NEW SCHOOLS OF THOUGHT

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New Schools of Thought

Critical Thinking and Creative Teaching

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INTRODUCTION

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21st century education has changed beyond all recognition. Virtual teaching, flipped classrooms, AI, ungrading, collective syllabi and the teacher as learner are concepts that, for many traditionalists, are foreign terrain. The issues at play are multiple, varied and often polemic. In some instances, it results in calls for a ‘return’ to what is tried and trusted – tests, grades and rote learning. In others, there are calls for more creative, critical and ‘evolved’ approaches – further pushing the boundaries of how we conceive knowledge and its application. In short, there are calls for ever newer schools of thought.

This scenario applies across disciplines: in the design fields of architecture and graphics. In the fields of art and design. In the STEM sector and the social sciences. In the disparate fields of health and business, or media and the creative industries. Despite the conflicting opinions at play, every discipline is seeing more inclusive pedagogy, inverted classrooms and an ever increasing emphasis on student agency. In this context, we have no choice but to assess how we think about school.

Central to this process is critical thinking. How do students learn to be critical – and what does it mean to be critical of teaching? Are the methods we use to communicate knowledge relevant today? Do they engage the modern student, visual learners and the social media generation? While communication is a celebrated core skill in the humanities, and representation is central to disciplinary practice in the arts and design, communication and representation methods in teaching – our modes of delivery – still often go unexamined.

Aiming to explore these broad and interrelated issues, the papers brought together in this publication are split into two volumes. The first examines a cross disciplinary teaching perspective, while the second focuses on design. Together, they help us better understand the new, emerging, evolving and established schools of thought in contemporary education.

TABLE OF CONTENTS

AN INVESTIGATION INTO POTENTIAL USE OF UAVS IN THE FIELDS OF ARCHITECTURE AND URBAN PLANNING

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INTRODUCTION

This paper aims to examine the potential novel uses for UAVs (unmanned aerial vehicles) in architecture which have thus far not been widely explored as of early 2025. The authors initially posited that the uses in architecture and related fields would have been well documented with regards to semi-autonomous aerial vehicles but that the fully manual craft used in the FPV (First Person View, henceforth) hobby would not have been researched in depth as outside of the hobby and the filmmaking industry, they are relatively unknown. This has indeed proven to be the case during the literature search, but the authors found a study by Rodriguez et al[1] which comprehensively and effectively documents research performed into the area of "traditional" semi-autonomous UAV use in architecture and urbanism, and to repeat their study would be redundant. The first part of this paper therefore is essentially a literature review of a literature review, a critique of their work, during which gaps will be sought and identified. This paper is thus structured as follows: the second section will provide background and context, and attempt to categorise the craft; the third section will analyse the work conducted by Rodriguez and clarify the relevance of their work to this study; the fourth section will examine the (limited) literature available on the use of FPV craft; and finally the discussion section will attempt to suggest the as yet unexplored potentials of these craft before presenting a brief conclusion. This attempts to answer the research question, *"Are there any areas in architecture/urban planning in which UAVs could be beneficially employed in ways in which they are not currently, and which type of craft could best suit these purposes?"*

BACKGROUND AND DISAMBIGUATION

UAVs can be categorised into various types. What are previously referred to above as "traditional semi-autonomous craft" can be considered to be vehicles which have pilot aids, and they may be capable of operating autonomously or require pilot input. These further fall into the category of either consumer craft or professional-use vehicles. Pilot aids include but are not limited to stabilised flight modes; GPS for navigation and positioning; and collision avoidance systems based on sonar/ultrasonic sensors, camera-based AI-powered visual systems, LiDAR, or optical systems such as infrared rangefinders. For the purpose of this paper, only multirotor craft will be considered as these are the most common type used in architecture (though fixed-wing and helicopters have been a feature of agriculture and research for decades, for example Yamaha first produced petrol powered

remote-controlled helicopters in 1990,[2] and their electric successors became autonomous around 2003 (ibid)). The reason for the popularity of multirotor craft is their manoeuvrability in tight spaces, which makes them better suited to urban environments.[3]

It would be prolixious and unnecessary to document the features of these traditional UAVs here since they are not the focus of this paper. DaJiang Innovations (DJI) offers a representative range, from the consumer Mini and Mavic camera drone series, through the research-focused Matrice range and the filmmaking Inspire line, to the agricultural offerings such as the T40 for example and the delivery drone Flycart 30. Overviews of the specific features of these craft are available on DJI's website but the basic operating principles and technology used are broadly similar across the range and are outlined in the paragraph above. Where they differ is in the equipment they carry for their intended task, e.g. camera and gimbal, cinema quality camera, LiDAR for 3D mapping, crop spraying delivery systems, etc. These tools can make them extremely useful for architectural applications as will be discussed in a subsequent section.

What is less well outlined in literature is the use of FPV craft. For the uninitiated, and there will be no detailed description of the various systems here, an FPV vehicle allows the operator to see from the perspective of the vehicle by means of a camera connected to a video transmitter which relays the image feed to a screen which the operator can see. Usually this takes the form of a pair of specialised goggles with small OLED or LCD screens, but it is also possible to view the video feed on a screen or even a smartphone in some cases. Kang et al[4] note that the weights of UAVs can range from 25g to 1,200kg and local laws governing these weights vary by country. In most of the world, craft with a maximum take-off weight of 250g or less are not subject to regulation (or the regulations are not overly restrictive), in Japan there is a blanket limit of 100g, and some countries do not allow UAV operation at all. For the purposes of this paper, small craft are the focus since their low weight and high manoeuvrability are what differentiates them from the traditional craft outlined previously. Discussions on the specific technologies employed in FPV craft are beyond the scope of this paper but the main equipment can be assumed to be an FPV image transmission system (either analogue or digital) and a small but high-quality video recording camera.

LITERATURE REVIEW

This section will focus mainly on the work or Rodriguez et al[5] to identify the current state of research into the roles of UAVs in architecture (as of 2021) and attempt to identify gaps which may be served by the use of UAVs. Shakhatreh et al[6] found that these craft are well suited to use in architecture, engineering, and construction (AEC) due to their ability to access spaces unfeasible for human workers to access in person. According to Albeino et al,[7] the most common tool carried by UAVs in this area are cameras for video and picture capture, followed by laser scanners, thermal cameras, and radio/ultrasonic beacons. Rodriguez et al then went on to collect a corpus of research into UAV applications which forms a very extensive body of work, though it may not necessarily be complete (and indeed, in the subsequent three years or so, more research has been performed). Of relevance to this current study, they found that between 2015 and 2019 across 14 highly credible journals (measured by author H index), in the areas of AEC there was a total of 60 publications with 1765 resulting citations. For reference, in these journals, there were 45 articles on topics unrelated to AEC and 813 citations, so it is apparent that the use of UAVs in AEC is a significant topic. It should be noted however that one of the journals- Automation in construction- was responsible for 37 publications and 1180 citations. This demonstrates very ably that in AEC at least, there has been a wealth of research undertaken concerning the use of UAVs and according to Rodriguez et al, the leading country for this work was the USA, followed by China, then several European countries. The

scope of the research they identified is of interest to this current paper and will be briefly summarised in the following paragraph.
By analysing keywords used in the research, Rodriguez et al made cluster maps of the general areas to which the keywords relate. Their table is reproduced below in Table 1 to save repetition.[8]

Field of application	Common UAV Payload	Application of UAV
Green cluster: Mapping and 3D modelling	GPS_RTK module for geo-referencing images, camera gimbal, vision stereo cameras, RGB-D digital cameras, laser scanning sensors (LiDAR)	3D Terrain digital reconstruction 3D Cultural heritage modelling
Red cluster: Construction monitoring	GPS, camera gimbal, RGB digital cameras, video-based cameras, laser scanning sensors (LiDAR)	Construction site monitoring in combination with Building Information Model (BIM) Safety on construction
Blue cluster: Structural damage detection	GPS, camera gimbal, RGB digital cameras, laser scanning sensors (LiDAR)	Building damage mapping Urban damage emergency situations
Yellow cluster: Energy efficiency prospection	GPS, camera gimbal, RGB digital cameras, thermal imaging infrared cameras	Building energy inspection Photovoltaic panels inspection
Orange cluster: Urban remote sensing	GPS, camera gimbal, RGB digital cameras, video-based cameras, laser scanning sensors (LiDAR), thermal imaging infrared cameras	3D City digital reconstruction Urban thermal monitoring Urban energy system inspection

Table 1. Summary of main UAV applications and common UAV payload by cluster[1]

Of interest for this current research, all of the payloads listed above include GPS and review of the cited literature reveals that in all cases, this is for either collecting spatial location information, maintaining the position of the craft in a fixed point in space, or both. It might be reasonable to assume that in red and blue clusters, this functionality may not be strictly necessary, and this is the hypothesis underpinning this current research, but nonetheless it was present in all cases. While Kim and Kim[9] suggest a scenario in which non-GPS equipped craft could be utilised (building site monitoring), their proposed solution ultimately also incorporated GPS and automated flight modes for reasons which they did not make explicitly clear. In 2023, Jouhou System Kougaku Laboratory from the University of Tokyo investigates the multi-link aerial robot which allows aerial transformation in tight aerial space, called the DRAGON.[10]

RESEARCH INTO FPV CRAFT

As has been previously stated, there almost no presence at all in academia of research into FPV craft. Much of the innovation is from industry (the RC hobby industry) or individual hobbyists. One example of a gap identified by a US-based company hobby drone company, Rotor Riot,[11] was the use of drones to inspect areas inaccessible not only to humans, but to other types of inspection equipment such as rovers, conventional drones, and laparoscopic cameras. In 2020, they performed an underground pipe inspection for a demolition company since the pipe was half filled with water and

was in a dangerous location, so there were few options other than an FPV drone (the pipe was too tight for a non-prop protected drone, and the sensors of a conventional drone would have prevented it from entering the pipe). The craft they used was a commercially available cinewhoop (a type of small FPV drone with fully enclosed propellor protection), refer to Figure 1. In 2020, they were novel, and the designs have been refined greatly in the interim years. They are typically used for filming close to people or filming indoors where the risk of injury or damage caused by spinning propellors needs to be mitigated. The video is available on YouTube.[12]

Figure 1. Cinewhoops (source: authors)

Clearly, the success of this project motivated them to continue to explore this niche, because in 2021, Shawn Morrison- one of the Rotor Riot designers who was involved in the pipe inspection- developed a small 2" class octacopter for even smaller spaces (2 inches is the propellor diameter, and an octacopter has eight rotors. In this case they were arranged in an X8 configuration, i.e. the rotors were paired up with four rotors arranged in an X shape with another four rotors directly beneath them). They used as inspiration a commercially available inspection drone from Skypersonic which employs a spherical cage around the drone to prevent it from becoming wedged in tight spaces, and to enable easier righting in case of a crash (FPV drones can right themselves after a crash using a feature called crash flip, widely known as turtle mode- a feature not generally available in autonomous UAVs, which are not designed to be crash-resistant in the way that FPV drones are).

The main disadvantage of the Skypersonic design, according to Rotor Riot, was its size. When trying to pass through passages which were barely larger than the drone, it would be sucked against the sides (this phenomenon also affects ducted craft such as cinewhoops, which can become stuck to walls in a crash- the motors accelerate as the flight controller tries to compensate for the unexpected angle of the craft). In their testing of the smaller X8 craft, they were able to successfully navigate though a duct approximately eight inches (200mm) in diameter and were able to inspect roof structures that they had previously been unable to access. Their design used commercially available parts supplemented by 3D printed parts, and they shared the STL files for the prints on Thingiverse. To achieve the small size, they did not fit a high-definition camera but instead relied on DVR (the digital video recording in the FPV goggles, made possible by the use of a digital FPV system in which the DVR resolution is 720p (1280 x 720 pixels, or HD [high definition]). The video resolution of analogue systems is either PAL standard or NTSC standard, i.e. 720 x 576 pixels or 720 x 480 pixels, respectively, and the image is noticeably less clear than digital video due to the manner in which the signal degrades.

The University of Zurich, among others, has been conducting research into using off-board AI-powered computers to pilot FPV race drones. In 2019, Delmerico et al[13] found that it was beyond the capabilities of the then current systems to respond as quickly as human pilots with available data from various sensors from a craft flying at high speed and performing complex acrobatic manoeuvres. In reality, racing drones are capable of in excess of 200kph and according to the Guardian (2025)[14] can execute manoeuvres which impose a load of 5G on the aircraft. This presents a number of technical challenges to which the team responded by inputting a preset flight path into their experimental craft, there was no scope for real-time adjustment of the course. By 2022, Kauffman et al[15] had developed the Swift system, and in experiments in which the drone raced against a former world champion drone pilot, the autonomous craft was able to beat the human pilot on a number of occasions. This was achieved using deep reinforcement learning, so the craft was able to adapt and become faster with practice. In 2025, according to the Guardian,[16] the system was able to win 15 out of 25 races against human pilots at the highest level.

DISCUSSION

From the above literature, there are three potential areas which are insufficiently researched in academia. The first is the use of UAVs as a pedagogical tool, to aid visualisation and ideation. The second is their use for site monitoring. Finally, there is the inspection scenario. Arguably, the second use presents the weakest case, because in the experience of these researchers (and this is anecdotally supported by other experts in the field), it takes tens of hours of practice to become basically proficient at FPV flying, and hundreds of hours to become competent (in much the same way as other skills such as driving, scuba diving, piloting a plane, etc.). It simply makes more sense for companies to purchase a semi-autonomous drone such as the Mavic or Mini series from DJI, since as the DJI marketing materials in the United States in 2015 for their Phantom series claimed, piloting one was "so easy, your grandmother can do it". Minimal training is required to operate these craft at a basic level and though Kim and Kim[3] suggested that the durability of FPV drones and ease of repair may make them attractive, ultimately the cost of training pilots may be less economical than the increased fragility and repair costs of autonomous drones.

The first scenario, using FPV drones for pedagogical purposes almost certainly has merit, but this research focus would be primarily on pedagogy so is not the focus of this current study (though cinewhoops are already used for related purposes in the real estate industry- property fly-through videos are increasingly common in marketing materials for more expensive properties). Thus, the main research gap identified in this current research would be into the use and development of inspection drones. The Rotor Riot octacopter introduced above would seem to be a logical point of departure, since at the time of writing, approximately two and a half years have elapsed since the development of that craft and Rotor Riot have apparently not developed the concept any further. In the past two years, there have been several developments which could result in a significantly improved design. To reiterate the basic specifications of the Rotor Riot design, it used two 85mm (motor centre to motor centre, the diagonal measurement of the frame) frames stacked in a double deck configuration to form a rough cube, and this design element seems to have been successful. However, there are now smaller and lighter digital video transmitters which mean the entire project could be scaled down, certainly to use 75mm frames or possibly 65mm frames (an 85mm frame measures approximately 12cm along each edge (outside dimension), a 75mm frame 10cm, and a 65mm frame 8cm). 85mm craft tend to use 2s batteries (a nominal voltage of 7.4v) while the smaller variants use 1s (3.7v nominal voltage). There is no inherent advantage to using lower voltages, in fact

the opposite is true, but weight can be reduced since 1s cells need no balance charger plugs and the power connectors can be smaller.
Regarding the work on using deep reinforcement learning to pilot UAVs under extremely demanding conditions, it would be reasonable to assume that this (or a similar) system could be used to pilot an inspection drone. The system requirements on the UAV are relatively simple- Inertial Measurement from the IMU, which all flight controllers already have, and visual data from the camera. This would negate the requirement for pilots to become proficient in flying FPV, but it is uncertain whether the cost of the system might outweigh the advantages of this.

CONCLUSION

While the above literature review is not comprehensive by any means, it was never intended to be. The main aim of this paper is to demonstrate that there is very limited research into the potential uses of non-automated UAVs- FPV craft- and with regards to AEC, this would appear to be a glaring omission, given their potential. There are inevitably potential uses for this type of craft which have not been identified here, but it is hoped that serious academic research into the use identified in the previous section- inspection purposes- with quantifiable results obtained from testing- will stimulate interest in this niche. To answer the research question, *"Are there any areas in architecture/urban planning in which UAVs could be beneficially employed in ways in which they are not currently, and which type of craft could best suit these purposes?"* it is proposed that the Rotor Riot design be refined, shrunk and optimised to be built ready for such testing. Observations during the course of this testing may suggest other novel areas for exploration, including the possibility of piloting the craft using AI rather than a human pilot.

NOTES

[1] Marta Videras Rodríguez et al. “A critical review of unmanned aerial vehicles (UAVs) use in architecture and urbanism: Scientometric and bibliometric analysis,” Applied Sciences no.11 (2021): 9966, doi: 10.3390/app11219966

[2] Akira Sato. *The rmax helicopter UAV* (National Technical Information Service, 2003)

[3] Marta Videras Rodríguez et al. “A critical review of unmanned”.

[4] Seungho Kim and Sangyong Kim. “Opportunities for construction site monitoring by adopting first personal view (FPV) of a drone.” Smart Structures and Systems (2018):139-149.

[5] Marta Videras Rodríguez et al. “A critical review of unmanned”.

[6] Marta Videras Rodríguez et al. “A critical review of unmanned”.

[7] Marta Videras Rodríguez et al. “A critical review of unmanned”.

[8] Marta Videras Rodríguez et al. “A critical review of unmanned”.

[9] Seungho Kim and Sangyong Kim. “Opportunities for construction site”.

[10] Moju Zhao et al. “Versatile articulated aerial robot DRAGON: Aerial manipulation and grasping by vectorable thrust control,” The International Journal of Robotics Research no.42 (2023): 214-248, doi: 10.1177/02783649221112446.

[11] “Homepage,” Rotor Riot, accessed January 8, 2025, https://rotorriot.com/.

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[13] Jeffrey Delmerico et al, “Are We Ready for Autonomous Drone Racing? The UZH-FPV Drone Racing Dataset” (paper presented at 2019 International Conference on Robotics and Automation (ICRA), Montreal, Canada, May 20-24, 2019).

[14] “AI powered drone beats human champion pilots,” The Guardian, accessed May 30, 2025, https://www.theguardian.com/technology/2023/aug/30/ai-powered-drone-beats-human-champion-pilots

[15] Elia Kaufman et al. “Champion-level drone racing using deep reinforcement learning,” Nature 620, 982-987 (2023), doi: 10.1038/s41586-023-06419-4.

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RESEARCH, EXPERIENCE AND IMAGINATION: HOW STUDENTS DEVELOP THEIR UNDERSTANDING AND PERCEPTION OF THE WORLD IN ARCHITECTURAL EDUCATION

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INTRODUCTION

This article will outline an approach and methodology as a new tool in architectural education that allows us to reach an in-depth understanding of space and place. Moreover, it will present a theoretical framework, the importance of research, and samples of the methodology's implementation in teaching and students' work.

As an architect myself, through my work process, I realised the importance of narrative. When discussing a project with clients, common metaphors of their own life revealed an architectural narrative intimately connected with the place and landscape of the given site and environment. As a researcher and PhD author years ago, I was guided by phenomenological and hermeneutical methods, anthropological principles and ethnographical observations in composing eight fictional narratives out of spatial, social, and landscape narratives and truths.

Consequently, after years of teaching theoretical and design courses, in this article/ presentation, I will present new tools for architecture students to develop their understanding of place and the ways in which life is negotiated within the boundaries of each public, private or common place. This methodology distances itself from drawings and modelling tables and introduces the world of texts, given that narrative and imagination have been tools in the hands of both architects and authors.[1]

Within this research and work with students from different departments of American universities during a study abroad program as well as architecture students from Greek universities, I will discuss how these methodologies affected their understanding and perception.

Philosophical framework: the use of narrative

Primarily through my PhD research, which took place in a farming landscape and a small community on the island of Tinos, I became aware of the value of metaphor as a natural language of sharing a communal way of living connected with the natural and built environment. It was revealed to me that the stories shared by a small community of villagers connect language with mimetic action, habit, which not only connect our physical and mental experience with the environment, but also place and space. This was adopted to discover and reveal the truth through fiction/story/myth as argued by Paul Ricoeur, through the "mediating role" of fiction as a weaving procedure of different things that make up life. It is this complexity of life that narrative tries to imitate.[2]

Implementation in study abroad programmes: "Public spaces in Athens. Contemporary stories in an Ancient City"

Since 2017, I have been teaching the contemporary urbanism course, "Athens through time, space, narrative" later developed into "Public spaces in Athens. Contemporary stories in an Ancient City". This allowed me to share with students the idea that the use of narrative and the creation of fictional narratives can develop a deeper understanding of what life is, offering a foundation for the imagination to flourish and anchor.

This course approached Athens as a city evolving in time, bringing together historic and contemporary architecture, as well as spaces of the communal, public and private realm, the Athenian landscape and its environs, and its social, cultural, and urban fabric. It aims to reveal boundaries and places of crisis, migration, negotiation, and coexistence, as this takes place between the ancient and the new, between the centre and the edges of the city. These places were recorded through the students' observations, videos, photos, texts, literature and discussions during each seminar. The seminars followed by field trips were developed chronologically from the ancient past to present, while remaining connected with the reality of the contemporary city.

Learning Objectives

In this course, research, experience, and imagination through fiction are presented as tools to help students gain a thorough understanding of what this Mediterranean capital really is by following their personal route in the city. By the end of the seminar, students are able to write their own fictional narrative on the truth revealed to them by the city and work on a methodology aimed at a deeper understanding of a 'foreign' reality, a way of seeing, thinking about the series of negotiable or non-negotiable boundaries that coexist in the city of Athens. They create a valuable archive of data about life in Athens and develop different ways of documenting the city in order to reveal a reality based on their experience and interpretation.

Excerpt 1 by a student in spring 2020 (during covid-19, lockdown)

"The pedestrian street was entirely empty as the wind raced up its incline. Any warmth offered from the Mediterranean sun directly overhead was rejected by the chilling gusts. We continued on our journey past the massive Acropolis Museum, our heads sweeping left to right, from neo-classical buildings to the pinnacle of classical architecture: the Parthenon. I had neglected a visit to the top of the rock for the first part of my trip, thinking I had all the time in the world, but in that moment I felt grateful to have scoured its treasures a week earlier.

At the top of the Dionysiou Areopagitou there were no red and yellow tour buses. We ducked into the forest, turning sideways and lifting our arms to make it past the barrier gate with our bellies full of roast pork, grilled pita, and tzatziki. The wind was muted by dense growths of olive and pine trees all around. The trees also blocked out the warming sunlight, sending a sharp shiver through my body. We stopped at the Church of Agios Dimitrios Loumbardiaris to admire its mixed stone exterior and were greeted by the smell of burning incense seeping through the loose window frames. As we turned right, the two dogs behind the barbed-wire fence, who usually bark at me when I run past, sat with their heads on their paws, tracing each of our steps with their beady eyes. We climbed up the metal ramp, our loud steps drawing an attentive gaze from one of the pups, and were welcomed to the lookout by a blast of wind. We had reached our destination."

Similar principles are followed in the summer course, 'Greek Island Architecture, Culture, and Identity: Amorgos, Santorini, Tinos' where, for four-weeks, students are travelling and exploring the life, the architecture and the possible future of these three Cycladic Islands. They pose and answer

questions about dwelling, belonging, and identity after investigating the local communities and their historic practices of creating sustainable architecture and means of living. Students have the opportunity to explore how the environment and the local architecture is related with the psychosomatic equilibrium of communal life in these places. By the end of this course, students have gained a way to interpret and connect with places, individuals, and communities through the composition of a logbook as a narrative record.

Excerpt 2 by a student, in summer 2024

"She missed these days when there were barely any private boundaries except for home spaces. When they would all gather together in communal spaces, dance to local songs, and drink their raki. The days when artisans would work secretly on marble artifacts and give them to one of the members of the community on their birthday. The sense of community was so strong, that the shared meals were uncountable. But those days were long gone. Where did the rain start beating them? About this time down in the port town, things were slowly beginning to change. The number of foreigners coming to the port was constantly increasing, business was booming. Every few weeks a construction project was begun to host a new taverna, or a fashion clothing store, or a tourist hotel. It didn't change a lot of things earlier on, because the tourists then would blend in with the locals, learn their way of life, and live it that way. It was before the advance of phones even, so the intricate tapestry of the island remained tightly woven together, communal events still happened, and vernacular architecture was still upheld.

A few years later, however, things started to change. There came a new generation of tourists. These were not like the ones before them who were used to the locals, they only cared about the aesthetic of the island. They came to teach their ways, not learn the ways of the locals. They didn't learn the language, they pioneered divergent forms of architecture and they popularised their small Island with their social media posts."

Architectural theory courses

Architectural theory courses, such as "Understanding and Imagination before Designing" at the University of Thessaly school of architecture and "Theory 1 & 2 / Architecture and Landscape" at the University of Ioannina school of architecture, were based on highlighting the theoretical and experiential concepts of architecture and landscape. Their purpose was to introduce students to the architectural discourse aimed at understanding landscape as a dynamic element.

These courses were based on case studies to reinforce research and experience and get students to analyse life in small communities through the creation of a file - a collection of observations, texts, interviews, stories, measurements. Field trips allowed students to create their personal archive by experiencing, recording and understanding the cultural and social structure through observations based on the following: what they see, listen, touch/ step on, smell, their observations of what is old and what is new, the differences in scale, the shadows, vegetation, human movement and uses of space. Students were asked to respond by exploring maps and physical spaces of the city, objects, landscapes or monuments, creating in that way their own archive of texts, photographs, images and critical interpretations.

The young architects needed to be aware of all these before beginning to imagine and create a new piece of architecture in this structure. Moreover, tools of interpretation were given to them (historical, anthropological, philosophical guidance) so that architecture and design could be understood as practices that were traditionally used to connect people with their community, place, religion, and environment. With an understanding of a "different" reality, the final assignment was the composition

of a fictional story using theory and history too in a creative effort to understand and interpret a place, space and architectural complexities.

Architectural design courses

Architectural design courses, such as “The scale of vernacular architecture in a contemporary city” which took place in Volos, at the School of Architecture of the University of Thessaly, and the “The anthropogenic shaping of the natural/rural environment in combination with a typology of Greek settlements” at the University of Ioannina school of architecture, invited the students to give three different readings of the landscape that would be chosen through different scales. They are invited to explore how our perception of place can be developed in connection with our participation in charitable and private events or activities of everyday life. These events express, reflect and maintain a dialogue between place and body, or between place, body, and an object, installation, or furniture in public space.

In these courses students were also challenged to further deepen their reading and understanding of design in an area with a fragile physical footprint. This goal was achieved through research, archiving and through the study of the elements that define the urban or rural landscape of an area such as boundaries. Their interpretations connected with the public, the private, and the community space, the importance of threshold, the importance of shadow, the use of various materials that compose the different scales within the urban or rural landscape. Students then compose a story of their understanding of what life is like in these areas, introducing characteristics, qualities of place, the locals’ stories and how they contribute to the social and cultural life of the area.

