

Original Article

# Design Studio Pedagogy during Disruption: A Study of Competition-based Studios in Postgraduate Interior Architecture Education

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**Abstract** - Architectural design studio constitutes the epistemological core of architectural education, which is a culmination of theory, practice, and experiential learning. In the same way, postgraduate interior architecture education has a design studio as its key pedagogical framework. Disruption of conventional studio environments happened because of the COVID-19 pandemic, creating unavoidable transitions to remote and hybrid modalities of studio learning. The disruption and, in turn, the shift in modality of learning lead to crucial questions regarding the structural resilience and adaptability of competition-based studio pedagogy in different contexts. Current studies on hybrid learning and design studio pedagogy have principally relied on qualitative reflections. Limited studies using statistical validation were found in parameter-driven comparisons of studio models across pre-, during-, and post-disruption phases. Evaluation of competition-based postgraduate studio projects to determine structural continuity across disrupted contexts remains underexplored. This research paper aims to comparatively evaluate such design studio projects conducted across pre-disruption, disruption, and post-disruption phases by a structured comparative case study design using literature-derived pedagogical parameters. A Yes/No matrix for the structured set of parameters was charted across the three cases and converted into binary form to evaluate the comparison quantitatively. The research further aims to statistically validate the resilience and continuity of studio pedagogy using a structured binary framework and chi-square analysis. A chi-square test of independence was conducted to examine differences among the cases. The statistical results indicated no significant difference across the identified parameters. These findings suggest structural pedagogical continuity despite contextual and instructional shifts, consistent with established design studio practices, i.e., competition projects. Within the structured analytical boundaries of this study, it concludes that competition-based studio frameworks demonstrate measurable resilience across disrupted academic conditions and sustain professional continuity by reinforcing competency skills and practice-aligned learning at the postgraduate level. This study is a comparative pedagogical model analysis, not an outcome evaluation study.

**Keywords** - Design Studio Pedagogy, Competition-Based Studio Projects, Resilience in Studio Pedagogy, Hybrid Design Studio, Postgraduate Architectural Education in India, Disruption in Design Pedagogy.

## 1. Introduction

Architectural and building design studies centre on understanding and shaping the built environment, with the design studio positioned as a reflective, experiential, and mentor-guided core of architectural education. [1-3] It operates as an interactive platform integrating theory, creativity, and practice within a structured curriculum framework. [4] While undergraduate studio pedagogy has been broadly studied, postgraduate studio education, particularly in niche specialisations, remains comparatively underexplored. Peimani & Kamalipour (2022), for instance, analyse blended learning in a postgraduate studio but highlight unresolved questions regarding what and how to teach in such

contexts. [5] Postgraduate studios delve into the juncture of theoretical inquiry and professional simulation. This aids in fostering critical thinking, collaboration, and performance-oriented outcomes.

The COVID-19 disruption significantly changed conventional studio delivery, accelerating transitions to hybrid & digital modes and further prompting renewed examination of studio resilience. Competition-based learning has continued as a professionally aligned model, integrating real-world briefs with limited time. Problem-solving, collaboration, evaluative rigor, etc., are the skills required for competition-based studio projects.





However, despite expanding discourse on disrupted studio models, existing research largely has qualitative methods over statistically validated, parameter-driven comparison. Systematic studies examining transformation or adaptive continuity, pre-, during-, and post-disruption studio structures remain limited.

This study addresses the absence of empirically validated evidence assessing structural pedagogical continuity across disruption phases. Without quantitative evaluation grounded in literature-derived parameters, claims of resilience remain interpretive. Monacella & Keane (2023) further emphasise the need for new pedagogical ecologies for uncertain futures [6], while Indian scholars call for policy-level and curricular reorientation in postgraduate architectural education to bridge the gap between pedagogy & practice and to create well-equipped educators for whom postgraduate studies are a must. [7] These views of researchers emphasize the need for this paper's study.

This paper aims to study the nature of competition-based postgraduate design studio pedagogy with two primary objectives. First, to identify the key parameters that characterize competition-based design studio projects in interior architecture education, and second, to assess the pedagogical continuity and resilience of competition-based studio projects across three time periods using a structured comparative framework. The research seeks to determine whether significant differences exist across the selected cases by converting pedagogical parameters into measurable indicators and testing them statistically.

The scope of the study is purposefully selected as competition-based postgraduate design studio projects conducted within a single institution across three critical time periods strategically positioned with the COVID-19 pandemic disruption. All cases are collaborative competition projects executed under one consistent primary mentor across three different student batches and varying co-mentors. Only structurally analogous projects accomplished across the three timelines are included to ensure meticulous pedagogical comparison.

## 2. Materials and Methods

### 2.1. Methodology

This study adopts a mixed-method approach incorporating qualitative investigation and quantitative validation, as illustrated in the research flowchart Figure 1. The process commences with an extensive literature review that gives an overview of architectural education and further establishes the conceptual foundation of postgraduate Interior Architecture design studios. In this literature review, basic types of studio projects, identification of core components, and attributes of design studio projects were identified. Based on these studies, five primary themes and twenty-five evaluative parameters are derived, forming the research

framework.

The initial stage of the qualitative study in this paper consists of an empirical investigation. Three competition-based postgraduate studio cases are selected based on the author's first-hand mentoring experience and their representation across crucial periods: pre-, during-, and post-disruption. Each studio project case is documented in depth, including project description, schedule, pedagogy involved, studio attributes, studio components, etc. A structured cross-comparison of all 3 cases is then conducted using a YES/NO framework across five primary themes and 25 evaluative parameters derived from the literature review, to determine the presence or absence of the identified parameters. This stage generates interpretative insights, Inference-I, regarding commonalities and variations across cases.

The quantitative phase acts as a validation stage. The YES/NO observations are converted into binary data, permitting statistical examination. A Chi-square test is applied to assess relations and determine if significant differences exist among the three studio implementations in Analysis II. The statistical inference, Inference II, is then integrated with interpretations from the qualitative phase of the study to produce the final consolidated findings.

The qualitative component allows contextual understanding and thematic comparison of the chosen cases, while the quantitative component enables statistical rigor and objective validation. This objective validation strengthens the inferences from qualitative studies. The integration of both approaches ensures methodological strength and analytical depth.

## 3. Literature Review

The literature review for this study is methodically organized across five major themes and fourteen subtopics, encompassing the foundational theories and scholarly contributions of eighteen researchers from across the globe, with expertise in the subject. The author has deliberately examined the subject from a macro to micro perspective, beginning with wider discourses on architectural education and studio pedagogy at the global level. The study includes scholarly works that have theorized, critiqued, and documented studio practices from across the world. Gradually, the focus narrows down to postgraduate Interior Architecture studios within the Indian context. The structured literature exploration includes insights from international researchers on design studio pedagogy, collaboration, disruption, and competition-based learning. Parallel studies on perspectives articulated by Indian academicians working in similar areas of research are conducted to document comparable educational and cultural backgrounds.

Tables 1, 2, and 3 represent the evolution of a thematic categorization of parameters identified within a design studio project, charting their corresponding sub-categories,

associated researchers, and their key theoretical concepts. This structured literature enables conceptual clarity and establishes meaningful connections between pedagogical theories, documented studio practices, and realities.

Encompassing the extent of the selected research, the literature review provides the necessary scholarly background for the study. More importantly, it formulated the evolution of five core themes and twenty-five evaluative parameters, which led to the framework to systematically assess and cross-compare the three selected cases of design studio projects.

### **3.1. Background - Architectural Education**

Architectural education combines technical knowledge with creative problem-solving, which requires teaching methods that, in turn, can enhance students' critical thinking and design skills. [8] Studio-based learning is the main approach through which these competencies are cultivated. Architectural education fundamentally aims to cultivate students' capabilities in designing the built environment through experiential, studio-based learning. Dewey (1938) emphasized that effective education is grounded in experience and reflective practice. [9] Building on this, Kolb's (1984) experiential learning framework highlights the cyclical process through which learners engage in studio contexts. [10] Cross (1982) posited that design embodies a distinct "designerly way of knowing," which differs from both scientific and artistic modes of cognition. [11] Extending these perspectives, Salama (2009) advocates for a transformed, learner-centred studio pedagogy that integrates socio-cultural and environmental considerations into architectural education.[2]

#### **3.1.1. Undergraduate Architectural Education in India**

In the Indian context, B.Arch. is a 5-year undergraduate degree program approved by the statutory body for architecture in India, Council of Architecture (CoA), as per the Architects Act 1972. [12] After the successful completion of the 5 years, a student can register with the Council of Architecture to practice architecture across India. With the 2020 National Education Policy, the duration of programs at higher educational institutions is prone to a great change to be in par with the institutions across the world, make institutions multidisciplinary hubs, and improve student-centred learning. [13] With the impending implementation of the National Education Policy, a change is expected in a nation-wide revision of architecture curriculum. In a 2023 CoA released an interim report titled, Architecture Education: Way Ahead in pursuit of Education Reforms, in which the report stresses Design thinking and Design development as one of the 4 major components in learning outcomes while developing the curriculum. This will have its focus on architectural design studios and modules that add further value to it. The thoughts put forth by the Council of Architecture in this report advocate for evolving pedagogical practices within design studios,

emphasizing critical, reflective, and contextually aware design processes.

#### **3.1.2. Post-Graduate Architectural Studies in India**

The postgraduate degree M.Arch. is a 2-year program with various specialisations. A successful completion of a five-year B. Arch (undergraduate) degree is a must for eligibility in the M. Arch program. [14] In India, postgraduate studies increased with an increase in the number of architectural institutions in the late 2000s and early 2010s.[15] With a greater number of institutions, the number of faculty required increased, hence there was an increased interest in postgraduate studies. Many architects prefer to stand out among the architects with a specialization. [15, 16] Analyzing and studying post-graduate design studios can provide valuable insights and benefits for various stakeholders, including students, educators, institutions, and the extensive design community. Architects who wish to pursue doctoral studies also take up post-graduation as a stepping stone towards their goal.

#### **3.1.3. Design Studio in Architectural Curriculum**

The design studio is the core of the architecture curriculum; it is dynamic and involves multiple stakeholders. Every subject's accrued knowledge from the curriculum can be applied in a design project. A design studio project carries maximum credits and the maximum number of hours a week. Architecture pedagogy in a design studio emphasizes a balance between learning and teaching methods in the design studio, fostering reflexive feedback and contextual adaptability. [17] A design studio is not a remote place where design happens. Exploring and analysing the components of a design studio in detail is vital and can lead to new solutions to pedagogical issues. Exploring new teaching methods through the components of a studio has its own advantages and disadvantages. Educators, rethink the traditional studio structures, advocating for flexible, context-aware methods to enhance creativity with five strategies: iterative critique, peer learning, real-world context, collaboration, and flexibility as critical for optimizing student outcomes [18, 19].

