Physical Environment is imperative that one. The design should pay attention to the details of the composition and organise the physical elements of the environment. That contributes to the appearance of the environment where support or promote the learning of the students. Moreover, the education in the 21<sup>st</sup> century has changed. Learning styles in the classroom changed from a relay knowledge to the study by the group activities.

Keywords: The Classroom-Physical Environment, Education in the 21<sup>st</sup> Century, Spatial Configuration

## INTRODUCTION

The interior element consists the composition of the space and the physical environment (Ambient). There are essential for the relationship between humans and the perception as the cues that contribute to the perceived usefulness of space. Also, the physical difference affects the perception of the appearance of different environments, such as shape, size, appearance, colour, etc., The classroom is one environment which the designer should pay attention to detail the components that can support or promote learners. Especially, education in the 21st Century has changed dramatically. The learning style in the classroom has changed from the transmission the knowledge to a learning activity by the students for creating their expertise in the brain and mind. The class must shift from "classroom by the teacher" to "classroom by the teamwork." The classroom design must change to be the studio because the students have to study by work or study by doing.

Figure 1  
Conceptual framework of the study



## THE PURPOSE OF THE RESEARCH

This research aims to study the determinant of physical components of the classroom, comparative floorplan-analysis, and lighting design that can enhance the learning of the different student groups. The research will guide the physical classroom design corresponding to the 21<sup>st</sup>-century education.

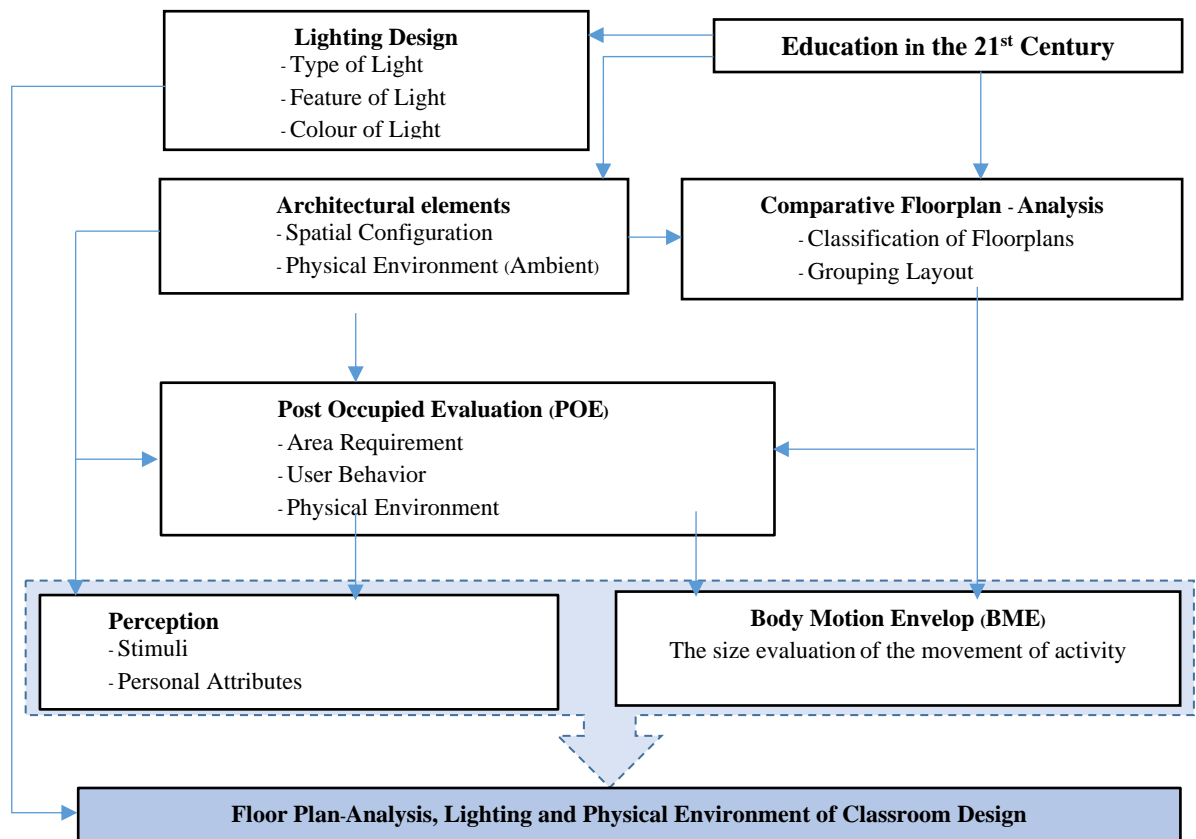
## HYPOTHESIS

The study posits the hypothesis that the interior design process of the physical classroom environment that has related to learners' study background, which can increase their knowledge to a learning activity.