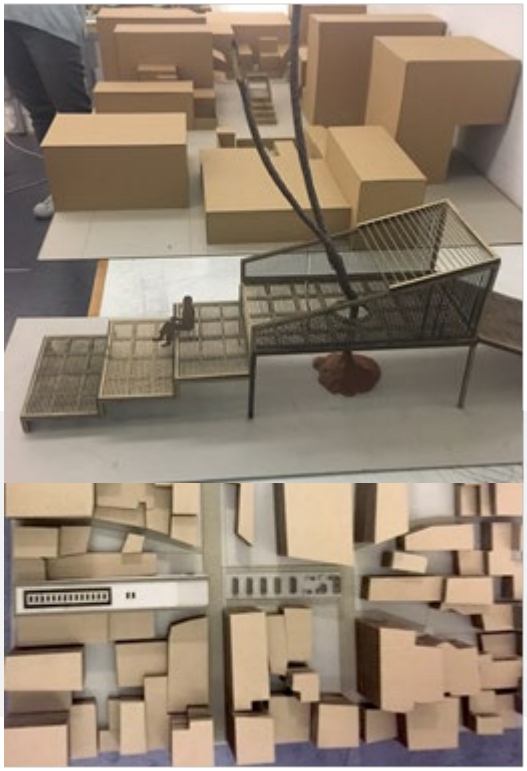

Figure 1,2,3. Students’ work/ public furniture/ installations in the city: Spring semester, University of Thessaly 2019

Why this methodology is important

a. The role of research: During their research into verbal history and local narratives, students were helped to understand a small community's perception of ownership and dwelling through the different set of metaphors and interpretation that boundaries reflected onto their lives. Then, phenomenology and hermeneutics helped them understand and interpret places created by boundaries that actually exist through the negotiation and narration of stories taking place in communal or public spaces.

b. The role of experience: Small communities such as the those experienced, as well as larger communities in the city, allowed the students not only to observe and engage with different ways of living and spatial perception through architecture, but also through the narratives of its inhabitants. Experience helped them create an imaginary plot, with a mediatory function rather than mimetic, not a duplication but a creative reconstruction.

c. The role of Metaphor: The students soon realised that the people's stories consisted of a series of metaphors about what dwelling is in this part of the world, in this specific landscape. Gadamer claims that "in language and only in it, can we meet what we never "encounter" in the world, because we are ourselves and merely what we mean and what we know from ourselves."[3] This knowledge from ourselves also involves emotions, which is another way of connecting ourselves with place and environment through fiction.

d. The role of Imagination: Through this reconstruction of a fictional narrative, the students realised how Kearney, in connection to the work of Ricoeur, explores the ability of language to open up new worlds, not as a collection of the subjective, but through productive linguistic imagination, "the metaphorical imagination",[4] as he calls it, which "not only combines the verbal and non-verbal, it also produces new meaning by confronting a literal with a figurative sense."[5] Pérez-Gómez also cites Ricoeur's preference for a "linguistic model of imagination,"[6] that is the replacement of a visual model with a linguistic model, writing that "imagining folded into the function of metaphor."[7]

e. The role of fiction: As Pérez-Gómez argues, the mindset that rejected both the significance of myth for human beings and poetry as a legitimate form of knowledge, led to a contemporary architecture based on economic benefits, technological production, institutionalised frames and political authority.[8]

Additionally, another aspect of the role of fiction that Grassi mentions is how this "metaphorical imagistic form of language," as he describes it, can offer a different manner of philosophising.[9]

EVALUATION - CONCLUDING THOUGHTS

During the research process, the students created their own narratives based on the metaphors of the local communities and their reality, fused with their personal experience in the city as a version of reality - many students' stories are being compiled for a book initially on the city of Athens.

They enjoyed both the engagement with the phenomena and places and working together in a group. They expressed enthusiasm about learning from narratives things they had not experienced before. I noted that initially it was very difficult for them to actually observe and record a place in order to learn from it. They needed to develop mindfulness and understand that their senses are their initial tools. Their difficulty in using their imagination and fiction to express aspects of their experience in these places was very instructive to me. Independently of that, they produced beautiful works both in terms of archiving, understanding, and composing their narratives either as a final work or as a process for a design project. There was a lot of excitement in the group of students who were introduced to the design part. The engagement and interaction with a place, under specific methodology and guidance, helped them primarily to develop a common approach or "language" to communicate with each other and share their findings and understanding. The creative part then came

easily using their experience, common understanding and imagination and by focusing on variations of the scenarios. The different projects from each group at this stage were particularly interesting and stimulating.

Research, experience and imagination are presented as tools for young architects to achieve a broader understanding of what the world that we design for really is by being released from the preoccupation of what this world should be according to contemporary social and political edicts, or urban rules that do not reflect a place's reality. Metaphor, narrative, and fiction allow different versions of reality to emerge. They equip students with a way of interpreting/incorporating the local tradition into a contemporary way of living, as opposed to responding to architecture and dwelling merely through form and the dominant architectural trends. It inspires them to bring forth the complexity and meaning of architecture, a "meaningful regionalism"[10] related with place and environment, culture, and human life.

NOTES

[1] Maria Vidali, *Liminality, metaphor and place in the farming landscape of Tinos: The village of Kampos,* A thesis submitted to University of Thessaly in partial fulfilment of the requirements of the degree of Doctor of Philosophy, (University of Thessaly, School of Architecture, 2017).
[2] Vidali, *Liminality*, 27-28.
[3]Hans-Georg Gadamer, *Philosophical Hermeneutics*, trans. and eds. Linge E. David, (Berkley, Los Angeles, London: University of California Press, 1976), 20.
[4] Richard Kearney, *"*Paul Ricoeur and the hermeneutic imagination*",* T. Peter Kemp and David Rasmussen, eds. *The Narrative Path: The Later Works of Paul Ricoeur*, (Cambridge, MA, London: The MIT Press, 1989), 3-6.
[5] Kemp and Rasmussen, eds. *The Narrative Path*, 15.
[6] Alberto Pérez-Gómez, *Attunement, architectural meaning after the crisis of modern science,* (Cambridge, MA: The MIT Press, 2016), 187
[7] Pérez-Gómez, *Attunement, 187*
[8] Alberto Pérez-Gómez, "The Architecture of Richard Henriquez: A Praxis of Personal Memory," ed. Shubert, Howard(ed.), *Henriquez, Richard: Memory Theatre*, Catalog of the exhibition co-organized by the Vancouver Art Gallery and the Canadian Centre of Architecture, Montreal, 1993.
[9] Ernesto Grassi, *Rhetoric as Philosophy. The Humanist Tradition,* (University Park, London: The Pennsylvania State University Press, 1980), 101.
[10]Alberto Pérez-Gómez, *Attunement, architectural meaning after the crisis of modern science,* (Cambridge, MA: The MIT Press, 2016), 193.

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GIVING IMAGE AND DESIGN GIVENNESS: THE HALLMARKS OF DESIGNING GOOD ARCHITECTURE

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INTRODUCTION

The pedagogical challenge of teaching architectural design is encumbered, on one hand, by the pragmatic approach to which many traditional architectural design studios subscribe, and on the other hand, by capriciousness of creativity to which students license themselves as their means of self-expression. The task of architectural design is usually narrowly cast as a problem of arrangement and accommodation of a program of functions within a site. When precedence is given to program accommodation, form is compromised, and vice versa, when precedence is given to form arrangement, function is compromised. Cast as such, the design process becomes akin to "shoehorning" and the definition of architecture is reduced to a pragmatic issue of building. To properly meet the challenge of teaching architectural design, pedagogy needs to recast the design task primarily as a task of giving and givenness. Good architecture should trigger the imagination and thought to ways of thinking about the place and nature of things in the world thereby unfolding the space of desire for moral virtue, truth, and beauty. Good architecture gives things an image albeit in a non-representational way.

Heidegger's example of the bridge that brings into presence the banks of the river, rather than merely connecting them, is a familiar example of good architecture that discloses the nature of things, making them visible. This paper explores image-giving and design givenness to avail pedagogy of architectural design studios from missing the mark when seeking the portrayal of the architecturality of architecture.

Contemporary critique on architecture is usually concerned with the rampant production of images which exudes a sense of superficial engagement with the built environment, and consequently, a sense of disorientation and loss of meaning. Rather than discarding the potency of the role of image in architecture altogether, this paper rectifies the negative perception of image by reasserting that Architecture's cultural and societal role is about communication of an image and experiences of architecture associated with that image. The quest is about architectural image and what makes it superficial or, on the contrary, charged with value.

This paper reintroduces the idea of image in a new light. The paper is divided into three parts. The first part highlights the design issue we are facing in architectural design studios and the need to transition from the practice of shoehorning function and form to the idea of what can be called a form-image. To do that, the paper points out two design approaches that are usually followed in design

studios: the rationalist and intuitive as a preface to identifying the task of design as a revealing of the form-image. The second part of the paper highlights the pedagogical role of architecture. The general tendency is to view architecture as an object which we need to design and we therefore apply a pedagogy to teach architecture design. If, however, we view architecture as itself pedagogical and didactic, architecture has the capacity to inform about truth and about values. To understand architecture as pedagogical the paper translates the three-subject model of the educational relationship as outlined by Marek Jezioranski. The three-subject model is opportune for an understanding of architecture design pedagogy that relies on the architectural image. A concept by philosopher Martin Heidegger that is related to the idea of image as a gathering is the concept of Dasein (being-there) which conveys both a spatial and temporal concept of dwelling. Finally, the last section of the paper refers to a Montreal architect, Melvin Charney, to posit architecture as images of images. Charney differentiates between monument and instrument and this differentiation will give us an idea about the difference between an image as a product and as a process. The paper concludes with asserting the capacity of architecture to achieve a new conception of reality through a proper understanding of the pedagogical role of the sublime architectural image.

RATIONALIST AND INTUITVE DESIGN METHODS

Two design approaches that are usually followed in contemporary design studios are either a rationalist or intuitive method.[1] In the rationalist method, the focus of pedagogy is on how things work. It is a very pragmatic approach wherein design educators present students with a functional program based upon which students start to think about functional relations arranging and composing spaces in a bottom-up process. The second approach, the intuitive method, the focus of pedagogy is on how things look. It is a very expressionist approach which depends on the designer's intuition as the driving force behind the design and follows a top-down process. Students find this as an exercise of artistic ability and individual expressiveness rather than a solution to a design problem. Neither the bottom-up process nor the top-down process satisfies the real criteria for an architecture that is comprehensive because the emphasis is either on function, in the first method, or on form, in the second method. Due to the excessive emphasis, we tend to shoehorn one into the other, either shoehorning form into function, following the famous dictum "Form follows Function," or shoehorning function into a rigid mold of a preconceived form. This paper proposes a change in this framework of design process from shoehorning to what can be called a form-image.

To understand the idea of form-image, I refer to Christopher Alexander's book, *Notes on the Synthesis of Form*, where he advocated designers to not think in terms of functional requirements based on the program alone, nor to think along the lines of form alone to produce the final product of design.[2] That is, neither a requirement diagram nor a form diagram would be sufficient for the design task. To design, according to Alexander, is to combine form and function into what he calls a constructive diagram, which I translated for the purposes of this paper to the idea of a form-image. A constructive diagram is a process of reconciliation of the pattern of a design problem with the process of designing. The form is realized due to successful reconciliation between the two. This is where the idea of the form-image comes into play because it involves structural similarity. Rather than trying to fit one (form) into the other (function), or vice versa, the form-image contributes to the understanding of its coming into being. The task is to discover a form-image that penetrates the problem so deeply that the designer not only resolves the problem but illuminates the understanding of the problem by exploring the nature of the context beyond the program. So, the missing factor here is inclusion of the context within a design problem.

Collusion of form and image into a form-image necessitates a clarification of what an image is. According to Mitchell, an image captures different cases such as mental, verbal, perceptual, optical, or graphic image.[3] Those cases demonstrate the concept of image as comprising in a differential manner a combination of tangible and intangible components spreading across the spectrum from imaginary mental representations to graphic images that are more literal. Mitchell gives as example the representation of a man which could take the figure of a picture, a pictogram, an ideogram, or phonetic sign just by writing the word "man". In his view, the ideogram is the one that best represents man because it gives information on structural similarity to the image of man, rather than just a mimetic representation. Structural similarity allows the diagram to radiate with meaning. So, when designing with form-image in mind, we need to shift focus to radiance of meaning through structural similarity rather than a mimetic reflection of outward form. To design for radiance of meaning recalls Michael Hays' definition of architecture as going beyond representation to epiphany and emanation of meaning.[4]

ARCHITECTURE AS PEDAGOGICAL

As design educators, we usually refer to pedagogical approaches to teach architecture design. Recognizing, however, that architecture is itself pedagogical in the first instance through the idea of form-image may shed light on how to approach architecture design pedagogy. Based on the role that context plays in furthering the understanding of form-image, form-image can be divided into two aspects that capture the process of relating to context: image-giving and design givenness. The two aspects circumscribe what David Leatherbarrow described regarding the "passively active" orientation of architecture as a two-step dance of advance and retreat.[5] Advance corresponds to the image-giving aspect where architecture is a foreground, while retreat corresponds to the design givenness aspect where architecture serves as a background. The cultural role of architecture is fulfilled with the proper balance between the two, i.e., without overemphasizing one over the other. Image-giving is the radiance of meaning that a design imparts on the context which it has absorbed in its design givenness aspect. The two aspects define a design approach that is called context-embedded, after Deleuze's understanding of architecture as a dual process of folding and unfolding.[6]
So, design pedagogy needs to recast the design task primarily as a task of giving and givenness. The task as alluded to above is moving from simple representation (the development of a narrative) to an epiphany (the discovery of style) where architecture becomes part of culture and the revealing of truth, to, finally, an emanation (the embodiment of values) where architecture reconfigures the context rather than just responding to context. Architecture is labelled as good architecture if it exemplifies the levels of epiphany and emanation. In so doing, good architecture, according to Alberto Perez-Gomez, kindles the space of desire for moral virtue, truth, and beauty.[7] This level is oftentimes lost in our architectural design studios when the task of design is reduced to a passive representation rather than an appreciation of the affect a design has on subjectivity and communication of moral values. The qualifying term "good" in good architecture simultaneously carries the sense of a bestowing and a holding, a giving and a letting go, and in giving, holding, as posited by Gregory Fried and Richard Polt in their chapter titled, The Idea of the Good and Unconcealment".[8] The Good (agathon), based on a Platonic idea, empowers being (ousia) and allows the revelation of truth (aletheia). The Good unifies being and truth under its yoke by providing the condition for the possibility of being and truth.

The three-subject model of the educational relationship

Marek presents a model of the educational relationship between instructor and student as a relation of embodiment composed of two interacting relationships, an external and an internal relationship.[9] The external relationship is between the instructor and the student while the internal relationship is an internal dialogue within the student. The overlap between the external and internal relationship represents a joint subject that Marek labels as an I-caller. The joint subject is the third subject enacted during communication between the other two subjects: instructor and student. This means that the knowledge an instructor shares with a student occupies a midway position in the communication process (which always carries a surplus and never perfectly pure) to be further processed internally by the student who engages in an internal dialogue to make sense of that knowledge. It is this third subject, the I-caller, that carries a potential avenue to understand the pedagogical role of the image of architecture.

To draw rough parallels from this model to architecture, the relationship can be modeled as a communication process between the object (the architecture) and the subject (the user) whose interaction creates three zones that correspond to the three subjects of Marek's educational relationship. The external relationship corresponds with architecture-as-other (external experience). The internal relationship corresponds with architecture-as-self (the internal dialogue). Meanwhile, The I-caller (the overlap) corresponds to architecture-as-image (the form-image). The third subject of architecture is the form-image which explains the fundamental role that a good architecture performs, namely, giving image and design givenness. The spectrum (object – architecture as other – architecture as image – architecture as self – subject) delineates a hierarchy of ways of conceiving architecture by working from the ends of the spectrum towards the middle (Figure 1). The first level, taking the outer ends of the spectrum (object – subject) delineates architecture's role for natural development which involves physiological and social needs that an architecture fulfills such as sense of safety and social belonging. This is a level that Hays would call representation. The second level, taking the second to last from both ends of the spectrum (architecture as other – architecture as self) delineates architecture's role for cultural development which involves thought patterns, values, and cultural needs that an architecture fulfills such as strengthening of cognitive schemas and appreciation of aesthetic styles. This is a level that Hays would call epiphany. Finally, the third level, taking the central term in the spectrum (architecture-as-image) delineates architecture's role for transcendental development which involves the creation of a worldview that promotes a way of seeing and a mode of being in the world. This is a level that Hays would call emanation. This means that architecture should not be reduced to design of an object because it involves more than that, it involves shaping the subjectivity of users.

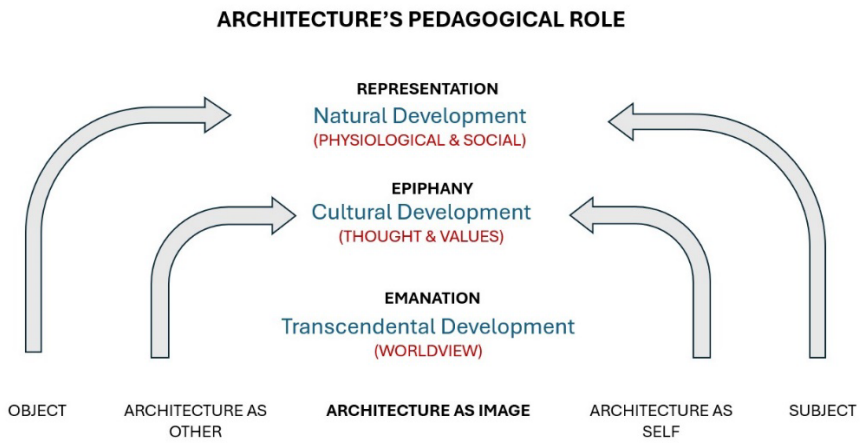

Figure 1. A hierarchy of architecture's pedagogical role

The temporal unity of "dasein"

Heidegger's notion of Dasein captures the human condition of being attached to place, i.e., of dwelling. The notion of Dasein, in conjunction with a human thinking being, suggests a process of gathering that is both temporal and spatial for the formation of an image of dwelling. The spatial aspect involves a gathering of a spatial unity between sky and earth. The temporal aspect involves a dynamic temporal unity of receiving, going forward, and making present. Formation of the image of dwelling has spatial and temporal aspects. Humans are living beings having logos which involves speaking and disclosing, as Katherine Withy observed.[10] So, we realize that speaking is a way we illumine the world and our own Dasein. Speaking is thus related to Dasein as it reveals entities by virtue of complementary processes of combining and dividing. In doing so, we are creating a world and the success of that world is contingent upon the moral values and truth that are communicated. In this sense, the process of gathering may be either authentic or inauthentic. When gathering is authentic, the synthesis is open while simultaneously being grounded in place which is the case of giving image and design givenness. When gathering is inauthentic, the synthesis is closed, ungrounded and uprooting which is the case of the production of an image.

ARCHITECTURE AS IMAGES OF IMAGES

Charney's critique of the difference between process (an intellectual process into the nature of things) and product (a preconceived image) in creation of the architectural image.[11] Undertaking architecture design as a process indicates architecture's role as an instrument for conveying meaning. Undertaking architecture design as a product indicates architecture's role as a monument that imposes an order external to its place. To give an example, Charney compares two skyscrapers in Montreal, Place Ville-Marie and Place Victoria. Place Victoria is more authentic because it displays a process of grouping in the form of the building. The building shows that it came out of a process where technology is integrated in its form. Place Ville-Marie, on the other hand, is a two-dimensional extrusion of form without grouping. The building appears as product of technology packaged in the design rather than integrated. The same difference also recurs in the design of houses where an authentic design of a house displays a process of life while an inauthentic design stultifies a sense of life in the design. Architectural image has the power to reflect, obscure, disguise, and simulate based on their relation to reality.[12] When image reflects and obscures, the presumption is that there is a profound reality underlying the image. Architecture in this case intimates the existence of an authentic

reality that the imagination apprehends as a sublime image. When image disguises and simulates, the presumption is the absence of a profound reality because the image in those cases is empty and ungrounded. Architecture here manifests falsity and fancifulness. The outcome of an architecture of disguise and simulation is a tragic and comedic image of society.

CONCLUSION

To properly meet the challenge of teaching architectural design, pedagogy needs to recast the design task primarily as a task of giving and givenness. Imagination and thought need to be deployed to ways of thinking about the place and nature of things for creating good architecture that unfolds the desire for moral virtue, truth, and beauty. This paper defines the hallmarks of good architecture as comprising image-giving and design givenness to avail pedagogy of architectural design studios from missing the mark of good design. Rather than discarding the potency of the role of image in architecture altogether due to the rambling usage of images in contemporary architecture, this paper rectifies the negative perception of image by reasserting the communicative function of Architecture's cultural and societal role through the architectural image. To fulfill this communicative function, the paper introduced the notion of form-image to emphasize the understanding of the coming into being of an image that is a combination of tangible and intangible components. When designing with form-image in mind, we need to shift focus towards radiance of meaning through structural similarity of process of form-making rather than a mimetic reflection of outward form. Design pedagogy needs to recast the design task primarily as a task of giving and givenness. This involves moving from simple representation of a narrative to an epiphanic discovery of style where architecture becomes part of culture and the revealing of truth, to, finally, an emanation of values embodied in an architecture that reconfigures the context rather than just responding to context. Architecture-as-image delineates architecture's role for transcendental development that promotes a way of seeing and a mode of being in the world. Good architecture empowers being and allows the revelation of truth for human flourishing and freedom.

NOTES

[1] Fathi Bashier, “Reflections on Architectural Design Education: The Return of Rationalism in the Studio,” *Frontiers of Architectural Research* 3, no. 4 (December 1, 2014): 424.
[2] Christopher Alexander, *Notes on the Synthesis of Form*, vol. 5 (Harvard University Press, 1964).
[3] William J. T. Mitchell, “What Is an Image?,” *New Literary History* 15, no. 3 (1984): 503.
[4] K Michael Hays, “Architecture’s Appearance and the Practices of Imagination,” *Log* 37 (2016): 205.
[5] David Leatherbarrow, *Architecture Oriented Otherwise*, Writing Matters (Princeton Architectural Press, 2009).
[6] Helen Hills, “The Baroque,” *Fabrications* 17, no. 2 (December 1, 2007): 48.
[7] Alberto Perez-Gomez, *Built upon Love: Architectural Longing after Ethics and Aesthetics*, The MIT Press (MIT Press, 2008).
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[9] Marek Jeziorański, “Education in the Perspective of the ‘Inner Image,’” *Paedagogia Christiana* 53, no. 1 (2024): 59.
[10] Katherine Withy, “Heidegger on Human Being: The Living Thing Having Logos,” in *Human: A History (Oxford Philosophical Concepts)*, ed. Karolina Hübner (Oxford University Press, 2022).
[11] Louis Martin, “Thinking Architecture, Its Theory and History: A Case Study about Melvin Charney,” in *The Figure of Knowledge*, ed. Sebastiaan Loosen, Rajesh Heynickx, and Hilde Heynen, Conditioning Architectural Theory, 1960s - 1990s (Leuven University Press, 2020).
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INFORMATION THEORY, BIG DATA, AND THE ART OF PERSUASION: A COURSE ON DATA STORYTELLING FOR DESIGN STUDENTS

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INTRODUCTION

At a time when Artificial Intelligence (AI) is increasingly being used to navigate our world, Big Data is growing exponentially. Before design students create data projects, they must understand how the Internet of Everything (IoE) is shifting consumer demographics toward a focus on the individual, enabling behavior prediction through data collection.[1] The author has created a course on data storytelling where students can learn by using open-source data sets, simple mapping, and data-related projects. The resources and projects in the course emphasize that there are more than numbers or quantification at work in Big Data.[2] The course designed by the author starts with an introduction to foundational theories of information, such as the information theory of Shannon and Weaver, along with the philosophical insights of Gilbert Simondon.[3] His ideas on individuation and the dynamic relationship between information and its milieu offer critical perspectives. Simondon's theory highlights how information is not static but interacts with, and potentially transforms, its environment and human culture.[4]

Students will learn about the types of structures exhibited by Big Data and explore how Machine Learning, AI, and algorithms process and reshape this data.[5] They will investigate data's ontology—its nature and existence—and critically engage with the 5 "V"s of data: volume, velocity, value, variety, and veracity.[6] These explorations will provide a comprehensive foundation for understanding how data operates in contemporary contexts and the ethical implications of its use. This course focuses on developing effective data representations for target audiences to encourage social change. Students will explore using games, quizzes, infographics, zines, animations, and other formats to persuade audiences with data.[7] They will work individually and in groups to foster peer interaction. Appreciating the qualitative aspects of data will help design students leverage the relationships and context of data in their design practice.[8]

INTEGRATING AI, BIG DATA, AND STORYTELLING IN DESIGN EDUCATION

The author was recently appointed to the design program to replace a professor who taught web design and infographic creation using Web Flow and Adobe Illustrator. While these tools provided a strong foundation in traditional design practices, the evolving landscape of Artificial Intelligence (AI), Big Data, and the growing dominance of non-Adobe software such as Figma in design and

prototyping has necessitated a curriculum overhaul.[9] This redesign highlights the evolving priorities within the design industry, emphasizing data-driven methodologies and user-centered approaches. Inspiration and a jumping-off spot for this class were drawn from an MIT OpenCourseWare course, Data Storytelling Studio: Climate Change, created by Rahul Bhargava.[10] Using his examples, this course explores innovative and engaging data representations through projects that utilize Open-Source datasets. For example, AI and Big Data advancements are reshaping our understanding of human behavior, offering tools that can predict actions and needs with unprecedented precision. Yet, designers face the challenge of harnessing these technologies to present data in ways that create trust and shared understanding by using qualitative methods to engage viewers with data.[11] Students should comprehend the broader implications of the Internet of Everything (IoE) before embarking on data-driven projects. IoE has shifted consumer demographics to focus on individuals, enabled by vast data collections that include location tracking, social media activity, and even household inventory like shopping lists or refrigerator contents. While these innovations offer powerful predictive capabilities, they also introduce ethical concerns regarding data privacy and trust. Social media and selective "data picking" have exacerbated belief silos, eroding public trust in statistics.[12] To counter these challenges, the curriculum will integrate principles rooted in classical rhetoric—ethos (credibility), pathos (emotional connection), and logos (logical reasoning).[13] These foundations help designers craft compelling, trustworthy narratives that resonate with diverse audiences. Going beyond numbers and statistics, students focus on storytelling, language, and visual imagery to bridge the gap between data and human experience—qualitative techniques essential for building trust and fostering shared perspectives.

The course also strongly emphasizes exploring creative methods to connect audiences with data, such as gamified surveys, online quizzes, interactive games, and participatory or kinetic activities. The research underscores the effectiveness of these techniques, showing that gamified surveys enhance both response rates and data comprehension.[14] Furthermore, approaches such as map-making, "unmapping" techniques, and using maps as visual storytelling make data more accessible and engaging. These techniques operated within ethical principles, emphasizing human-centric design and responsible innovation.[15]

Key Theoretical Foundations and the Interplay of Technology, Data, and Culture.

Shannon and Weaver

At the core of these foundations lies the seminal work of Shannon and Weaver (1949), whose *Mathematical Theory of Communication* introduced essential concepts such as entropy, noise, and information redundancy. Their quantitative approach to information transmission has significantly influenced modern communication technologies and continues to impact the technical aspects of data systems today. While their framework emphasizes abstract and technical elements, it lays a vital foundation for understanding how data is transmitted and processed in interactive systems.

Gilbert Simondon

Expanding on this technical perspective, Gilbert Simondon provides a philosophical lens with his theory of individuation. He reinterprets information as a dynamic force interacting with systems—technical, biological, and cultural—leading to the continuous evolution and redefinition of entities and structures. This perspective is crucial for AI and interactive project design, as it highlights information's transformative and generative potential, emphasizing the interaction between data systems and human contexts. Simondon illustrates that technological artifacts are not static; they

evolve through relational networks with users and societal norms, profoundly shaping the environment in which they exist.

