

Comparative Learning Environment of Architectural Design Studio Layout in Malaysia

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Abstract. Architecture is a collective art with many design projects of group-based were held. The design culture of the school is influenced by each particular project, which makes the students participate in this critical group discussion and highly urged to work in the studio. This study tends to compare the spatial layout of architectural design studios by highlighting the advantages and disadvantages affecting the student's productivity. They were differences in the learning cultures among architecture students in universities A, B and C as the local university in Malaysia. The current generation of students demands a smart studio with an interactive spatial design layout, which may foster students' development, especially in their learning-based studio sessions. This study aims to identify the characteristic of a good spatial design layout suitable for the architectural design course with better anthropometric measurements. The qualitative methodologies involved observation of the studio's environment based on the three selected universities in Perak, Selangor and Johor Bahru. The comparative analysis involved a few attributes, such as the space layout, walkway distance, lecture space and furniture arrangement in the studio, which affect the student's learning and the lecturer's teaching method. In summary, characteristics of a good and conducive learning environment will be highlighted, and recommendations for interactive space for students were proposed for them to learn and work in good conditions by improving the studio's spatial design.

1. Introduction

Students majoring in architecture live essentially the same lives in all universities, putting in more than 8 hours a day in the studio. A studio means a room filled with a variety of special equipment where the students can observe, learn, work, and experiment with their assignments or projects design. It is because the studio is full of various equipment that could help them to complete their tasks. The 'Studio' serves as a testing ground for new ideas; one of its most beneficial features is its diversity and informality. Many of the best ideas come to mind outside of the context of a particular class, structure, or event, during an after-hours conversation or by accidental contact. Moreover, a campus, through its architecture and planning, can play a predominant role in shaping the lifestyle and culture of the students [1].



Previous studies on design classes have indicated that studying in unconducive studio environments negatively impacts students' performance due to unfavourable studio settings. The terms "ergonomic workplaces" and "anthropometrics" in the studio context refer to the arrangement of instruments and furniture, which promote a positive learning environment and make students feel at ease. Students with good ergonomics workspace are expected to increase efficiency in design tasks and reduce working time to produce their tasks [2]. In addition, an ergonomic workspace provides a conducive environment for students to develop their ideas, creativity, and sense into high-quality design outcomes [3] [4].

2. Literature Review

2.1. Anthropometric

The anthropometric measurement and application of the human body art create the physical geometry, mass properties and strength capabilities [5]. Anthropometric is a study dealing with the body dimensions such as size, shape, strength and work capacity for design purposes and body composition [6] [7]. The listed point is essential for an architect to ensure the design produced is suitable and comfortable for the human being. With the proper anthropometric studies, no such problems will surface in daily activities. A good studio layout and equipment with improved anthropometric and ergonomic applications are essential for architecture students [8].

