COLLABORATIVE DESIGN PEDAGOGY (CDP) FOR CULTIVATING STUDENT-CENTERED LEARNING (SCL) IN A HYBRID ARCHITECTURE DESIGN STUDIO DURING THE ENDEMIC PHASE

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ABSTRACT

Architecture education is unique because the architectural education system is project-based learning, where the primary teaching and learning process occurs within the studio. However, during the endemic phase, architecture studios are conducted in a hybrid manner in which the learning process for architecture design faces many challenges.This includes exposing and testing students' ability to combine knowledge from disciplines such as philosophy, art, sociocultural, management, science and technology whilst nurturing student-centred learning within a hybrid environment. This paper elucidates how student-centred learning (SCL) is emphasized and implemented in a hybrid architecture design studio during the endemic phase using Collaborative Design Pedagogy (CDP). This paper is significant as it will showcase the practical approaches and successful methods done by the UTM Architecture program in applying the CDP framework for a hybrid architecture design studio that led to the recognition by the Board of Architect Malaysia (LAM) in the year 2022 for the program to gain five years full accreditation until the year 2026. The paper outcome will be presented as a CDP framework module specifically on conducting a hybrid architecture design studio that promotes SCL as an example for other

architecture schools to refer to for future lifelong architecture learning. The CDP framework is also beneficial as it highlights the flexibility to be adopted as a non-conventional architectural learning strategy that can lead to nurturing creative thinking among architecture students.

Keywords: *Student-centred learning (SCL),Collaborative design pedagogy (CDP), Architecture design studio, Hybrid architecture design studio, Creative thinking*

INTRODUCTION

Architectural education is one of the earliest forms of education that existed since medieval times in the 5th century and began to be recognized by the world community as an official education in the early 19th century (Dizdar, 2015; Griffin, 2019). This comprehensive architecture education combines theoretical and practical knowledge and includes a wide range of disciplines covering art, science, technology, and humanities (Charalambous & Christou, 2016; Mahdavinejad et al., 2014). In this regard, this architectural education is unique in that it promotes the expression of creativity and appreciation of intellectual satisfaction with the foundation to provide the career path of professional architects as well as those related to the field of design and construction arts (Glasser, 2000; Soliman, Taha, & El Sayad, 2019; Tzonis, 2015). In general, architectural education is essential to produce the profession of the architect responsible for creating a quality built environment to uphold the prosperity of society in order to keep pace with the rapid development of the construction industry towards ensuring the development of a country (Celani, 2012; Khair- El- Din, 1988; Nicol & Pilling, 2000, 2005).

Architectural education in Malaysia began in 1925 as a training program to produce the profession of a technician. Nevertheless, in 1967, architectural education continued to expand to the level of Bachelor (LAM Part 1) and Masters of Architecture (LAM Part II) until now. Architecture is a professional field, and its education is subject to ethics and charters established by professional bodies(Shari & Jaafar, 2012). In Malaysia, two central bodies preserve the description of architects and the architectural

profession: the Board of Malaysian Architects (LAM) and the Malaysian Akitek Organisation (PAM). The Malaysian Council on Accreditation and Architecture Education (MAPS) closely monitors architectural education in Malaysia(Hasan, Abd Baser, Abd Razzaq, Puteh, & Ibrahim, 2017). Public Universities and Private Institutions of Higher Learning that offer this architectural program are subject to the requirements of the professional body, namely the Board of Architects Malaysia (LAM), as a recognition of the Architecture Programme through the accreditation process at the LAM level of Parts I and II(Shari & Jaafar, 2012). The Architectural Higher Education Provider (AHEP) is responsible for revealing the government's influential agenda towards national development to make Malaysia a quality and competitive education hub on par with other universities globally. This is important in producing holistic graduates with marketability, employability and income-ability(Hasan et al., 2017).

Moreover, cohesive architectural education will create professions and areas of architectural work capable of performing various tasks. This includes planning, building design, landscape design, municipal design, interior design, leading and coordinating the work with certain parties from other areas of the design and construction group, communicating with the authorities, and managing and regulating the construction process. The birth of a capable graduate based on criteria that meet the characteristics of a quality professional architect will create a sustainable built environment in tandem with the rapid development of the country's construction and architecture industry.