Henri Bergson

Henri Bergson's philosophy adds further depth to this discussion. Bergson's concepts of durée (duration) and creative evolution offer a way to understand technology and data as dynamic forces that unfold over time, generating new possibilities for societal and cultural change.[16] His focus on intuition and the lived experience contrasts with purely mechanistic interpretations of technology, reminding us that technological systems and data analytics are embedded in human temporality and creativity. This lens is particularly relevant to interactive data project design, where human-data interactions' temporal and emergent qualities influence outcomes.

Bernard Stiegler

Bernard Stiegler builds upon and expands these ideas, emphasizing technology's dual nature as a tool that can enhance and disrupt human capabilities. Stiegler's critique of "technological time" and its effects on cultural memory and social structures demonstrates how data systems and AI transform not only societal norms but also individual cognition and collective imagination. By highlighting the concept of technics as a mediator of human experience, Stiegler stresses the ethical necessity of designing data systems that promote care, creativity, and collective well-being instead of alienation.

Technological and Cultural Interplay

Central to the course is examining the reciprocal relationship between technology and culture. As Simondon, Bergson, and Stiegler collectively argue, technological systems are deeply entwined with cultural practices, and their evolution reflects broader societal shifts.[17] Technology drives cultural transformations, reshaping the social milieu, yet it is simultaneously influenced by the historical and cultural contexts in which it operates. This dynamic interplay introduces opportunities for innovation in data project design but also necessitates grappling with challenges such as privacy concerns, the digital divide, and the ethical implications of AI-driven systems.

As both a product and a driver of technological systems, data plays a crucial role in reshaping cultural norms and societal structures. The ethical dilemmas surrounding biases in data systems reflect broader societal power dynamics and cultural values. Understanding these intersections enables students to design technically robust and socially responsible projects. For example, interactive data projects can harness Simondon's emphasis on relationality to create systems that adapt to and reflect user needs, Bergson's notion of duration to design temporal flexibility, and Stiegler's critique to address technological dependency's ethical and social consequences.[18]

THE STRUCTURE AND CHARACTERISTICS OF BIG DATA

Understanding the interconnected dynamics of Artificial Intelligence (AI), Machine Learning (ML), and algorithms necessitates a strong grasp of the 5 V's of Data: Volume, Velocity, Value, Variety, and Veracity. These dimensions form a comprehensive framework for analyzing and managing data, foundational for interactive data projects and AI systems.[19]

- Volume: The immense volume of data generated worldwide—from devices, sensors, and digital platforms—plays a crucial role in training AI and machine learning systems. Larger datasets improve model accuracy and performance, as demonstrated in facial recognition systems, which rely on extensive and diverse image repositories to ensure precision and reliability.[20]

•Velocity: The rapid pace of data generation and real-time processing is crucial for applications such as fraud detection, where instantaneous analysis is essential to identify and respond to suspicious activities effectively.[21]

•Value: The ability to extract actionable insights from data is key to distinguishing high-value information from irrelevant noise, ensuring data drives meaningful decisions and outcomes.[22]

•Variety: The diversity of data, encompassing both structured formats (e.g., databases) and unstructured formats (e.g., videos, text), necessitates adaptable systems. Sentiment analysis illustrates this by combining text reviews, multimedia posts, and structured surveys to generate comprehensive insights.[23]

•Veracity: Data reliability and accuracy is crucial for unbiased and effective data usage. For example, flawed data used to train employment recruitment tools can reinforce discrimination, highlighting the need for clean and trustworthy datasets to promote fairness and objectivity.[24]

CREATING A NARRATIVE IN DATA STORYTELLING

Effective data storytelling begins with understanding the audience—considering their demographics, preferences, and knowledge levels to ensure the narrative is relatable and engaging. Establishing clear objectives, such as raising awareness, inspiring action, or educating, helps maintain focus and achieve meaningful impact. Blending data-driven insights with emotionally resonant stories creates a credible and compelling narrative. Additionally, maintaining graphical integrity is essential; data visualizations must accurately represent the underlying information to foster audience trust and confidence.[25]

OTHER COMPONENTS OF THE COURSE

The course focuses on developing practical skills in sourcing, cleaning, and analyzing publicly available datasets. Students will leverage these datasets to create narratives addressing pressing global issues, such as climate change or public health while concentrating on a social problem of their choice. This approach ensures that learning is both relevant and impactful. The course is structured around three critical areas:

1. Effective Data Representation: Creating clear and engaging visuals.
2. Targeting Audiences for Social Impact: Tailoring narratives to diverse groups.
3. Exploring Alternative Formats: Leveraging creative presentation methods.

By integrating these elements, students are equipped with the skills to harness data as a powerful tool for driving meaningful and positive societal change.

However, students must choose appropriate visualizations. For example, bar charts are ideal for comparisons, timelines for sequences, and colorblind-friendly palettes ensure inclusivity.[26] Storytelling, particularly for advocacy, should be a core focus, with case studies on successful campaigns in areas like public health or environmental conservation.[27] The course encourages the exploration of the following diverse formats:

- Interactive Formats: Games and quizzes to engage audiences and test understanding.
- Infographics: Simplify complex data into visually appealing designs.
- Creative Outputs: Zines for a magazine-style approach and animations to add dynamic elements.

Students can drive change that resonates with diverse and targeted audiences by combining technical proficiency with creative formats.[28]

INCORPORATING ETHOS WITH LOGOS

This course transcends mere numbers, emphasizing quantifiable data analysis and visualization while fostering an appreciation for the qualitative nature of data. Participants are guided to view data not as abstract figures but as reflections of real-world phenomena.[29]

Through exploration of broader contexts and relationships within datasets, they learn to uncover narratives that connect with audiences intellectually and emotionally.[30]

A key focus is understanding the interconnections within datasets and their contextual significance. Students are taught to analyze variable relationships and design frameworks that highlight these connections.[31]

The course also explores common pitfalls in data visualization, drawing insights from Edward Tufte's critiques of conventional techniques. Topics such as 'chartjunk' (unnecessary visual embellishments), oversimplification, and lack of contextual information are analyzed for their potential to distort or obscure meaning.[32] Tufte emphasizes the use of rich, multidimensional displays—like small multiples and sparklines—over simplistic visuals such as bar or pie charts, advocating for depth, precision, and clarity in representing complex datasets.[33]

Beyond technical skills, the course emphasizes the significance of ethos (credibility) and pathos (emotional resonance) in design. Credibility is established through accuracy, transparency, and adherence to ethical standards, while emotional engagement is fostered by creating narratives that inspire empathy and connect deeply with the audience.[34] Participants are trained to integrate and balance these elements, crafting visually compelling and meaningful data stories that enhance understanding of critical issues and inspire social change.[35]

Building Connections: Human-Centered Data Storytelling and Representation

This series of assignments builds on technical skills with creative approaches to using data for social impact. Students will combine data analysis, visualization, and storytelling to create meaningful, human-centered projects.

Sample Data Representations: From Charts to Sculptures

Students will design 3D data artifacts that appeal to the senses and accommodate diverse learning styles. Research shows that creating data sculptures helps novices overcome learning barriers and engage deeply with data.[36]

Assignment:1

- Group Project: Create a data sculpture providing a sensory or kinetic interpretation of data
- Objective: Apply principles of physical data representation to transform static charts into interactive, engaging artifacts

Visualizing Data for Human-Centric Problem Solving

Students will explore the human dimension of data through images, quotes, and stories, illustrating its role in solving real-world problems and supporting users.[37]

Assignment: 2

- Group Project: Develop a data narrative using the media of your choice
- Objective: Apply storytelling principles to create narratives that connect with audiences emotionally and intellectually

Creating Participation with Data

This unit uses interactive methods like surveys, quizzes, and participatory games to engage audiences. Research shows gamified surveys improve completion rates and data quality.[38]

Assignment: 3

- Group Project: Design an interactive data artifact to engage the class
- Objective: Leverage gamification and participatory design principles to encourage data interaction and exploration[4]

Maps and Creative Mapping Techniques

Students will represent data through traditional and innovative mapping techniques, using maps as a visual language to engage diverse audiences.[39]

Assignment: 4

- Group Activity: Create a data-driven map tailored to a specific audience/goal
- Objective: Demonstrate how mapping can effectively communicate complex datasets while addressing audience-specific needs

Individual Course Project

The final project synthesizes the skills developed throughout the semester, focusing on civic datasets to create a compelling data story presentation. Projects must address issues of social injustice, sustainability, or climate change and culminate in a final presentation during the exam period. Students will also submit a printed booklet documenting their process.

Social Justice or Climate Change Course Assignment:

- Data Story Presentation: Present the data story creatively and engagingly, ensuring alignment with a clearly defined audience and specific goals.
- Project Presentation: Deliver a 5-minute presentation summarizing your project, goals, and impact.
- Final Documentation: Submit a printed booklet documenting the exploration, process, and creation of your project. This booklet should include reflections on the methods used, project goals, and outcomes.
- In this final project, showcase your ability to analyze datasets and communicate complex issues clearly. to a target audience through an innovative and engaging data story.

Potential Project Ideas:

- Long-Form Journalism Article: Craft a detailed, data-driven narrative with visuals to simplify a complex issue for a general audience.
- Physical Sculpture: Use art to reinterpret data, creating a 3D sculpture that draws attention and sparks curiosity.
- Interactive Board or Card Game: Develop a game to engage users emotionally and inspire action on your chosen issue.
- Online Quiz: Create an interactive quiz with educational responses that teach participants about your topic.
- Community Collaboration: Partner with a community organization to analyze their data and create visuals to secure funding or spread awareness.

• Comparative Study: Research how different audiences perceive and respond to various data presentation methods.

These assignments connect data to action while emphasizing integrating technical rigor with creative storytelling. By blending quantitative analysis with creative representation, they align with ethical visualization principles and balance the use of ethos and pathos. The resulting data stories drive social impact in richer, more powerful ways than tables and charts alone.

INTERDISCIPLINARY INTEGRATION

Data Visualization can serve as a unifying theme across university disciplines, creating a unique learning ecosystem that prepares students for the complexities of modern data-driven fields.[40] The College of Arts and Science recently introduced a new Integrated Multimedia Production BA program, including an elective on data visualization. This interdisciplinary program integrates design, communications, journalism, and music elements. Each discipline contributes its unique perspectives to this area of focus, including:

• Web Data Scraping (Journalism): Training students to use web-based tools for collecting and processing data, equipping them with essential skills for investigative reporting and online research. This fosters a free press and supports a democratic society by enabling journalists to uncover, verify, and report critical information with precision and integrity.

• Statistics Application (Communications): Teaching students to apply data analytics in storytelling, ensuring that insights are both accurate and compelling while emphasizing the use of statistical tools and techniques to enhance the clarity and persuasiveness of their narratives.[41]

• Design Visualization (Design): Empowering students to create visually engaging representations of complex datasets, fostering clear, impactful communication, and enhancing their ability to translate data insights into compelling visual narratives.

• Music and Dance: Contributing unique approaches to expressing data, such as musical scores that enable audiences to experience information through sound and dance performances that interpret data kinetically. These innovative auditory and embodied forms open new pathways for engaging with and understanding data creatively and effectively.[42]

The integration of assignments and concepts from the Data Visualization course—such as creating interactive artifacts, data sculptures, and participatory activities—facilitates interdisciplinary connections (e.g., merging journalism and design) and intradepartmental innovation (e.g., fostering creativity within music and communications). These experiences prepare students with practical skills for their respective fields and nurture their capacity for critical thinking and collaboration across diverse disciplines.

CONCLUSION

Connecting quantitative analysis with qualitative storytelling creates a transformative method for understanding and communicating data. By integrating principles of data visualization, human-centered design, and interdisciplinary collaboration, students are empowered to craft narratives that resonate emotionally and inspire social impact. These narratives are built on reliable, evidence-based insights, enhanced with human experiences and contextual storytelling, making complex issues relatable and actionable.[43]

The assignments and projects developed throughout this program—spanning interactive artifacts and participatory activities to musical and kinetic interpretations of data—underscore the importance of engaging diverse learning modes and perspectives.[44] This multifaceted approach reinforces the interconnectedness of disciplines, exemplified by collaborations among journalism, design, music,

and communications. Students acquire technical skills and enhance their capacity for critical thinking, creativity, and ethical engagement.[45]

Ultimately, the program empowers students to create compelling narratives that balance logos, pathos, and ethos, tackling pressing social issues through facts and emotions. By leveraging interdisciplinary and intradepartmental synergies, these initiatives pave the way for meaningful change, enabling students to emerge as adaptable thinkers and innovative leaders in a data-driven world.[46]

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TESTING INTERIORS: AN EXPLORATION OF EMERGING DIGITAL PRACTICES AS LEARNING TOOLS.

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INTRODUCTION

Interior Design by its very definition is a discipline of circumstance and situation. We are working within a room, space, site, building, or area and using its existing physical characteristics as an intrinsic part of the design process. We often 'react' to a space, using this as one of many starting points for a project. When considering teaching architecture and design this focus on an existing context, of a particular building site, presents us with the problem of how to provide a scenario and/or brief that is equally applicable to all participants, irrespective of where they are based or what knowledge the individual students bring with them from their previous study. In addition, as practitioners we are bound by the problematic nature of the building process. It is rare that we can make a full scale 'mock up'[1] of an interior or architectural proposal, instead we reply on an array of representations to communicate our intentions. The representation of design proposals, sited in a context, with inherent human occupation, materiality, atmosphere, scale, colour and expression of use can comprise a large part of the pedagogy for a design course. Communication of ideas is key. It can be argued that no one mode of the regular representational devices such as visuals, models, diagrams or technical drawings can fully express all aspects of a proposal. 'Communications related to architectural projects have become more complicated due to more complex design projects, the growth of technology and design information management systems and different backgrounds of stakeholders.'[2] Depending on who you are communicating to, will have an impact on what type of information should be produced.

Adaptive Reuse and Technology

When considering the Adaptive Reuse of buildings, the character of the existing takes on additional relevance as part of the conversation between old and new. 'Reuse or Adaptive Reuse implies a change of function, of a building whose previous use is obsolete and therefore is changed to accommodate a new use, with new occupiers with different needs and priorities'.[3] This more sustainable strategy when thinking about the built environment, requires careful research into the existing structure, history and intended new purpose of a host space after all 'The greenest building is the one that is already built'.[4] The advent of technology such as digital twin prototyping (DTP), AR, VR and Lidar scanning, amongst others, allows us many innovative ways to test out our various interventions, into the existing built environment, before committing to a final proposal. We are

teaching cohorts who are immersed within a Digital Anthropology based culture, often spending long periods 'of their attention within digitised environments'.[5] This paper reviews my direct involvement in three recent case studies that promote technology as a way of engaging students with existing space and how the students, in turn, use emerging digital technology to communicate their ideas to a wider audience:

1. A metaverse in common is part of a yearly, international experimental collaboration looking at how virtual spaces utilise emerging technology to test hypothetical solutions. The participants used Ai as conceptual instigators, which were then modelled to become 'real', before being AR displayed in actual physical locations.
2. In the 'Conversations about Climate Change' exhibition[6] viewers were able to experience the work on display during a period that the gallery was closed. If a space is scanned and conceived as an Extended Reality[7] experience at inception, how can this expand a student's grasp of an existing site's condition?
3. Digital Landscapes is an ongoing experiment to utilise some of the student outcomes, mostly Sketchup or 3ds Max models, by converting them into Augmented Reality experiences. The AR can then be overlayed into the original, existing space that they were designed to re-model.

The technologies discussed here are:

Web based User Generated Content Platforms[8]

3D laser scanning[9]

Augmented Reality authoring software[10]

It is important to note that these technologies are all readily available, with the basic versions of the software used being free. [11] I wanted to only consider apps that the students could access with either a basic computer or on a mobile phone.

Web based User Generated Content Platforms

For the last three years MA Interiors at Middlesex London and the Thesis Incubator Design Studio at Politecnico di Milano have engaged in a short, creative collaboration between the two cohorts.[12] For the 2023 iteration, we wanted to focus on the possibilities of the Metaverse and how shared digital spaces might be designed (Figure 1). The Metaverse is the post-reality universe, a perpetual and persistent multiuser environment merging physical reality with digital virtuality.[13] Spatial io is a UGC platform which allows, predominantly gamers, to share 'social experiences for web, mobile and VR.' [14] We set the space for collaboration directly on the platform encouraging the two groups of students to meet in, and explore the confines of, the digital rooms.

Figure 1. Metaverse collaboration 2023.

Rather than siting the context as a real place, within one of the participating countries, we speculated that if the nature of the given, completely digital setting was disentangled from familiar local contexts and forces, then the communal work would have a more equitable basis. Working in mixed cohort groups we initially asked the participants to reflect on how the Metaverse might inform or alter the subjects they were perusing in their main dissertation projects, to come up with some commonalities and design new spaces based on these links. The challenge to the students was to consider how environments based in the Metaverse, free of most site-based constraints and contexts,[15] might prompt innovative experiences and unlock new real/virtual environments.

Some findings:

1. Spatial io provided a workable 3D learning environment. As the platform provides an immersive, somewhat believable environment, familiar yet odd, participants are free to explore, interact and communicate. The verisimilitude of the spaces prompts people to make their avatars behave similarly to how they would in the real world. In Spatial, like other Multiverse or online gaming platforms, interaction is twofold; person to person and person to object. [16] Sometimes the online person to person adjacencies would be uncomfortable in the real world, people got too close, you can merge with other people and walk through them. The sound reflects real world acoustic performance, people can whisper, and proximity will dictate what you hear.
2. The participants choose what they are called and within certain parameters, what they look like. People can be both familiar and alien at the same time. The outfits are often not what would be usually worn at a regular design review. As staff we chose staid avatars that closely represented ourselves so that we are recognisable within the crowd, our names were real so that students could navigate around us.
3. Student feedback highlighted a sense of play and trying something innovative. The students were very engaged in the process with most of the teams working very well together. The avatar can sometimes aid the less confident speaker, which is potentially a good thing, this is what Yee and Bailenson describe as the Proteus Effect [17], where you adopt characteristics you perceive your avatar

would have. At the end of our session informal dancing took place, as far as I know, unfortunately perhaps, this has never happened in the real studio.
4. The students presented their shared work outputs in a conventional manner, against the walls, as one would in the real world. In Spatial io gravity, structure and weathering are not considerations, yet the students still always put their work on a wall and their avatars stood in front of it to present their work.
5. The student teams required little introduction to the platform, only some basic guidance and this is expected due to the relatively high levels of digital literacy among the cohorts. Affordances within the space are quickly understood and acted upon. Dalgarno and Lee[18] argue that immersion with interaction in 3D virtual worlds leads to the additional affordances of identity construction, presence and co-presence. Co-presence is the feeling of being together in a virtual space,[19] in this case meeting synchronously in the same 3D virtual space with other avatars.
6. The work the students produced was all set in within hypothetical, non-specific, locations. The cohorts did not have an issue with the context being unreal, if anything it was liberating within the parameters of the collaboration. They could have chosen to place their work in a real space but did not.

3D laser scanning and Conversations about Climate Change

One of my architectural projects was chosen for display in an exhibition at Building Centre, in London. The competition asked for interventions that would prompt 'Conversations about Climate Change". My proposal (Figure 2) was for a column which marked the current High Tide and the NASA predicted tide in 100 years' time, [20] on the Thames this meant that significant areas of adjacent land would be flooded. As per many exhibitions during the pandemic an interactive scan was made of the show which online visitors could navigate. A real space made virtual by necessity.

Figure 2. Conversations about Climate Change, Building Centre London 2021.

3D laser scanning has become very accessible and is common practice in the Architecture, Engineering and Construction sectors, to accurately capture the shape, dimensions and surfaces of physical objects and spaces. Laser scanning describes the general method to sample or scan a surface using laser technology.[21] The resulting point cloud, or data points, can then be shared with multiple users so that all members of a team, or cohort, are working from one source. As Interior Design and Architectural educators the scan has the potential to unify the information provided to students and expand the reach of the student's understanding of a given physical context. We typically show the site we have chosen, either by hosting a site visit or providing plans, sections and photographs of the spaces. Although physical context is by no means the only consideration for designing responsive environments, when considering a design curriculum[22] that allows equitable access to all the cohort, a real site could be seen to put those students who cannot visit the actual place at a significant disadvantage. Remote learning via conference[23] calls and uploaded information, cannot replicate the experience of being 'on site 'and accessing the huge amount of information available in any given place. The distance learner is always reliant on a curated package of information which has gone through a filter of what the educator thinks is relevant and important. By making a digital scan of the chosen space we can allow a more expansive understanding of the site's exiting condition. While the digital scan cannot provide the random encounters and happenstance that physically being there might allow, it does provide an immersive 'physical' experience that the viewer can control.[24] By scanning all the space without biases or curatorial control, the educator can give a level of information where the student gets to decide what is or is not important for them. The educator may still use the scan to highlight key aspects of the built environment that they particularly want the student to notice, but this can now be done within a wider, more holistic experience.

My experiments with scanning have been using Matterport,[25] a program often used by estate agents to 3D scan residential and commercial property. It is easy to use, after 10 minutes of instruction- all available online.

With a 3D laser scan we can see huge levels of detail. We get to walk around a space and become more aware of its features, details and atmosphere. One person can usually scan a site, providing a remote team with huge amounts of information. We can add annotation and further levels of data into the scan created, using it as a way of recording observations and as a collaborative design tool. As the scan is hosted online it can be worked by multiple people in different time zones. At its best it can be seen as an engaging collaborative tool.

Augmented Reality authoring software

There are limitations around how we are able to communicate our design proposals to a wider audience. A client may not understand plans and sections or be left unclear over the inherent lack of detail that a scale model conveys. Augmented Reality allows us opportunities to showcase our design ideas, at full scale, in existing contexts, with interaction and spatial navigation.[26]

In 2024 Middlesex University again worked with the Thesis Incubator Design Studio at Politecnico di Milano to research developing techniques utilising AR software.

1. The participants met virtually, in their groups, to discuss their ongoing dissertation projects with the intention of finding a set of commonalities that would act as prompts for Ai.
2. The groups then inputted their agreed words into a mixture of generative Ai software, to create speculative 3d environments.
3. The subsequent environments were then modelled using conventional 3D architectural visualisation software.
4. The results were displayed and reviewed in an exhibition hosted in Spatial io.

5. After the exhibition the designs were adapted, in line with the feedback given.
6. The resulting buildings, experiences and spaces were then exported into Adobe Aero[27] with the subsequent AR experience being recorded in both Milan and London locations.
7. The short films of the AR experience and the QR codes were finally presented and critiqued during an online Symposium.

AR technology is ideally positioned for retrofit and Adaptive Reuse projects as it combines real environments with virtual objects. Aero has a relatively simple interface; the learning takes approximately half an hour and can yield excellent results. The AR software allows the students to take their design scheme with them everywhere on their phone. They can display their work full scale and share the experience with anyone who has the QR code. The viewer can walk around the design proposal, go inside and have 360° immersive experiences. There are some restrictions as to the size of the vector files that the software can deal with, some student groups having to simplify the 3D model prior to importing into Aero. An interesting aspect of showing design work through AR software is the juxtapositions that can be made between existing space and the created scheme. When viewed through a phone the user can test their work in many varied contexts. If the work is site specific then the AR experience can be overlayed to the host space, becoming a digital palimpsest [28] a temporary layer over the existing fabric of the building. Part of the fun of the collaboration is seeing pavilions, interventions and rooms 'appear' in many varied places. As the proposals initially stemmed from Ai, they were removed from reality, created only using language and not our usual methods of planning, sketching and other iterative design processes. The student's more traditional based knowledge and skills was evidenced in their ability to rationalise the space, in many cases making the proposals more real, before inserting them into new contexts. Part of the implicit understanding is that the spaces are for human navigation[29] and habitation, while some groups considered structure, construction and functional use, other interpreted the brief in a looser way, making designs that were to be left more open ended and truer to the speculative staring point.

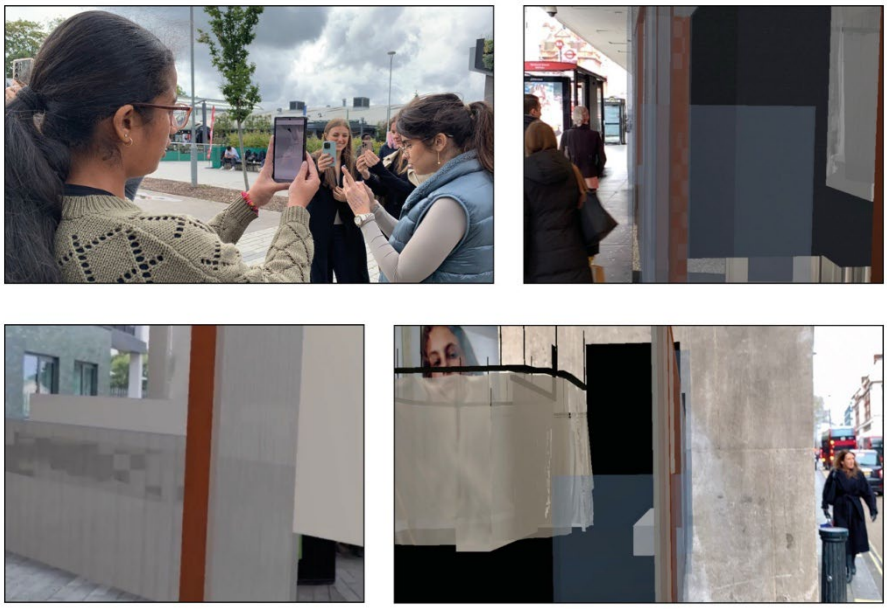

Figure 3. Augmented Reality experiments. Top left features Middlesex students.

We can see (Fig.3) that in AR the distinction between reality and fiction is blurred. The methodology provides a full-scale mock-up of a design proposal which can be used as an innovative way of testing an interior proposal, one that can be used anywhere and with limited resources. As the scheme is life size, 1:1 scale understanding of the proposal does not require any specialist knowledge, it can be appreciated by anyone. The design work becomes as accessible and open to understanding as possible. In Architecture, Heritage, and the Metaverse, Andrea Monet writes "We live in an extended world that includes the coexistence of real and virtual places, which determine our real and virtual lives." [30] Adobe Aero allows us to interface these two lives, overlaying and merging the virtual with the existing.

CONCLUSION

Online 3D Collective meeting spaces, 3D laser scanning technology and Augmented Reality hold transformative potential for design education, reshaping how students and educators engage amongst themselves and to a wider audience. This does not remove the obligation to center the intelligence of a designed space on the needs and aspirations of the client, customer or other end users. By Integrating experimental technologies into a curriculum, alongside more conventional approaches to architecture education, we can create immersive learning environments that can fully interrogate a design proposal. As Dalgarno and Lee state 'It is the tasks, activities and underpinning pedagogical strategies supported or facilitated by the technology rather than the technology itself that have an impact on learning. [31]

The affordability of the hard and software involved allows equal access to high-quality education and can transcend geographical limitations. This integration supports rather than undermines the core values of our built environment profession. It enables key graduate aptitudes. The technology discussed in this paper fosters interactive and experiential learning, making complex concepts more tangible and relatable. Our ongoing experiments have seen these 3D tools bridge cultural and linguistic gaps, offering inclusive educational experiences tailored to diverse needs. As we move forward, it's essential to address the challenges related to accessibility and digital literacy to ensure that these benefits in technology are equitably distributed. By embracing spatial technology, we not only enhance educational outcomes but contribute to a more connected and culturally aware global learning community. In my view the future of design education lies in our ability to leverage such technologies to test the students' proposals. If we do this in the fields of Interior Design and Architecture, we can fully describe the relationship between existing and proposed, foster a dynamic and sustainable learning environment, while facilitating an experiential, and therefore more inclusive and meaningful, dialogue with a greater range of audiences.