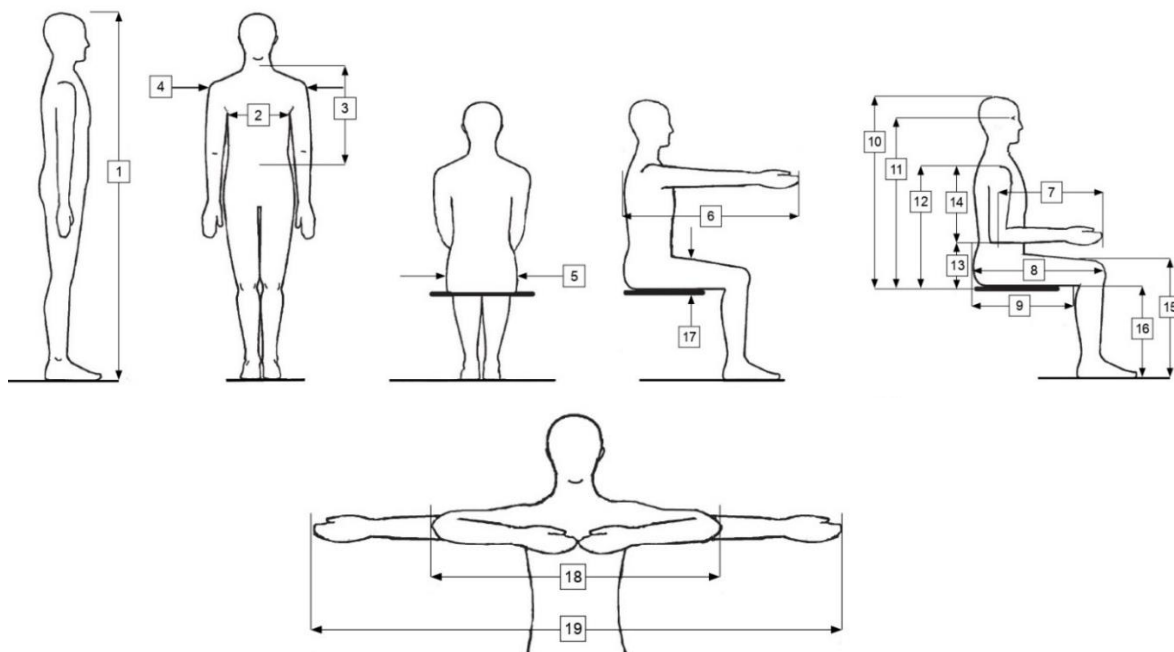


Figure 1. Anthropometric dimensions. Notes. 1 = stature; 2 = interscye breadth; 3 = back waist length; 4 = shoulder breadth; 5 = hip breadth, sitting; 6 = arm reach forward; 7 = forearm-hand length; 8 = buttock-knee length; 9 = buttock-popliteal length; 10 = sitting eye height; 11 = sitting shoulder height; 12 = sitting elbow height; 13 = sitting elbow height; 14 = shoulder-elbow length; 15 = knee height; 16 = popliteal height; 17 = thigh clearance; 18 = elbow span; 19 = span.

Students required carefully thought-out furniture and studio layouts to ensure they never feel cramped or uncomfortable when working on a particular assignment; they must draw, write, paint, etc. The student's performance in the studio may be impacted by certain situations if there is poor anthropometric furniture and arrangement [9]. Anthropometric data are used in ergonomics to specify the physical dimensions of workspaces, equipment, furniture and clothing [10]. Another viewpoint on anthropometry suggests that it is more suitable to employ it in design to increase products' comfort,

safety, and well-being [6]. Architecture students must use suitable equipment such as high-back chairs, drafting tables and wide desks to meet the routines of the architectural program.

Due to improper equipment, many architecture students are reported to have regular back, neck and headache pain [10] [11]. Referring to [12] [13], the student's sitting posture is influenced by the activities performed in the classroom or studios. The anthropometric measures of the university students and the studio's furniture are shown to influence the issues. Figure 1 shows the anthropometric human body size and position of the body standing, sitting and arm reaching forward for a working distance suitable with the human position body. Study anthropometric measurements in students' classrooms related to furniture dimension to avoid or minimize discomfort and musculoskeletal disorders [14].

2.2. *Spatial Design*

Planning and optimization of facility layout have been studied for decades. Various approaches are applied for structuring and developing studio layouts based on the experience and creativity of the planning expert. Typically, the complexity of the planning processes constantly increases due to further requirements of energy and media supply [15]. The furniture arrangement increases participants' well-being and engagement with other occupants in the room [16]—the design-based architectural studio deal with moving activities, sketching, modelling and presenting projects. The spatial layout studio should be flexible to achieve creative learning in the studio [17]. The spatial layout should be more intimate and interactive for the student to help them explore existing architecture and creative spaces for teaching studio design [4] [18].

2.3. *Learning Environment*

A learning environment is usually defined as a diverse physical location, context and culture in which students learn. Since the students would have their learning sessions in various settings, such as outside of the university and outdoor environments, the term used is more suitable to be called a classroom [19]. In our context, here is the studio. It has more limited and traditional connotations. For example, a typical classroom is usually prepared with rows of tables and a chalkboard. A classroom is a learning environment for learners from different family backgrounds, practices, cultures, studios and norms [17] [20]. It caters to those from numerous communities and regions with different cultures to practice.