## RESEARCH METHODOLOGY

This study aims to evaluate the determinant of physical components of the classroom, comparative floorplan-analysis, and lighting design that can enhance the learning of the different student groups. By the way, field survey in conjunction with the assessment of the physical environment of the learning environment and the Quasi-Experimental Research and interviews.

Figure 2  
Study framework: Relationship between conceptual and Operational framework



## RESULTS

### 1.1 The determinant of physical components of the classroom

Design Guidelines for the Classroom Corresponding to the 21<sup>st</sup> Century Education was the effectiveness study of the design environment modelling to test the perception level. The purpose of this research was to study the physical components of the classroom and different class users. To compare attitudes and satisfaction of the classroom users to propose a design approach to the classroom environment. By experimenting with Stimuli (3D) in a related design environment factor. The classrooms of the university were a case study. By starting the research was study the necessary physical components of the classroom and the characteristics of the different classroom users. Then, the results of the study were synthesized and summed up to create a virtual simulation (Simulation 3d) and then tested the perception of classroom environment for proving the difference of recognizing levels of different stimulation methods.

Figure 3  
A virtual simulation (Simulation 3d)



Table 1  
An example of a research questionnaire

Qualification (Your Feeling)	Left picture A					0	Right picture B				
	5	4	3	2	1		1	2	3	4	5
	extremely	extreme	Very prefer	prefer	indifference	equal	indifference	prefer	Very prefer	extreme	extremely
Relax											
Agreeability											
Stimulation											
Excitement											
Liveliness											
Overall satisfaction											

- The students who study design
- The general students

The overall attitudes and satisfaction toward the physical environment of the art-based group and general group show that the perception of each design factor is mostly in the same direction. There are only two different factors: In the pattern and the decorative element (Prop). The designing of classroom environment consistent with overall attitude and satisfaction student should be the cool colour scheme and soft in the decor. The material of floor decoration is synthetic material, oily or non-oily surface of the material and patterned or non-patterned materials. Wall decoration is synthetic materials, the non-oily surface and patterned or non-patterned materials. The design style should be modern and no pattern. The furniture is synthetic materials, oily or non-oily surface and patterned materials. The windows should be semi-open. There are also many interior decorations (Prop).

Figure 4  
An example of the Physical Environment of Classroom Design



### *1.2 Comparative floor plan analysis*

Comparative floor plan analysis for developing a classroom design was study focused on the real needs of users. The purpose was to study and comparative floor plan of classrooms, to relative attitudes and satisfaction of different classroom users, and to propose the design guideline of the floor plan of classrooms according to the needs of learners. This research was qualitative studies along with quantitative studies of learners with different learning backgrounds.

Figure 5  
An example of the Body Motion Envelop (BME) as the tool



Figure 6  
An example of the measuring the area around movement of activities



The results showed that the users were satisfied with the classroom: 1) Group Layout Classroom 2) U-Shaped Layout Classroom 3) Circle or Half Circle Arrangements Classroom 4) Traditional Classroom. Size and relative location of classroom spaces must consist the function and the same type of usage. The size of a lecture classroom should be 1.50 -2.00 square meters per a student. The size of a practice or specifically classroom should be 2.30 -2.80 square meters per a student. The relation between groups of space or zoning must be a mix of space and social groups which relate to spatial behaviour including the public area, shared-space area, instructor area and learner area. Utilizing classroom layout has the entrance to the front and back. When you get in the classroom, you will find the instructor area and shared-space area on the front of the classroom. But

if you turn to the back of the classroom, you will see the public spaces area that is the walkway of the classroom. There are on the right and left side, and also in the middle of the learner area. The learner area often placed in the middle of the classroom between the entrances on both sides. This layout is the most needs of users.