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INSTEAD OF OBJECTS: DESIGNING DESIGN EDUCATION

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INTRODUCTION

So why do we not admit that what distinguishes architecture is not what is done—since, on their good days, all the world and his wife can apparently do it better—but how it is done. Reynar Banham[1]

In *A Black Box: The Secret Profession of Architecture*, Reyner Banham contends that architecture is not defined by construction, or the design of buildings in general, but rather by the intellectual and representational processes through which architectural artifacts are conceived. For Banham, architecture is not about *what* it is but *how* it is done. He infers that disegno, a technique for designing buildings that originated in the Mediterranean basin, lies at the foundations of architectural thinking, and evolved into the discipline's unique and complex approach to critical thinking and making—one that transforms objects and spaces into architecture. This distinction suggests that architecture is not an inherent condition of form or objects but rather a framework of thought, critique, and collective agreement.

If architecture, as Banham suggests, is a discursive practice rather than a category of objects, then its ways of thinking and making could be used to design anything—including its own pedagogy. Architecture is widely acknowledged as one of the most complex and rigorous design disciplines, equipping students with skills and methodologies transferable across various fields. In this paper, we explore the potential of using architectural thinking[2] to design new possibilities for architectural education. While a self-reflexive proposition, we position this experiment within the broader discourse of the Scholarship of Teaching and Learning (SoTL) to frame its relevance within an expanded context of educational design.

This paper investigates three key questions: How can architectural thinking be used to interrogate and reinvent existing design education models? What role and agency should students have in this process of pedagogical experimentation? How can contemporary SoTL practices be integrated in architectural design studios?

As professors of architecture, we have observed that architectural pedagogy is stifled by entrenched hierarchical structures rooted in historical modes of teaching and learning—modes that increasingly fail to reflect the needs of contemporary students. As a professional degree primarily taught by practitioners and researchers without formal training in education, architectural pedagogy evolves slowly. The traditional master-apprentice model,[3] which has dominated the field for centuries, perpetuates a static transfer of knowledge rather than fostering an evolving discourse. For a discipline defined by discursive rather than purely technical practices, this model creates tensions that limit both instructors and learners.

In response, this paper examines the outcomes of an experimental design studio[4] that sought to address these questions. The studio challenged students and instructors to critically reflect on their educational experiences and co-create a non-hierarchical, participatory learning environment based on contemporary SoTL theories. Through a collaboratively authored syllabus and student-led assignments, participants engaged in a structured yet fluid process of reimagining architectural pedagogy. The studio incorporated historical analyses of architectural education, diagrammatic critiques of its current structures, and experimental design techniques to develop new pedagogical models.

Reflecting on the studio's results reveals the potential of architectural thinking to generate innovative educational approaches. These approaches challenge traditional hierarchies, encourage student agency, and create more inclusive pedagogical structures that reflect the diversity of the student body. The implications of this research extend beyond architectural education, offering insights applicable to broader discussions on participatory learning and curriculum design. If, as Banham suggests, architecture is a discursive framework rather than a fixed category of objects, how might architects redesign architectural pedagogy? What happens when the teaching of architecture is conceived through the same critical and iterative processes that define the discipline itself? How might other fields benefit from the use of architectural thinking in their course and curriculum design?

As architectural education evolves to better reflect its moment in time, it remains tethered to its history. The trajectory of architecture pedagogy has been shaped by competing forces: professional accreditation, pedagogical experimentation, and the challenge of balancing technical competency with conceptual rigor and aesthetic discourse. The latter has historically functioned both as a defining characteristic of architectural education and as a contested domain, where evolving cultural, technological, and theoretical paradigms continuously redefine its significance and application. These tensions, long embedded within architectural discourse, prompt a fundamental question: How might the history of architectural education inform its future? To address this, we must examine the historical forces that have shaped architecture's education in our context and consider how emerging pedagogical strategies can reframe our educational methodologies to be more adaptive and inclusive.

According to Joan Ockman, American architecture schools have evolved through a centuries-long negotiation of professional, cultural, and pedagogical forces.[5] Rather than representing a fixed or monolithic tradition, she argues, these institutions have adapted European precedents to North American contexts in ways that continually redefine architecture's intellectual scope and social obligations. While the French École des Beaux-Arts and the German Polytechnique models established the basic grammar of studio-based instruction and scientific inquiry, Ockman emphasizes that, across the twentieth century, American universities increasingly integrated liberal-arts ideals, professional accreditation, and disciplinary innovation.[6] In this sense, American architecture schools did not merely transplant European methods; they reworked them to accommodate local demands—an ongoing process that simultaneously broadened and constrained architectural education.

Although the École des Beaux-Arts influence originally prioritized draftsmanship and master-led critiques,[7] Ockman highlights how post–World War I transformations—in part influenced by philanthropic endowments and expanded university systems—encouraged a more eclectic curriculum.[8] Yet Ockman also points out how this amalgam was shaped by professional bodies seeking to standardize outcomes, a fact that introduced external oversight into what was once a highly individualized atelier tradition.[9] Over time, accrediting authorities, like the AIA, NAAB, CACB, RIBA, etc. have intensified the tension between academic freedom and the profession's need for uniform competencies. And while these frameworks help ensure consistency, they constrain the

spontaneity of the atelier model. This conflict produces a pedagogic challenge of balancing these regulatory requirements, while exploring the potential of open-ended student-driven explorations

Early 20th-century reforms, notably those inspired by the Bauhaus in Germany, introduced interdisciplinary collaboration, technological experimentation, and a break from the divergent artistic or engineering oriented silos of the former European models.[10] Nevertheless, entrenched hierarchies and the persistence of the master-apprentice model remained dominant, reflecting broader structural habits that Ockman contends American schools have never fully escaped, despite periodic bouts of internal critique.[11]

Today, many schools of architecture replicate and rely on a master–apprentice pedagogic structure, often at odds with students' increasing desire for participatory, collaborative learning.[12] Ockman suggests that these hierarchies are not merely pedagogical anachronisms but products of institutional frameworks that reward traditional markers of expertise.

Ockman's scholarship is critical to this discussion because her history of architecture schools clarifies how the interplay of accreditation demands, institutional identities, and evolving design paradigms has repeatedly redefined the parameters of architectural education. Her account underscores the necessity of balancing professional legitimacy with intellectual innovation, suggesting that meaningful pedagogical reform requires navigating this continuum rather than rejecting or embracing one pole.

Informed by both historical insight and contemporary SoTL frameworks, we argue that educators should recalibrate the architectural design studio experience by engaging dialogic, design-driven explorations that foreground the integration of student-led deliverables and collaborative course design, as mechanisms for fostering agency, critical thinking, and deeper engagement in professional education. By enabling students to co-author learning outcomes and contribute to course structuring, these methods disrupt traditional top-down instruction,[13] instead promoting iterative feedback loops akin to architectural design processes. Building on this, we argue that collaborative course design ecologies align with the foundational principles of architectural thinking, positioning students not as passive recipients of knowledge but as active participants in shaping their pedagogical environment. Just as Banham infers that objects and spaces transform into architecture through a conceptual overlay, we suggest that architectural education must similarly be reconsidered as an evolving construct—one that gains its meaning through continuous critique, adaptation, and reinterpretation. This perspective challenges educators to reconsider not only how knowledge is transmitted but how architectural education itself can function as a designed and iterative system, responsive to both disciplinary transformations and broader societal shifts.

METHODOLOGY – CO-CREATION OF THE COURSE STRUCTURE

The Senior Research Studio at the University of Calgary's School of Architecture, Planning, and Landscape (SAPL) served as the site for this pedagogical experiment. As the culminating design studio in the six-term Master of Architecture program, it traditionally follows a research-focused model, reinforcing hierarchical master-apprentice instruction. Given the tensions surrounding accreditation structures, studio traditions, and evolving student expectations, this setting provided an ideal environment to test alternative, participatory models of architectural education.

This studio arose when a group of students, questioning existing power structures, expressed frustration with faculty-driven pedagogies. Their concerns aligned with this study's broader research questions, prompting a transformation of the studio into a collaborative space where students critically examined architectural education itself. Instead of producing buildings, students applied architectural design methodologies to interrogate and reconstruct pedagogy.

The course began with structured discussion sessions where students articulated critiques of their education. These conversations informed a co-authored syllabus, marking a significant departure from conventional top-down curriculum design. Working within the department's syllabus template, students negotiated institutional policies and accreditation requirements, ensuring compliance while fostering pedagogical innovation. The iterative process required multiple syllabus revisions, mirroring the iterative design practices central to architectural thinking.

The course followed a three-phase structure[14] emphasizing pedagogical experimentation and reflexivity. It began with analytical mapping, where students used architectural design methodologies such as visual mapping and conceptual diagramming to critically examine architectural education, synthesizing research and institutional critique through graphical representations. In the second phase, students designed pedagogical interventions that challenged existing educational models, drawing on precedent assignments and refining their concepts through iterative desk critiques and feedback loops. Finally, the third phase involved testing and evaluating these interventions, with students piloting their assignments and engaging peers as participants and evaluators. This process culminated in critical reflection sessions and a final panel discussion with faculty, situating the interventions within broader institutional discourse.

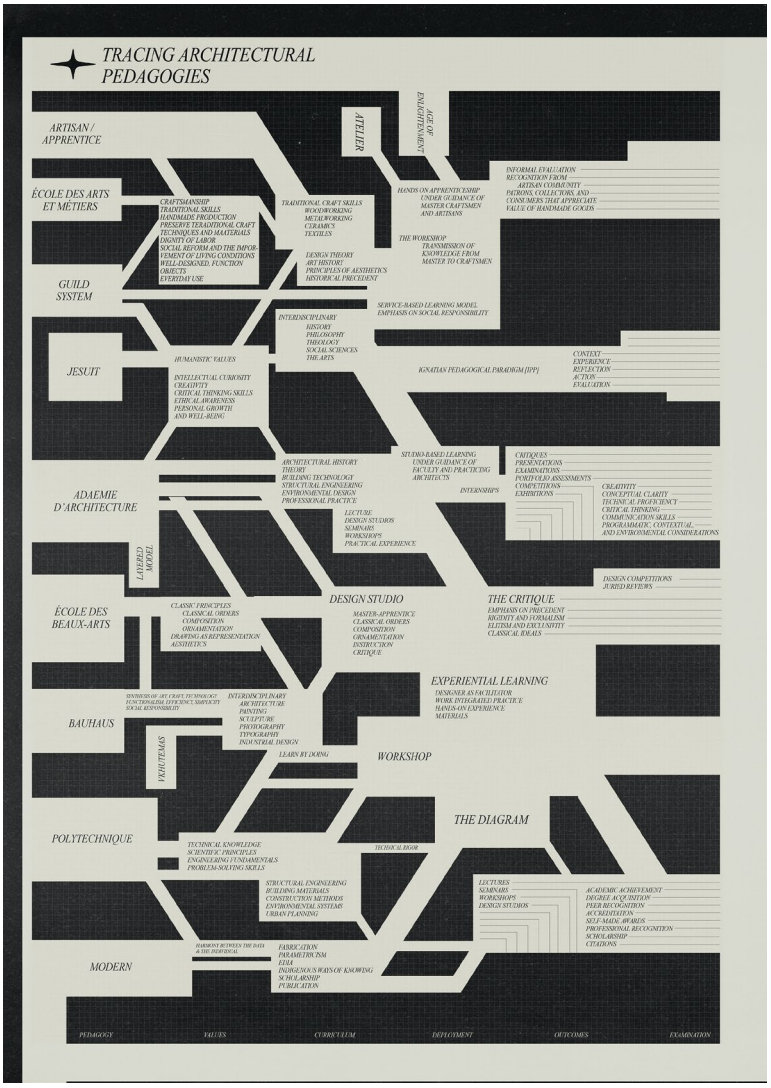

Figure 1. Student's Critical Mapping of the History of Architectural Pedagogy

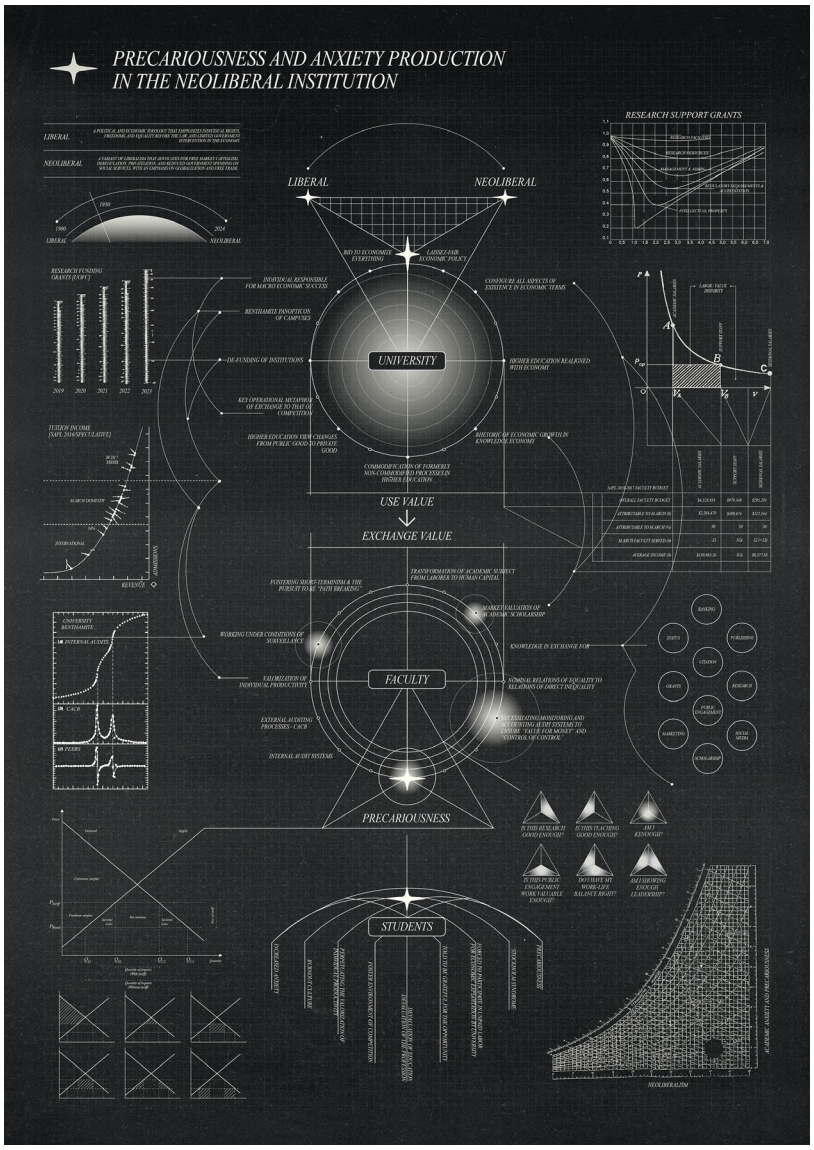

Figure 2. Student's Critical Mapping of SAPL's Relationships to University Structures

STUDENT-LED INTERVENTIONS AND PEDAGOGICAL DISRUPTIONS

If architectural education is to reflect the discipline's ethos of continuous critique and reinvention, students must be positioned as active agents in shaping their education. By dismantling rigid hierarchies and embracing iterative, design-based learning, the studio demonstrated how participatory education could reshape studio culture, expanding student-driven learning beyond a single studio project.

A key outcome of this studio was the reconfiguration of power dynamics, positioning students not merely as learners but as active participants in shaping their pedagogical environment. Engaging students as co-creators tested how participatory design could dismantle entrenched hierarchies and foster intellectual agency. Rather than merely questioning instructor authority, this approach redistributed agency, encouraging students to take responsibility for both critique and creation.

Student projects demonstrated various ways in which traditional pedagogical structures could be unsettled, using experimental assignments to critique architectural education's embedded hierarchies

and biases. One such project, *This is Not Interesting*, interrogated biases in research funding structures, revealing how faculty's tendency toward scientific problem-solving, shaped by funding bodies, limit forms of attention in design courses. The project challenged students to reconsider what is deemed "interesting" architectural knowledge by prompting them to select mundane moments from their daily lives and subject them to a surreal rendering process. The resulting speculative renderings disrupted conventional aesthetic values, questioning what constitutes significance in architectural discourse. This intervention was facilitated through pre-recorded tutorials and in-class workshops, allowing students to develop technical skills while engaging with broader critiques of research culture.

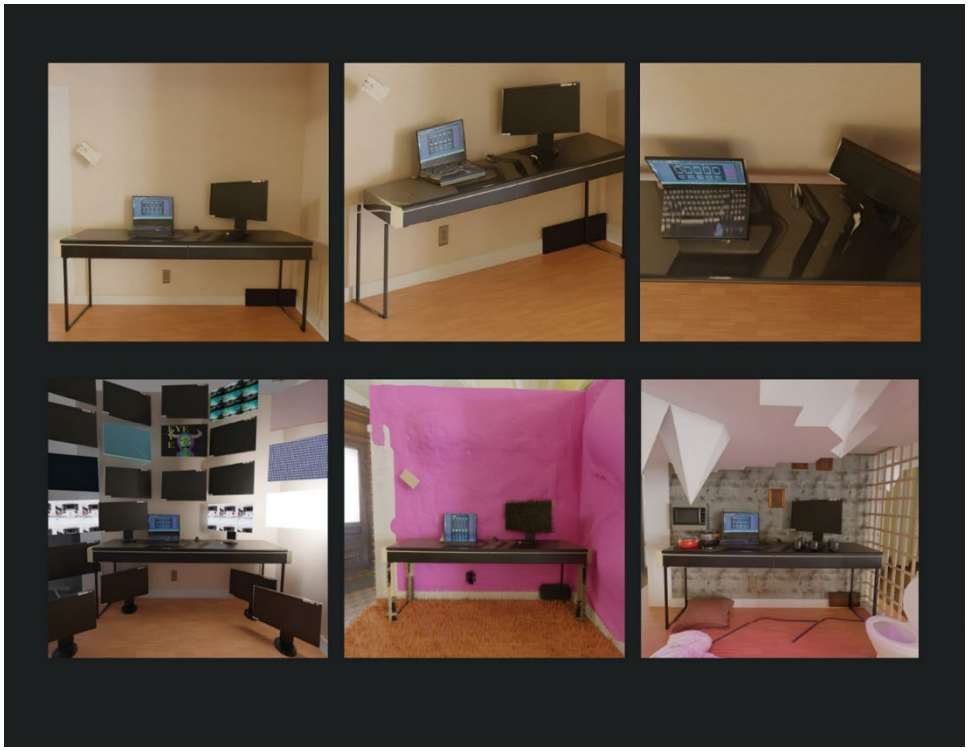

Figure 3. Sample Student Response to "This is Not Interesting" project

Another project, *Vitruvian Man Re-Imagined*, examined accommodation policies and the implicit biases shaping the idealized architecture student. This project was inspired by a student's personal negotiations with university accommodation policies while pregnant, raising questions about how institutions define normative bodies in architectural education. The assignment began with students distorting an idealized human figure into exaggerated, atypical forms. They then designed dwelling units to accommodate these unconventional bodies, opening discussions on accessibility, diversity, and the biases embedded in normative architectural design. By critically engaging with architectural assumptions of bodily normativity, the project prompted students to explore inclusion through an unconventional design lens.

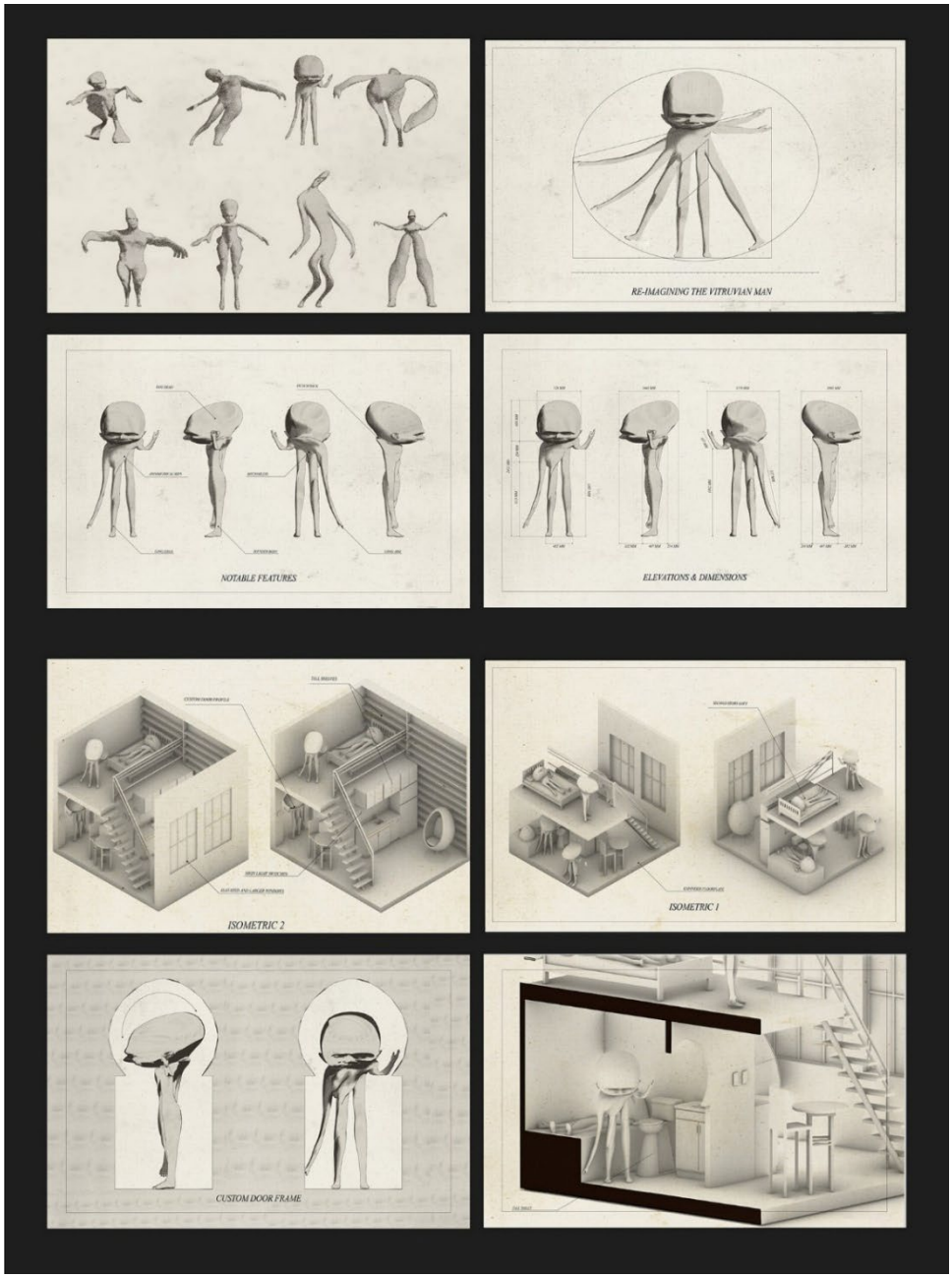

Figure 4. Sample Student Response to "Vitruvian Man Re-Imagined" project

A different project, *Embedded Pedagogy*, responded to the architecture program's relocation from the University's suburban campus to downtown Calgary. While the move was intended to embed architectural education within the urban fabric, the curriculum remained largely unchanged, lacking engagement with the immediate city context. This project confronted this disconnect by tasking students with foraging discarded materials from the surrounding neighborhood to mass out designs for a speculative architecture school. Through photogrammetry, 3D modeling, and unconventional material combinations, students developed provocative compositions that disrupted traditional notions of architectural beauty and function. The assignment forced students to confront the material and social realities of the downtown core, critically examining the role of architectural education in urban contexts.

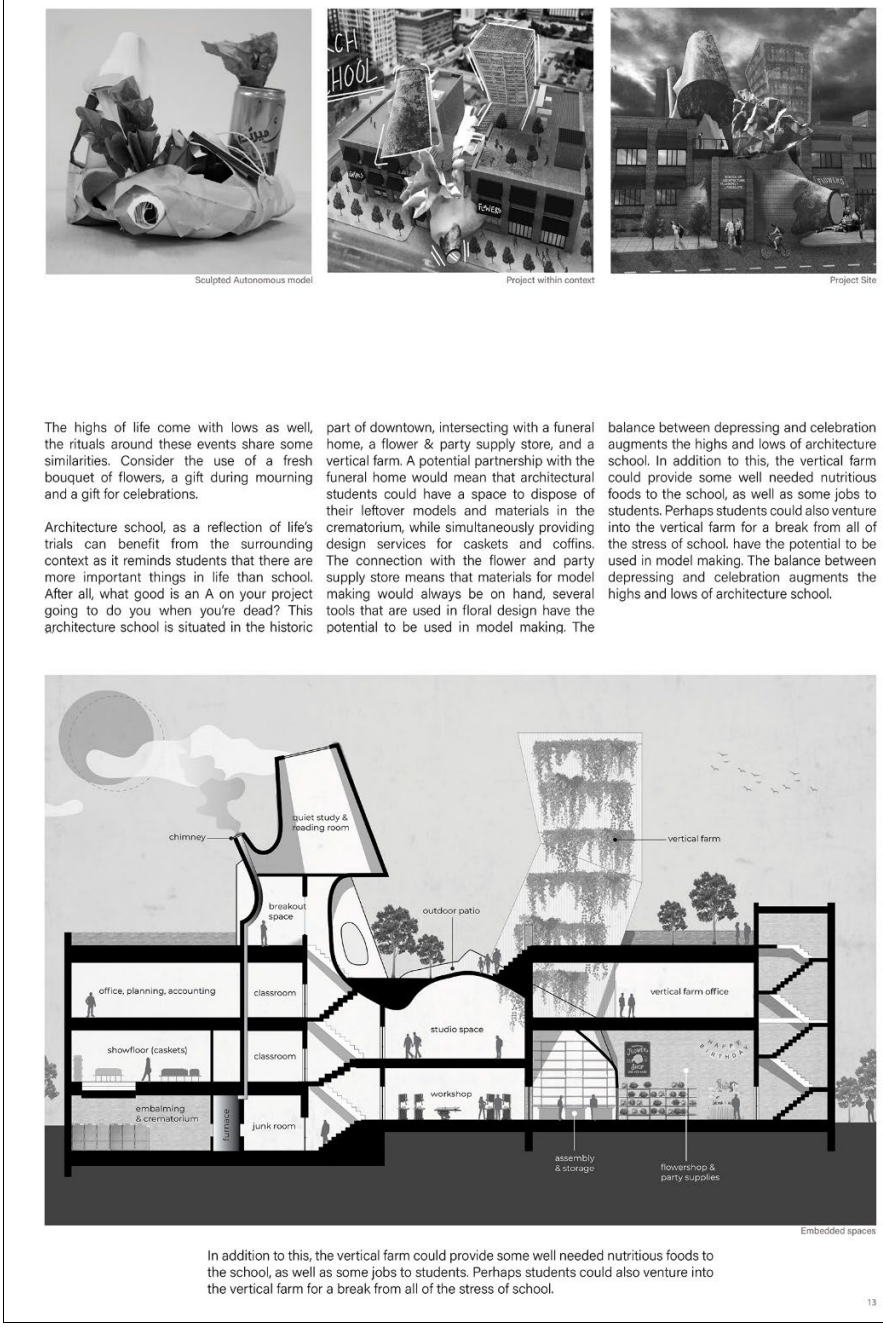

Figure 5. Sample Student Response to "Embedded Pedagogy" project

The project *Co-Creating Architecture* investigated collaboration in both professional practice and education, experimenting with non-hierarchical authorship. Through a series of subversive charrette exercises, students worked through tasks designed to erode individual control over the design process. Exercises included drawing with their fingers on a peer's back while the other, blindfolded, attempted to translate the movement into ink drawings; interpreting tactile models within a concealed box and translating them into drawn elevations; and other forms of design estrangement that disrupted conventional modes of authorship. These interventions destabilized assumptions about control, authorship, and collaboration, demonstrating how participatory and unpredictable design methods could foster new architectural sensibilities.