Teachers try to move away from the usual chalk lecture by providing various learning environments for the students to come up with their meaning of concepts teaching. Architecture students' learning sessions might differ from other course students. It is because architecture student usually has their learning session in the working place called the studio. Refer [21] to students more interested in collaborating or flipped classroom challenges the teachers, use modelling in learning architectural design and perceive what they are learning in class as matching their learning at home. As we know, students studying architectural design usually need to work in a group, so the studio spatial layout is applied to achieve the standard of comfortable learning layout. It is because the more comfortable the spatial layout applied, the more pleasant the learning environment and the more effective. The physical and social learning environment experiences the nature of studio culture engagement in the learning process interaction within the space [22].

3. **Methodology**

This study used the qualitative approach by collecting data through photo analysis and layout plans to measure anthropometrics and achieve comfort in studio architecture as per conducted methodologies [23]. The observation was conducted at three different universities in Malaysia. Samples of studio types were analyzed based on the anthropometric measures of students during studio class by video capturing and direct observation methods [24] [25]. This study aims to identify a comprehensive studio layout suitable for architecture students working and learning styles. The selected studio is based on the capacity of architecture students in the studio, the space layout, walkway distance, lecture space and furniture arrangement in the studio. All the 3 case studies are mainly among the typical studio units found in those schools.

The selected studio of A, B and C have different ambiances and studio cultures. Some students complained about the spatial layout, cramped furniture arrangement and uncondusive surroundings. Some studios were over-occupied and not according to the proper ratio between students and the area of working space. Student feedback was considered in the study's findings, analysis and recommendation. This study employed a qualitative approach where data was collected using observation of architecture studio layout design at three universities. The following explains the details of observation studios for students of architecture. This study compares layout learning environments more effective for architecture students in universities in Malaysia and how the ergonomic factors affect architectural education based on the studio learning environment [26].

4. Case Studies

4.1. Architecture Studio in University A

Case Study A is a sample of an architecture studio in the university in Perak, occupied by Semester 05 students. The studio is on the 3rd floor with a capacity of students 29 – 30 pax at one time. This studio has a complete facilities projector, a whiteboard, and a table for students attending subject lectures utilizing the same studio as a classroom. Figure 2 shows the layout plan of a studio with 30 pax students, including a workstation with a table, chair and space for making models of around 2490mm for four people. The arrangement table is also narrow to accommodate people's circulation areas with only 1430mm clearance. (Refer to Figure 3.)

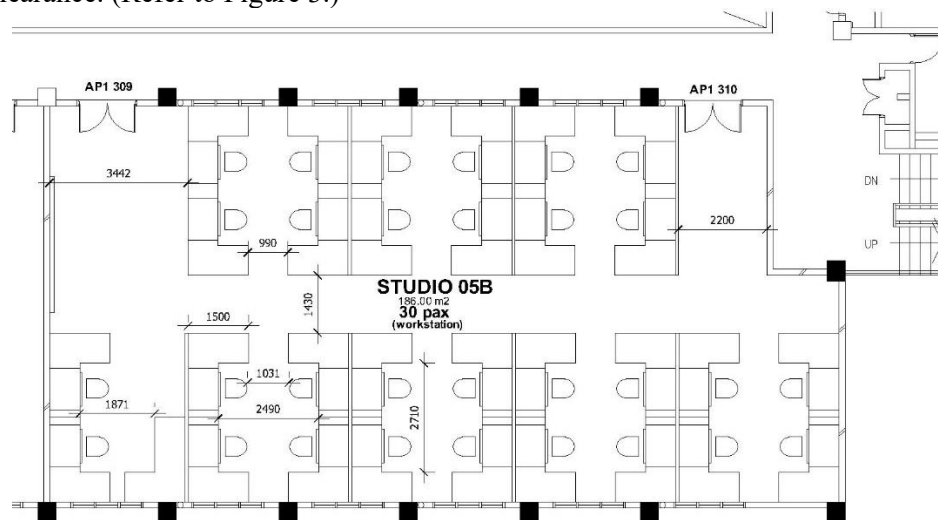


Figure 2. Studio 5th year

This Studio 05 is the workstation for the design course and, at the same time, was used for other courses. Teaching and learning methods for design courses and other courses were different. Still, the furniture layouts did not comply with the design course subjects—no flexibility was found in such a cramped space. Figure 3 shows the different types of chairs used in the studio. Anthropometry shows the table and chairs' height unsuitable for an ergonomic workstation in studio design. The studio culture generated student culture learning experience affected interaction in studio design [1] [27]. This finding shows students' architecture is more flexible using space study and comfort in a cultural environment studio with informal discussion.