#### **3.1.4. Postgraduate Interior Architectural Design Studio**

A design studio in postgraduate studies should be flexible, advanced, skill-based, and on par with national and global peers. Postgraduate design studios emphasize advanced, research-oriented, and skill-based learning, integrating flexible structures, professional insights, and reflective pedagogy to prepare students for academic and professional excellence. [20] Particularly, a postgraduate Interior Architecture design studio needs to be advanced when compared to an undergraduate studio, as the students have already gained five years of learning in their undergraduate studies, and some might even have a few years of experience in practice. A blended approach in the design studio enhances student participation and engagement by combining flexible learning modalities, promoting continuous feedback, and

fostering collaboration among instructors and peers. [17] A postgraduate architectural design studio should focus more on the research quotient, as it forms the basis for a few who would go on to pursue doctoral studies. Integrating knowledge and research-focused pedagogy in PG studios fosters inquiry-based and interdisciplinary learning that prepares students for

doctoral pursuits. [21] Interior architecture, as an emerging academic and professional discipline, continues to face a notable shortage of comprehensive scholarly documentation. Addressing and critically examining its theoretical, pedagogical, and practical dimensions is therefore essential to support the systematic development of the field (Günçe).

**3.2. Types, Components, and Attributes of Postgraduate Academic Design Studio Projects**

**Table 1. Types, components, and attributes of postgraduate academic design studio projects (specialisation: interior architecture)**

S. No	Category of parameters in a Design Studio Project (DSP)	Sub-Category of parameters	Researchers	Key Theories
1.	Type of Design Studio Projects	Competition	John Dewey, David Kolb, Nigel Cross, Herbert A. Simon, Ashraf M. Salama, J.P. Chupin, D. Nichol S. Pilling	Experiential and Problem-Based Learning; Bounded Rationality; Design Thinking Under Competitive or Real-World Constraints.
2.	Collaboration in a Design Studio	Stakeholders	John Dewey, Jean Piaget, Donald Schön, David Kolb, Donald Norman, Ashraf M. Salama, Peggy Deamer	Roles And Learning Processes of Students, Mentors, Users; Experiential and Reflective Learning; User-Centered and Critical Pedagogy.
		Interactions	Lev Vygotsky, Donald Schön, Hagay Hochman, Itay Dafni, Ashraf M. Salama, Peggy Deamer	Social Constructivism, Feedback and Critique Dynamics, Scaffolding, and Reflection-In-Action in Teacher–Student Relationships.
		Space (Physical & Digital)	Thomas Cochrane, Burak, Johan Verbeke, Gabriela Goldschmidt, David Sinfield, Mariotti J, Niblock C	Offline and Online Studio Models; Sketching and Visual Cognition; Spatial Dynamics, Flexible Studio.
3.	Attributes of a Design Studio Project	Design Process	Dewey J, Goldschmidt, Dafni, Lev Vygotsky, Jon Kolko, Piaget J, Nigel Cross	Experiential and Inquiry-Based Learning, Non-Linear and Exploratory Problem-Solving, Iteration and Reflection
		Collaboration	Lev Vygotsky, Ashraf M. Salama, Johan Verbeke, Burak Pak, David Sinfield, Peggy Deamer	Collaborative and Interdisciplinary Learning; Participatory Design; Collective Authorship and Social Learning.
		Modality	Thomas Cochrane, Burak Pak, Johan Verbeke, Gabriela Goldschmidt, David Sinfield	Digital and Hybrid Studio Models; Sketching and Visual Cognition; Experimental and Practice-Led Learning Environments.
		Time	Donald Schön, Ashraf M. Salama, David Sinfield	Time Bound studio, Phases of Learning, Flexibility in design process, and Iterative reflections.

Source: Classification based on Observations from Literature Review by the Author

**3.3. Types of an Academic Design Studio Project**

Architectural design studio pedagogy encompasses a range of project typologies, including hypothetical, live, design–build, and competition-based studios, each addressing distinct educational objectives. Salama conceptualizes the

design studio as an evolving pedagogical framework in which traditional hypothetical projects are increasingly complemented by experiential and practice-oriented formats to enhance critical and reflective learning. [2] Live projects and design-build projects, as design studio projects, are

recognized for their ability to expose students to real-world constraints, collaborative processes, and practical construction-related information and decision-making. [22] In this spectrum, architectural competitions are identified by Chupin as experimental platforms that promote innovation, design rigor, and experimental thinking beyond the systematic conventional academic boundaries. [23] Collectively, these studio typologies demonstrate the pedagogical diversity characteristic in architectural education and highlight the relevance of competition-based projects as a significant mode of learning in postgraduate design studios. [24]

### 3.3.1. Competitions as Academic Design Studio Projects

Though competitions are not always directly theorized, several studies have highlighted their pedagogical potential. Herbert A. Simon (1969) introduced the concept of bounded rationality, explaining how design functions within constraints, a notion that reflects the structured yet creative conditions of competition-based learning. [25] The effects of using student architecture competitions as studio design projects, evaluating their impact on the learning environment, student experiences, and outcomes, were studied. It reveals that competitions can boost student motivation, foster teamwork, and provide realistic, profession-oriented assignments, while also cultivating a supportive studio atmosphere. [26] More recently, El Deeb and Faragallah (2024) found that while competition participation fosters many professional skills, schools must address early gaps in teamwork readiness and student self-confidence to capitalise on the learning potential fully. [27] Recent evidence shows that students report that based assignments enhance design skills, teamwork, and time management. [28] Collectively, these perspectives affirm competitions as valuable extensions of experiential studio pedagogy.

## 3.4. Components of a Postgraduate Academic Design Studio Project

### 3.4.1. Stakeholders of an Academic Design Studio

A design studio comprises various stakeholders like students, teachers, peers of students from within and outside an institution, peers of teachers from within and outside an institution, the institution's decision-making authority, etc. The skills, character, and individual interests that each stakeholder possesses have a direct impact on a design studio. Every stakeholder has a role to play either directly or indirectly in a design studio project across various stages of the design process. [29] Learning from and with the instructor is key. The role of an instructor is stimulating and speeds up the design process. Architectural pedagogy in studios often creates a disconnect between teaching intent and student understanding, suggesting a need for more interactive, student-centred approaches to close this gap. [30] Detailed research studies on pedagogy suggest a shift towards integrated knowledge in the studio. Strong mentoring structures accelerate students' ability to translate creative freedom into coherent design outputs. [31] Layered mentoring

models improve teaching effectiveness and support student growth in studios. [32] Socio-cultural awareness has led to new methods of exploration in a design studio with a specific focus on students' experience in architecture studios.

### 3.4.2. Interactions in an Academic Design Studio Project

The most important yet intangible aspect of a design studio is the interaction that happens among the people involved in it. It is important to study the interactions and group dynamics that occur between various stakeholders in a design studio. Donald Schön (1983) expanded these ideas through his concept of the reflective practitioner, framing design education as a dialogic process in which both teacher and student engage in reflection-in-action and reflection-on-action. [33] These interactions play a major role in the way the design studio evolves in its process. It can have a major influence on the outcomes as well. It is not just sketches, drawings, and models that evolve ideas; verbal interactions play an equal role in the studio discourse. Discussion, both formal and informal, leads to learning. [34] Each of such interactions can have prime importance in shaping the design studio. Primary interactions happen between a teacher and a student, a teacher and a deciding authority of the institution for approval of the design projects. Teacher – student interaction is primary and is a continuous interaction that happens throughout the design process. Students' progress through phases of exploration, reflection, and synthesis, and peer collaboration is crucial for studio learning. Donald Schön (1983) further articulated this interaction through his study of "crits" as reflective conversations in which both mentor and student co-construct meaning and understanding through design action. [33] Hagay Hochman (2017) explored the communicative dimension of critiques, identifying how linguistic framing and tone shape the emotional and cognitive response of students. [29] Lev Vygotsky's (1978) social constructivism underscores that learning emerges through interpersonal engagement. [35]

### 3.4.3. Spaces Involved in an Academic Design Studio Project: Physical Studio

A design studio space literally hosts a design studio project along with its people involved and their interactions. Physical environment has a greater impact on the students' perception and their pedagogical needs. [36] Physical characteristics of design studios influence student behaviour, collaborative learning, and formative feedback practices. [37] Spatial features like furniture, environmental control, and social layout shape students' emotional experiences and productivity in design studios. [38] It happens in multiple places, favourable to the convenience of the instructor and more predominantly the students. Learning spaces across the institution, other than the studio space, help in peer interaction outside the stipulated classmates. Most of the architecture and design students have a dedicated workspace in their homes. Policy and practice at various architecture schools allow extended studio hours and night studios. These aspects

completely change the dynamics of the concept of space based on time. Space and time dimensions of studios influence creativity and project engagement, and overall spatial learning experience. [39] But the design process cannot be confined within the physical realms of a design studio.

### *Digital Space*

Contemporary studies on architectural pedagogy increasingly conceptualize digital space as an extension of the design studio rather than a supplementary medium. Salama's work positions this shift within broader transformations in studio culture, where learning is no longer limited to physical settings but scattered across digital modes of interaction. [40] Further building on this narrative, Pak and Verbeke conceptualize Design Studio 2.0 as a pedagogical framework in which web-based platforms facilitate continuous collaboration, iterative feedback, and collective knowledge assimilation. [41] Subsequent studies establish how communication tools such as email, messaging applications, and online meeting platforms have progressively facilitated studio instruction, critique, and coordination in blended and remote learning environments. Ioannou further highlights the role of structured digital environments in supporting interaction, documentation, and peer learning across virtual settings. [42] Recent studies by Mariotti and Niblock position learning management systems, including platforms such as Google Classroom, as official digital studio infrastructures that integrate communication, submission, assessment, and reflection. This further redefines the spatial and pedagogical boundaries of the architectural design studio. [43]

## **3.5. Attributes of a Post-graduate Academic Design Studio Project**

### *3.5.1. Design Studio Process*

The design studio process is experiential; it involves continuous interaction, reflection, and iteration. [10] Students may have a brainstorming session around a whiteboard, and then break off and sketch individually. Then, they may come together, critique the work, and draw on top of each other's sketches. A mentor might give them feedback, and then they may present their work. This process is fluid. [44] Unique ideas can evolve following such a fluidic process. Rooted in Dewey's learning by doing philosophy, the studio enables students to construct knowledge through active engagement rather than passive instruction methods. [9] Mentor autonomy, where the mentor has freedom to decide on certain aspects, aids in the design studio process. Competition projects create a flexible learning environment where exploration and independent thinking are encouraged, which aligns with Piaget's constructivist approach. [45] Preparatory exercises act as cognitive primers, preparing students to decode complex design briefs and contextual variables. Vygotsky's concept of the Zone of Proximal Development explains how guided mentorship helps students address challenging design tasks. [35] The design brief functions as a catalyst for inquiry, and the site introduces real-world constraints that shape design

thinking. Goldschmidt's notion of design as a dialectical process highlights the role of expression and reflection in idea generation. [11] As noted by Nigel Cross, design thinking evolves through continuous movement between problem framing and solution development. Norman's perspective on iterative problem solving establishes iteration as a core attribute of actual design studio learning. [46]