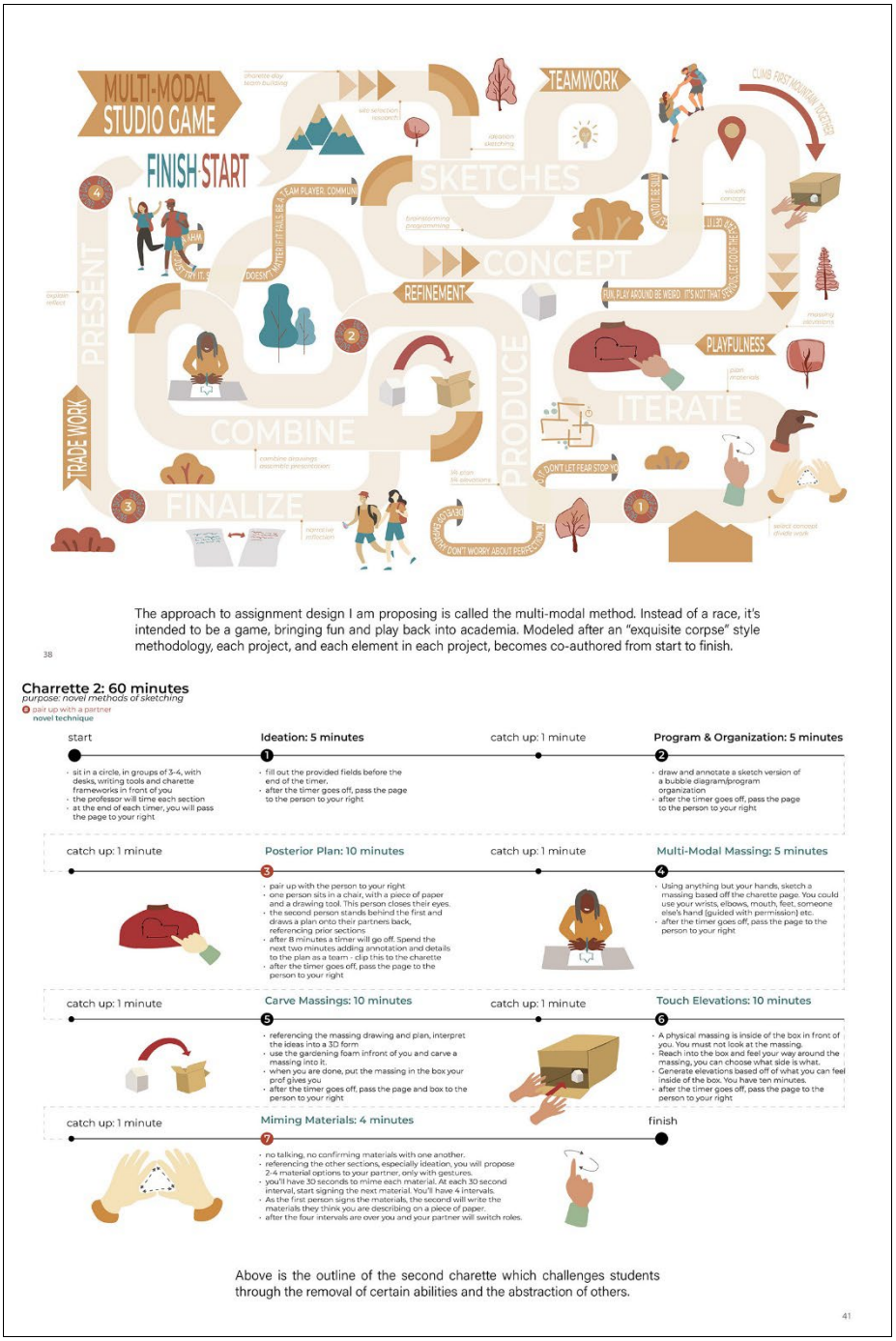

Figure 6. Student's Critical Framing and Design of the "Co-Creating Architecture" Project

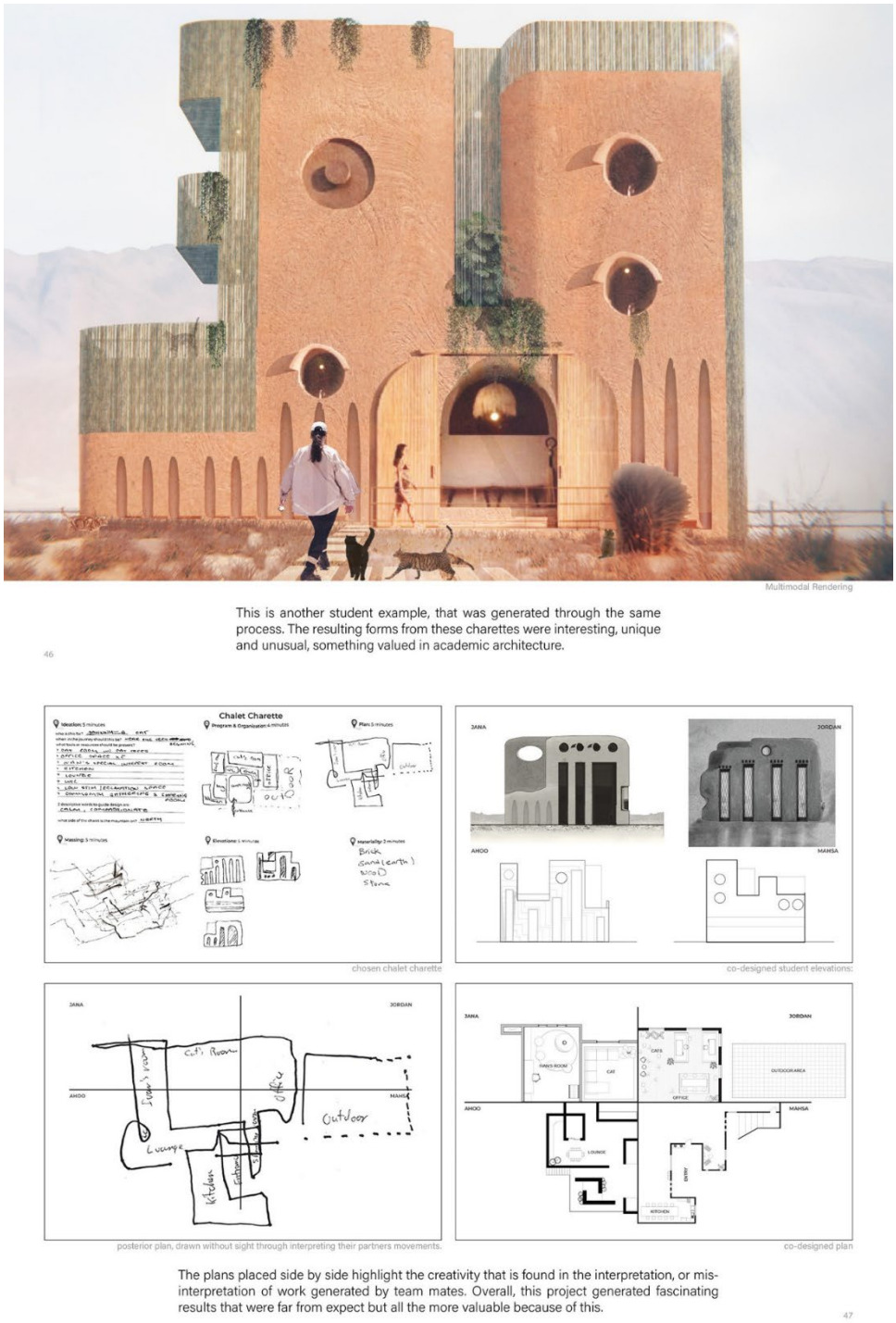

Figure 7. Sample Student Responses to the "Co-Creating Architecture" Project

Collectively, these student-led projects exemplified how architectural pedagogy can be critically restructured through experimental, participatory methods. By challenging embedded biases, rethinking architectural norms, and engaging with the socio-material conditions of architectural education, these interventions underscored the potential of student-driven critique to generate new ways of thinking and practicing architecture.

REFLECTION AND LIMITATIONS

Research in participatory education underscores how co-creative models, like those deployed in our experimental design studio, enhance engagement and critical reflexivity. Cook-Sather et al. argue that participatory pedagogies foster intellectual ownership,[15] while Bovill et al. highlight how collaborative course design shifts education from passive reception to active co-creation.[16] The studio embodied these principles by positioning students as co-authors of assignments and pedagogical structures, integrating participatory models to assess the feasibility of student-led learning.

This approach reinforced the idea that architectural pedagogy, like the discipline itself, should be iterative and shaped through co-creative processes. Biggs emphasizes that deep learning occurs when students critically engage with content and assessment design, fostering higher-order thinking and meaningful engagement.[17] The studio reflected this principle by allowing students to design their own assignments and learning trajectories, reinforcing that pedagogical structures should be subject to the same iterative methodologies that define architectural thinking.

This experimental studio raises critical questions about whether students should actively shape their curriculum. Student-led curriculum design fosters agency, deeper engagement, and awareness of learning processes, aligning with SoTL research that suggests participatory models enhance critical thinking, problem-solving, and disciplinary identity formation.[18] By co-authoring learning outcomes, students not only engaged with content but also developed skills in negotiation, leadership, and self-directed learning—abilities increasingly recognized as essential for professional and academic success.[19]

However, while the studio demonstrated the potential of student-led pedagogical structures, it also revealed challenges in balancing autonomy with necessary structure. One concern is whether students, particularly at the graduate level, possess the disciplinary and pedagogical awareness to constructively shape their learning experiences without creating gaps in knowledge acquisition. Research in participatory education warns that while student-designed curricula foster engagement, it may also risk reinforcing pre-existing knowledge biases or overlooking essential competencies if not carefully guided.[20] This tension underscores the importance of structured facilitation by instructors to ensure that student agency does not come at the cost of rigor or coherence to program-level objectives.

Institutional structures and accreditation requirements also present limitations to the scalability of such experimental models. The flexibility afforded in this studio allowed students to explore alternative assessment and pedagogical strategies; however, replicating this approach across programs with rigid accreditation frameworks may be more difficult. Studies in higher education reform suggest that while participatory curriculum development enhances engagement, its implementation requires careful negotiation with institutional policies and accreditation bodies.[21]

While this studio experiment demonstrated the potential of student-led design education, its scalability within different institutional contexts remains a challenge. As previously discussed, architectural education is deeply embedded in accreditation frameworks that establish standardized learning outcomes which may not easily accommodate co-creative curriculum design. This structural rigidity can limit students' ability to redefine educational frameworks and pedagogical structures.

Additionally, there is an inherent tension in shifting too much responsibility onto students, particularly regarding learning outcomes, assessment structures, and quality assurance. While participatory curriculum design enhances engagement, excessive reliance on student-led structures risks inconsistencies in educational standards and assessment reliability.

Another critique of this model relates to long-term sustainability. While this experiment successfully fostered student agency, its effectiveness relied on highly motivated students and faculty willing to

embrace pedagogical risk. This raises questions about its broader applicability, particularly in larger, more structurally constrained programs where faculty and institutional support may be limited.

Despite these challenges, the studio's outcomes highlight the necessity of exploring new models of architectural education. If the discipline is to remain relevant, it must continually adapt to shifting pedagogical, technological, and professional landscapes. The question moving forward is not whether student agency should be integrated into architectural education, but rather how institutions can structure such models in ways that uphold disciplinary rigor while fostering a participatory and reflexive learning environment.

CONCLUSION

Reyner Banham's provocation - that architecture is distinguished not by the objects produced but by the processes through which these objects are conceived - offers a foundational lens for reimagining architectural education. If architectural thinking thrives through iterative exploration, critical reflexivity, and responsive adaptation, educational practices in architecture should likewise embody these characteristics. The experimental studio examined in this study explicitly leveraged architectural thinking such as diagrammatic analysis, iterative refinement, speculative scenario-building, and participatory co-authorship to redesign pedagogical structures. This deliberate application of disciplinary-specific techniques to educational contexts illuminated architecture's inherent potential to address pedagogical challenges, positioning education itself as a critical, iterative design problem.

By employing these disciplinary methodologies, architectural educators can actively address the conventional lag between scholarly research findings and their practical integration into teaching contexts. Techniques such as rapid prototyping, visual critique, and iterative co-creation, core strategies in architectural design, allow for real-time curricular adjustments that more accurately reflect contemporary student expectations and emerging professional realities. Architecture's unique capacity for continuous adjustment and future-oriented scenario modeling can thus effectively reduce the traditional delays between scholarship and educational practice, enhancing both relevance and responsiveness.

However, the adoption of participatory, co-creative educational approaches also introduces significant challenges. While increased student agency fosters greater intellectual ownership, deeper engagement, and nuanced critical thinking, such models demand rigorous oversight to maintain coherence and academic rigor. Balancing student autonomy with institutional expectations, accreditation requirements, and standardized learning outcomes requires careful navigation. Moreover, these innovative pedagogical models depend heavily on faculty willingness, institutional support, and student readiness—factors that may limit scalability or long-term sustainability.

Thus, future architectural education will benefit from strategic efforts aimed at embedding flexibility within institutional frameworks, fostering faculty openness to pedagogical experimentation, and ensuring rigorous yet adaptable assessment structures. Banham's concept of architecture as a reflexive discipline highlights the necessity for educational practices to remain equally dynamic and responsive. Recognizing architectural education itself as an iterative and designable project, rather than a fixed transfer of knowledge, positions it to actively adapt to shifting technological, professional, and societal landscapes. Through embracing this dynamic, participatory approach, architectural education can not only better meet the needs of contemporary learners but also reaffirm architecture's relevance as a critically engaged and forward-thinking discipline.

NOTES

[1] Reyner Banham, “A Black Box: The Secret Profession of Architecture,” in *A Critic Writes: Selected Essays by Reyner Banham*, ed. Mary Banham, Paul Barker, Sutherland Lyall, and Cedric Price (Berkeley: University of California Press, 1996), 292–300.

[2] For the purposes of this paper, architectural thinking refers the many techniques and manners of thinking used in the practice of architecture including but not limited to: orthographic projection and drawing, analytical diagramming, iterative prototyping, model-making, and various other co-creative processes that pivot between creative play and intellectual analysis.

[3] The master-apprentice model is a hierarchical system historically central to architectural pedagogy wherein knowledge transmission occurs through direct tutelage from a master to a student, often privileging the authority of experience over experimentation. See Kurak et al., “Vocational Training Process and Master-Apprentice Relationship,” Procedia - Social and Behavioral Sciences (2014), https://doi.org/10.1016/j.sbspro.2014.01.1381 ; and Patrik Schumacher, “Pedagogy and Paradigm: The Master-Apprentice Model in Architectural Education,” in Five Critical Essays on Architectural Education, ed. A. Williams (London: Machine Books, 2021), https://patrikschumacher.com/pedagogy-and-paradigm/ .

[4] For the purposes of this paper, design studio refers to the central course in architectural education. It is an experiential learning environment similar to the fine arts studio where students are mentored as they work through the design of buildings using architectural methods.

[5] Joan Ockman, *Architecture School: Three Centuries of Educating Architects in North America* (Cambridge, MA: MIT Press, 2012).

[6] Even as schools diversified curricula to integrate liberal arts and broader theoretical perspectives, Ockman observes that professional standards often narrowed the scope of permissible experimentation. This paradox created an environment where the push for innovation had to coexist with the pull of accreditation, institutional tradition, and market-oriented outcomes. A similar dynamic is observed in *Building Impact*, a RAND Corporation report that identifies gaps between academia and professional practice in architectural education, noting how accreditation standards and institutional traditions can constrain experimentation. See P. Nguyen et al., *Building Impact: Perspectives and Recommendations on the Current State and Future of Architecture* (Santa Monica, CA: RAND Corporation, 2025).

[7] Ashraf M. A. Salama, *Spatial Design Education: New Directions for Pedagogy in Architecture and Beyond*, 1st ed. (London: Routledge, 2016), https://doi.org/10.4324/9781315610276.

[8] Following World War I, philanthropic endowments and expanded university systems accelerated shifts in architectural pedagogy. The influx of private and institutional funding facilitated the development of architecture programs within broader university structures, moving them away from atelier-based models toward more research-oriented frameworks. However, this financial support also introduced administrative oversight, often aligning architectural curricula with broader institutional priorities and professional expectations rather than experimental pedagogies. As Ockman notes, this period saw an increased tension between architecture’s historical autonomy as a discipline and its emerging role within the bureaucratic framework of higher education. See Ockman, *Architecture School*, 115–118.

[9] Organizing bodies—such as the AIA, RAIC, RIBA, and CACB—aim to standardize educational outcomes, historically guiding curricula toward vocational benchmarks. These forms of external oversight function as a double-edged sword: they enhance professional legitimacy while simultaneously reinforcing hierarchical practices and limiting experimental teaching approaches. For an overview of these tensions, see Ockman, *Architecture School*, 118–121.

[10] Katja Thoring, Roland Mueller, S. Giegler, and Petra Badke-Schaub, “From Bauhaus to Design Thinking and Beyond: A Comparison of Two Design Educational Schools,” *Proceedings of the Design Society: DESIGN Conference* 1 (2020): 1815–1824, https://doi.org/10.1017/dsd.2020.

[11] The “Texas Rangers” (Colin Rowe, John Hejduk, Robert Slutzky, Werner Seligmann, Bernard Hoesli, and Lee Hodgden), operating at the University of Texas at Austin’s School of Architecture in the 1950s and 1960s, exemplify one such moment of self-reflection in architectural education. Influenced by European modernism and the analytical methodologies of Rowe, the group challenged prevailing functionalist paradigms by emphasizing theoretical depth, formal analysis, and reinterpretations of modernist principles through a conceptual lens. Their pedagogy reflected broader tensions between inherited instructional models and emergent, interdisciplinary critiques of architectural form and meaning. See Alexander Caragonne, *The Texas Rangers: Notes from an Architectural Underground* (Cambridge, MA: MIT Press, 1995).

[12] Maii Emam, Dina Taha, and Zeyad ElSayad, “Collaborative Pedagogy in Architectural Design Studio: A Case Study in Applying Collaborative Design,” *Alexandria Engineering Journal* 58 (2019), https://doi.org/10.1016/j.aej.2018.03.005.
[13] Mick Healey, Abbi Flint, and Kathy Harrington, “Students as Partners: Reflections on a Conceptual Model,” *Teaching and Learning Inquiry* 4, no. 2 (2016): 1–13, https://doi.org/10.20343/10.20343/teachlearninqu.4.2.3.
[14] The majority of design studios in our context follow a three-phase structure that usually includes a research phase, analysis phase, and design phase.
[15] Alison Cook-Sather, Catherine Bovill, and Peter Felten, *Engaging Students as Partners in Learning and Teaching: A Guide for Faculty* (San Francisco: John Wiley & Sons, 2014), ProQuest Ebook Central, https://ebookcentral-proquest-com.ezproxy.lib.ucalgary.ca/lib/ucalgary-ebooks/detail.action?docID=1650837.
[16] Catherine Bovill and Catherine J. Bulley, “A Model of Active Student Participation in Curriculum Design: Exploring Desirability and Possibility,” in *Improving Student Learning 18: Global Theories and Local Practices: Institutional, Disciplinary, and Cultural Variations*, ed. C. Rust (Oxford: The Oxford Centre for Staff and Educational Development, 2011), 176–188.
[17] John Biggs, Catherine Tang, and Kayoko Kennedy, *Teaching for Quality Learning at University*, 5th ed. (New York: McGraw-Hill Education, 2019).
[18] Bovill and Bulley, “A Model of Active Student Participation,” 176–188.
[19] Healey, Flint, and Harrington, “Students as Partners,” 1–13.
[20] Kelly E. Matthews, “Five Propositions for Genuine Students as Partners Practice,” *International Journal for Students as Partners* 1, no. 2 (2017): 1–9.
[21] Bovill and Bulley, “A Model of Active Student Participation,” 176–188.

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DESIGN STUDENTS' REFLECTIONS ON THEIR REFLECTIVE EXPERIENCES: A DIARY AND JOURNAL STUDY

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INTRODUCTION

This study aims to explain the impact of first-year design students' reflective journals about their studio experiences. To this end, a 13-week case study was conducted in two pre-disciplinary first-year design studios with the participation of students, instructors, and research assistants from the Departments of Architecture, Interior Architecture, and Industrial Design. The authors gave a notebook they designed, which requires daily and weekly entries to volunteer students every Monday and received the previous week's one. The first section of the notebook is dedicated to summarizing their learning experiences through reflective diary entries for each day. The weekly section, completed on Sunday, is structured around specific topics based on the four stages of Kolb's learning cycle.[1] The inclusion of metacognitive acts, which allow twelve volunteer students to document their experiences at the most immediate moments without any external pressure and to reflect on their learning experiences, is a critical element of the data generation process. Furthermore, in the last week of the one-semester reflective process, the students were expected to answer the question, "Explain the effect of your daily and weekly writing and drawing activities on your learning experience for one semester?" in written and visual form to understand their diary and weekly journaling experiences. In accordance with the purpose and scope, we addressed the research question of how reflective diary-keeping and journaling function in first-year design learning.

Theoretical background: Experiential learning cycle and design education

Experiential learning, which has significantly influenced the comprehension and elucidation of adult learning, is based on the constructivist lens on how individuals construct knowledge. Learning is regarded as a process of transforming experience to create knowledge that extends across all stages of life. The experiential learning cycle provides a crucial perspective on the relationship between learning and experience.[2] According to this view, the generation of knowledge is the result of the tension between the four learning modes of concrete experience (CE), abstract conceptualization (AC), reflective observation (RO), and active experimentation (AE). For learning to be effective, individuals must undergo all four stages. The learning cycle is depicted as a highly idealized, integrated, and recursive process that involves experiencing, reflecting, thinking, and acting.[3] Learners can acquire a profound comprehension, which facilitates learning, by adhering to and

experiencing the four critical components of the learning cycle. As learners construct knowledge and meaning from their experiences, they progress through the cycle. Experiential learning can serve as a foundation for design education, as it posits that design can be acquired through reflection, experimentation, and action. Parallel to this perspective, the act of design encompasses all phases of the experiential learning cycle, as it is considered as a kind of amalgamation of disciplines such as art, science, craft, and technology.[4]

Methodological background: Diary and journal as reflective practices

Reflective writing-based diary and journal entries offer a variety of mutual benefits to classroom stakeholders. With a "win-win" perspective, the researcher and the student may benefit from the design of diaries and journal used in educational research that considers the participants' conditions and needs.[5] Reflective diaries and journals facilitate the disclosure of participants' emotions regarding their experiences and events in a relatively private environment, thereby enabling researchers and educators to develop a more profound comprehension of the participants and students.[6] Although educators generally offer students feedback on their projects, reflective accounts of students may include a variety of comments regarding the social, cultural, and educational aspects of the classroom's stakeholders. This enables the collection of data on the cognitive, metacognitive, social, and motivational stands and strategies that are difficult to observe in the classroom.[7]

A CASE STUDY: REFLECTIONS ON REFLECTIVE EXPERIENCES

Metacognitive acts that will enable students to record their experiences at the moments closest to their experiences without any pressure and to reflect on their learning experiences played a crucial role in producing primary data. The diary method was implemented in this study by providing students with a weekly notebook with two sections. The first section of the notebook consists of seven pages in which participants summarize their learning experiences for each day in a diary format. The weekly section, expected to be completed on Sunday, is structured according to the four main stages of Kolb's learning cycle (Table 1). The research procedure differentiated it from other studies in literature as a mixed method by including the daily and weekly entries of the volunteer students through a booklet (Figure 1).

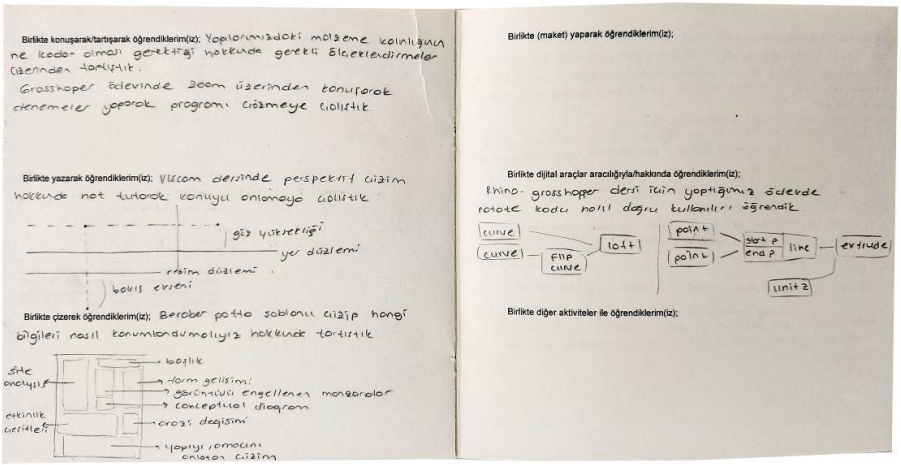

Figure 1. Reflective Notebook.

KLC's stages	Headings in the journal
Concrete experience	What I (we) learnt by talking/discussing (together); What I (we) learnt by writing (together); What I (we) learnt by drawing (together); What I (we) learnt by making (model) (together); What I (we) learnt through/about digital tools (together); What I (we) learnt with other activities (together);
Reflective observation	If I were to describe what I learnt in class this week based on my thoughts, reactions and feelings... [neutral] Fortunately... [positive meaning] If only... [negative meaning] Thanks to my classmate(s)... [positive meaning] Because of my classmate(s)... [negative meaning]
Abstract conceptualization	If I summarize the issues and concepts emphasized by my educators in the studio this week… I understood more clearly this week… If I explain the role of my classmate(s) in my understanding and implementation of the issues and concepts I have mentioned…
Active experimentation	So, what has changed in me? If I mention my plans and goals after all my experiences this week…

Table 1. Journal Questions.

The diary section was conceived and implemented with two primary objectives. The initial objective is to allow students to document and contemplate their educational experiences at the most recent possible moment. The second objective is to minimize data loss and serve as a source of reminders for their reflections on the issues in the weekly section. Furthermore, the diary entries from the students' data provided the author with crucial details and insights that enabled them to comprehend the entries about the weekly questions in the second section of the booklet. Students were reminded of the content of their entries by adding the statement "Regarding your learning experiences and your classmates" to the top of each diary page. Furthermore, students were expected to record the concepts that encapsulated their reflective and descriptive content in the "Keywords summarizing your day:" section at the bottom of the pages.