Figure 3. Students' 5th year have discussions.

4.2. Architecture Studio in University B

This second Case Study is a typical layout of the architectural studio at University B. This university is relatively new and has the privilege of facilities such as a projector, ample plug points, drafting tables for lower semesters (semesters 1, 2, 3 and 4), cubicle workstations for upper semesters and moveable chairs. Most studios are spacious, with proper furniture arrangement and ample spaces for group discussion and model making. Space for presentation, crit session, wrapped-up session and gathering area were found in the studio layout, as shown in Figure 4. Studios with a more extensive open space area are more flexible where the occupants can have the opportunity to rearrange and redesign the studio layout based on the occupant's and project's needs.

Each studio project might need different furniture arrangements and layout design approaches. Spaces with open-plan layouts with no internal columns help the students to get a clear view without distraction and can focus in class. Mechanical appliances such as air-conditioning systems and proper lighting also comfort the students. Classroom lighting should support a positive learning environment and enhance the educational experience by delivering ambiances and illuminations that are functional and comfortable. The high ceiling volume and floor-to-floor height with a minimum of 3 metres help to give proper natural lighting and ventilation.

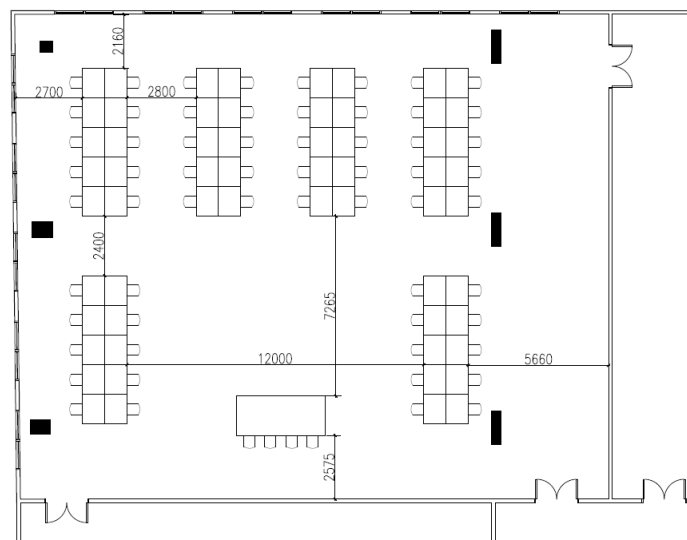
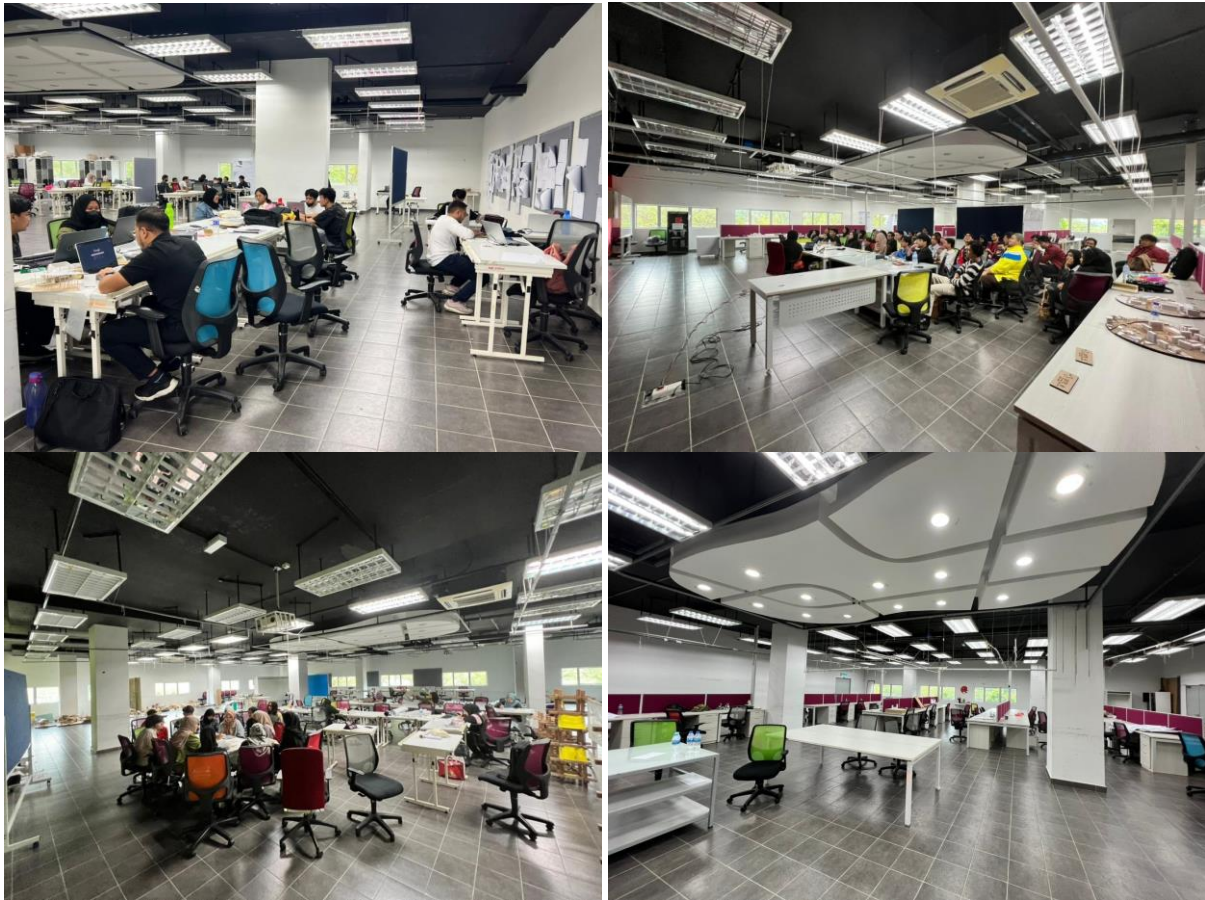