Architecture education must be unique in focusing specifically on integrating practical teaching in the studio and theory in the classroom. The architectural education system is project-based on learning, where the primary teaching and learning process occurs within the studio (Gregory, Herrmann, Miller, & Moss, 2013). Most of the knowledge and skills exposed to architecture students are through various new skills, including structural and construction technology, history and arts across disciplines, and internationalization features such as collaboration projects with institutions or agencies globally. Throughout engineering studies, especially in the design art studio, students must produce designs based on various innovative and creative design criteria (JPTM, 2010). The architectural teaching and learning system in Malaysia is studio-based. It is used to implement design

simulation projects to expose and test students' ability to combine knowledge from various disciplines such as philosophy, art, sociocultural, management, science and technology (JPTM, 2010). This studio system is intensive and requires long hours of student-academic contact.

However, during the endemic phase, the studio's process needs to be innovated to suit the needs of students and academic staff. There are various problems encountered during the operation of the hybrid studio during the endemic phase as follows- The concerns include nine main aspects involving – i) Limited resources on education facilities and equipment like teaching tools and aids, materials to run the hybrid teaching and learning(Varma & Jafri, 2020); ii)Issues involving governance and administration of learning institutions like management of students in hybrid classes and having appropriate ratio students to academic staffs(Milovanović et al., 2020); iii) Shortage number of experienced academic staffs in handling digital teaching and learning as well as having digital literacy expertise(Varma & Jafri, 2020); iv) Unreadiness of curriculum design and delivery that only focuses on traditional approach and method of teaching and learning which does not provide diverse learning needs- transdisciplinary and flexibility(Khogali, 2020); v) Specific education goal and learning outcome which does not increase student motivation and enhance generic skills - lifelong learners, teamwork skill, creative and fun learning that designed for hybrid mode(Khogali, 2020). In turn, impacts nurturing student-centred learning activities in architecture education (Kebritchi et al., 2017; Jena, 2020).

This is because architecture education plays a role in producing graduates with the skill to work in intuitive and practical contexts. Typically in the design studio, students are required to express their architectural ideas and creativities through numerous communication techniques and methods such as drawings, physical models, and others. In this regard, the hybrid or non-hybrid architecture studio needs to have a context where active learning occurs through group or individual problem-based projects(N. Abdullah, Beh, Tahir, Ani, & Tawil, 2011). In order to improve education and student learning in the studio, evaluation and assessment must be appropriately designed and implemented in a hybrid studio context.

On the other hand, other essential points in assessing architectural

projects during hybrid scenarios are also critical regarding the best type of critique for each hybrid session. This is because whenever the critique is conducted in a hybrid manner, there may be miscommunication between students and lecturers(Mourtzis et al., 2021). Therefore, when doing hybrid studio, lecturers and students should have an appropriate cognition of the evaluation's purposes, objectives and educational value as well as different approaches to assessment techniques (Steinø & Khalid, 2017). During this endemic phase, the architecture program at Universiti Teknologi Malaysia took a new initiative to work on the learning process of student-centred learning (SCL) successfully managed through the Collaborative Design Pedagogy (CDP) application of the pedagogy module in the studio in a hybrid manner. This is because the nature of traditional architecture design studios is based on students' experience with a given design problem. Hence studios influence the future design actions of the students (Kararmaz & Civavoğlu, 2017). In contemporary settings, design studios are active spaces where students take social and intellectual actions such as drawing, communication, and modelling by having live face-to-face interaction and communication. However, having a hybrid studio with the application of CDP changed the environment and culture of communication among students due to unphysical communication and peer review(Senbel, 2012).

Therefore, this paper will meet the following two objectives. First, to identify issues relating to the student-centred learning approach in conducting a hybrid architecture design studio. Second, to elucidate the method and pedagogy of collaborative design pedagogy CDP techniques that enhance student-centred learning in conducting a hybrid architecture design studio. The research outcome will be a framework on collaborative design pedagogy and technique that can contribute to student-centred learning in conducting a hybrid architecture studio to achieve a global learning outcome. The scope of this study will focus on studio design projects Year 1 and 2 (involving Bachelor level- LAM Part I) and assignments in elective subjects (Masters Level – LAM Part II). These subjects are chosen as, in the running of the projects, the application of CDP is carried out comprehensively in a hybrid manner in the Bsc Architecture 1st , 2nd and 3rd year design project and Master Architecture subject assignment from Week 1 – 6 of Semester 1 session 2021/2022 during the endemic phase. For the benefit of the study and to fulfil the objectives, section two is divided into three parts. The first part will define the role of implementing CDP in a hybrid architecture design

studio, including its relevance. This is followed by methods of conducting CDP to promote SCL among learners for successful collaboration. The third part will review the approaches and techniques of CDP in a hybrid architecture design studio. This is vital as understanding the different ways of approaching the learner's skill will engage learners with an ideal learning process that results in well-skilled architecture students.