### *3.5.2. Collaboration in an Academic Design Studio Project*

Collaboration has become a crucial aspect of contemporary design pedagogy. Johan Verbeke (2010) viewed collaboration as a catalyst of innovation, arguing that exposure to varied disciplinary approaches improves critical and creative thinking. [47] Peggy Deamer (2012) had strong opinions against traditional hierarchies in design education, further promoting equitable and collaborative learning. [48] Team-based learning in architecture nurtures collaboration, which allows students to reflect on their practice and benefit from peer feedback, which boosts creativity and problem-solving skills. [49, 50] David Sinfield (2019) conceptualized collaboration as co-creation, where collective authorship replaces individual expression. [51] Studios provide a dynamic environment for project-based learning, encouraging hands-on exploration and iterative design through collaboration and critiques. [52]

### *3.5.3. Modality of an Academic Design Studio Project*

The modality of the design studio evolves alongside technological and cultural shifts, leading to physical, digital, or hybrid modes of operation. The pandemic's forced shift in studio practice led to hybrid learning methods. The digital adaptation led to both new opportunities and challenges at the same time. [53] Learning spaces in an architecture school, like the library, studio, computer lab, classrooms, etc., are rapidly changing and losing their need and old charm due to digital advancements. Thomas Cochrane (2014) examined digital and blended learning modalities and how mobile and networked technologies helped to sustain continuity between classroom and fieldwork. [54] Further adding to this, Burak Pak (2018) explored web-based participatory design studios, where online platforms and digital collaboration tools facilitate inclusive engagement and collective learning beyond the studio's physical boundaries. [55] Similarly, Johan Verbeke (2010) deliberated experimental and hybrid studio models that merge physical and virtual dimensions of design education, nurturing interdisciplinary collaboration and adaptive learning environments that respond to the evolving modalities of contemporary pedagogy. [47] Peimani and Kamalipour (2022) evaluated a blended studio format during the pandemic and identified that while digital platforms provided flexibility, students still valued direct in-person studio interaction for peer learning and tutor feedback. [5] Moreover, a survey of architecture schools across the UK (2022) documented a major drop in student satisfaction following the move to remote studios, attributing the decline to weakened peer

networks and loss of informal studio culture. [56] But this is prone to change according to various contexts and times.

3.5.4. Time and an Academic Design Studio Project

Time is a critical attribute in the architecture design studio, shaping both the learning process and design outcomes. Schön emphasizes flexibility in studio schedules, allowing iterative reflection and responsive engagement with evolving design challenges. [1] Similarly, Salama highlights that adaptable time structures enable experiential learning and foster creativity by accommodating diverse student approaches. [2,

22] In contrast, Simon and Sinfield discuss the implications of limited or bounded time, noting that constraints can stimulate focused problem-solving and decision-making within realistic project scenarios. [18, 25] The balance between flexible and constrained temporal frameworks thus directly influences student engagement, iterative design exploration, and the development of critical thinking skills. Considering time as both a constraint and a resource underscores its centrality in structuring effective and reflective design studio pedagogy.

Table 2. Evolving parameters from the literature review

S. No	Researcher	Theories	Parameters of a Design Studio Project (DSP)
1.	John Dewey	Learning by doing; reflective thought.	Physical studio interactions; Pre-project as 1st project; Competition project; Mentor autonomy; Challenging design brief; Successful outcomes
2.	Jean Piaget	Constructivist learning; cognitive development	Participation of all students; Design lag in students; Site as a variable; Limited time
3.	Lev Vygotsky	Social constructivism; scaffolding; ZPD	Mentor autonomy & dual course load; Cross-batch (Vertical Studio); Intra/Inter batch dynamics; Collaboration (teams); Interactions
4.	Donald Schön	Reflection-in-action & reflection-on-action	Physical/digital critiques (Zoom, Teams, WhatsApp, Gmail, Classroom); Flexibility in studio schedule; Pre-project
5.	David Kolb	Experiential learning cycle	Competition project; Preproject; Mentor critiques; Challenging design brief; Site as variable; Collaboration; Successful outcomes
6.	Gabriela Goldschmidt	Design cognition; sketches; visual thinking	Physical studio interactions; WhatsApp/Gmeet visual exchanges; Challenging design brief
7.	Nigel Cross	Designer ways of knowing	Mentor autonomy; Competition project; Semester 1 initiation; Participation of all students; Successful outcomes
8.	Donald Norman	User-centered design; cognitive ergonomics	Challenging design brief; Site as variable; Collaboration (teams); Limited time; Design lag in students
9.	Herbert A. Simon	Problem-solving & bounded rationality	Competition project; Preproject; Limited time; Primary/Secondary interactions; Design lag
10.	Christopher Alexander	Pattern language: participatory, human-centered design	Cross-batch/Inter-batch dynamics; Collaboration (teams); Challenging design brief; Site as variable; Successful outcomes
11.	Ashraf M. Salama	Design studio pedagogy frameworks; cultural/contextual dimensions	Mentor autonomy; Cross-batch dynamics; Challenging design brief; Flexibility in studio schedule
12.	Thomas Cochrane	Digital/technology-enhanced studio learning	WhatsApp; Gmail; Zoom/Teams; Google Classroom; Online critiques
13.	David Sinfield	Redefining studio pedagogy: practice-led experimentation	Preproject; Competition project; Limited time; Flexible schedule
14.	Burak Pak	Web-based & participatory urban studio methods	Collaboration (teams); Cross-batch/inter-batch dynamics; Communication with organizers (students)
15.	Johan Verbeke	Experimental studio learning: interdisciplinary collaboration	Inter-batch (disciplinary); Vertical studio; Team-based projects
16.	Peggy Deamer	Critical pedagogy: questioning traditional hierarchies	Mentor autonomy; Participation of all students; Design lag; Challenging design brief

17.	Hagay Hochman	Teacher–student communication in studio “crits.”	Physical studio interactions: Gmeet/Zoom/Teams
18.	Itay Dafni	Studio critique dynamics: role of feedback loops	Interactions; Communication with organizers; Reflective discussions

Source: Researchers were identified, their corresponding theories and parameters for the Design Studio Project were evolved and classified by the Author

**Table 3. Parameters of postgraduate academic design studio project**

Types, components, and attributes of postgraduate academic design studio projects (IA)			Parameters
<b>Type of Project</b>			Competition project
<b>Stakeholders</b>	<b>Interaction</b>		Mentor autonomy in pedagogy
			Participation of all students in a class
			Mentor's dual course load (handling an additional subject)
			Cross batch (Vertical Studio) dynamics
			Intra-batch (disciplinary)
			Inter batch (disciplinary)
			Collaboration (work as teams)
	<b>Space-Digital</b>	Communication with organisers (by faculty)	
		Communication with organisers (by student)	
		WhatsApp (Design-related interaction)	
		Gmail	
		Gmeet / Zoom / Teams	
		Google Classroom	
<b>Space – Physical</b>	Physical Studio Interactions		
<b>Design Process</b>			Semester 1 (M. Arch - Interior Architecture)
			Pre-project as the 1st project in the semester
			Challenging Design Brief
			Limited Time
			Flexibility in the design studio schedule
			Site as a Variable
			Decoding design brief
			Design Lag in students
			Design iteration
			Successful Outcomes

Source: Result of the author's detailed literature review, which will be applied in the following case studies and cross-comparison

## 4. Case Study Method - About

### 4.1. Selection of 3 Cases

The architecture faculty at the primary author’s Institution has an undergraduate architecture program and a postgraduate architecture program with 3 specializations, namely Interior Architecture, Landscape Architecture, and Construction & Project Management. The primary author is an Associate Professor of Interior Architecture at the faculty handling the Interior Architecture Design Studio. The three studio project cases that happened between 2019 and 2022 were handled by the primary author. A detailed case study of each design

studio project is done to understand the process of studio learning and knowledge dissemination. The primary author, being a design mentor for all the 3 design studio projects, is again a constant parameter for the choice of cases. This comparative analysis of cases helps us understand how the studio approach changed over the span of 4 years and what makes a design studio successful. In the 4-year span, there was one major disruptive event, the COVID-19 pandemic, which brought the world to a standstill. This single event influenced everyone’s life and, in turn, education. The design studio pedagogy went through changes in a tremendous way. The

three design studio projects chosen for the case study fall strategically before COVID, during the COVID lockdown, and after the COVID lockdown in the years 2019, 2021, and 2022, respectively. The three cases of design studio projects were competition projects and had successful outcomes at the end. Each of the design studio projects was a collaborative design studio project.

Furthermore, all three cases were competitions predominantly addressing the pressing issues of the changing times. An external non-biased agency, which is the competition organizer, assigns a jury for the selection and judging of the final competition entries. The jury process happens in a confidential way, where the identity of the entries is not revealed. This fair process gives an efficient result. Competition success is not restricted to performance assessment within a studio among their peers. In competitions, the students compete with peers at the national and international level, depending on the competition brief and organizers. Students understand where they stand with their skills at national or international levels, and even the design mentors are able to gauge where their mentoring stands when it comes to their students’ performances. The research does not include the internal evaluation criteria while studying the cases.

**4.2. About Competition**

With years of experience and accumulated knowledge, the primary author always chooses design competitions that

are free and do not charge a fee during any part of the competition. Genuineness of the competition lies with the greater good and higher value than monetary benefits. Students of the studio have to match the eligibility criteria mentioned in the competition brief and requirements. The competition timeline should match that of the academic schedule of the design studio in the respective semester. (The University where the primary author is an associate professor follows the semester method.)

**4.3. Competition Brief**

The challenging brief also helps design mentors to step out of their comfort zone and learn. The cycle of experiential learning not just happens for a student in the design studio set up, but even for a mentor as they co learn with the students in understanding the design brief, decoding it along with students, brainstorming ideas with students, iterating their design ideas, and finally in evolving unique design solutions. This knowledge that is acquired in an experiential way is applied by the mentor in the design studios that follow. Each design studio project gives a new learning experience not just for the student but also for the mentor in various aspects of the design studio process.

- Challenging design brief.
- Varying site contexts.
- Differing socio-cultural background.
- Different/unique user groups.
- Addressing pressing issues of the world.