After 12 weeks of diary keeping and journaling, the students were emailed the question, "Explain the effect of your keeping diary and journaling activities on your learning experience for one semester?" in the final week of the academic term and they were asked to reply visually and in writing. In this manner, students were asked to reflect on their reflective experiences during the final week of the semester, immediately following their diary-keeping and journaling experiences.

FINDINGS

After collecting the data, we developed our themes using reflexive thematic analysis.[8] As educators working in a first-year design studio, we incorporated our observations and experiences into our analytical process. Our analysis was based on the four learning stages outlined by David Kolb's Experiential Learning Theory. Finally, we created the following themes: "agenda as a tool" for the concrete experience stage, "affective observation" for the reflective observation stage, "self-awareness/assessment" for the abstract conceptualization stage, and "internalization" for the active experimentation stage (Figure 2).

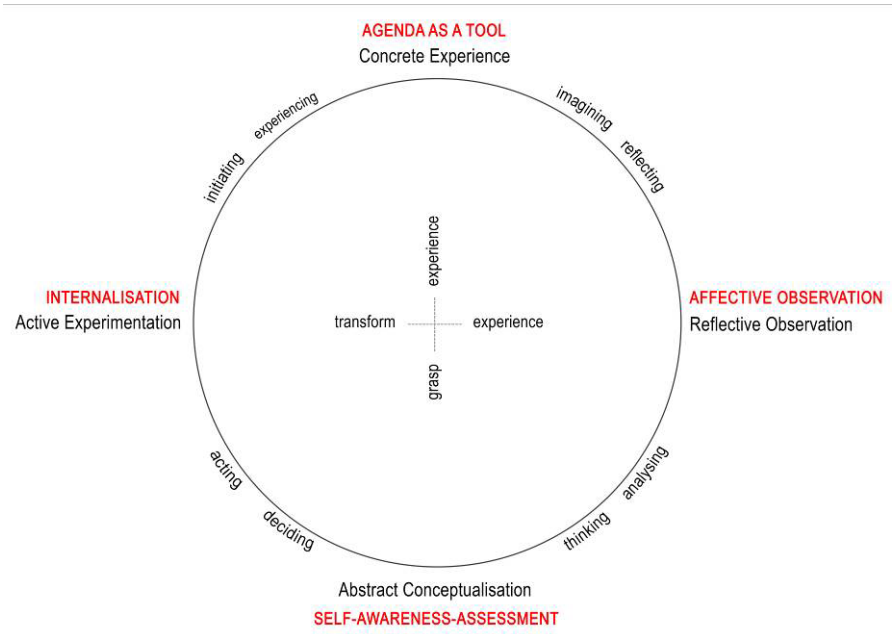

Figure 2. Experiential Learning Cycle and Themes Explaining Students' Reflections on Their Experiences.

Concrete experience: Agenda as a tool

The design studio is defined as a community of practice.[9] Therefore, the concrete aspect of design based on practice is the first step of learning. Students' regular diary and journaling activities are primarily useful for documenting their experiences and learning. Documentation enables them to carry out three basic actions such as planning, preparing for class and remembering what they have learned. In this way, they turn the diary and the journal into an agenda for constructing their experiences, which are material in nature and related to the body and physical things.[10]

Documentation Tool: Students recorded their experiences and work in writing, allowing them to monitor their learning and progress effectively. *Planning Tool:* By keeping a weekly overview of their activities, students could identify which topics to focus on for the following week. This process helped them set new goals, recognize areas where they needed improvement, take necessary precautions, and plan more effectively for upcoming tasks. *Preparation Tool:* Occasionally reviewing their diaries allowed students to prepare for their following project lessons accordingly. *Reminder Tool:* Their reflective writing served as a helpful reminder of what they had learned during the week.

Concrete experience: Agenda as a Tool	Students' Reflections
Documentation	Although we all seem to be in the same process, we actually experience so many different things. The differentiation of our experiences and perceptions is one of the first reasons for this change. In fact, at this point, it is also beneficial for us to record our experiences through this notebook (A5). I think reporting the work we do in the lessons week by week is a helpful practice for monitoring our development (B2).
Planning	The part where I mentioned my plan for the next week contributed to my planning process. Since I wrote down what I did that week, I was able to shape my next week accordingly (A4). …and was very effective in setting goals for the new week (A5). It helped me to progress in a more planned way (B3). Writing and drawing helped me to recognize some things I had not noticed early on and to take precautions (B6).
Preparation	I looked at the notes I wrote in the notebook occasionally during the week and prepared for the next project lesson (A4).
Reminder	Writing down what I learnt daily and weekly helped me remember the information I learnt during the week (A1).

Table 2. Concrete Experience and Student Reflections.

Reflective observation: Affective observation

Students often experience a wide range of emotions during design learning, including excitement, impatience, curiosity, and enjoyment.[11] Their emotional responses develop in reaction to various actions and situations within the design studio.[12] In our research, the diaries we utilized served as a tool that triggered additional therapeutic aspects, allowing students to express their feelings.[13] We discovered that students' diary entries sometimes evolved into narratives and that writing personal stories can have therapeutic effects.[14] Volunteer students reported that writing and seeing what they were doing and feeling during the intensive lectures felt good. As a result, it can be argued that reflective observation in the first-year design studio took on an affective character in the diary and journal.

Another issue related to the affective observation phase is the sense of hesitation and responsibility. Students doubted whether their diary and journal entries were within the scope of the research. The personal nature of the diaries and the fact that it was their first experience with them led to hesitation about the validity of their writing. Since responsibility is about experience rather than intellectual endeavor and they were part of relatively long-term participatory research, they felt responsible. Students expressed that they felt bad when they could not submit their notebooks and write in detail due to the intensity of their classes and time constraints, and they wrote apologies in their diaries.

Reflective Observation: Affective Observation	Students' Reflections
Affective expression	It had a positive effect. It was a rapid process. It was very good to write and see what I was doing and feeling during that busy period (B3). Collecting data for research was a nice experience. I am happy to have participated (B6).
First time	In general, it was a different experience because I never reflected on what I experienced and learnt at school before (B4).
Responsibility	I was sad that I could not write in the last weeks, but I adapted to the intensity of school and worked until the morning, and I could not make time for the notebook (B6).

Table 2. Reflective Observation and Student Reflections.

Abstract conceptualization: Self-awareness/assessment

Self-awareness and self-assessment are the two main attitudes that keeping diaries and journals provides in students in the context of abstract conceptualization. This finding is in line with the views that reflective diaries and journals make students aware of personal development involves planning, monitoring and evaluation processes as well as thinking about thinking and recognizing themselves as learners.[15] The awareness gained by the students because of our case study can be summarized as follows:

- Recognition of the tools and methods used in learning,
- Acknowledge their experiences and actions,
- Recognize deficits and mistakes,
- Awareness of their (relatively limited) communication in the classroom,
- Awareness of thoughts, feelings, and emotions.

Awareness brought self-evaluation as a critical and analytical attitude. While the diary section of the notebook was more helpful in recording their experiences, the journal section headings helped them evaluate their weeks. In short, students tend to evaluate their learning process and performance in the diary.

Abstract Conceptualization: Self-awareness/assessment	**Students' Reflections**
Self-awareness	The most important thing I realized during the diary process was that before writing the diary, I was unaware of what I had learned and done that day. Even if I had noted down the things I had learnt during the day, I did not go back and look at them. They did not come to my mind. Therefore, I could not use what I learnt that day in my production and learning process long-term. When I wrote the diary, I repeated and remembered the things we learnt that day. This made the information more permanent (A4). Writing in this notebook actually helped me see my problems more clearly and realize that I was thinking too negatively (B6).
Self-assessment	While answering the questions in the notebook, I was able to evaluate myself on a weekly basis, whether I was doing well or not. This helped me see my own process (A4). At the end of each week, it allowed me to think about what I could improve myself (B4).

Table 3. Abstract Conceptualization and Student Reflections.

Active experimentation: Internalization

We have observed that students' learning can be effectively assessed using diary and journal tools. When students articulate their thoughts in writing, their learning becomes more self-directed and self-motivated, leading to more lasting understanding. This process allows for knowledge to be generated by transforming experiences and by integrating new learning with existing knowledge. Consequently, this approach fosters personal transformation and the development of autonomous thinking.[16]

Writing journals feeds the students' active experimentation in two aspects: individual and social. The individual aspect aims to enable students to reflect in detail on what they have learnt during the week, draw lessons, reinforce their learning by reflecting and repeating what they have learnt, and thus increase the permanence of the knowledge they have constructed. The social aspect is to review their communication with their peers in the studio because of the scope of the notebook and to try to interact more with their peers because they do not find their studio interactions sufficient.

Active Experimentation: Internalization		Students' Reflections
Social	Learning lessons	Answering the questions in the notebook made me think more about what I learnt that week. For example, I thought about the things I said, "I'm glad I did it" or "I wish I had done it differently" and tried to learn from them. Thanks to my inferences, I learned many things (A1).
	Consolidating learning	Looking back at what I learnt helped me to consolidate my knowledge (A4). Seeing my mistakes and shortcomings every week has made me better (B3).
	Permanence	We can learn and experience many things during the day, but reflecting and remembering them at the end of the day or week increases the permanence of learning (A1).
Individual	Trigger to peer interaction	After I started writing in the diary, I realized that I was working in isolation from the class, only staying in group assignments and contact with my own group of friends. I forced myself to improve my communication and interaction in order to write in the diary (B2).

Table 4. Active Experimentation and Student Reflections.

CONCLUSION

In this study, the contribution of keeping a diary and journal during an academic semester to the learning of first-year design students was described through four themes based on Kolb's experiential learning cycle. The first step in this cycle is that students use the diary as an agenda to activate concrete experiences. Therefore, keeping a diary and journal serves as a basis for the students' concrete performances. The second learning step, reflective observation, has an affective character in diary and journal writing. We argue that the therapeutic effect of keeping a diary and journaling and the many emotions they experienced during design education are the sources of this affective character. In the abstract conceptualization stage, journaling provides first awareness and then evaluation skills. In this way, students build their identity as learners and develop a critical approach to themselves and the situations they encounter. In the final stage, active conceptualization, we found that they used the diary and journal to internalize and make their knowledge permanent.

These themes, developed based on students' reflections, are valid for pre-disciplinary first-year design studio students. Therefore, participatory and reflexive studies designed for this purpose are needed to discuss reflective action's effects on students' learning in upper years of design disciplines.

In sum, we found that reflective diaries and journals are not only research tools but also learning instruments that enhance students' experiential learning. Accordingly, we recommend that design educators integrate reflective practices into their studios and curricula.

ACKNOWLEDGEMENTS

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EMERGING PARADIGMS IN INTERIOR DESIGN EDUCATION: NAVIGATING DIGITAL TRANSFORMATION AND CRITICAL PEDAGOGIES

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INTRODUCTION

The 21st century has transformed education through digital innovation, evolving pedagogies, and shifting knowledge production. As design disciplines adapt, interior design education faces a pivotal moment. Traditional methods reliant on rote learning and static curricula are being challenged in favour of dynamic, student-centred models that encourage critical inquiry, creative exploration, and technological integration. In this changing landscape, a key question emerges: How can interior design pedagogy incorporate digital fabrication while maintaining craftsmanship, materiality, and spatial intelligence?

This paper examines the intersection of digital transformation and critical pedagogies in interior design education. It explores how advanced manufacturing techniques such as 3D printing and laser cutting can be integrated with traditional craft methodologies like folding, tessellating, and sectioning to create immersive learning experiences. A case study of third-year students designing and fabricating a free-standing room divider illustrates how iterative prototyping, interdisciplinary collaboration, and material experimentation enhance critical thinking, sustainability, and user-centred design.

The themes of this paper align closely with the *New Schools of Thought* conference, which interrogates the evolving landscape of 21st-century education. The integration of digital fabrication and craft resonates with key themes, including *Critical Thinking in Teaching & Learning*, *Representation in Creative Pedagogy*, and *Student-Centred Pedagogy*. By challenging conventional design education hierarchies, this study highlights how new methodologies empower students as active learners. In an era of rapid technological advancement and shifting professional demands, this paper contributes to the discourse on how digital tools and critical pedagogies can prepare students for contemporary design practice.

Ultimately, this research underscores the need for a holistic approach to interior design education, one that bridges traditional craftsmanship and digital innovation to foster an inclusive, adaptable, and forward-thinking curriculum. By doing so, it positions students as agents of change, equipping them with the skills and critical perspectives necessary to navigate an increasingly digital and interdisciplinary design world.

DIGITAL FABRICATION IN INTERIOR DESIGN EDUCATION

Digital fabrication represents a transformative shift in design pedagogy, offering new tools for conceptualisation, prototyping, and material exploration. The advent of the Fourth Industrial Revolution has significantly altered the landscape of interior design education, necessitating the integration of digital manufacturing techniques as a fundamental component of contemporary pedagogy.[1] As digital technologies become increasingly embedded in professional practice, interior design education must evolve to equip students with the technical proficiency and critical thinking skills required to navigate this changing environment.[2]

The role of digital fabrication in contemporary pedagogy

Digital fabrication includes computational and machine-driven processes such as 3D printing, CNC milling, laser cutting, and robotic assembly.[3] These technologies enable rapid prototyping, parametric modelling, and customisation, fostering an iterative approach to spatial problem-solving.[4] Integrating these tools into interior design curricula moves beyond traditional drafting and model-making, encouraging a more experimental, research-driven approach.

A key advantage of digital fabrication in education is its ability to facilitate hands-on learning. Papert's[5] constructionism theory suggests that meaningful learning occurs through making, testing, and refining ideas. Digital fabrication supports this by allowing students to transition between digital modelling and physical prototyping, enhancing their understanding of material properties, structural integrity, and design feasibility.[6] This approach also aligns with Schön's[7] concept of reflective practice, where students iteratively refine their designs through feedback and material exploration – as illustrated in Figure 1.

Figure 1. Reflective practice and iterative design.

Bridging digital and traditional craftsmanship

Integrating digital fabrication with traditional craft methods marks a significant advancement in interior design pedagogy. While historically focused on manual craftsmanship and material manipulation,[8] concerns have emerged that digital tools might reduce tactile engagement and material intuition, which are essential to design thinking.[9] To counter this, hybrid approaches blending digital and handmade methodologies are being explored to ensure students develop both technical proficiency and material sensitivity.[10]

Oxman[11] highlights how computational design and digital fabrication can enhance rather than replace traditional making. By combining parametric design with artisanal techniques such as folding, tessellating, and sectioning, students gain deeper insights into form generation, structural efficiency, and material optimisation[12] – as illustrated in Figure 2. This hybrid approach preserves material intelligence while expanding design possibilities through algorithmic and data-driven methods.[13]

Figure 2. Hybrid design approach integrating computational and traditional techniques.

The impact of digital fabrication on design thinking

Beyond technical skills, digital fabrication shifts design thinking toward a more exploratory, systems-based problem-solving approach.[14] Engaging with algorithmic design, parametric modelling, and generative strategies strengthens students' spatial reasoning and adaptive design skills.[15] This aligns with the broader discourse on computational design, where digital fabrication is not just a production tool but a driver of innovation and conceptual development.[16]

Rapid prototyping through digital fabrication also builds students' confidence in experimentation and failure-driven learning. Ratto's[17] research on critical making highlights how physically constructing prototypes deepens engagement with design problems, allowing students to interrogate social, cultural, and environmental implications. Embedding digital fabrication in interior design curricula fosters inquiry, experimentation, and critical reflection, essential for the next generation of design professionals.

THE ROLE OF CRITICAL PEDAGOGIES

Critical pedagogies in interior design education prioritise active learning, problem-solving, and collaboration, challenging traditional instructor-led approaches.[18] Moving beyond passive knowledge acquisition, they position students as active learners, encouraging iterative experimentation and engagement with socio-cultural and technological contexts.[19] This approach is particularly relevant in design disciplines, where innovation, adaptability, and interdisciplinary collaboration are essential.[20] By embedding critical pedagogies into curricula, educators cultivate environments that build technical proficiency while fostering critical inquiry and ethical awareness.

Foundations of critical pedagogy in design education

Critical pedagogy traces back to Paulo Freire,[21] whose *Pedagogy of the Oppressed* critiques hierarchical education models as cultural domination. He advocates for dialogic learning, where students and educators co-create knowledge through reflective inquiry. In interior design education, this shifts instruction from didactic to collaborative, encouraging students to interrogate spatial, material, and socio-political aspects of design.

Bell Hooks[22] expands on Freire's work, highlighting how traditional classrooms reinforce passive learning, limiting critical engagement. A liberatory approach in interior design education requires exploring diverse perspectives, questioning normative design ideologies, and integrating real-world social issues into project-based learning.

Active learning and critical engagement in interior design

Interior design education benefits from active learning strategies that incorporate real-world problem-solving, participatory design, and material experimentation.[23] Research by Crysler, Cairns, and Heynen[24] suggests that students develop deeper cognitive and technical skills when engaging in iterative refinement and peer collaboration. This aligns with Schön's[25] concept of reflective practice, where professional competence emerges through cycles of reflection and action.

In the case study, students developed multiple room divider prototypes, integrating digital fabrication and craft methodologies. This iterative process allowed them to test material properties, assess structural integrity, and refine designs based on critical feedback – as illustrated in Figure 3. Peer critique sessions further reinforced engagement by encouraging students to evaluate their own and others' work through constructive discourse.

The project's integration of critical pedagogy also encouraged students to question conventional interior design norms and explore alternative spatial configurations. As contemporary spaces increasingly blur boundaries between work, home, and public environments, students must develop an adaptive mindset that considers aesthetics alongside social, economic, and environmental factors.[26]

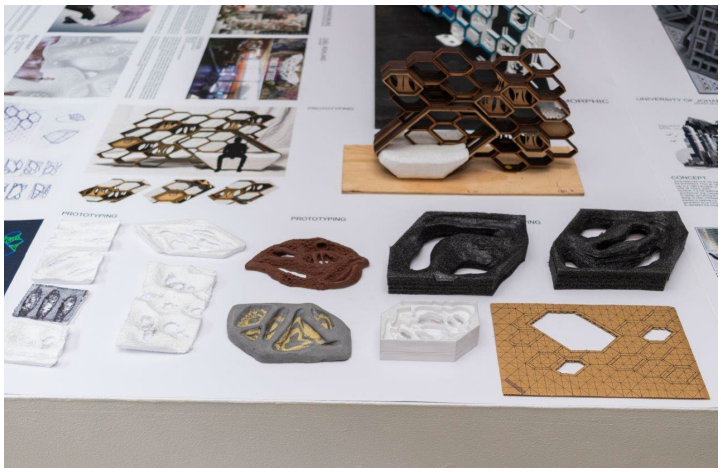

Figure 3. Iterative prototyping and testing.

Collaborative learning and knowledge co-creation

Collaboration is central to critical pedagogy, enabling students to construct knowledge collectively rather than passively receiving information.[27] In design education, this takes the form of team-based projects, interdisciplinary engagements, and peer mentorship, aligning with professional design practices where cross-disciplinary collaboration drives innovation.[28]

The *Room Divider Project* fostered collaborative learning by requiring students to exchange ideas, challenge assumptions, and refine their designs together. This aligns with Wenger's[29] communities of practice framework, where learning occurs through social interactions and shared experiences. Group critiques and discussions deepened students' understanding of interior design as both a technical and contextual discipline responsive to human needs.

Such collaborative engagement also fosters student agency, positioning them as co-creators of knowledge rather than passive recipients. This reflects Dewey's[30] experiential learning theory, which emphasises real-world problem-solving and reflective action. In this context, interior design education extends beyond skill acquisition to cultivate critical thinking, ethical awareness, and a deeper understanding of design's impact on users and environments.[31]

The impact of critical pedagogy on interior design practice

The application of critical pedagogy in interior design education has significant implications for the profession. As the industry evolves, addressing sustainability, inclusivity, and technological advancements, graduates must think critically, adapt to challenges, and advocate for ethical design solutions.[32] Critical pedagogy encourages students to question design norms, engage with diverse perspectives, and develop context-sensitive solutions. Integrating digital fabrication with critical inquiry equips students to balance tradition and innovation, craftsmanship and automation, and aesthetics and function.[33] Research shows that graduates from critical pedagogy programs are more likely to become field leaders, contributing to design discourse and pushing boundaries.[34] By promoting independent thinking and interdisciplinary collaboration, such education produces professionals who are technically skilled, critically engaged, and socially responsible.[35]

CASE STUDY: ROOM DIVIDER PROJECT

The *Room Divider Project* is a critical pedagogical experiment that combines digital fabrication with traditional craft methodologies. This integration enhances students' design thinking, problem-solving, and material literacy. Positioned within contemporary interior design education, the case study explores how digital tools can complement hands-on craftsmanship, fostering a hybrid design process that meets industry demands for technological proficiency and creative adaptability.[36]

Project brief and objectives

The project was designed to address key educational objectives rooted in experiential learning and iterative design. The following pedagogical goals were established:

Exploration of structural systems

Students engaged in iterative model-making, exploring various structural configurations through prototyping and digital simulations. This approach aligns with Schön's[37] concept of reflective practice, refining ideas through continuous testing and feedback.

Integration of digital and handmade techniques

By combining laser cutting and 3D printing with traditional techniques like folding, tessellating, and sectioning, students developed a dual understanding of computational design and material responsiveness – as illustrated in Figure 4.

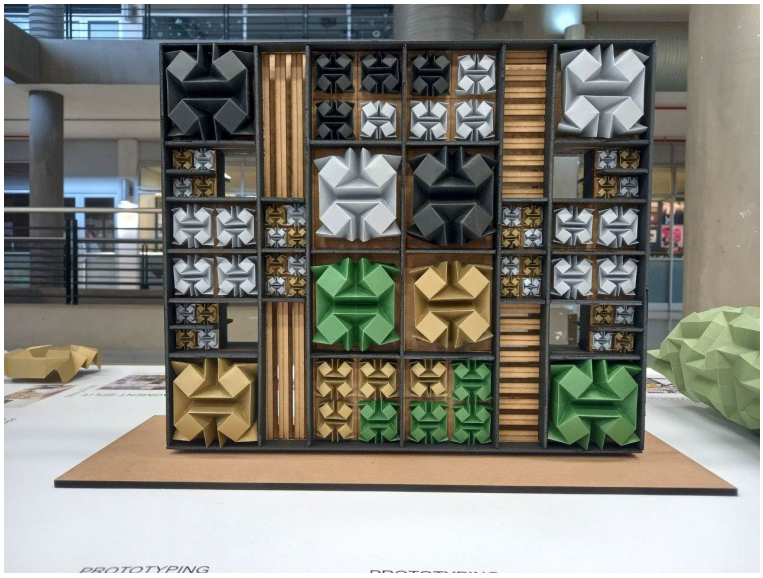

Figure 4. Hybrid approach to design and fabrication.

Critical thinking and justification of design decisions

Students were required to articulate their material and construction choices – as illustrated in Figure 5, supporting knowledge-building through inquiry and self-reflection, as advocated by constructivist learning theories.[38]

Figure 5. Articulating material and construction choices.

Sustainability in fabrication processes

The project introduced sustainable material use, emphasising waste reduction, modular adaptability, and lifecycle considerations in digital fabrication.

Design development process

The project followed a structured yet flexible design process that encouraged iterative development and material experimentation, aligning with generative design approaches prioritising continuous refinement. The process comprised four key phases:

Research and conceptualisation

- Students conducted precedent studies on biomimicry, parametric design, and lightweight structures to develop initial concepts.
- Research included case studies on digital fabrication in architecture and product design – as illustrated in Figure 6.
- Theoretical discussions on the role of digital fabrication in contemporary design, referencing Kolarevic's[39] concept of mass customisation, took place.

Figure 6. Case studies on digital fabrication in design.

Material experimentation

- Prototyping involved various materials, including plywood, acrylic, and recycled composites, to evaluate mechanical properties and fabrication feasibility – as illustrated in Figure 7.
- Material tests focused on structural performance, flexibility, and environmental impact.
- Generative design principles were applied to optimise material usage and reduce waste.

Figure 7. Material prototyping and evaluation.

Digital fabrication integration

- Computational design tools like Rhino and Grasshopper were used to develop parametric models that informed fabrication strategies.
- Students worked with CNC milling, 3D printing, and laser cutting to produce precision-cut components, reinforcing the connection between digital modelling and physical realisation – as illustrated in Figure 8.
- Digital tools enabled real-time design iteration for refining aesthetic and functional aspects.

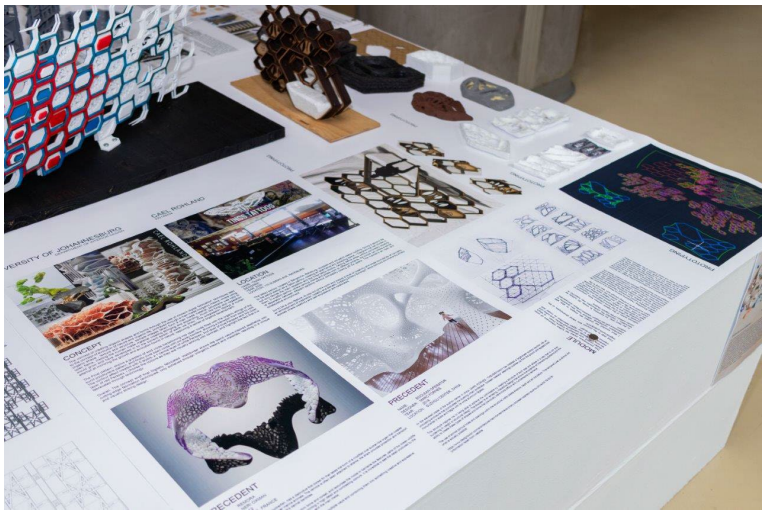

Figure 8. Digital fabrication tools and techniques.

Iterative prototyping and refinement

- Multiple prototype iterations were developed, evaluated, and refined based on structural stability, aesthetic coherence, and functional performance.
- Peer reviews and faculty critiques provided continuous feedback, allowing students to critically evaluate their design decisions.
- Final models demonstrated an evolution in material intelligence and fabrication accuracy.

Outcomes and student engagement

The project offered significant educational and professional benefits, highlighting the value of digital fabrication in interior design education. The outcomes can be summarised in three key areas:

Enhanced problem-solving and design thinking

- Students gained a deeper understanding of structural systems through hands-on experimentation, aligning with Schön's[40] reflective practice model.
- Translating concepts into prototypes reinforced spatial reasoning and iterative learning.

Material awareness and fabrication literacy

- Direct engagement with materials enhanced students' understanding of their properties and applications.
- The project balanced digital precision with traditional craft, demonstrating how computational tools complement making processes.

Confidence in digital tools and collaborative learning

- Students gained confidence in using digital fabrication, preparing them for industry demands for skilled, tech-savvy designers.
- Peer critiques fostered collaborative learning and knowledge exchange, creating a design community.

IMPLICATIONS FOR INTERIOR DESIGN EDUCATION

The findings of this study have important implications for interior design pedagogy, especially in the evolving 21st-century design education landscape. Integrating digital fabrication into the curriculum enhances student engagement and aligns with industry demands for technologically proficient, critically engaged designers.[41] As the profession increasingly relies on digital tools, interior design education must adapt to equip students with the skills needed to navigate contemporary design complexities.