LITERATURE REVIEW

New Academia Learning Innovation Approach Implemented for The CDP In A Hybrid Architecture Design Studio

CDP pedagogy plays an essential role in achieving the SCL as nature in handling architecture curricula based on hybrid and virtual design studios during the endemic period(Keith Thomas McPeek, 2009). In this case, the CDP is defined as collaborative learning in a design studio that is mainly a learner-centred approach (K Thomas McPeek & Morthland, 2010). It transfers some power to students to work together and engage them to learn more about the studio's assignments(Kelly, 2017). The collaborative design has many benefits as it allows students to evolve their ideas by discussing them with their peers in the same or different groups(Emam, Taha, & ElSayad, 2019).

During the early stages of a collaborative model, the studio master or coordinator provides learners first-hand with given project materials to study and assimilate the project content(Keith Thomas McPeek, 2009). Following this, the learners discuss the project studio content with their peers and instructors. During this process, the instructor in the studio will guide and help to develop the students' teamwork skills through systematic peer discussion(Rich, West, & Warr, 2015).This is often achieved by developing a series of group-based exercises to help transition authority and responsibility to the students during the studio period. After each studio session ends during the weekly semester, the learners further enhance and confirm their understanding of the given studio projects individually until the design project completes.

Methods to Conduct CDP In A Hybrid Architecture Design Studio

There are two essential phases to conduct CDP to promote SCL in the hybrid architecture design studio as follows-

Grouping

The first step to collaborative engagement in the studio is forming learner groups or teams. Three essential topic areas should be considered when forming learner groups: (1) group types, (2) group size, and (3) group membership(Nováková, Achten, & Matějovská, 2010). There are three typologies for groups: (1) formal, (2) informal, and (3) base groups. The most appropriate type depends on the project's duration; the shorter durations require informal groups, which are often randomly formed to create a more diverse interaction for all participants(Nováková, Achten, & Matějovská, 2010). The formal group is more often to be created when the project is of greater complexity, task-oriented and has a longer duration. The participants will work together until completing the task; the group can be either heterogeneous or homogenous. Students of diverse backgrounds, experiences and ideas form heterogeneous groups. This results in actual stimulation of the professional practice through more robust discussions but may affect the performance and the final output(K Thomas McPeek & Morthland, 2010).

On the other hand, the homogenous groups might achieve better performance and output but lack diversity. The formal groups' size varies from a minimum of two participants to a maximum of five. The base group learning experience requires the duration of an entire course. The optimum size is between three to four participants. The odd number of students is preferred in the design studio to prevent stalemates and encourage debate, and smaller sizes which make it easier to distribute tasks(K Thomas McPeek & Morthland, 2010).

Project Selection

Appropriate assignment selection is considered one of the essential components for achieving successful collaboration. As project complexity increases, group members' interaction level increases, forcing all members to engage. This helps to diminish the "free-rider" effect. However, making

the project too complex will make it too hard to analyze; and hence harder to communicate and interact with, resulting in an inefficient collaborative experience(Keith Thomas McPeek, 2009). To develop a collaborative learning course, advisable to use Bloom's taxonomy. It identifies four critical considerations that can be applied to design courses and assignments: (1) identification of the most important educational objectives, (2) developing exercises at an appropriate level for the learner, and (3) developing assessment methods to evaluate students 4)applying four approaches of studio learning technique to conduct hybrid studio projects with community, industry and international institutions to promote SCL using CDP involving a)flipped studio b)jigsaw studio, c)inquiry-based teaching studio and problem- based learning studio and d)studio project choice board(Rich et al., 2015). To understand this, the following section will elucidate the four approaches to conducting hybrid studio learning.

Approaches and Techniques of CDP in A Hybrid Architecture Design Studio

Flipped Studio

The flipped studio is a reversible approach opposite the traditional studio learning method wherein the learners are given input lectures in the studio and given tasks, projects or practice exercises as homework(Lazendic-Galloway, Fitzgerald, & McKinnon, 2016). In the flipped studio approach, studio learning shifts from instructor-controlled to learner-controlled.In this sense, the learners are given the design project material to be read at home. The learners then come to the studio to discuss the design project material with fellow learners and the instructor for further understanding(Lazendic-Galloway, Fitzgerald, & McKinnon, 2016). Therefore, in the flipped studio approach, the time is spent discussing the topic and performing more learning activities to deepen the understanding of the topic. After studio hours, the learners further assimilate the learnings via more online discussions, experiments, or real-life applications through the given design projects independently to establish appropriate design project program briefs, concepts and end products. The instructional strategy in the flipped studio uses a blended learning approach using electronic media and conventional Instructor-led face-to-face instructional methods. The content given to the students before the studio is online digital content in the form

of online inputs and videos. In the studio, students discuss their design ideas with their peers or perform more learning activities, ask the instructor questions, and get feedback on the proposed design projects.