**Table 4. Essential details present across the three competition design briefs**

	<b>DDA – Restaurant in Urban Greens, DDA_CP1</b>	<b>Force Majeure – Community Housing, AIA_CP2</b>	<b>IGBC 2022 – Learning Spaces, IGBC_CP3</b>
Title	DDA Student Design Competition 2019	Force Majeure – Design for Crisis 2021	IGBC Student Design Competition 2022 (Ethos)
Organizers	Delhi Development Authority (DDA)	AIA Austin + Design Voice	IGBC + Ethos Foundation
Theme	“Design with Nature”	“Community Resilience in Crisis”	“Where We Learn” – NEP 2020 Focus
Year / Level	2019 / UG & PG	2021 / Open (Students & Professionals)	2022 / UG & PG
Target Users	Park-goers, families, and the general public	Homeless individuals, support workers	Learners of all ages, educators
Site Context	Any of the 6 DDA parks in Delhi	Fixed urban sites in Austin, TX	Any learning site in South Asia (≤10,000 sq.m.)
Typology	Restaurant / Food Kiosk in Urban Park	Housing Village / Hotel Renovation / Modular Outreach	Learning Complex / School Spaces
Design Intent	Integrate architecture with nature	Build community through space	Redefine learning environments
Sustainability	Use of local materials, net-zero aims	Mobile, adaptable, reused materials	Passive systems, contextual relevance

Deliverables	2 A1 sheets + 3D + CAD + Design Statement	24"x36" board + perspectives + program table	Max 6 A3 sheets (digital only)
Awards	₹20,000 + DDA Recognition	\$1,000 + Digital/Physical Exhibition	₹50,000 + Green Congress Showcase

Source: Author's Classification of essential information across the 3 competition design briefs provided by the respective competition organizers

**4.4. Case 01 – DDA – Pre-COVID**

In the author's institution, a tentative design studio plan is prepared for the whole semester prior to the semester. But the faculty Dean was keen on students participating in the Delhi Development Authority Student Ideas Competition and was ready to deviate a week from the previous studio plan. The author, being an Interior architect, deciphered an equal scope for both the interior architecture and landscape architecture students in collaborating for the competition. The Delhi Development Authority (DDA) hosted a Student Design Idea Competition in 2019, encouraging graduate and post-graduate students to develop innovative restaurant designs within urban green spaces, under the theme "DESIGN WITH NATURE." Participants were asked to submit proposals in categories such as kiosks or fine dining, reflecting sustainable design principles aligned with the DDA's Master Plan. The competition emphasized the integration of architecture with the environment, requiring comprehensive deliverables, including architectural diagrams and design statements. The opportunity driven by the competition brief and the resourceful spontaneity of the author led to the idea of a collaborative interdisciplinary vertical studio, a unique design ecosystem. This is a design project that happened in 2019, pre-COVID times, in a predominantly offline mode of a physical studio. Digital interactions happened even before the pandemic outbreak. There were a lot of tools and applications that could actively run a design studio course online. There were MOOC course models that were using all the digital

advancements even before the pandemic. WhatsApp groups, Gmail, etc., helped bridge minor gaps and helped the stakeholders in a design studio to stay connected and communicate consistently. Face-to-face interactions were the predominant way that helped in every stage of the design studio process. Physical environment and all the primary, secondary, and tertiary interactions happened in this design studio project as students visited their physical campus. Digital interactions also happened through phone calls, WhatsApp, and Gmail for after-college hour discussions among students and with mentors. The design studio project was time-bound and planned as a one collaborative design project in their first semester design studio (Jun – Dec 2019) for 1st year M. Arch Interior architecture students (20 students) & third semester design studio (Jun – Dec 2019) for 2nd year M. Arch Landscape architecture students (10 students). Hence, it became a collaborative interdisciplinary vertical design studio. Devising a design studio project is not an easy task; it involves meticulous planning, creative ways of thinking among the design mentors, interactions among the faculty, confidence of the mentors to achieve the desired output, an ideal design brief, scope for collaboration identified by the design mentor, etc. Collaboration between different disciplines and different years led to the planning of the time-bound studio. Each design studio faculty had pre-planned that semester, and this DDA competition project brief reached the institution a few weeks after the start of the semester.



Fig. 2 Semester timeline of case 01 B1-P2 (DDA\_CP1)

So, allowing changes to fit in an interesting design competition project, altering the preplanned semester, also worked as an advantage in this design project. Out of the 3 cases that are to be discussed here, this particular case was a very stringent time-bound project, as this was the only vertical interdisciplinary studio project model. Multiple stakeholders across studios are involved, and an exclusive design week was planned and facilitated, considering the challenges in making

this happen. As shown in Figure 3, the initiation of the studio project happened 20 days prior to the project schedule. Vertical interdisciplinary teams were formed, and registration of the teams was done with the organizers through email communication. A unique code was also created by the mentors for the teams as instructed by DDA, the organizing body. The design studio students worked as teams for 6 full days in the physical studio during the college hours. Beyond

the college hours, the groups would communicate and work individually from their homes. They would connect on calls, discuss on WhatsApp, and share their work with fellow groupmates and mentors to share their progress, brainstorm, and receive feedback.

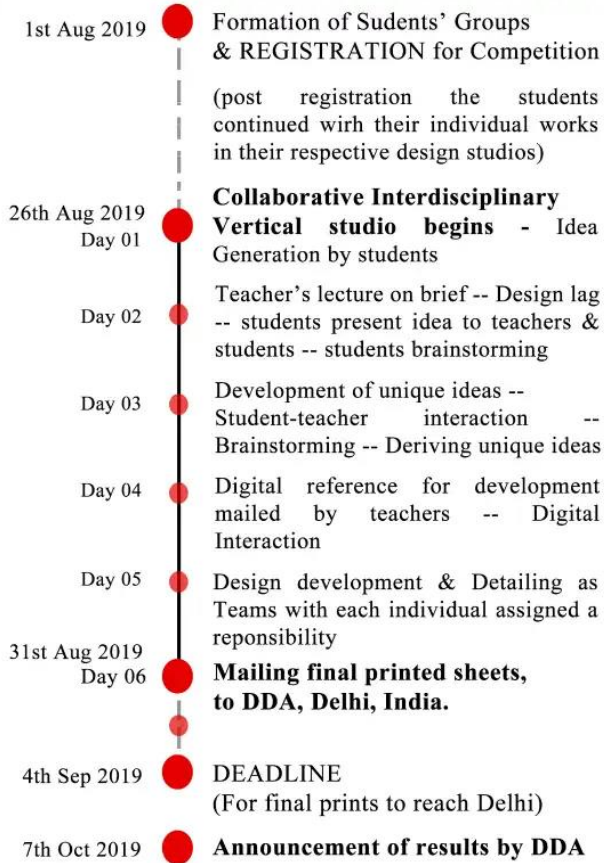


Fig. 3 Detailed schedule of B1-P2, a timebound design studio project

The timeline above shows how the studio project was meticulously planned w. rt the time constraint. Competition projects always bring in a zest of energy to a design project, as the competition here was beyond their class or institution peers. This being a national-level competition, the students were competing with national peers of reputed institutions from across the length and breadth of the country. Design Process is a series of actions, interactions, etc. In the initial discussion session, everyone came up with the concept of a Charbagh (a four-part quadrilateral garden synonymous with the Persian earthly paradise) due to Mughal influences in Delhi. Design lag was created due to a lack of inspiration and thinking about the obvious. With the determination to bring about diversity towards design ideation in mind, the mentors brainstormed with the students using verbal dialogues of the multiple possibilities. Since each team had a different site, they were asked to be as unique as possible in terms of design approach, etc.

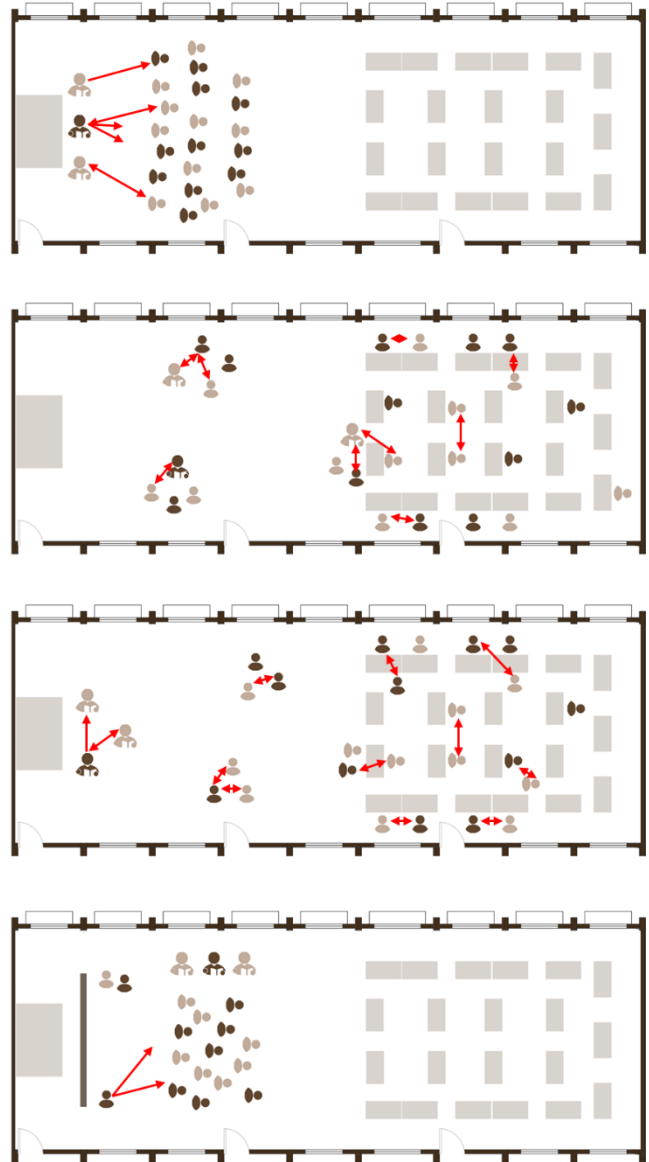


Fig. 4 Various mapping showcasing the interactions among the major stakeholders (mentors & students) in their studio (physical space), for the case of B1-P2 (DDA\_CP1) (top to bottom) (a) Decoding the design brief in a common gathering, (b) Individual interactions among mentors and students' groups, (c) Interactions among students, and (d) Pin up presentation by students' Group.

The studio exemplifies experiential learning. Students had brainstorming sessions around a drawing board, and then broke off and sketched individually. Then, they came together, critiqued the work, and drew on top of each other's ideas. The mentors gave them feedback, and then they presented their work. This process was fluid. In Figure 4, the human figure with a book indicates the mentors, the light shade human figures belong to M.Arch (IA) students & mentors, and the dark shade human figures belong to M.Arch (LA) students & mentors. Figure 4(a) shows how the decoding of the brief happened, where mentors addressed their understanding of the brief and interacted with the students in the same way. Figure

4(b) highlights peer interactions (students), mostly primary (with group mates) and secondary interactions (with other group peers); it also shows mentor peer interactions. In Figure 4(c), we can see group-wise discussions between the mentor and students. Figure 4(d) graphically describes students explaining their designs in a pin-up crit. The mentors take up the role of a critique here.

By following such organic methods, unique ideas for each team were developed as a team, and the group then split into their specialization and worked on the landscape and architectural details separately. It was a complex coordination between mentors and students, but it was made easy with meticulous planning and execution by the mentors. The three design mentors worked keeping aside self-interest and worked with confidence towards the common goal of a successful outcome in the national competition. The designs were set up in 6 sites identified by DDA, which were all developed using landscape-oriented site planning, integrating food kiosks in strategic places. The students were constantly in touch with their groupmates and mentors throughout the 6 days for ideation, followed by feedback, then iteration based on that feedback, and finally design detailing after finalizing the design ideas. Students even got feedback on their sheet compositions, as the printed sheets were physically mailed to the organizers. In that case, the sheets should be self-explanatory.