Figure 7

Group Layout Classroom for the design learners group

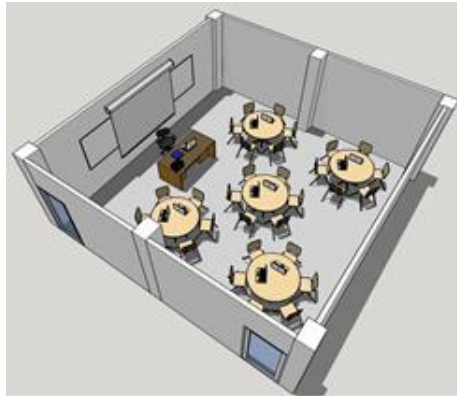
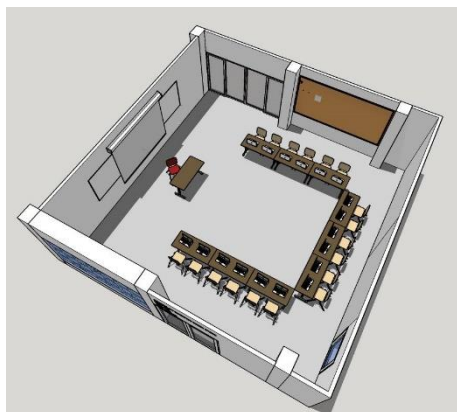


Figure 8

U-Shaped Layout Classroom for the general learners group



In conclusion of this research, the classroom design guideline of the design learners group is Group Layout Classroom. The general learners group, who are not studying the design, and instructional groups are U-Shaped Layout Classroom, depending on the structure of the building and each teaching style. The instructor must manage the classroom for the benefit of the learner. Also needs to change according to the needs of the learner and the content of the class subject. The classroom is more motivated than the teaching methods and encourages the intellectual, physical, emotional, and social to the learners, as well as external motivations that motivate learners to love being in the classroom.

### ***1.3 Lighting factors affect the learning performance of learners***

The purpose of this research is to study and compare different lighting design factors affect learners' learning behaviours. The research hypothesis is that different lighting design factors affect learners' learning efficiency within classrooms. They enhance the ability to learn and support or promote learners' learning and stimulate the interest of the students.

The research method was exploratory and interviews of learner's popularity with the use of lighting in the classroom. The research instruments used were interviewing form and classroom physical environment modelling by different lighting issues. Through controlling other design factors (an unadorned environment) to reduce the attention of interview respondents and no stimulated of their feeling. The questionnaires were used

to collect two issues. There are the personal data of 50 non-artistic learners or designers and 50 artistic learners or designers, totalling 100 people, and the data of the correlation of perception between the two groups' and response of learner groups; friendly, relieve, privacy, excitement, the beauty of classroom and overall satisfaction. These all response to classroom environment with different lighting in 3 main factors; light pattern, colour temperature and type of light.

Figure 9  
An example of light pattern; the point-lighting and the diffuse-lighting



The results found that the diffuse-lighting is more suited to classroom design than the point-lighting. The colour temperature of the light found that the cool white can make the feeling relieve and excite when using the area and promote the beauty of the classroom. In the design of the classroom, if the designer uses the warm white, it will respond to the privacy rather than the cool white. The diffuse -cool white are more appropriate for classroom design than a point-cool white. These can respond to the needs of the learner, contribute to the ability to learn, support or promote learners' learning and stimulate the interest of the learner. Due to the diffuse -cool white make the feeling; as friendly and relax when the learners access the classroom. But if the designer wants to design a classroom that emphasizes privacy, exciting and enriching the beauty of the room, they should choose the point-cool white.

### CONCLUSION AND FUTURE WORK

In the research conclusion is the design should pay attention to the details of the composition and organize the physical elements of the environment. That contributes to the appearance of the environment where support or promote the learning of the students. Moreover, the education in the 21<sup>st</sup> century has changed. Learning styles in the classroom changed from a relay knowledge to the study by the group activities. The design elements on classroom are influencing and communicating to learner through three factors including floor plan, lighting and physical environment. The point that designers need to take into account in the design that is the instructor and learner feel that they can share the workspace, flexibility and adaptability to the learning style and can promote learning and interest in lessons. The learner feels independence and encourages participation. Also, they think the mobility of joint activities. The essence of the design must include the characteristics that distinguish between user space groups and the user-specific features. Designers should emphasize the sense of space which uses the concept of aesthetically pleasing human area and can be beneficial to the design.

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