The flipped studio approach has many benefits, including three main areas(Bequette, 2018). First, learners will become more responsible for achieving their learning results. It is a learner-controlled approach. Learners can study the project material before coming to the studio, and based on their understanding, they discuss, analyze, and question the studio content. Second, learners have more hold on the studio content. As the studio project material is given to the learners for learning and assimilation through electronic media, they can access the material and related content readily and at any time, irrespective of the instructor's presence or availability. Third, the learning programs are efficient. In flipped studio environments, learners get more time to interact with their peers, discuss the content, get guided assistance from the studio masters as instructors, and self-practice as well as manage time.

Jigsaw Studio

The jigsaw studio method is a cooperative learning strategy. It is a suitable approach to be adopted in a hybrid studio as it allows learners to be directly immersed in the design project information and material, which promotes a deeper understanding of that material(Perkins & Tagler, 2011). In addition, this approach also allows learners to venture and be responsible for a subcategory of a more critical topic or issues relating to any scale of design projects that promotes students to become an expert on a specific topic through communication and discussion with each other researching on the same topic or issues.

Jigsaw studio can be conducted using three approaches or a combination of two or three approaches. First, by individual techniques by assigning each student subcategories to specific research on design issues and topics. Following this, the instructor or studio masters further instruct each learner to do the individual presentation and conduct sharing sessions within more prominent groups to develop the subcategory of the design issues and problems to provide a more in-depth look at each subcategory of topics(Perkins & Tagler, 2011).

Second, through cooperative groups. This technique starts with dividing learners into small groups depending on the number of subcategories that fit into the overarching studio design projects. Each learner group would then be given a subcategory to research and develop the design project framework and then crisscross the findings using comparative analysis with other groups to further strengthen and develop the design issue projects for a more sound finding and finally presented to the bigger studio audience(Perkins & Tagler, 2011).

Third, using the approach of jigsaw within groups. For this method, the instructor or studio master will divide the learners into various groups and respond with a specific design topic or issue category. Each group learner is then given one subcategory relating to the main specific category of design topics or issues and required to develop their understanding and become experts in the subcategory. The findings are then combined with the larger group to establish the final findings and outcomes(Perkins & Tagler, 2011).

There are many benefits in adopting the jigsaw studio method as learners will earn life skills such as communication and working within a timeline. This method also promotes collaboration, discussion, and self-motivated learning strategies. Learners who work together to ask questions to clarify their understanding will provide critical feedback in an appropriate manner. In addition, the jigsaw method in studio design education will effectively produce academic gains in problem-solving and analyzing, two crucial cognitive skills for learners(Perkins & Tagler, 2011).

Inquiry-based and Problem-based Learning in Studio and Class Assignments

Inquiry-based and problem-based learning method engages learners by creating real-world connections through high-level questioning and exploration(Malopinsky, Kirkley, Stein, & Duffy, 2000). The inquiry-based learning approach encourages learners to engage in experiential and problem-based learning as it triggers and initiates curiosity to achieve far more complex goals in design studio projects than information delivery. Despite its complex nature, Inquiry-based learning is considered easier for studio masters and class instructors because it not only shifts responsibility from them to learners but also engages students.

In applying inquiry-based and problem-based learning in design studio

and class, four processes can take place in conducting the studio design project. There are four levels of Inquiry(Tawfik, Hung, & Giabbanelli, 2020). The first is adopting the confirmation inquiry method. In this sense, learners in a design studio must confirm the principles and requirements of a studio project or activity. For example, in producing a product or building typology already known, the learners must self-discover and further explore the details and specifications of the studio project. Second is the application of structured Inquiry in which learners are required to investigate the given assignments through a prescribed procedure. In this sense, learners can openly and critically analyze the given design project using the systematic methodological analysis framework established by the studio master. Third, by having guided Inquiry, learners will investigate specific project issues proposed by studio masters using procedures and analysis methods established independently by the learners. Fourth, through open Inquiry, learners investigate questions on design studio projects based on learners own designed knowledge and selected procedures(Friedman et al., 2010).