Two design teams out of the six participating teams from the institution bagged the 1st prize and a consolation prize, respectively, in the national-level ideas competition hosted by the Delhi Development Authority, India. The first prize-winning students collaboratively developed a conceptually adaptable, sustainable design addressing societal issues, drawing on prior project experience and team synergy. Their idea of "farm to table" emerged from interdisciplinary brainstorming. This juncture showcases how mentors and peers occupy the Zone of Proximal Development (ZPD), where a student can do things with guidance. The student cannot achieve the same without the guidance received in this zone. Visual connection to the Lotus Temple influenced spatial planning, with viewing points integrated into design nodes. Inspiration from past projects and biomimicry (like the self-cleaning lotus leaf) enhanced innovation and air quality features. The reflective observation stated in Kolb's experiential learning can be seen applied by the winning team from past projects to generate an innovative idea.

The various kiosk designs proposed by the students for the urban spaces in New Delhi. In this case of a collaborative time-bound vertical interdisciplinary studio project, the successful outcome does not just measure the students' groups securing 2 prizes in a national level competition, but the learning and experiences of both the students and mentors. Even if the students had not won a prize, the studio would still

be a success in terms of planning and executing such a complex and interesting studio project model. This case is further compared with two other cases of design studio projects handled by the author as one mentor, which happened in different years, for a different set of students in different modalities. The cross-comparison is mainly to understand how a design studio model works and what the dynamics are when some attributes are different.

#### 4.5. Case 2 – AIA – Covid Lockdown

Architecture The studio project was part of semester 2 of the post-graduate M. Arch Interior Architecture (Batch 2020 to 2022). This studio happened 100% online as it happened during the COVID lockdown time (2021). There were 2 mentors for a class of 17 students. This competition was an international ideas competition named Force Majeure, organized by the American Institute of Architects, Austin chapter. The theme of the idea competition was to address the HOMELESSNESS that was prevalent in Austin, Texas. The competition was free to enter. The brief has about three different scenarios listed, and those need a solution. The mentors decided to have teams of 2 students and on two scenarios for their teams initially out of the given 3 scenarios, as they felt the 2 scenarios (Brief A & B) were relevant for the interior architecture postgraduate students. This was not an interdisciplinary collaboration like the Case 01 design studio project.

The collaboration happened only among students of Interior Architecture. Communicating with the organizers and getting clarifications was very difficult. As mail was the only way to communicate with them, and also, there was the issue of the time difference. Brief B required the existing hotel's details for which remodelling was required. Through email communication, the mentors and the students were not able to receive the same.

Later, because of this, the mentors had to decide on the trailers scenario, where students had to decide on Healing Community: Modular Community Outreach. This scenario focuses on designing modular structures that promote mental, physical, and social health within urban campsites by rotating between 3 different locations in Austin. The modular structures were trailers of a standard size, hence easy to proceed without further details from the organisers.

A detailed study was carried out by students on understanding the context, as the context is a new and unfamiliar city from a different continent. This studio project is not a time-bound project and was treated as one project, with more focus; proportionately, a good amount of time was spent on this project, unlike case 01 and 03 design studio projects studied by the author in this paper.

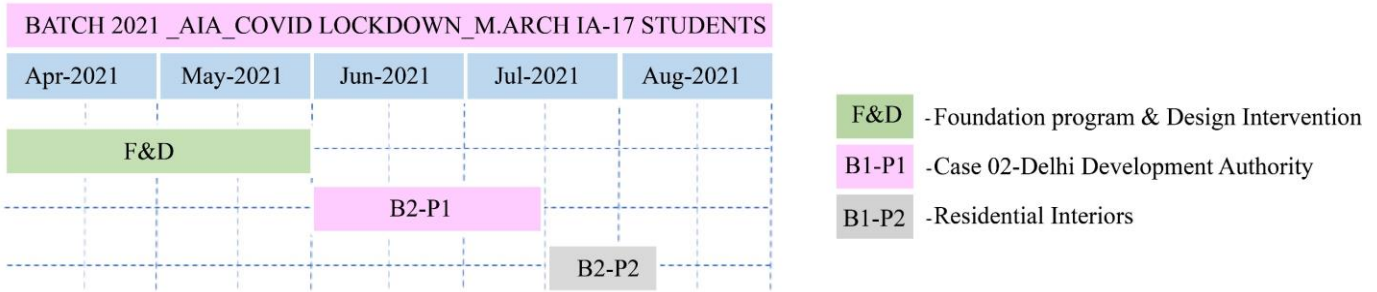


Fig. 5 Semester timeline of case 01 B2-P1 (AIA\_CP2)

This studio project happened in the second semester of the postgrad program. Since 2019, the author has started the first semester one of the design studios with a foundation program, but in this batch, the first semester studio course was handled by different mentors. The author discussed with her co-staff and the institution head about conducting the foundation in semester 2 to emphasize literature related to interior architecture topics. So even though this was semester 2, the students started the semester with a foundation program which included a literature review, analysis of interior spaces used by the students based on the literature, followed by providing design interventions for the analysed spaces. This foundation program imbues in students the nuances that an interior architect ought to have in shaping built spaces that nurture lives in various dimensions, carrying out multiple activities.

This design studio project was not introduced as a strict time-bound project, as the entire design studio happened online via Gmeet without even the video turned on, as everyone was shifting online due to the pandemic lockdown. Everyone, including the students and mentors, worked from home, gradually adapting to the situation. Figure 6 shows how virtual interactions happened for the entire semester’s studio course. Figure 6(a) showcases how discussions happened on the screen between mentor and student, and between student peers using different colour coding. Figure 6(b) explains a particular scenario in a virtual classroom where a student is presenting their study and his/her fellow students are listening, and the mentor is asking a query on his/her presentation. Numerous such interactions happened in virtual mode from the comfort of everyone’s homes. It had its own positives and negatives. In the design process, case studies done by the students for this studio project were vivid and helped them understand the context better to come up with a context-driven design program that addressed the issue of Homelessness. More time was spent on the initial stages of the design, that is, understanding the context and studying the context and solutions through case studies. Students took references from news articles that revolved around the topic of homelessness, the statistics about it, and the reasons that led to the situation in Austin. This enriched the knowledge of the students, establishing a strong foundation that led to better design programs. There was no design lag in this specific design project since students and mentors both did not have any presumptions, as the context was totally new, everyone came with a mind like that of a clean slate. In case one, where the site was Delhi, a city within their country, every student had a preconceived mental image that led to similar ideas among all the groups and a stagnant design process, which the author terms design lag. Students who worked in groups came up with interesting solutions using 3 trailers that would move among 3 locations, generating revenue for homeless people and the community surrounding them. Multiple iterations happened in the design program stage to come up with the right solutions. This stage of the project becomes the most dynamic stage with cyclic stages of designing, iterating, and improvising. Self-sustenance, smart solutions, community building, etc were the key ideas driving the design process. The winning entry had three trailers with the following programs: beauty salon, pet grooming salon, and a cycle repair

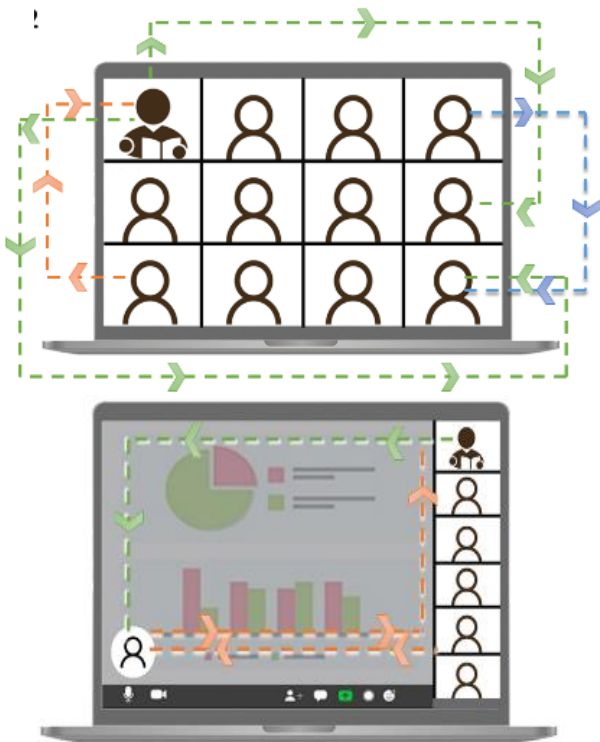


Fig. 6 Various mapping showcasing the interactions among the major stakeholders (mentors & students) in their digital space, for the case of B2-P1 (AIA\_CP2)

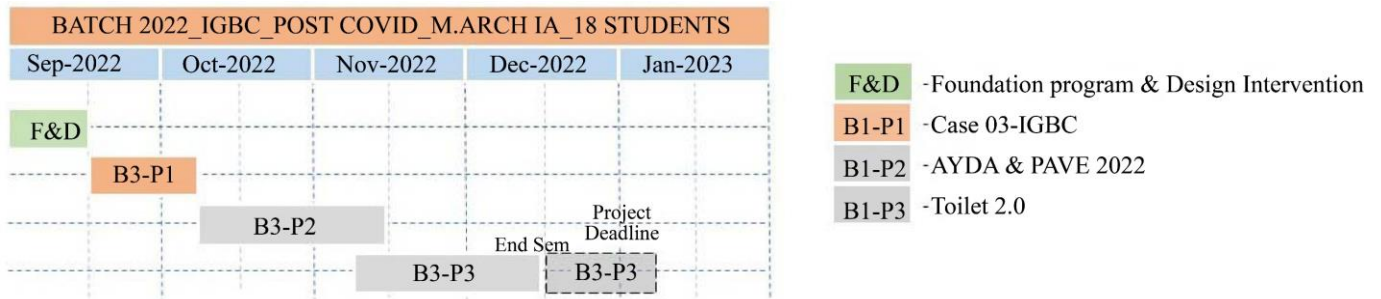
studio, derived based on the statistics of the people and their activities in Austin. The three trailers would move between three locations on a schedule to provide job opportunities for the homeless and foster community building. Solar panels, green walls, light wells, etc were the design statements in the Scandinavian minimalist trailers that won the international ideas competition. Kolb’s Active experimentation can be seen applied by the students who had won the competition.

Video disabled Gmeet was the design studio in this particular case of a design studio project, which brought together mentors and students during the lockdown. Google Classroom was used to get stagewise submissions and was also set as a norm for the years that followed, for getting submissions, archiving, and holding records were digitally easier with it. GCR became a common word even in physical classrooms and studios because of the lockdown times.