Figure 4. A typical layout studio in University B.



Figures 5, 6, 7 and 8. These four figures show different ambiances and learning environment happened in the studio.

4.3. Architecture Studio in University C

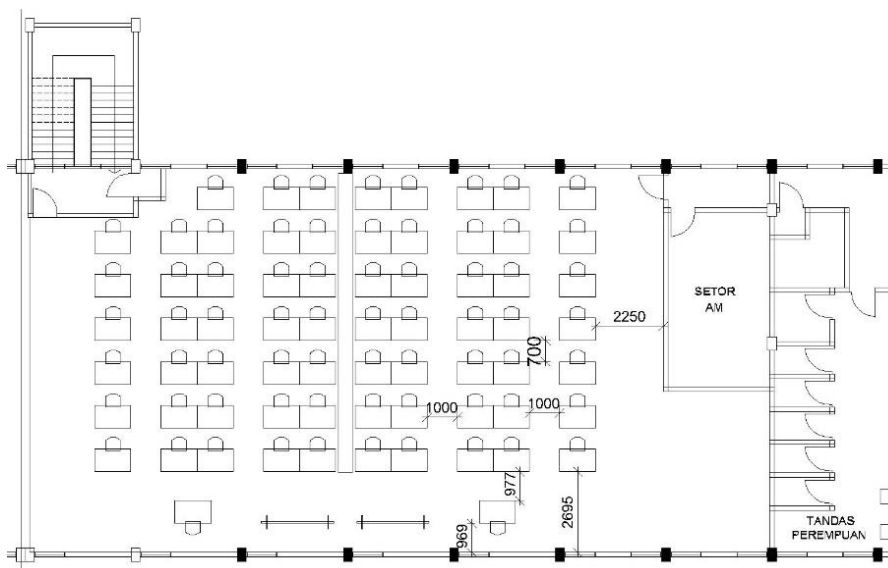


Figure 9. Studio 1st year

The third sample is architecture Case Study C- Block B05, level 3. This studio is used for 1st-year architecture students. Previously it was the library of the Faculty of Architecture at University C. The focus of this case study is different. The most crucial problem faced is the poor condition of the space and unmaintained spaces. The carpet is damaged and emits a bad smell. The state of ventilation of the space depends on the air conditioner. The studio space also has a fungus that threatens the health of students. The furniture is also quite old and less suitable for students to use for drawing. However, some adjustable desk units have been placed for student use. Overall, the condition of the studio is not conducive to teaching and learning. Therefore, the studio was returned to the space and facility unit of the faculty to be repaired and refurbished for future use.