These four processes trigger the essential components of Inquiry-based learning involving four steps: orientation, in which the studio masters or instructors introduce new topics or concepts(Zairul, 2020). Following this, learners develop questions during the critique and peer review sessions relating to specific design issues or problems and form the basis of investigation to unveil and develop the design concepts. This will lead to a final design work presentation to obtain reflection and feedback for more substantial design outcomes. Inquiry-based learning is essential for creating excitement and motivating learners to become specialists in their learning process in the studio, which in the long run, cultivates learners' ability for independent learning skills. This kind of pedagogy encourages active learning and enhances critical thinking through multi-faceted investigation from various parties(Friedman et al., 2010).

Project Choice Board

Conducting studio projects using the choice boards technique is essential to improve learning in hybrid design studios, increase learners' engagement and ownership, and even make learners more eager to conduct and do design studio projects(Moloney & Harvey, 2004). Concerning this, there are five approaches of choice boards technique that can be adopted in conducting design studio projects: developing aspects and

principles relating to design principles comprising of standard aligned aspects, strategic specific, thematic choice, review and practice and project performance(Norazman, Ismail, Ja'afar, Khoiry, & Ani, 2019). Each of these four approaches has different ways of approaching the learner's skill and ability to engage learners in depth in design studio projects(Moloney & Harvey, 2004).

To understand this, the next section will explain how the four approaches of CDP are adopted in design studio projects by looking at a case study in the UTM Architecture Program involving the Bachelor of Science Program for 1st and 2nd Year Design Studio as well as elective subject assignments at Master Architecture Program. These four approaches are essential to be considered as determinants and parameters to document the process of CDP about the design studio projects and assignments as case studies to promote SCL among learners. The following section elucidates the methodology and analysis procedure using the explanatory building technique.

METHODOLOGY

This study utilizes case studies as the research strategy under the interpretive paradigm. The interpretive paradigm is utilized as it is based on a deep understanding of reality and the causes that lead to general and causal explanations. The case studies were selected based on the application during Semester 1 20212022, where the UTM Architecture Program experimented with the CDP by having studio design projects and elective subjects in a hybrid manner. The selected projects and assignments are highlighted based on their adoption of these four learning techniques involving tripartite engagement involving academia, profession and fieldwork. This is important to enhance the SCL among students. The justification for the selection is based on the purposive sampling technique to arrive at valuable research outcomes. This is essential as purposive sampling allows the gathering of qualitative findings, leading to better insights and more precise research results. The development of the parameters on four learning techniques is established using hermeneutics and coding from the literature review on the role and importance of CDP in teaching and learning. For the data collection method from the chosen case studies- direct observation and

design crits are used to obtain data based on four approaches of studio learning and subject assignment techniques. This is important to answer the study objectives in developing the appropriate module framework for CDP to heighten the SCL. (refer to Figure 1). In order to analyze the data from direct observation and design crits, an analysis approach using explanatory methods is used to comprehend the four approaches of studio learning and subject assignment techniques. This is important to understand and document how CDP is applied in the teaching and learning of architecture. All collected data is then used to propose the best possible framework to achieve the study's objective.
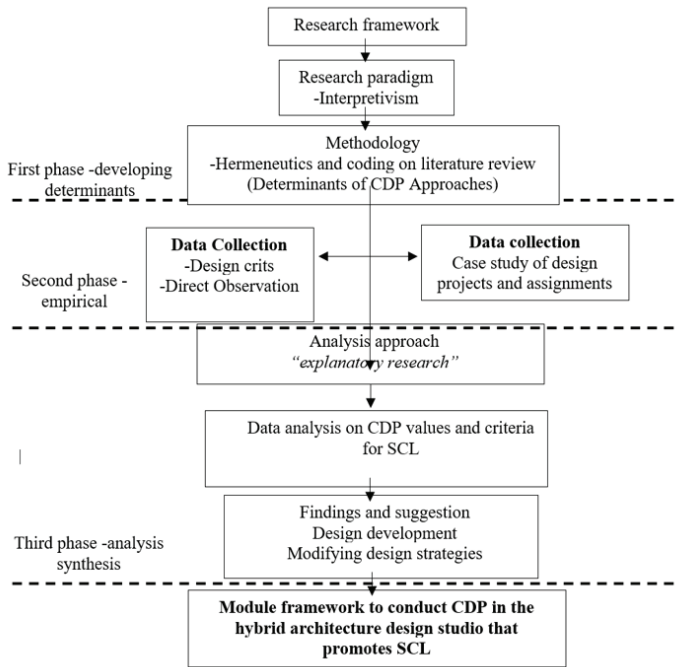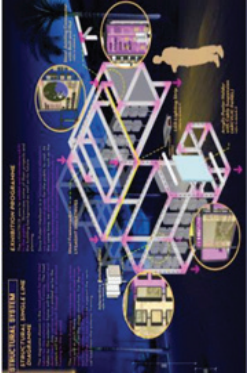