**4.6. Case 3 – IGBC – Post-COVID**

This case is again an interdisciplinary collaborative project with teams comprising two or three students. The design brief emphasized creating innovative and inclusive learning environments that would enhance exploration and curiosity. It encouraged designers to consider the emotional impact of spaces on learners, promoting natural light and

sustainability. The proposed learning environments were expected to foster positive interactions among students and teachers while addressing diverse learner needs. Overall, the brief created by the Indian Green Building Council advocated for spaces that inspire creativity and facilitate meaningful educational experiences. The focus of the design competition was also towards a Net Zero solution. With the above decoded design brief, the author set out to mentor the design studio project. The vision of IGBC is to facilitate India to emerge as a global leader in green buildings and a green built environment by 2025. The brief also allowed site selection of the students’ choice, which could be anywhere in South Asia, in an urban, rural, or suburban context. With abstract conceptualisation from previous design studio projects, the mentor decided to choose sites that the students had already studied in detail during their undergraduate program. The design brief had a focus on community engagement, learning beyond the age factor, and experiential learning. So, the students were asked to choose a familiar site that had been part of either their undergraduate rural or urban study. As per the Indian B. Arch curriculum, one semester is allocated to the rural design studio, and one more is allocated to the urban design studio. A familiar site context, through reflective experience, helps the student save time and evolve a design program for a time-bound design studio project.

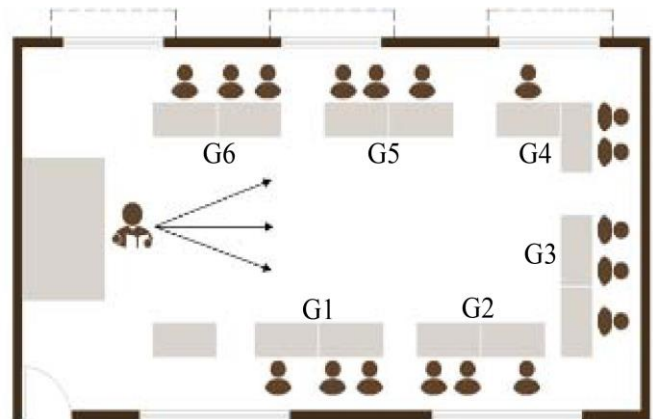


**Fig. 7 Semester timeline of case 03 B3-P1 (IGBC\_CP3)**

The foundation program integrated with a detailed literature review; analysis of interior spaces and design intervention of the analysed spaces was the first project of the semester. This project was 3 weeks long and was followed by 2 more projects. In this case, the project’s design process brainstorming was done during the ideation stage to understand the concepts of Net Zero and how it could be incorporated in their context and evolve a design program that answers all the key points addressed in the design brief.

Net zero was a new area of study for the students, which was the conceptual goal that every student group had to achieve in the design project. It was not a linear type of learning intended for the spaces the students were supposed to design. Interactions led to understanding unique contexts, exploring relevant design programs like craft clusters, diverse user group learning, etc in the initial ideation stage. A unique design program was devised by each group with interesting

and original net-zero ideas, which in turn was intended to bring about a change in the community.



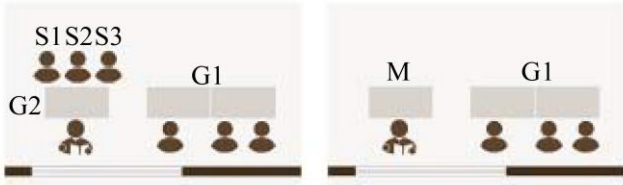


Fig. 8 Various mapping showcasing the Interactions among the major stakeholders (mentors & students) in their studio (physical space), for the case of B3-P1 (IGBC\_CP3)

The above Figure 8(a) showcases the mentor addressing the students on common concepts, clarifications, and instructions. Figures 8(b) and 8c show a part of the studio. Students predominantly worked on their laptops. The seating was planned in such a way that the mentor could see everyone without any hindrance, which helped in consistent distraction-free performance of the students. Figure 8(b) shows how the mentor(author) is seated like any other student. This position

made the students feel free to communicate with the mentor. Figure 8(c) shows how the place around the mentor would become a discussion space for the group of students.

One design team had the concept of obtaining everything required to design, execute, and function their craft learning centre with resources within a 5km radius of the site. The idea evolved after constant interactions with their design mentor during the initial brainstorming stage. This unique idea of creating a learning centre with local resources and materials would, in turn, enrich the community with craft-based opportunities, and fetched the team a national-level jury commendation. Even though the studio modality was physical and interactions happened in person, Google Classroom became a norm for collecting, monitoring, reviewing, and archiving students' stagewise progress and final works, since this studio project happened post covid lockdown.

Table 5. Design outcomes

	DDA Student Design Competition 2019, DDA_CP1	Force Majeure – Design for Crisis 2021, AIA_CP2	IGBC Student Design Competition 2022, IGBC_CP3
<p><b>Design Outcomes: Glimpses of Students' Winning Designs</b></p>			

Source: Author & her students from across the batches, Images from winning design entry's sheets

### 5. Results and Discussion

An intense literature review had been carried out to get a theoretical framework for this paper’s research. The literature review parameters were broadly fit into themes based on an in-depth analysis of theoretical studies. Followed by this, a

detailed case study was carried out for the 3 design studio projects. The table reflects the phases, components, and attributes of a design studio project under various themes and how the 3 cases respond to the same in the format of a yes or no table.

Table 6. Cross comparison of the 3 cases of postgraduate interior architecture design studio projects (type: competitions)

Types, components and Attributes of postgraduate academic design studio projects (IA)			Project Name	DDA_CP1	AIA_CP2	IGBC_CP3
			Year	2019	2021	2022
			Parameters	Time period	Pre - Covid	Covid Lockdown
<b>Type of project</b>			Competition project	✓	✓	✓
Stakeholders	Interaction	Space-Digital	Mentor autonomy in pedagogy	✓	✓	✓
			Participation of all students in a class	✓	✓	✓
			Mentor's dual course load (handling an additional subject)	✓	✓	✓
			Cross batch (Vertical Studio) dynamics	✓		
			Intra-batch (disciplinary)		✓	✓
			Inter batch (disciplinary)	✓		
			Collaboration (work as teams)	✓	✓	✓
	Space – Physical	Communication with organisers (by faculty)	✓	✓		
		Communication with organisers (by student)		✓	✓	
		WhatsApp (Design-related interaction)	✓	✓	✓	
		Gmail	✓			
		Gmeet / Zoom / Teams		✓	✓	
		Google Classroom		✓	✓	
		Physical Studio Interactions		✓		
					✓	
<b>Design Process</b>	Semester 1 (M. Arch - Interior Architecture)		✓		✓	
	Pre-project as the 1st project in the semester		✓	✓	✓	
	Challenging Design Brief		✓	✓	✓	
	Limited Time		✓		✓	
	Flexibility in the design studio schedule		✓	✓	✓	
	Site as a Variable		✓	✓	✓	
	Decoding design brief		✓	✓	✓	
	Design Lag in students		✓		✓	
	Design iteration		✓	✓	✓	
	Successful Outcomes		✓	✓	✓	

To understand the yes/ no table, the 28 parameters (type, components, and attributes of a design studio project) were observed. The parameters that had all yes for all three cases acted as a constant, thereby determining what brings out

success in a design studio project. A Sankey chart has been created based on the relationship of the parameters with respect to the 3 cases of design studio projects.

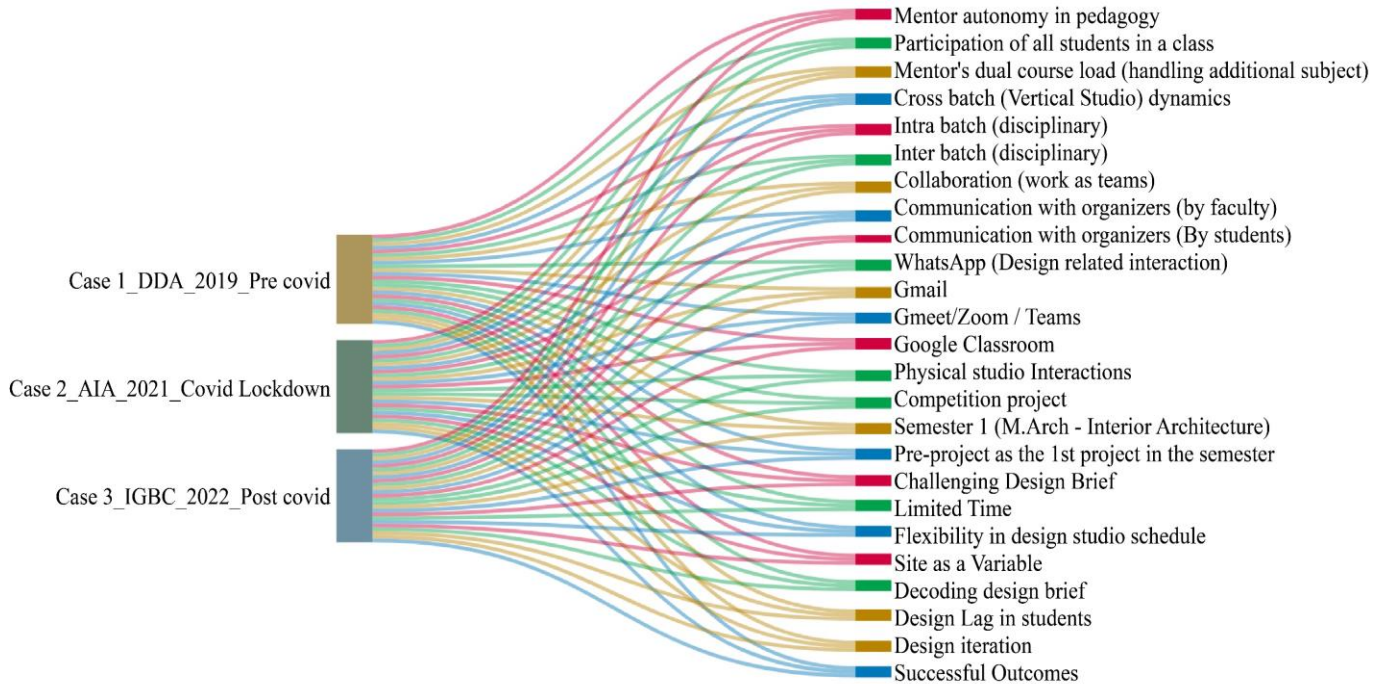


Fig. 9 Sankey chart showcasing how various parameters are distributed across the 3 cases of design studio projects

The above Sankey chart helps visualize the flow of emphasis and shows how different parameters (e.g., collaboration, limited time, design iteration) are distributed or weighted across each of the three studio projects. It further helps trace how themes overlap or diverge among the three cases in Compare Cross-Case Relationships, making patterns or unique emphases visible.

Here in this particular research, we could observe the variation in pedagogical dynamics across the three cases that happened pre covid, during the COVID lockdown, and post covid. Even after returning to physical studios in 2022, online platforms were still used. The 13 consistent parameters across the three cases can be visually seen in the chart and were discussed in detail in this research paper.

Furthermore, persistent parameters such as time constraints, challenging design briefs, and schedule flexibility suggest that a few structural pressures are integral to design pedagogy, particularly competition projects, regardless of external disruptions. Finally, the presence of project-specific factors such as site variability and semester sequencing highlights the contextual dependencies shaping studio outcomes.