Digital fabrication as a catalyst for pedagogical innovation

A key implication of this study is the role of digital fabrication in driving pedagogical innovation. Traditional interior design education, rooted in hand-drafting, manual model-making, and material exploration,[42] is evolving with the advent of digital technologies like 3D printing and laser cutting. These tools require a shift toward computational design strategies focusing on precision, customisation, and iterative prototyping. Integrating these technologies enables a research-driven, inquiry-based approach to design education. Students are encouraged to experiment with parametric modelling, algorithmic design, and material optimisation, fostering resilience and adaptability, critical qualities for future design professionals in an increasingly complex, interdisciplinary field.[43]

Enhancing creativity and critical thinking through hybrid methodologies

A significant implication of this study is the role of hybrid methodologies in fostering creativity and critical thinking. By combining digital fabrication with traditional craft techniques, students gain a deeper understanding of materiality, form, and structural behaviour. Research shows that working across multiple fabrication methods enhances problem-solving, as students critically evaluate the strengths and limitations of different tools and techniques. This hybrid approach aligns with Schön's[44] concept of reflective practice, where expertise is developed through cycles of making, testing, and refining. The iterative nature of digital fabrication reinforces this model, enabling students to assess structural, aesthetic, and functional qualities in real time. Engaging hands-on with materials and fabrication processes cultivates a stronger design agency, positioning students as active participants in knowledge creation rather than passive receivers of theoretical instruction.

Play and exploration as fundamental pedagogical strategies

A key finding of this study is the importance of play and exploration in design education. The project emphasised iterative experimentation, where students engaged in trial-and-error processes to refine their designs – as illustrated in Figure 9. Research has long shown that play fosters creativity, problem-solving, and cognitive flexibility.[45] The LEGO Foundation[46] reinforces this, stating that "Play enables us to explore, practice, and try out ways of tackling similar challenges in the real world." Embedding playful methodologies into the curriculum can cultivate innovation and adaptability in interior design education. Serious play, where students engage in structured yet open-ended experimentation, encourages them to take creative risks, question design norms, and explore unconventional solutions. The integration of digital fabrication allows students to test ideas through rapid prototyping, reinforcing the value of hands-on experimentation in learning.

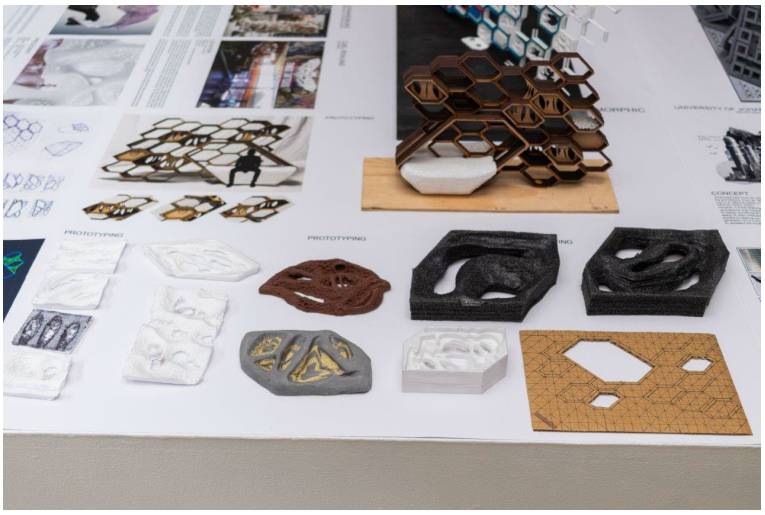

Figure 9. Iterative design process.

Preparing students for the evolving design industry

The intersection of digital fabrication, critical pedagogy, and exploratory learning has key implications for preparing students for the evolving interior design industry. As the field embraces emerging technologies, students must develop competencies beyond traditional design principles, including:

Technical proficiency
Familiarity with digital fabrication tools, computational design software, and parametric modelling.

Sustainability awareness
Understanding material efficiency, waste reduction, and circular design principles.

Interdisciplinary collaboration
Engaging with fields like architecture, engineering, and material science to create integrated solutions.

Design thinking and innovation
Cultivating an iterative mindset focused on experimentation, adaptability, and user-centred approaches.

Integrating these competencies into the curriculum helps align interior design education with the evolving demands of contemporary practice. Graduates with expertise in digital fabrication and critical design thinking will be well-prepared to drive innovation and adaptability in the built environment.[47]

CONCLUSION

The *Room Divider Project* demonstrates the transformative potential of integrating digital fabrication with critical pedagogies in interior design education. By combining traditional craftsmanship with advanced manufacturing technologies, students gain a comprehensive understanding of design, materiality, and spatial intervention. This approach enhances technical proficiency while cultivating critical thinking and adaptability, essential skills for navigating a design landscape increasingly shaped by digital innovation, sustainability, and interdisciplinary collaboration.[48]

The findings contribute to broader 21st-century education discourse, particularly themes explored at the *New Schools of Thought* conference, including *Critical Thinking in Teaching & Learning*, *Representation in Creative Pedagogy*, and *Student-Centered Pedagogy*. These themes emphasise the need for pedagogical models that engage students as active participants in learning. By integrating digital fabrication into the curriculum, educators not only provide technical expertise but also encourage students to challenge traditional design paradigms, explore new representational methods, and engage in iterative, student-driven learning processes – as illustrated in Figure 10.

Figure 10. Digital fabrication integration in curriculum.

Digital fabrication as a bridge between traditional and contemporary practice

Integrating digital fabrication into interior design education allows students to engage with contemporary industry practices while preserving the hands-on, material-focused ethos of traditional craftsmanship. This shift from passive learning to experiential making aligns with constructionist learning theories, emphasising knowledge acquisition through direct engagement with materials and processes.[49] By experimenting with computational design tools like parametric modelling, algorithmic design, and robotic fabrication, the project fosters an interdisciplinary approach, preparing students for the convergence of digital and physical design realms.

This pedagogical framework reflects the evolving role of the interior designer as both a craftsperson and a digital innovator. As the industry embraces sustainable, technology-integrated solutions, graduates must navigate the intersection of artisanal techniques and computational methods. The *Room Divider Project* exemplifies this shift, enabling students to explore biomimetic principles, material optimisation, and generative design methods, reinforcing the importance of adaptability in contemporary practice.

Implications for inclusive and student-centered pedagogy

A key contribution of this study to the conference themes is its alignment with *Student-Centered Pedagogies* that emphasise agency, collaboration, and critical inquiry. The project's iterative nature creates a learning environment where students actively construct knowledge through experimentation and reflection, rather than passively receiving instruction. This challenges hierarchical educational structures and aligns with the movement towards inclusive, participatory learning models.[50]

Additionally, the focus on peer critique and collaborative design processes highlights the value of collective knowledge-building in interior design education. The *Room Divider Project* demonstrates how students can learn from one another, refining their ideas through dialogue and shared problem-solving. This approach resonates with the conference theme of *Representation in Creative Pedagogy*, encouraging students to explore new ways of communicating and visualising design concepts beyond traditional architectural representations.

Future directions in research and practice

As education evolves, interior design curricula must embrace emerging paradigms. Future research should explore further applications of digital fabrication in design education, particularly regarding sustainability, interdisciplinary collaboration, and AI-driven design methodologies. The intersection of digital fabrication and social innovation also presents an opportunity for designers to engage in community-centred projects addressing pressing spatial and environmental challenges.

By balancing tradition and innovation, educators can equip students with the skills needed to shape the future of interior design practice. As digital fabrication continues to redefine the discipline, pedagogical approaches must evolve to ensure students are proficient in emerging technologies while critically engaging with the ethical, social, and environmental implications of their work.

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EMPOWERING BRICK-AND-MORTARISM: ESTABLISHING A MARKETPLACE FOR ARTISANS, DESIGNERS, AND GRAPHIC DESIGN STUDENTS

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INTRODUCTION

Online marketplaces have become a convenient shopping option for consumers.[1] The appeal lies in their vast product selection, flexibility, and the ability to shop anytime from home or elsewhere using electronic devices.[2] While physical stores are not obsolete, their roles are evolving. For brick-and-mortar businesses, establishing a local presence and fostering community engagement remain crucial for building long-term customer relationships and brand loyalty.[3] Despite detailed online product descriptions, consumers often prefer in-store interactions with knowledgeable associates. Personalized service and direct engagement with products foster emotional connections and brand loyalty, which online platforms struggle to replicate.[4]

This raises questions: Is the era of physical stores over? Are graphic design students at local universities equipped to navigate the changing retail landscape? To explore this, the researcher used his sabbatical from December 2023–May 2024 to establish slyck, a physical store in downtown New Albany, Indiana. Launched on October 6, 2023, slyck served as a creative hub for current and former graphic design students, local artists, and makers until its closure. Located at 313 East Spring Street, the store offers 1,200 square feet of retail space and 700 square feet of basement space. Since its soft opening, slyck has hosted three exhibitions, attracted local and regional clients, and collaborated with seventeen vendors. The project aims to assess the likelihood of student participation and the level of support from local creatives for such initiatives.

LITERATURE REVIEW

In recent years, there has been growing recognition of the need to diversify design pedagogy by integrating entrepreneurship education. Institutions like the University of Michigan offer programs such as the Entrepreneurship Minor, which includes over eighty courses on startup creation, innovation, marketing, finance, and business development, catering to students from diverse academic backgrounds. Similarly, the California College of the Arts offers courses like Creative Founder, which explores the intersection of design and entrepreneurship, teaching students to think like entrepreneurs and leverage design thinking principles to innovate and create successful ventures. Research highlights that interdisciplinary collaboration significantly enhances innovation, underscoring the importance of integrating entrepreneurship into design curricula to equip students with the skills needed to navigate the evolving professional landscape.

The Need for Design Pedagogy to Diversify

The University of Michigan's Entrepreneurship Minor offers over 80 courses on startup creation, innovation, marketing, finance, and business development, fostering interdisciplinary collaboration.[5] Similarly, Christina Wodtke's Creative Founder course at the California College of the Arts emphasizes entrepreneurial thinking and design innovation.[6] Research by Frans Johansson, author of The Medici Effect, shows that collaboration across diverse disciplines enhances innovation.[7] Anderson argues that graphic designers can leverage their creativity to become entrepreneurs by helping clients bring ideas to market.[8] Frans Johansson, author of The Medici Effect, found that collaboration among individuals from diverse disciplines, backgrounds, and expertise areas significantly enhances innovation.[9] At Grand Canyon University, the IDEA Club's entrepreneurial spirit came to life during the 2016–2017 academic year as students organized a marketplace like a flea market, engaging in buying and selling goods while contrasting online shopping with brick-and-mortar stores. Initially, most participants were student companies showcasing their ideas and promoting their businesses, which ultimately encouraged some of them to start their businesses on Etsy.[10] Similarly, the Federal Reserve Bank of Kansas City provides educators with resources, lesson plans, and activities to empower students to consider entrepreneurship as a future option.[11] These tools have helped students envision themselves as entrepreneurs and understand the principles of starting and managing a business.

The Impact of Online Sales on Local Economy

The Small Business Squad notes that during the 2018 holiday season, $126 billion was spent on online purchases in the United States which significantly impacted the sales tax revenue collected by states and local governments.[12] The state of Indiana lost $195 million in sales tax revenue to online purchases in 2012, according to the University of Tennessee.[13] To mitigate these losses, Indiana implemented a law in October 2018 requiring retailers with at least $100,000 in sales in Indiana or those serving at least 200 Indiana residents annually to collect sales taxes on online purchases.[14]

Brick-and-Mortar Advantages and Disadvantages

While brick-and-mortar stores offer unique advantages, they face challenges such as high overhead costs, including rent, utilities, storage, and maintenance, which affect profitability.[15] Competing with online businesses like Amazon.com and other physical stores requires unique products, effective marketing, and excellent customer service.[16] Despite the rise of online shopping, brick-and-mortar stores remain significant, accounting for 72 percent of U.S. retail sales in 2024.[17] A.T. Kearney's study of 2,500 shoppers across demographics found that 90 percent prefer brick-and-mortar stores, highlighting their enduring appeal.[18]

The Era of Physical Stores is Far from Over

While online shopping has transformed retail, physical stores remain relevant. Trax Retail (2023) notes that 87 percent of shoppers start their searches online, but 90 percent of transactions occur in physical stores.[19] Consumers value the social experience, instant gratification, and avoidance of shipping costs and return hassles. Physical stores also build trust and credibility, offering stability and reliability.[20] They provide unique benefits like immediate product access, personalized service, and the ability to try products before purchasing. Additionally, they foster face-to-face interactions, creating opportunities for professional growth.[21] Ortiz highlights that physical marketplaces build community among designers and clients, encouraging partnerships that enhance portfolios and business opportunities.[22]**METHODOLOGY**

The research method employed is action research, a cyclical process of planning, acting, observing, and reflecting. Introduced by Kurt Lewin in 1944, this methodology emphasizes collaborative problem-solving and critical reflection, bridging the gap between theory and practice.[23] In this project, the researcher single-handedly creates and operates a physical marketplace, slyck, which serves as a real-world laboratory for testing entrepreneurial and design concepts. By engaging directly with vendors, students, and the local community, the researcher gathers valuable insights into the challenges and opportunities of integrating design education with entrepreneurship. These insights inform the development of a senior-level graphic design course, which incorporates practical, real-world scenarios to prepare students for professional challenges. This iterative process—where observations from the marketplace directly influenced academic curriculum—exemplifies the core principles of action research.

The methodology's focus on continuous implementation, reflection, and adjustment ensures the project adapts to evolving needs and contexts. For example, feedback from the marketplace's soft launch prompted refinements in both store operations and course structure, showcasing how action research drives adaptability and innovation. By linking academic theory to practical experience, this approach enhances the relevance of design education and equips students to navigate the complexities of the modern creative economy. Action research thus serves as both a methodological framework and a catalyst for transformative learning, aligning academic goals with real-world outcomes.

Factors Influencing the Choice of Location

After surveying multiple potential locations, a two-story building constructed in 1919 at 313 East Spring Street in downtown New Albany was selected as the site for slyck (Figure 2). With approximately 2,260 square feet of usable space, it allows for a flexible layout accommodating the gallery, marketplace, and workshop. Its central location near local eateries, retail stores, and civic amenities fosters a vibrant and synergistic environment.

The area sees consistent foot and vehicle traffic, especially during lunch hours and weekends, making it ideal for spontaneous visits and community engagement. The building's street-facing facade and corner positioning enhance visibility, supporting effective signage and display opportunities. This combination of historic charm, square footage, and prime location maximizes exposure and supports long-term growth.

Naming and Design Decisions for the Store

The selected name is short, memorable, and must be available as a website URL (Figure 1) and on social media (Figure 4). A concise name ensures easy recall and online searchability. The decision to use all lowercase letters creates an approachable, modern feel. The last three letters, "YCK," are the researcher's initials in reverse, adding a personalized and unique touch. Orange is chosen as the brand color for its associations with enthusiasm and creativity, helping differentiate the brand in a crowded market with a clear and visually appealing identity.

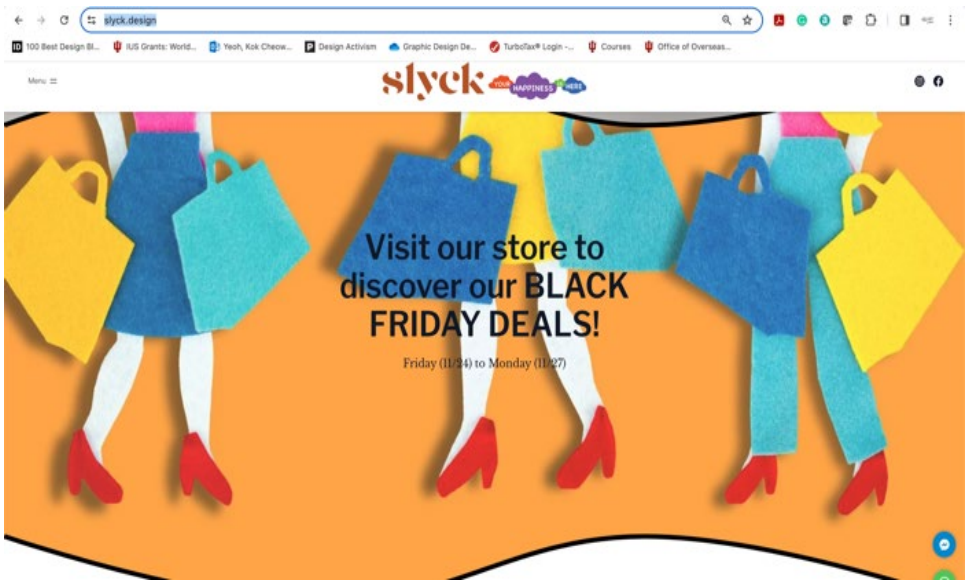

Figure 1. The slyck website occasionally updates its messaging to align with seasonal themes.

Renovation and Construction of the Physical Space

This stage focuses on the comprehensive renovation of the physical space to support the store's multifunctional use as a gallery, marketplace, and workshop (Figure 3). The renovation process entails significant structural and aesthetic updates, beginning with the installation and removal of interior walls to define and optimize distinct zones for displaying artwork, showcasing vendor products, and hosting creative workshops. Outdated fluorescent lighting fixtures are being replaced with energy-efficient 2' x 4' LED ceiling panels and adjustable spotlights to enhance visibility and create a warm, inviting ambiance tailored to the needs of each area. Infrastructure improvements also include the installation of a modern surveillance system for security, the setup of high-speed Wi-Fi to support digital transactions and connectivity, and the addition of essential fixtures such as secure door locks, cabinetry for a kitchenette area, and accessible storage solutions. These updates are critical to ensuring the space is both functional and welcoming for artists, entrepreneurs, and visitors alike.

Developing Vendor Partnerships

The researcher seeks partnerships with local designers, artists, and makers to feature their products and artwork in the store. Potential vendors are identified through recommendations from friends, colleagues, social media, forums, and visits to farmers' markets in Floyd County and the Louisville metropolitan area. A lawyer-vetted agreement is drafted during this period. The number of vendor partnerships and the variety of products available are tracked to measure progress. By selling their creations at slyck, vendors acknowledge that they are the sole creators of their products and do not plagiarize others' work. Due to the nature of the products, slyck enforces an "all sales final, no refunds, no exchanges" policy.

Readying the Store

This stage involves curating a roster of artists and vendors for consignment while preparing the space for daily operations and events. Selected participants reflect local talent, product diversity, and alignment with the store's mission. At the same time, essential infrastructure is installed, including anti-theft devices, a point-of-sale (POS) system, and modular furnishings such as shelving, tables, and

seating to support events and workshops. The POS software supports inventory tracking, vendor management, and sales reporting. The retail floor is designed for flexibility, with shelf units rotated regularly to keep the space visually fresh. In the gallery area, a rail-based hanging system with stainless steel cables and hooks is used—nails or adhesives are not permitted to protect the walls. All vendors and exhibitors must carry their own insurance, as slyck's policy does not cover theft, accidents, or other losses.

Vendors have three options:

a) A free white metal shelf rack (21inches deep × 36 inches wide × 62 inches high) with four tiers.

b) An open gallery space (40 feet) adjacent to the retail floor, divisible into 20-foot sections for bulky or larger items.

c) An enclosed gallery room (54 inches deep × 160 inches wide × 90 inches high).

Launching the Store

slyck operates from 10:00 a.m. to 7:00 p.m., four days a week, providing consistent access for shoppers, artists, and community members while maintaining flexibility for events and vendor needs. The store remains closed on public and observed holidays to accommodate staff schedules and community rhythms. The business held a soft opening in October 2023, which featured an initial marketplace and the debut gallery exhibition. This phase marked the beginning of operations, allowing for real-time observation of foot traffic, vendor logistics, and customer engagement. Insights gathered during this preliminary period were instrumental in refining the business model, improving layout decisions, adjusting vendor policies, and clarifying operational workflows.

In preparation for slyck's launch, participating vendors are encouraged to actively promote their merchandise on social media—especially Instagram and Facebook—at least twice per month. Posts should include the hashtag @slyck313 along with other relevant tags and media to increase reach, improve brand awareness, and drive in-store traffic. This coordinated marketing approach helps build a collective identity while expanding each vendor's audience.

Figure 2. The façade of the store.

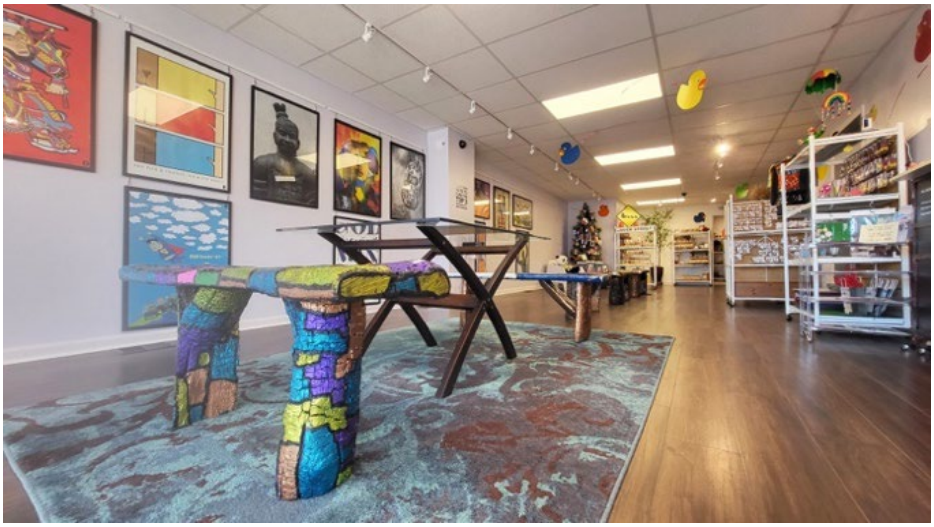

Figure 3. The main retail space.

Generating Revenue and Sustaining Operations

This stage is about generating revenue and sustaining operations to ensure the long-term success of the store. Revenue and expenses are meticulously tracked to assess financial sustainability and evaluate the effectiveness of marketing and outreach efforts aimed at attracting customers and building partnerships with local artists and makers. Depending on their status (vendor, exhibitor, or student), slyck retains a commission of 30 percent to 40 percent of the sale price for each product sold. Consequently, vendors receive 60 percent to 70 percent of the sale price, minus additional fees such as those imposed by the POS company (3 percent to 5 percent per transaction) or slyck.

EVALUATION AND IMPACT ASSESSMENT

The Brevity of the Project

At its core, this project employs a methodology blending literary studies, observations, and a business plan, merging theoretical insights with practical applications to bridge academic research and real-world entrepreneurship. It tests a business concept while aligning with academic goals, particularly integrating entrepreneurship into education to equip students with skills for the evolving professional landscape. However, tight timelines, limited budgets, and market complexities constrained its scope and impact. Despite these challenges, the project offers valuable insights into combining academic theory with entrepreneurial practice, laying groundwork for future initiatives.

Administrative Barriers to Grant Acquisition

Aside from the salary provided during the sabbatical period, the entire project budget was funded by the researcher's personal savings. This self-financing approach allowed the project to proceed independently but also placed significant financial strain on the researcher. Despite proactive efforts to secure grants, including extensive research and multiple grant applications, the researcher faced significant setbacks due to the university administration's refusal to provide support, which complicated efforts to obtain institutional funding. This lack of financial backing not only limited the project's resources but also highlighted the challenges of aligning innovative academic initiatives with institutional funding policies.

Timing and Logistical Challenges

Renovations were scheduled to begin in January 2022 but were immediately delayed due to contractor issues. The initial contractor abandoned the project and ceased communication, prompting the researcher to file a lawsuit on May 24, 2022. This legal battle lasted two years, resulting in significant financial setbacks. Although some funds were eventually recovered, the delay substantially increased costs and disrupted the project's timeline. The need to find and hire a new contractor further compounded these challenges. The new contractor began work during the COVID-19 pandemic, which introduced additional obstacles such as supply chain disruptions and labor shortages.

SUMMARY AND ACHIEVEMENTS

Importance of Supporting Local Artisans and Designers

Beyond conventional creative approaches, this project serves as a symbol of inclusivity and empowerment, engaging the broader community. By offering marketplaces, curatorial spaces, and entrepreneurial opportunities to diverse audiences, slyck has fostered human expression, creativity, and skill development. These initiatives have contributed to the overall well-being of southern Indiana and its surrounding counties. The educational significance of this project is profound, as it addresses accessibility gaps in creative learning and entrepreneurial opportunities.

Incorporation of Real-World Practices

Rooted in client expectations, pragmatic solutions, and material exploration (especially for merchandise), this project lets students and former students tackle problems in a realistic business setting. By addressing client needs and market demands, they gain hands-on experience in solving real-world challenges, from concept to execution. Unlike hypothetical classroom scenarios, this initiative mirrors real-world expectations, preparing students for professional challenges. This experiential approach enhances problem-solving skills, fosters creativity and adaptability, and deepens their understanding of business complexities. Bridging academic theory with practical application, the project equips the students with the tools and confidence to thrive in a competitive, evolving marketplace.

CONCLUSION

While digital opportunities abound, brick-and-mortar stores remain crucial for graphic design students, offering practical experience, networking, and innovation—key to building a self-employed career. This sabbatical project eventually led to the creation of an assignment integrated into a 400-level senior course launched in spring 2024. After returning to Indiana University Southeast, the researcher implemented the assignment, which uses a practice-based methodology to explore design thinking processes like concept generation, creative experimentation, and prototyping. As a result, ten graphic design students embarked on an entrepreneurial journey to create sellable merchandise, including branded apparel and typography-infused art prints. Beyond branding and aesthetics, students produced mockups of their final products. Open to alumni, the initiative also benefits the university. The project has provided a platform for local designers and students to showcase talent, gain real-world experience, and contribute to downtown New Albany's cultural and economic vitality, albeit for a short amount of time.

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COMPREHENDING BIO-BASED MATERIALS: EXPERIMENTAL MODES OF LEARNING FOR STUDENTS OF DESIGN

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INTRODUCTION

Understanding the *design potential* of sustainable materials is crucial for today's design students, and as academics and educators in the design field, it is our task is to frame this learning amidst changing times.

Over the past 10 years there has been growing interest in the development of bio-based materials, with a specific focus on biopolymers as a potential alternative to fossil fuel-based plastics. This research is of interest to the design fields of product, furniture and spatial design where sustainable and performative materials that also possess sensory and aesthetic qualities are required.

There is significant research in the adjacent fields of material science and engineering on biopolymers, with a focus on their quantitative and objectively measurable properties, although these studies do not entirely satisfy the requirements of students of design who are also interested in the qualitative attributes of these materials. As designers, we need to explore methods to develop and explore materials that also emphasize softer, more subjective characteristics in tandem with the objective values to be able to assess their design potential.

This paper describes the process and results of a first-year project for design students at the Royal Danish Academy where we, as tutors, ask them to investigate the characteristics of self-made biopolymer plastics. We report on how a combination of scientific and artistic research methods frames a way of learning that homes in on design potential of biopolymers and how this approach becomes imbedded in students as they progress throughout their studies.

This research asks these central questions: How can we design a course for students of design that promotes a responsible and designerly attitude to new materials? How can we develop a learning environment where the scientific methods of investigation are explored in tandem with artistic and designerly methods? And finally, how does this learning framework develop over time throughout the students' bachelor education?