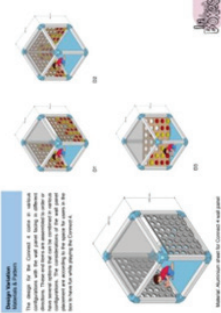**Figure 1. A research Framework**

Source: Author

FINDINGS

Case Study of Studio Design Projects And Subject Assignments To Conduct CDP In A Hybrid Architecture Design Studio and Class

For the case study in Semesters 1 20212022, the UTM Architecture Program showed the involvement of various parties from the industry collaborators like UEM Sunrise Bhd as industry collaborators and with international university partners such as the Vellore Institute Technology, Architecture School from India. From direct observation, the four approaches are described in Table 1.

Table 1.Four Approaches of Studio Learning and Subject Techniques to Conduct Hybrid Studio Projects and Class Assignments with Community, Industry and International Institutions to Promote SCL using CDP

Studio learning and subject assignment techniques and approaches	Method and approach in teaching and learning (T&L)	Project and Assignment Application	Sample of students' work and participation in a hybrid manner (Author : 2022)
Flipped studio (In adopting this technique, students can study the project material before coming to the hybrid studio. When the students gather in the hybrid studios, they develop the issues on available communal streetscape through interaction with peers to establish the parameters)	The first phase - Instructs inputs design program brief beforehand using video, podcast and website for students to gain in-depth, informative knowledge building (the materials are prepared and organized by studio masters and UEM Sunrise Sdn Bhd-industry partners). All of these inputs are related to the design scheme, industry needs and requirements (1-2 weeks) Second phase: The interactive activities conducted in the studio for effective learning. Students develop conceptual designs and produce content and design in the studio among peers with feedback crits from the industry. This feedback crit is conducted in a hybrid manner (blended crits) with industry panels (3 weeks) Third phase: Presentation of product outcome to lecturers, community and industry (1 week)	Design studio: Bsc Architecture 2nd Year Design Studio (SBEA 2148) collaboration with UEM Sunrise Sdn Bhd (multipurpose exhibition board) (6 weeks project)	 Project Theme: Designing Public Communal Streetscape Furniture

| Jigsaw studio activity (In applying this technique, students are free to venture and be responsible for any subcategory of a more prominent topic or issues relating to any scale of design projects. This, in turn, promotes students to become an expert on specific topics through communication and discussion with each other researching the same topic or issues) | -Students Architecture UTM works with VIT Architecture students online and has Focus Group Discussions (FGD) online with the selected local community in Chennai.

UTM group of students to become "experts" on a specific topic (on Malaysian culture), then share with the VIT group of students to be integrated into the design scheme.

-Process developing concept and design scheme relating to site requirement in Chennai, India (1-4 weeks) in hybrid mode | Design studio: Bsc Architecture 2nd Year Design Studio (SBEA 2148) collaboration with Vellore Institute Technology (VIT) Architecture School, India (Fifty International students and four lecturers from VIT) |

Project Theme : Designing A Public Communal Park In Chennai, India (Aykakula)

Project Theme: Edutainment Play Capsule (In Between Boxes)

Inquiry-based & problem-based learning in subject assignments (Inadopting this method, the Inquiry-based learning leads to active learning because this promotes the application of structured Inquiry in which learners are required to investigate thegiven assignments througha prescribed and systematic procedure established and carried out by learners themselves)	-Students Architecture UTM created an interactive play capsule for kids to enjoy that stimulates their learning and awareness of recycling via modernized traditional games. -Identifying real-life community problems, needs, and sites from surveys and Focus group discussions. -Inquiry and problem base processes were conducted to solve real-world issues through concepts and scenarios in phases as follows – i)on-site input issues and site visits (contextual (macro, and micro) (1 week) ii)Group meeting with the client (UEM, Nusajaya Community (vendors, visitors, tourists)- deliberate in the task in student group (1 week) iii)Developing program briefly in student group (crit and monitor by client and studio facilitators) (2 weeks) iv)Group meeting with material supplier for construction method (1 week) v)Designing skills (software adaptation) (problem-solving skills) (3 weeks) vi)Presentation (Communication, visual and verbal, with the client, supplier, and studio team) (1 week)	Elective subject: Master Architecture Outreach Subject (MBEA 2323) collaboration with UEM Sunrise Sdn Bhd