The list of parameters that were constants is as follows:

1. Mentor autonomy in pedagogy
2. Participation of all students in a class
3. Mentor's dual course load (handling an additional subject)
4. Collaboration (work as teams)
5. WhatsApp (Design-related interaction)

6. Competition project
7. Site as a Variable
8. Pre-project as the 1st project in the semester
9. Flexibility in the design studio schedule
10. Challenging Design Brief
11. Decoding design brief
12. Design iteration
13. Successful Outcomes

52% of the mentioned parameters were common for all the 3 design studio project cases. Especially the parameters under the theme design process had the maximum no of constants in it, amounting to 70%. This consistency indicates core pedagogical stability. This proves that when the design process is meticulously planned and executed by the design mentors, success is easy to achieve in a design studio project.

### 5.1. Mentor Autonomy in Pedagogy

A mentor cannot work autonomously in isolation but must involve various stakeholders of the institution. At the same time, the freedom of being able to put forth suggestions about a design studio project, considering various components of the project, is vital.

It is also equally vital that the opinion is accepted by the fellow mentors and then by the deciding authority, which in this case would be the head of the Department. All three design project cases were competitions, and two out of three were suggested by the author (mentor) for the respective studios and projects, which were accepted by the institution heads.

The suggestion was taken into consideration and put into action for the studio project, thinking about the benefit of all the stakeholders, from the student to the mentor, to the institution, and finally, the profession. The convincing skills of the mentor play a vital role in upholding the strength that should be inherent in a design mentor to whom students need to look up to and learn.

### **5.2. Participation of All Students in a Class**

The entire class participated in the studio project invariably, competing among themselves and other national and international peers based on the competition guidelines. When a competition is made as part of a design studio project, it is intended to imbibe qualities in students beyond the mere studio explorations and design skills.

The competitive spirit that is evoked in every student, even in a few rare cases, comes from their participating as a whole class in the mentioned competitions as part of the design studio curriculum. The 3 cases of design studio projects had all the students in the studio actively participating and submitting their designs.

### **5.3. Mentor's Dual Course Load (Handling Additional Subject)**

All the 3 cases had the author handling additional courses along with the design studio in the specific semester of the postgraduate program. Mentors handling more than one course in a program have more impact on the students, and their bonding is better, as they spend more learning time.

When the author handled one more course along with the design studio in that particular semester, the success rate was higher, which is a subjective observation that had proved correct in multiple cases. Mentor also has the possibility to actively link the other courses' learning to design, and spending more time with mentors in addition to design has improved professional bonding among students.

This further helps interactions without inhibitions, which in turn helps in better design dialogues. Getting inspiration from another course through the teachings from the same mentor helps students look at the design process through a different lens. The author, in one of her previous design studio projects, linked a theory cum studio course and a design studio course to design a furniture design for an international competition.

### **5.4. Collaboration (Work as Teams)**

All three cases studied are collaborative projects. Collaboration remained unaffected, regardless of modality, like in-person or online settings, for all the 3 discussed cases. Inter-batch and intra-batch interactions were consistent regardless of the modality, highlighting the effectiveness of both face-to-face communication and digital communication.

Facilitating collaborations in a design studio involves meticulous planning. The collaboration model is similar to that of the real-world architectural practice model, where external stakeholders play a major role. Looking at the detailed cases, it is evident that design thinking skills, problem-solving skills, and decision-making skills are honed in collaborative design studio projects.

### **5.5. WhatsApp (Design-related Interaction)**

WhatsApp messages, especially WhatsApp groups, helped maintain consistent communication after college hours. With its multiple interactive and sharing options, it was a digital interface that aided in design planning and discussions among the group of students.

Even before the covid outbreak and the shift in modality of the design studio, WhatsApp helped connect students outside their institution in planning both academic and non-academic activities. These groups were strong modes of communication even for the design mentors in passing vital information, getting opinions, etc. Over the years, the application has been upgraded in such a way that polls can happen in its groups.

Doodling or making notes on images was made possible. The author reviewed designs using WhatsApp image edits after college hours during regular studio sessions and regularly in online mode. This helped in continuing communication beyond the stipulated studio hours.

### **5.6. Competition Project**

All the 3 design studio project cases that were studied were competition projects. This helped the institution, mentors, and students compete with their national and international peers. Aligning and planning the timeline, scope, and deliverables of the external organization with that of the institution's curriculum framework always remained the crucial task while facilitating competition projects in a design studio.

Aligning with the timeline, adhering to the eligibility of the competitions, and motivating the students to participate actively are a few responsibilities of a mentor proposing a competition for a design project.

### **5.7. Site as a Variable**

The site was always a variable for the competition project. For instance, the first case of DDA sites was urban pockets across the Indian capital city, New Delhi, the second case sites were 3 public spaces in Austin, Texas, USA, and the third case, the context was open for students' choice from anywhere in South Asia. With varying site contexts came great challenges. .

By giving different site contexts, the complexity of the project increased. The inquisitiveness of the students and

mentors also increased as each student group worked on a different site context in all three project cases discussed. The complex nature had led to in-depth studies and design ideations, which further led to effective learning outcomes.

### **5.8. Pre-Project as the 1<sup>st</sup> Project in the Semester**

A foundation program was the first project of all three semesters, where the 3 design studio project cases were done. This foundation program acts as a transition from an undergraduate program to a postgraduate program with a specialization in interior architecture.

This foundation consists of book chapter reviews and finally culminating the reviewed literature as spatial analysis and design interventions in existing interior spaces. Every student studied a couple of chapters from a book related to interior architecture, interpreted their findings, discuss about it with their mentors, and finally presented it in front of their classmates.

Learning happened by observing what the other fellow students present. In this way, every student gets to know an entire book. This pre-project has proved efficient as it has been a constant start of every semester, which has had the three design studio project cases.

### **5.9. Flexibility in Design Studio Schedule**

The choice of design studio project was made by the mentors and approved by the head of the institution prior to the semester, and if needed, the design schedule was even altered to accommodate competition design projects. Aligning the design studio curriculum with an external competition schedule is not easy. With meticulous planning by the mentors, it was made possible. This brought flexibility to the semester's design studio schedule, which further allowed selecting the design studio project even after preplanning the semester to accommodate a competition project. This dynamic replanning was critical in creating a unique possibility.

### **5.10. Challenging Design Brief**

A competition brief that challenges the mentors and the students brings about great outcomes. All three competitions that are part of the case study had challenging design briefs, varying site contexts, differing socio-cultural backgrounds, catering to different/unique user groups addressing pressing issues of the world. Case 1 focused on green spaces in a highly polluted Indian city context, case 2 addressed homelessness and joblessness in the case of Austin, Texas, and case 3 looked for net-zero building concepts for a learning environment anywhere in South Asia.

### **5.11. Decoding Design Brief**

Decoding a challenging design brief has been a vital phase of the design studio process that leads to improved

design ideation. This phase is done primarily among the design studio mentors and the students. It is time-consuming but is much required for successful outcomes.

This involves reading and re-reading the brief by both students and mentors, followed by their interpretations and discussions, which leads to brainstorming, which can lead to ideation. The author had sessions exclusively planned to decode the brief in all three cases, where students would present their views on the brief in front of their peers, for which mentors would respond. This happened in both the online and offline modalities.

### **5.12. Design Iteration**

The design process that happens in a design studio is cyclic, and some phases and steps in a particular phase are repetitive to provide design iterations. These iterations help the student and mentor to decide on the most relevant solution for the multifaceted design challenge that considers heterogeneous sites, diverse cultural frameworks, and unique user communities to respond to pressing global concerns put forth by the competition brief. To attain solutions to the pressing issue, multiple iterations of design happened for most of the students in all three case projects.

### **5.13. Successful Outcomes**

Participation and successful outcomes remained unchanged in the three design studio projects, indicating that students adapted well to online and hybrid learning models. Success is subjective and, in this paper, it is directly defined as the competition jury's decision, but it can have diverse meanings and effects on various people.

Delving deep into it would be separate research by itself. According to the author, the three studio projects were successful in terms of design studio planning, facilitating, and outcomes from a subjective mentor's point of view.

## **6. Chi-Square Test**

The Chi-Square test is a statistical method to evaluate the association between categorical variables by comparing observed frequencies with expected frequencies. It is used to check if variations across categories are due to random chance or significant differences.

For this research, it helps in determining whether the parameters of the themes People, Interactions, Space, and Design Process vary significantly across the three projects (DDA\_CP1, AIA\_CP2, and IGBC\_CP3).

The Chi-Square test was applied to analyze the distribution of parameters (People, Interactions, Space, and Design Process) across three design studio projects (DDA\_CP1, AIA\_CP2, IGBC\_CP3).

Table 7. Observed frequency (conversion of yes/no table to binary)

Types, components and Attributes of postgraduate academic design studio projects (IA)	Project Name		DDA_CP1	AIA_CP2	IGBC_CP3	Row Total	
			Year	2019	2021		2022
			Parameters Time period	Pre - Covid	Covid Lockdown		Post Covid
<b>Type of project</b>	Competition project		1	1	1	3	
<b>Stakeholders</b>	<b>Interaction</b>	Mentor autonomy in pedagogy	1	1	1	3	
		Participation of all students in a class	1	1	1	3	
		Mentor's dual course load (handling an additional subject)	1	1	1	3	
		Cross batch (Vertical Studio) dynamics	1	0	0	1	
		Intra-batch (disciplinary)	0	1	1	2	
		Inter-batch (disciplinary)	1	0	0	1	
		Collaboration (work as teams)	1	1	1	3	
		Communication with organisers (by faculty)	1	1	0	2	
	<b>Space - Digital</b>	Communication with organisers (by student)	0	1	1	2	
		WhatsApp (Design-related interaction)	1	1	1	3	
		Gmail	1	0	0	1	
		Gmeet / Zoom / Teams	0	1	1	2	
		Google Classroom	0	1	1	2	
		<b>Space - Physical</b>	Physical Studio Interactions	1	0	1	2
			Semester 1 (M. Arch - Interior Architecture)		1	0	1
<b>Design Process</b>	Pre-project as the 1st project in the semester		1	1	1	3	
	Challenging Design Brief		1	1	1	3	
	Limited Time		1	0	1	2	
	Flexibility in the design studio schedule		1	1	1	3	
	Site as a Variable		1	1	1	3	
	Decoding design brief		1	1	1	3	
	Design Lag in students		1	0	1	2	
	Design iteration		1	1	1	3	
	Successful Outcomes		1	1	1	3	
	Column Total			21	18	21	60

Source: Author

The binary dataset of “Yes/No” responses was tabulated into a binary value (1 for presence, 0 for absence), and a contingency table with observed frequencies was counted for each project. The expected frequency for each cell was determined by  $E = (\text{Row Total} \times \text{Column Total}) / \text{Grand Total}$  from the observed value.

The expected frequency for each cell was derived. The Chi-Square statistic was then computed using the formula:  $\chi^2 = \sum (O-E)^2 / E$ , which obtained the total Chi-Square value of 14.683. The degrees of freedom (df) were computed as:  $df = (r-1) \times (c-1) = (28-1) \times (3-1) = 48$ .