Figure 10. Studio 1st year

The studio's 1st-year table and chair arrangement are so narrow, around 700mm, and the walkway distance is 1000mm. Figure 5 shows learning space is not suitable for architecture students in studio design. The anthropometric student's position workstation is not comfortable for drawing position.

4.4. Comparison Architecture Studio

An observation will compare the architectural studio layout in universities A, B and C and the layout supposedly applied according to the architectural requirements. The differences would be the point of the conclusion the design provided follows the criteria provided in architecture. The findings comparison is the following:

- a) To identify the main focal point in the room. An interactive spatial layout and arrangement of the table and chair at the studio. Universities A and B do not achieve design layouts with effective learning environments for architecture students.
- b) Compared to University B, the facilities and spacious area is more efficient and give students and lecturers flexibility.
- c) Space perception is based on body size. Different size spaces suit other size people. The room suitable for the studio needs to be wider to accommodate the number of students. Usage tools architecture in the studio needs to be updated according to the height and size of students.
- d) Tools inside the studio need to be updated to follow students' needs in a learning environment: an example screen, speaker, mic, and another.
- e) Distance from the whiteboard or projector should be sufficient to allow a better view for the students. It should be too near or too far. The cramped layout of a studio won't help to resolve this issue.

Table 1. Comparison architecture studio.

Item	University A	University B	University C	Description
Space Layout	186.00m ² 30 tables	432. 00m ² 60- 70 tables	186.00m ² 30 tables	University A- 30 pax students, one studio University B – 70 pax students one studio divides two compartments University C – 30 pax students one studio divides two compartments
Walkway distance	1430mm	2400- 3000mm	1000mm	University A- two-person walk distance. University B- four-person walk distance. University C – one person within walking distance.
Lecture space	3442mm	7000mm	2695mm	University A and C area lecture space is so narrow, while University B had an ample open space

Table 1 shows the comparison of universities A, B, and C. The environmental study and culture studio are so compact with furniture that it is unsuitable for architecture students in the studio design subject. University C has a compact space layout with a narrow walkway distance of only 1000mm. Also, the distance of the lecture space to the lecture table and whiteboard is so close to the distance of the student's seating area. University A has a spacious layout with medium comfort in the architecture studio, while University B offers a spacious area. Figure 3 shows student discussion informally among them sitting at the table and standing in the walkway area. Studio culture is significant in giving students' architectural experiences more flexibility. Previous studies have found that studio culture impacts final product students in a studio design environment [25].

5. Conclusion

Every architectural student needs a supportive emotional environment because school can be difficult at any age. Addressing the demand for self-expression and the freedom to express emotions in a dynamic setting is necessary to create a psychological environment's safe zone. Lecturers can assist students in developing their emotional intelligence and, in turn, their confidence by supporting their needs and emotions on an emotional level. [1] [23]. Lecturers can foster a positive emotional learning environment by establishing routines that students can count on, promoting diversity and individuality, and acknowledging their successes. Spatial layout studio design for students' architecture from the three universities shows usage tools architecture in architecture studio design. The natural spatial problem in studio-based deals with the typology of the built environment in the studio [17]. A study by three universities found that most of the layout planning provided in the studios of Universities A and C was not suitable and comfortable for the student's learning environment. This study finds that the learning environment in the studio needs to be a more productive, interactive, and comfortable space for the student. It is because the layout planning in the studio can affect students' focus during the lecture. A recommendation is that the university provides more suitable and flexible layout planning for the learning spaces in the university to have a perfect learning environment in the studios, especially for architecture students. The broken and unstable tables and chairs need to be replaced with new furniture with specific furniture for architecture students. The environment studio can achieve a better place for students to study. For example, adjustable chairs and tables are the students' most suitable furniture. Tools make the studio an intelligent room for students to learn more interactively and practically.

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