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| Project choice board (The application of this board provides flexibility and freedom to explore various options within a limited time. This It increases learners' engagement and ownership and makes learners more eager to conduct and do design studio projects or given tasks. | -Student Architecture UTM embarks on an independent learning strategy where students are given multiple choices in the kinds of studio activities they will complete based on their strengths. Although the lecturer specifies which activities the student will choose, the student gets to choose one from several options.

This promotes and improves remote learning in hybrid situations, increasing student engagement and ownership and making the students more eager to dig into their assessments and tasks.

i)input on-site issues and site visits (contextual (macro, and micro) (1 week)
ii)program brief and design development choosing various types of park benches from various materials: timber, steel, concrete etc., to be constructed depending upon own knowledge and understanding. (1 -3 weeks)
iii)benches model making (2 weeks)
iv)Presentation of benches model to industry panels | Design studio: Bsc Architecture 1st Year Design Studio (SBEA 1118) collaboration with UEM Sunrise Sdn Bhd.

Project Theme : Designing Public Communal Streetscape Furniture (Benches In The Park) |

Source: Author

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DISCUSSION

Embedding CDP with non -conventional design learning pedagogy as added value

About the above four approaches to conducting CDP in a hybrid architecture design studio and class, the UTM Architecture Program establishes and produces a module framework to conduct CDP that can promote SCL that may be applied in other architecture schools as a reference for the future (refer to Figure 2). This module framework

covers all aspects, from the development of design course information to the application and assessment stage. This module can be applied as it covers four main phases identifying the design studio or class objectives, developing studio design exercises or assignments, establishing the level outcome of learners' ability, and finally, the assessment phase to measure students' achievement and progress. Each of these four phases emphasizes CDP and SCL as crucial importance so that students can learn openly to engage with a broader audience and speak in front of a diverse audience. This makes them more comfortable sharing their work, better speakers, and more confidence. In addition, it will challenge them in terms of critical thinking and analysis (refer to Figure 2).
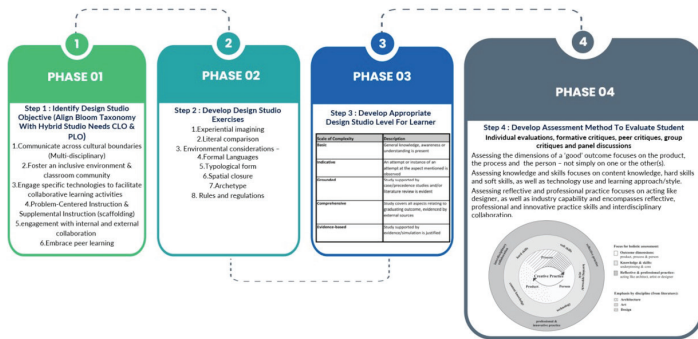

Figure 2. Innovative Module Framework to Conduct CDP in the Hybrid Architecture Design Studio that Promotes SCL

Source: Author

In Phase 1, the identification of the design studio objective must first be aligned with the Bloom Taxonomy and viewed in a broader context that covers multidisciplinary fields' involvement across various boundaries beyond the studio's four walls. This is vital to embrace the spirit of peer learning and develop collaborative practices among various parties. After establishing the design studio objectives, phase 2 should be concurrent with the proposed design exercise to implement the aims. This design exercise must be in varied modes that explore students' ability at various competency levels for diverse expression in phase 3. In phase 4, the scale of design complexity and student abilities can then be explored and assessed from its level of achievement - low (e.g. basic level) to moderate (e.g. inductive or grounded) and high level (e.g. comprehensive or evidence-based) for a complex decree.

The framework module mentioned above in Figure 2 hence is suitable to be adopted to conduct architecture design studio at both levels LAM Part 1 (Bachelor level) or at LAM Part II (Masters level), as the primary outcome of architecture education is meant to provide students with the expertise and knowledge necessary in order to produce innovative and competent individuals. Nevertheless, the phases above can be improvised according to the program requirements applied by individual architectural higher education providers (AHEP).