Table 8. Outcome

<b>Total Chi-square value</b>	Total $\chi^2 = \text{SUM of all } (O-E)^2 / E \text{ values}$	14.683
<b>Degree of Freedom</b>	$df = (r-1) \times (c-1)$ Row - 28, Column - 3	48
<b>Chi-square Value</b>	=CHISQ.DIST. RT (x, deg_freedom)	1

Source: Author

The p-value (~1) was derived from the Chi-Square distribution table using Excel’s CHISQ.DIST. The RT

function indicates the probability of observing such variations under the null hypothesis.

Since  $p$ -value  $> 0.05$ , the chi-square test result shows that the variations in the parameters across the three case studies DDA\_CP1, AIA\_CP2, and IGBC\_CP3 are not statistically noteworthy. This means that all three projects demonstrate similar patterns in mentorship, interactions, digital/physical space use, and design processes. This lack of difference is meaningful, and it reflects the strength of the studio model and the effective adaptation of the institution, mentors, and students under shifting conditions.

### 6.1. Findings

The findings of this study reveal no statistically significant difference across pre-, during-, and post-disruption competition-based postgraduate studio projects, demonstrating strong structural endurance of an academic design studio model. The observed continuity further supports that the epistemological core of the studio is process-driven rather than dependent or restricted by physical boundaries. This paper's study statistically validates that core pedagogical attributes, such as critique sessions, collaboration, and an iterative design development process, remained intact even during the shift to a digital modality within the specific context of competition-based postgraduate studios. In the Indian postgraduate context, the findings demonstrate that competition-based studios maintain pedagogical integrity across disruption phases, contributing insights that are both locally grounded and internationally evident.

### 6.2. Digital Tools and Pedagogical Innovations in Remote/Hybrid Studio Delivery

Remote/hybrid studios employed video conferencing for synchronous critiques, cloud-based platforms for collaborative file exchange, and digital pin-up interfaces for juries. Pedagogical innovations included structured online critique schedules, informal online collaborations outside video conferencing, recorded reviews for reflective learning, and asynchronous submission tracking, which helped the mentors and students adapt to the challenging disruption. Though the physical studio's spatiality was altered, the core mechanisms, such as dialogic critique, timeline, iterative feedback, and competition benchmarking, remained intact. These findings indicate that digital tools transformed the medium of delivery without altering the essence of the underlying pedagogical framework, demonstrating adaptive technological integration within the studied competition-based postgraduate studios.

## 7. Conclusion

This paper set out to study the nature of competition-based postgraduate design studio pedagogy with two primary objectives. First, to identify the key parameters that characterize competition-based design studio projects in interior architecture education, and second, to assess the pedagogical continuity and resilience of competition-based studio projects across three time periods using a structured comparative framework. In addressing the first research

question, a comprehensive literature review was undertaken, through which academic design studio projects were classified into categories and sub-categories encompassing type, components, and attributes.

Based on this framework, 5 themes and 25 parameters were identified as critical to understanding the structure and functioning of competition-based design studios. These parameters were then applied to three cases of postgraduate interior architecture studio projects, all conducted as competition-based studios under the same academic mentorship. The analysis revealed thirteen common parameters that consistently characterized competition-based studios, including controlled time engagement, iterative design development, reflective learning, collaborative interaction, and mentor-driven studio culture. These findings establish a clear set of attributes that distinguishes competition-based studios from conventional academic studios.

In response to the second research question, the study examined how these attributes performed across pre-pandemic, pandemic, and post-pandemic contexts. A Yes/No table was developed to compare the presence of the identified parameters across the three studio cases. This table was subsequently converted to a binary (1/0) dataset and further subjected to a Chi-square test to evaluate the significance of variation among the 3 studio models. The statistical results indicated that the differences observed across the three phases, among the 3 studio models, were not statistically significant. This inference suggests that, despite shifts in delivery modes and external constraints during the COVID-19 period, the central pedagogical structure of competition-based studios remained consistent in postgraduate studies.

The lack of statistical variation in the comparative is not suggestive of stagnation but rather reflects the resilience and adaptability of the design studio model. The study validates that competition-based studios successfully transitioned across physical, digital, and hybrid modes while maintaining core educational values such as iterative learning, critical reflection, peer interaction, and design consistency. The constant presence of 13 common parameters across all phases highlights the strength of competition-based pedagogy and its capacity to absorb disruptions. The study thus contributes to architectural education discourse by analytically validating the reliability of key pedagogical parameters within competition-based design studios.

### 7.1. Expanded Limitation

Though the study in this paper is methodologically rigorous, it is bounded by certain structural and contextual limitations. The study is restricted to three competition-based postgraduate studio projects within a single institution. Though this study ensured consistency in curriculum design, mentoring approach, and evaluation criteria, it limits the

broader generalizability of findings across varied contexts. The use of binary Yes/No enabled statistical comparison through the Chi-square test, but it inevitably simplified the complex and layered nature of studio pedagogy. Chi-square analysis finds relations within distributions rather than measuring qualitative impact, learning depth, and learning outcomes.

### 7.2. Future Scope

The present study emphasizes studio structure and its pedagogical attributes. Future research can extend this work by probing the long-term impact of competition-based learning on students' professional trajectories. Detailed post-graduation surveys with multiple sets of stakeholders could explore how skills acquired through such studios, such as time management, collaborative working, critical thinking, and design decision making, translate into professional competence, career adaptability, and industry readiness. Future research may also conduct in-depth studies to document and analyze the perspectives of other stakeholders, including employers, jurors, and academic mentors. This stakeholder feedback, when structured, can develop a more holistic understanding of the educational and professional advantages of incorporating competition-based design projects as part of the curriculum.

### 7.3. Policy and Future Proofing

The findings indicate strong structural consistency of competition-based studios across pre-, during-, and post-disruption, signifying that resilience depends more on

strengthening the design process and its parameters. Competition-based studio models should be embedded as structured curriculum components, as they simulate real-world challenges and foster adaptability. Studio curricula must be disruption-proof, ensuring stable learning, assessment methods, and iterative processes across various modes of learning like physical, remote, and blended modes. The future-proof curricula should accentuate process-driven learning and collaboration with the help of clearly defined parameters that enable seamless transitions

Resilient & adaptive policy and capacity building at the faculty level and institutional level is a must. Faculty development programs facilitating digital pedagogy training, hybrid modality, and adaptive mentorship models to balance synchronous & asynchronous interactions are advised for all studio faculty. Institutions must invest in strong technological infrastructure, cloud-based collaboration platforms, and design well-structured academic policies that can sustain design studio learning during disruptions. It is suggested to avoid treating crises as a momentary interruption. It further suggests that disruption readiness be embedded in the academic curriculum during long-term planning.

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Appendices

Appendix Table 1. Chi-Square Test: Expected Frequency

Types, components and Attributes of postgraduate academic design studio projects (IA)		Project Name		DDA_CP1	AIA_CP2	IGBC_CP3	Row Total
		Year		2019	2021	2022	
		Parameters period	Time	Pre - Covid	Covid Lockdown	Post Covid	
<b>Type of project</b>		Competition project		1.050	0.900	1.050	3
<b>Stakeholders</b>	<b>Interaction</b>	Mentor autonomy in pedagogy		1.050	0.900	1.050	3
		Participation of all students in a class		1.050	0.900	1.050	3
		Mentor's dual course load (handling an additional subject)		1.050	0.900	1.050	3
		Cross batch (Vertical Studio) dynamics		0.350	0.300	0.350	1
		Intra-batch (disciplinary)		0.700	0.600	0.700	2
		Inter-batch (disciplinary)		0.350	0.300	0.350	1
		Collaboration (work as teams)		1.050	0.900	1.050	3
	<b>Space-Digital</b>	Communication with organisers (by faculty)		0.700	0.600	0.700	2
		Communication with organisers (by student)		0.700	0.600	0.700	2
		WhatsApp (Design-related interaction)		1.050	0.900	1.050	3
		Gmail		0.350	0.300	0.350	1
		Gmeet / Zoom / Teams		0.700	0.600	0.700	2
		Google Classroom		0.700	0.600	0.700	2
							2
		<b>Space - Physical</b>		Physical Studio Interactions		0.700	0.600
<b>Design Process</b>		Semester 1 (M. Arch - Interior Architecture)		0.700	0.600	0.700	2
		Pre-project as the 1st project in the semester		1.050	0.900	1.050	3
		Challenging Design Brief		1.050	0.900	1.050	3
		Limited Time		0.700	0.600	0.700	2
		Flexibility in the design studio schedule		1.050	0.900	1.050	3
		Site as a Variable		1.050	0.900	1.050	3
		Decoding design brief		1.050	0.900	1.050	3
		Design Lag in students		0.700	0.600	0.700	2
		Design iteration		1.050	0.900	1.050	3
		Successful Outcomes		1.050	0.900	1.050	3
<b>Column Total</b>				<b>21</b>	<b>18</b>	<b>21</b>	<b>60</b>

Source: Author

Appendix Table 2. Applied the chi-square formula

Types, components and Attributes of postgraduate academic design studio projects (IA)		Project Name		DDA_CP1	AIA_CP2	IGBC_CP3	Row Total
		Year		2019	2021	2022	
		Parameters period	Time	Pre - Covid	Covid Lockdown	Post Covid	
<b>Type of project</b>		Competition project		0.002	0.011	0.002	0
<b>Stakeholder</b>	<b>I</b>	Mentor autonomy in pedagogy		0.002	0.011	0.002	0
		Participation of all students in a class		0.002	0.011	0.002	0
		Mentor's dual course load (handling an additional subject)		0.002	0.011	0.002	0
		Cross batch (Vertical Studio) dynamics		1.207	0.300	0.350	2

			Intra-batch (disciplinary)	0.700	0.267	0.129	1
			Inter-batch (disciplinary)	1.207	0.300	0.350	2
			Collaboration (work as teams)	0.002	0.011	0.002	0
		Space-Digital	Communication with organisers (by faculty)	0.129	0.267	0.700	1
			Communication with organisers (by student)	0.700	0.267	0.129	1
			WhatsApp (Design-related interaction)	0.002	0.011	0.002	0
			Gmail	1.207	0.300	0.350	2
			Gmeet / Zoom / Teams	0.700	0.267	0.129	1
			Google Classroom	0.700	0.267	0.129	1
							1
Space – Physical	Physical Studio Interactions	0.129	0.600	0.129			
Design Process	Semester 1 (M. Arch - Interior Architecture)	0.129	0.600	0.129	1		
	Pre-project as the 1st project in the semester	0.002	0.011	0.002	0		
	Challenging Design Brief	0.002	0.011	0.002	0		
	Limited Time	0.129	0.600	0.129	1		
	Flexibility in the design studio schedule	0.002	0.011	0.002	0		
	Site as a Variable	0.002	0.011	0.002	0		
	Decoding design brief	0.002	0.011	0.002	0		
	Design Lag in students	0.129	0.600	0.129	1		
	Design iteration	0.002	0.011	0.002	0		
	Successful Outcomes	0.002	0.011	0.002	0		
Column Total				7	5	3	15

Source: Author