For example, in determining and developing design studio projects, it is vital to initiate critical, creative and pragmatic thinking among students so that throughout the entire design project, they feel enthusiastic and aspire to venture into all angles of possibilities in exploring new design ideas. This can be enhanced if studio tutors develop the design studio framework based on non-conventional academic pedagogy, that is, the CDP four approaches (refer to Table 1) with the embedding of i) reverse engineering discovery learning and ii) immersive inferential learning.

CDP and Reverse Engineering Discovery Learning

For instance, in adapting the CDP four approaches with reverse engineering discovery learning, the students will build an understanding of producing design projects reversibly from the stage of disassembling to reassembly(De Luca, Veron, & Florenzano, 2006). Concerning this, the application of inductive learning, a process where the learner discovers rules by observing examples, comes into place. To understand this, let us take an example of a retreat house design project.

In this case, instead of directing students either individually or in groups to produce an end studio project of a retreat house, the students are given one complete real-life building of a retreat house and then assemble and disassemble the existing building into parts, fragments and segments(De Luca et al., 2006). During the assembly and disassembly process, the knowledge of dismantlement (in part or whole) involving structural components, materiality and others will be considered. A ceiling and four walls remain by stripping away the furniture and other details. During this process, architecture students can identify the retreat house's design factors or problems. At this level, students can distinguish design

issues and solutions in the building and select relevant information to design a retreat house. This will lead students to evaluate the merits of all information acquired to resolve the design of a retreat house. By this time, students will be able to justify essential design elements hierarchically relating to retreat house design. Finally, the students can produce their program briefs or proposals for a retreat house which will then be the actual design solutions for the problems addressed. At this level, the students should also be able to predict the effects of their program brief or proposals and later produce their design of a retreat house with a new solution(Ding, Liu, Liao, & Zhang, 2019). Through this process, creativity can be produced by utilizing knowledge in a new format or structure. Creativity depends on a broad range of knowledge but possesses other qualities, including the ability to break or depart from a generally known solution. Creativity also includes restructuring a problem to achieve a new outcome.

CDP and Immersive Inferential Learning

As for CDP's four approaches to immersive inferential learning, a simulated or artificial environment can also be used. The environment enables the learners, individually or in a group, to ultimately get immersed in experiencing an actual learning environment. This inferential learning is a process that can be described as one or more knowledge transmutations, for example, induction, abstraction, and simulation(Paes, Arantes, & Irizarry, 2017). It is a unified framework for developing and implementing multistrategy learning systems(F. Abdullah, Kassim, & Sanusi, 2017).

For example, designing an eatery space. By using virtual reality simulations that include exterior and interior visualizations, students can develop an understanding of spatial experience in an eatery setting as a subjective assessment that emerges through visual perception in a group or individually. The elements that make up the human visual perception, like light, colour and depth, can be explored with the excellent quality of function, aesthetics and structure(Fazidah Hanim, 2016). This will help students craft experiences that congruently engage more of their senses in design, enhancing the quality of space and form-making and further promoting the end user's social, cognitive, and emotional well-being(Paes et al., 2017)

CONCLUSION

Collaborative design pedagogy is essential for improving students' quality in architectural design. CDP is also an effective learning method to increase motivation among students for SCL and to have critical, creative and pragmatic thinking skills as individuals and as a team. This is crucial as when involving the design process is widely certified as a complex iterative process which involves the step of collecting, processing, analyzing, translating, synthesis, designing and delivering product results, where students are exposed to various theories related to architecture and the built environment. Hence, the CDP allows students to evolve their ideas by discussing them with their peers in the same group, which may lead to better solutions. This scenario reflects the reality of architectural practice, which relies mainly on group work to achieve a project.

This research demonstrates how CDP can be applied in studio design projects and class assignments by involving a group of architecture students within their program and the participation of different parties and stakeholders. In this sense, it demonstrates how students' creativity can be unleashed beyond normal expectations when working in groups in which the design exploration outcome solved real-life community issues. This study has merit as it adds new knowledge to existing studies focusing on architecture education in Malaysia. The framework module of CDP in teaching students how to design in a collaborative environment through a learner-centred approach or SCL can be a reference to be adopted in other architecture schools locally and globally.

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All authors contributed to the writing of the paper. The researcher did the data compilation. All authors have read and approved the final manuscript.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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Tarikh : 20 Januari 2023

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Sekian, terima kasih.

"BERKHIDMAT UNTUK NEGARA"

Setuju.

27.1.2023

Saya yang menjalankan amanah,

PROF. MADYA DR. NUR HISHAM IBRAHIM
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