This research comes out of the intersection of 3 different forces. Namely, the design culture at the Royal Danish Academy, a move towards material driven design, and the effects of the academisation of the arts and design fields. This section will describe these forces.

Teaching Design at the Royal Danish Academy

The design education at the Royal Danish Academy has always had an emphasis on material exploration and craftsmanship. Informed by the Danish modernist movement[1] as well as Bauhaus thinking, materials and the user continue to be at the centre of our approach to design.[2] In 2018, the bachelor courses of furniture, textile and spatial design were merged into a single course called Produkt+,[3] with the intention that we educate more flexible and innovative designers that can work across traditional professional divides. As we continue to develop our teaching programs to accommodate this combination of traditional disciplines, we maintain a pedagogical approach that emphasises tacit knowledge and thinking through making. This has given us the opportunity to reconsider how we teach materials as things that already exist, to something the designer might also 'design' or at least have a critical stance on.

Material Driven Design

One of the pioneers of the contemporary material driven design movement is Neri Oxman, who since the 00's has advocated for *"a deeper relationship between design object and its environment".*[4] As part of her philosophy Material Ecology[5], Oxman views computation, fabrication and the material as inseparable dimensions of design. We share this position, although in our case, we simplify the idea to focus on the material, and to some degree the mode of fabrication, as being indispensable aspects of design. In more simple terms, we want to promote the idea that materials are not things that are applied to a design several steps into the process, but that their constitution, way of coming into being and innate characteristics are a central part of the design process.

Our pedagogical approach is informed by the recent movement in 'material driven design', an evolution from a traditional 'form driven design' that is described by Mette Bak Andersen as *"causing a lack of knowledge regarding materials and creating a knowledge barrier between designer and product."*[6] Andersen's research describes the cross disciplinary nature of material exploration that require both phenomenological sensory-based methods as well as more systematic observation and measurement. While we use a similar method to Andersen's, our research contribution differs in the sense that we show the evolution of the design students thinking over the course of their bachelor course.

Research Methods in Design Teaching

In addition to the pedagogical culture at the Royal Danish Academy and the move towards material driven design there has been another major force that has informed our pedagogical approach – the ongoing academisation of the arts within our teaching institutions.[7] As we see a shift from design being taught by practitioners, to being taught by a combination of practitioners and researchers, there is a greater focus on 'method' and an ongoing discourse on the combination of scientific and artistic methods, and how the student gains both explicit and tacit knowledge.[8]

While using research methods and methodologies is certainly nothing new in the design process, or the way we teach design, what is new is an explicit teaching of them. So that students recognise what type of method they are using and the type of knowledge they are gaining, so they can identify these research procedures and apply them in later projects. We teach them to be designers, as well as starting to give them research tools and frameworks to operate within.

PROJECT DESCRIPTION

The project described in this paper was set out as a 3-week course for 24 Produkt+ students in their first semester of study on the bachelor course at the Royal Danish Academy and ran in 2022, 2023 and 2024. It was part of a series of courses where other design domains such as colour, drawing, registration and modelling were introduced.

Students were introduced to biopolymers as composite materials that are of interest in the design fields as an alternative to fossil fuel-based plastics and were given a brief that asked them to develop their own biopolymers from basic recipes.[9] During this process they were asked to register the materials properties, qualities and effects. The course took place in a laboratory setting on campus and was supervised by 2 teachers from the Produkt+ program[10] and 1 technical advisor.

The core objective was to train students in their ability to identify design potential in the new materials. The experiments were recorded and structured in a scientific research method that allowed them to repeat and amend them, as well as using an artistic method where materials were subjectively interpreted, and design potential was identified.

The project was based on the forementioned sources in the material driven design section as well as from an article written in 1919 by the Danish architect and ceramicist Carl Petersen, Stoflige Virkninger,[11] to which the students were also referred to.

It was stated that the outcome should not be a 'design', but a pool of knowledge that could be disseminated to a fellow student. It was imperative that these initial experiments were open and exploratory as opposed to related to a specific design object since the objective was about identifying potential rather than finding solutions.

DESIGNING BIO-BASED MATERIALS

Biopolymers

Students began the course with guided experiments in the laboratory following 4 recipes to create biopolymers and biofoams. The recipes were based on natural polymers such as starch, collagen and milk protein that act as binders in the composition of the new material. Each recipe combined a minimum of 3 ingredients from the following categories: 1. Binder (ie. Starch, collagen, protein), 2. Cracking agent (ie. Vinegar), 3. Plasticizer (ie. Glycerine), 4. Dilutant (ie. Water), 5. Additive (ie. Dyes, fibres, seeds, organic matter), 6. Foaming agent (ie. Dish soap), 7. Solvent (ie. Alcohol). A set of the required tools was also stated, the procedure to follow, as well as a suggestion for the type of behaviour, qualities or properties to observe. This is a sample experiment:

Experiment 2:

Plastic from starch.

Ingredients: *Starch - potato starch, cornflower starch (binder), water (dilutant), vinegar (cracking agent), glycerine (plasticiser), dyes (additive)*

Tools: *mixing bowl, measuring cup (cl), scale, small pot, silicon stirring spoon, cooking plate, thermometer*

Procedure: *Mix 5tbsp of starch, 10tbsp water, 2tbsp acid. Bring to boil and stir constantly. The liquid becomes a translucent gel/paste. To achieve flexibility – add glycerine. Spread the paste on a baking tray and dehydrate in an oven.*

Observe: *shrinkage and material qualities.*

The students were asked to read scientific literature about the processing of polymers to understand what was happening as they altered the naturally obtained polymer bonding structures of their ingredients.[12]

The process of making

The process of making the biopolymer materials involved various ways of dissolving, hydrolyzing, heating and cracking of the naturally occurring polymer. As an example, we look at how Experiment 2, stated above, was undertaken. Students hydrolyzed potato flour (binder) in distilled water (dilutant) and calculated 5% of the total weight and added that amount of acetic acid (cracking agent). The mixture was heated to 90-95 °C and agitated on a simple hob. Figure 1. Students discovered a semi-transparent, gel-like viscosity in re-formation to a paste of the starch bonds under the influence of heat. The properties of the new material could be altered by introducing an additive like glycerin (plasticizer) to the mixture. Figure 2. The addition of glycerin molecules to the re-forming of the glucose monomers positions the Glycerol triol compound in between the forming links, thereby retaining a flexibility in the newly formed polymer. The students tested additives such as fillers and fibers (ie. coffee grounds, mineral powders, plant fibers) to introduce compressive or tensile strength. Foaming agents, like dish soap were found to alter the material into cellular structures of less weight per volume. Figure 3. Spongy, energy absorbing characteristics were be achieved through a combination of foaming agents and plasticizers. Pigments and dyes for color, also responded well to transforming material characteristics.

Figure 1. Students heating and agitating the starch-based mixture

Figure 2. Discovering the effects of adding glycerin to the mixture

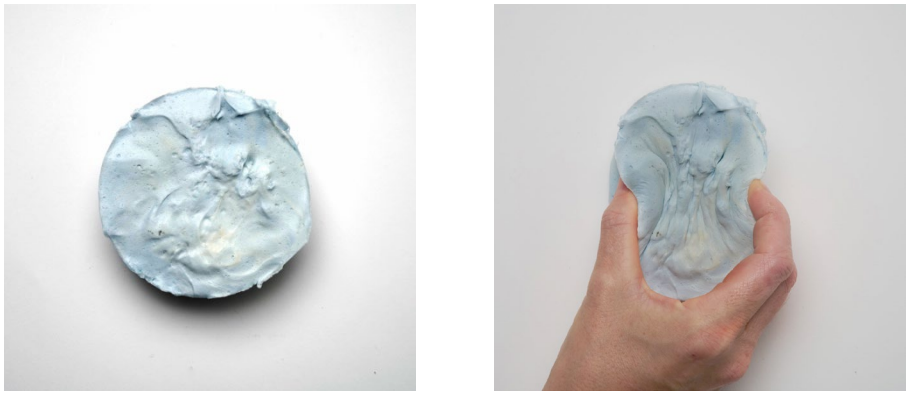

Figure 3. The creation of a biofoam with an aerated structure

The process of observing and recording

After understanding the workflow and interrelationships of components students were asked to continue their experimentation in small groups. We asked them to record their findings with a method in line with scientific enquiry where ingredients, quantities, and processes were documented to allow for verification, repeatability, consistency.

In addition to the procedural and quantitative information, they were asked to analyse the outcomes further by applying criteria for assessment in 3 categories: 1) Properties: technical properties (strength, mechanical, thermal, acoustic, structure etc.), 2) Quality: sensory qualities (colour, structure, tactility, texture etc.), and 3) Effect: the experiential effect or aesthetic emotions the material induces (a sense of calm, joy, sadness etc.)

We did not ask them to measure the technical aspects ie. Strength or acoustic property as this would require additional skills and technologies, rather that they would identify that a material might have these properties that could be tested outside the scope of this course.

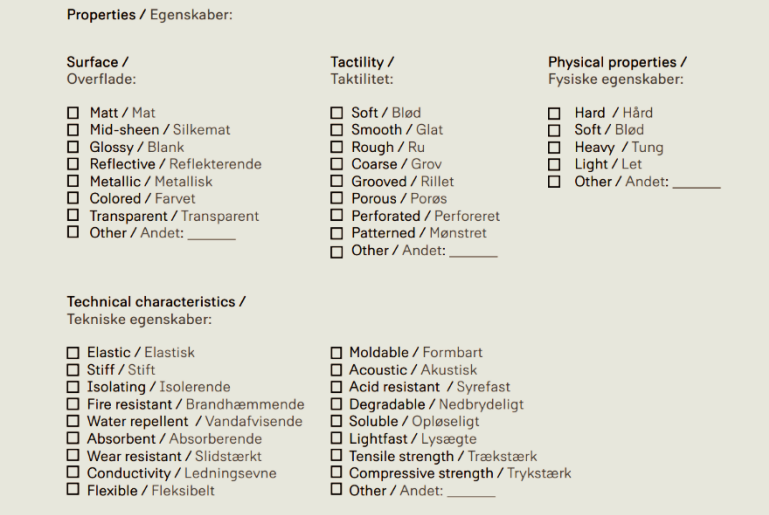

Figure 4. An example section from the template to record findings

As the course developed between 2022 and 2024, a registration template was developed so students could categorize and classify their material discoveries. Figure 4. This tool was created with the intention of making an open-source database and to form a directive for a future experimental set-up.[13]

It was imperative that these explorations remain unbiased and unrelated to (future) material applications, since the objective was to work with the development of the material itself. As an example, if there is a discovery of flexibility as an interesting material property, further experiments should be conducted to investigate this occurrence, to optimize and alter the property, thus establishing understanding and knowledge of how to create materials with certain characteristics or abstract stimuli.

OBSERVATIONS AND DISCOVERIES

Our observations and discoveries following the outcome of this course are divided into 2 categories. The first is what we observed as the course took place and the second is what we observed 2.5 years later as students undertook their own self-directed bachelor projects.[14]

Observations during the course

Throughout the course, we observed a high level of development in students' ability to articulate materiality in both objective and subjective terms. We observed them analysing, describing, and communicating material qualities through discussion, and recording their findings in the template. Being able to differentiate and describe both measurable and perceptual attributes helped students to identify design potential in the materials they were creating.

We also observed students adopting the structure of experimentation, in terms of setting up, analysing, recording and identifying potential lines of enquiry based on both intuition and logically trains of thought. An example of both findings appears in the following set of iterative experiments:

One pair of students set up an experiment using sodium alginate (binder), calcium lactate (filler), glycerine (plasticiser) to create a basic biopolymer. The result was a thin, elastic material that could be stretched out into thin sheets. The students struggled to categorise this material but ended up describing it as a type of ‘film’. They discussed whether its type should reflect its ingredients, its properties or whether archetypal categories would be better for designers to understand.[15] They

identified design potential in that the effect of the material would change by colouring it and introduced spirulina (pigment) to the next round of tests to turn it a deep green colour. They also saw the potential to extrude the material given its gel like consistency while it was being processed to make a yarn. Canula oil was added to the mixture as a lubricant to aid its trajectory as it was squeezed through a syringe to create long stringy threads.
The students then discussed the possibility of replacing the calcium lactate (filler) with crushed mussel shells (filler) to create a harder material that would chemically react differently with the sodium alginate (binder). Once this experiment proved successful, they continued with further iterations of the experiment considering the effects and qualities of the shells milled to different grain sizes. Figure 5.

Figure 5. Iterative experimentation creating different effects by altering the same base recipe

Application of ideas in bachelor students' work

We were curious to understand how this experimental pedagogy might evidence itself as the students' academic journey progressed. Whether we might see the effects and material qualities being a driver of the students' self-directed bachelor projects as well as evidence of the course's framework being used and adapted. We were delighted to find, that when we revisited the group that undertook the course in 2022 in 2025[16] that there were several clear examples of how a responsible and designerly attitude to new materials had been fostered with clear links to the original course.
Three examples of such work are 1.) "Rooting for reconnection. How to incorporate nature as a co-creator in design to create a meeting point for people." Frida Brock Jeppesen developed her bachelor project through a 'material by design' approach where she developed a composite of grassroots grown on textile canvas to cultivate and fabricate bespoke screens, utilized for an experiential pavilion at the nature "Bloom Festival" in the city of Copenhagen. Her focus lay on comprehending the process of growing her material, understanding its value and strength, as well as the challenges when working with the articulation of the live materials´ appearance, qualities and effects in its designed context.

Figure 6. A test piece of a bespoke screen cultivated for the project "Rooting for Reconnection"

2.) Maria Bull´s bachelor project "My mother´s hug" searched for an association to her mother´s hug through the tactile response of material. The result was a chair-like piece of furniture with the tactile response and association of comfort. The process challenged her to develop and produce an object and a material which would articulate a subjective experience as a reference and experience. Maria partially substituted conventional materials for furniture with a bespoke mixture of potato starch and glycerol, embedded into latex poaches within her construction. She was able to communicate the dynamics of a material that meet a user with initial resistance followed by absorption and formation to firm response of the underlaying structure. The necessary material did not exist, nor is it a feasible and scalable solution but the material by design[17] approach enabled her to investigate and to articulate a desired material behaviour.

3.) The bachelor project by Ditte Sibylline Kyed and August Skydsgaard Tromborg "Lime Pellets as a Resource: An Architectural Metamorphosis" investigated the architectural potential of a waste product from the decalcification process of hard water in Copenhagen. After discovering there was 4-5 tonnes of lime pellets produced as waste in the borough of Frederiksberg.[18] The students began an investigation into how this material could be repurposed in architectural context. They initially experimented with making bricks out of the material by following basic geopolymer recipes blending the lime pellets with sodium hydroxide and sodium silicate. These experiments resulted in a set of bricks with different properties, qualities and effects which they were able to analyze in a structured way to reveal the architectural potential of the new material. The result was a proposal for a pavilion where in-situ layered casting of the material was proposed reflected both its qualities as a monolithic mass and a mode of construction that reflected the need to work quickly with a material that 'set' rapidly. Figure 7. They were able to position their new material as a more sustainable material to concrete while being precise about both the pros, cons and further development needed to bring this material to market.

Figure 7. Scale models for a pavilion made from a geopolymer based on lime pellets

CONCLUSION & OUTLOOK

Through presenting an experimental mode of learning presented in this paper, and setting up the conditions for students to discover *design potential* in self-made bioplastics, we have illustrated the positive implications on a student's responsible and designerly attitude to new materials. The key points being an ability to articulate 'materiality' at an advanced level, to understand and apply rigorous methods that cross the domains of scientific and artistic research to be specific to design, to self-formulate a material driven design project and to be able to combine intuition and analytical rigour when handling materials in a design project. The approach is proved to expand the scope of design, inducing the student's attitude to innovate at the crossroads of material development and meaningful expression.

The significance of this study is that it highlights the importance of method in both pedagogy and the design process and how important the initial projects are to students as they undertake a bachelor course in the design fields.

The outlook for this study is how we might integrate our findings throughout the bachelor course, including how we might develop courses between the first and fifth semester where a comprehending a material is followed by a more traditional design exercise.

NOTES

[1] The movement that was at its peak between 1940's and 1960's in Denmark where design reflected the nations values that were based on simplicity, functionality, democracy and a connection with nature.
[2] Royal Danish Academy - Bachelor Education Design, 21 March 2025, https://royaldanishacademy.com/en/bachelor-education-design.
[3] 'Product+ | Det Kongelige Akademi', accessed 21 March 2025, https://royaldanishacademy.com/en/programme/produkt.
[4] Neri Oxman, 'Material Ecology', *Computer-Aided Design,* 1 January 2015, https://www.academia.edu/125686524/Material_ecology. Preface
[5] Neri Oxman, *The Neri Oxman Material Ecology Catalogue*, ed. Emily Hall and Jennifer Liese (New York: The Museum of Modern Art, 2020).
[6] Mette Bak-Andersen, *'When Matter Leads to Form: Material Driven Design for Sustainability'*, Temes de Disseny, no. 34 (3 October 2018): 10–33, https://doi.org/10.46467/TdD34.2018.10-33.
[7] Jan Silberberger, ed., *Against and for Method: Revisiting Architectural Design as Research* (Zürich: GTA Verlag, 2021).
[8] Bernhard Böhm, 'Tacit Knowledge', in *Against and for Method* (Zürich: GTA Verlag, 2021), 66–85.
[9] Recipes were developed from various open source locations online
[10] The teachers of the course are the co-authors of this paper
[11] see Carl Petersen, '*Stoflige Virkninger: Foredrag* holdt på Akademiet i Februar 1919.', n.d. – particularly describing the sensory and phenomenological aspects of the material. Petersen had a great sensitivity to the potential effects of materials and whose texts argue for a greater material consciousness in architects and designers through analysis and clarify in their effects. We use his text as an example of how to analyse materials effects in a sensitive and imaginative way and to be able to clarify material choices in an erudite manner.
[12] For example, starches, one of the selected polymers, are polysaccharides made up of glucose monomers. The bond of the two starch molecules, amylose and amylopectin, is considered a linkage between glucose units by starch synthesis. These natural occurring polymers are in their basic composition, to some extent, comparable to the structural formation of fossil-based polymers. Chemical processing of crude oil involves isolating or purifying (distillation) and cracking of polymers into monomer components, followed by re-forming new polymer bonds to specific material properties. In our experiments, students are essentially emulating this process.
[13] Lore Veelaert et al., *'Experiential Characterization of Materials in Product Design: A Literature Review', Materials & Design 190* (1 May 2020): 108543, https://doi.org/10.1016/j.matdes.2020.108543.
[14] At the Royal Danish Academy students of design take a 6 semester bachelor course where the 5th semester is self-directed, and they decide the scope of their own project. The 6th semester is an internship, so the 5th semester is the final design project before graduation.
[15] 'The students later organized all the samples into archetypal categories they called films / rubbers / leathers / fiber composites / mineral composites and foams. The idea was that a designer would have a better understanding of the effect and qualities of the material through these archetypes.
[16] when they completed their self-directed bachelor project
[17] Elvin Karana et al., 'Material Driven Design (MDD): A Method to Design for Material Experiences', *International Journal of Design 9*, no. 2 (2015), http://www.ijdesign.org/index.php/IJDesign/article/view/1965.
[18] This is one of the boroughs of Copenhagen that is 8.7km2 with a population of 103,000 so the amount of waste is vast if one considers what other boroughs might also produce

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COLLABORATIVE TEACHING PRACTICE FOR ARCHITECTURE EDUCATION

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INTRODUCTION

The ability to collaborate with multiple consultants and specialists has been an integral part of the architecture profession since the early 20th century.[1] In contrast to this very collaborative occupation, the studio environment for architectural education is very insular. Students may rarely or never collaborate with anyone outside of their studio professor. The University of Kansas (KU) 4th year spring ARCH 609/610 Integrated Design Studio partnered with Burns & McDonnell in a collaborative relationship. This collaborative studio is in the third year of operation. The first year for this studio collaboration was spring 2023. That year, we had nine teams of partnered students working on a design for an envisioned Kansas Aviation Museum in Wichita, Kansas. Spring 2024 was the second year for the collaboration, and there were five partnered teams, and three individuals. The project for that year was to design an Aviation Academy in Wichita, Kansas. Each student team/individual met with not only architects but also civil, structural, electrical, and mechanical engineers from Burns & McDonnell. Students met with the Burns & McDonnell architects and one civil engineer for the first site visit. This was followed by an in-person meeting at Burns & McDonnell where presentations by each of the consultant groups gave information about their role in architecture projects. Students presented schematic designs to all the consultant groups at Burns & McDonnell and received feedback to move the design forward. Individual sessions were scheduled for each student group to meet one-on-one with each consultant group and talk through the specifics of their design. These meetings and presentations were iterative, allowing students to adjust and then follow up with the consultants to confirm newly tested ideas. Because the Master of architecture program at KU is accredited by the National Architectural Accreditation Board (NAAB), students in this level are required to demonstrate specific learning criteria. The collaborative nature of this studio allowed the students to meet the criteria specified by NAAB in a more realistic process.

The ARCH 609 Integrated Design Studio (6 credits) is a concurrent course with ARCH 610. Integrated Design Documentation (3 credits). These classes are required for the 4th year, spring semester in the Master of Architecture program at (KU). This studio met for class Monday, Wednesday, and Friday from 8:30am-12:20pm. Arch 610 meet on Mondays from 1:30pm-4pm.

Learning Outcomes

At the completion of the studio, students can demonstrate the following learning outcomes:

- Following a theoretical and methodologically rigorous design process that includes problem identification, gathering relevant information, setting evaluative criteria, analyzing solutions, and predicting the effectiveness of implementation of design decisions.
- Demonstrating broad integration and consideration of environmental stewardship, technical documentation, accessibility, site conditions, life safety, environmental systems, structural systems, and building envelope systems and assemblies.
- These abilities are exhibited via schematic plans, sectional and elevation drawings; exterior/interior renderings; physical models; conceptual/design process diagrams; analytical drawings; axonometric drawings; drawings and/or models of a Wall Section and specific construction details (to appropriate scales with annotations) and structural framing (columns and beams) system; and diagrams showing applicable building codes of accessibility and fire safety (egress diagram).
- Create an effective representational strategy and developing related oral and visual communication skills, exhibited via vivid and clear display panels that include above-mentioned drawings and/or physical models. Students are also required to submit a Studio Portfolio that documents their design process and final design product.
- Students are required to continue developing their working knowledge of design-related software.
- Analyze design ideas in accordance to the Architecture 2030 Plan mission "...to rapidly transform the built environment from the major emitter of greenhouse gases to a central solution to the climate crisis."[2]
- Collaboratively work with a team of architects and civil, structural, mechanical, electrical, and fire-protection engineers to create an integrated building system to support the design intentions. By focusing on a holistic approach to design, students will demonstrate communication skills and the ability to creatively solve design and engineering problems.
- Demonstrate a broad understanding of design factors including aircraft logistics, site conditions, technical documentation, code compliance, sustainability, life-safety, HVAC systems, plumbing systems, electrical systems, and the building envelope assembly.

NAAB Criteria (National Architectural Accreditation Board)

The NAAB is the sole agency authorized to accredit United States regional professional degree programs in architecture.[3] The University of Kansas (KU) offers an accredited Master of Architecture degree.[4] Accreditation may occur at different intervals for different programs based on their last Accreditation. KU is currently preparing for review from an eight-year interval. Typically, internal assessment is used for lower-level classes. However, for the 4th year level studios, a random sampling of student work is collected by NAAB for assessment. Students must demonstrate in their work the Student Criteria (SC) for two areas:

SC.5 Design Synthesis—How the program ensures that students develop the ability to make design decisions within architectural projects while demonstrating synthesis of user requirements, regulatory requirements, site conditions, and accessible design, and consideration of the measurable environmental impacts of their design decisions.

SC.6 Building Integration—How the program ensures that students develop the ability to make design decisions within architectural projects while demonstrating integration of building envelope systems and assemblies, structural systems, environmental control systems, life safety systems, and the measurable outcomes of building performance.

SC.5 and SC.6 are further broken down into the following sub-categories:
SC.5.1 Design Decisions that Synthesize Multiple Factors
SC.5.2 User Requirements
SC.5.3 Regulatory Requirements
SC.5.4 Site Conditions
SC.5.5 Ecological Concerns and Consider Measurable Environmental Impacts
SC.5.6 Accessible Design
SC.6.1 Integrated Decision-Making Design Process
SC.6.2 Integrate Building Envelop Systems
SC.6.3 Integrate Building Assemblies
SC.6.4 Integrate Structural Systems
SC.6.5 Integrate Environ. Control Systems
SC.6.6 Integrate Life Safety Systems
SC.6.7 Measurable Outcomes of Building Performance[5]
The courses were also mapped to the Higher Learning Commission (HLC)[6] accreditation as well. However, this mapping was achieved by assigning NAAB criteria to the Institutional Learning Goals (ILG) of the HLC in the following manner:

NAAB PC.2 - Fulfills KU's HLC:
ILG5: Ethical and professional responsibility. Demonstrate integrity and act responsibly with the interests of the larger community, environment, discipline, or profession in mind.
ILG6: Effective leadership and collaboration. Establish, grow, and sustain productive relationships to effectively address key issues facing local, national, or global communities and solve problems that advance society.

NAAB SC.5 - Fulfills KU's HLC:
ILG1: Creative inquiry and discovery. Apply a broad base of knowledge to promote inquiry, discover solutions, and generate new ideas and creative works.
ILG3: Analytical reasoning. Access, evaluate, and use qualitative and/or quantitative information to identify patterns, and formulate and support interpretations.

NAAB SC.6 - Fulfills KU's HLC:
ILG2: Effective communication. Articulate thoughts and ideas clearly and effectively in a range of contexts using a variety of means and modalities.
ILG6: Effective leadership and collaboration. Establish, grow, and sustain productive relationships to effectively address key issues facing local, national, or global communities and solve problems that advance society.
The most challenging SC for student demonstration level included SC.5.5 Ecological Concerns and Consider Measurable Environmental Impacts, and SC.6.7 Measurable Outcomes of Building Performance. Both criteria were met with an assignment in which students used the CoveTool software plug-in with either Autodesk Revit or Trimble SketchUp to analyze daylighting in their building, and then adjust fenestration as needed based on the analysis results. The collaboration with Burns & McDonnell assisted with the student demonstration for the following criteria:
• SC.5.1 Design Decisions that Synthesize Multiple Factors, SC.5.3 Regulatory Requirements, SC.6.1 Integrated Decision-Making Design Process, SC.6.2 Integrate Building Envelope Systems, and SC.6.3 Integrate Building Assemblies were all incorporated with the help of the architect team. They

provided guidance on design, building code (specifically egress), building materials, and how all the design components work together to create the final result.

• SC.5.5 Ecological Concerns and Consider Measurable Environmental Impacts and SC.5.4 Site Conditions was aided with the help of the civil engineer who taught students about stormwater collection in retention ponds. They were also taught about site electric and sewer lines as well as some basic planting guidelines for sites near active runways.

• SC.6.4 Integrate Structural Systems was aided with the help of the structural engineer. They were given some basic "rule-of-thumb" calculations as well as guidance for most appropriate structural system for their desired spans.

• SC.6.5 Integrate Environmental Control Systems was incorporated with the help of the mechanical and electrical engineer consultants. They provided dimensional information for equipment sizing which in turn helped size the mechanical, electrical, communications rooms and associated exterior yards. The electrical consultants also helped with lighting schemes for interior and exterior spaces.

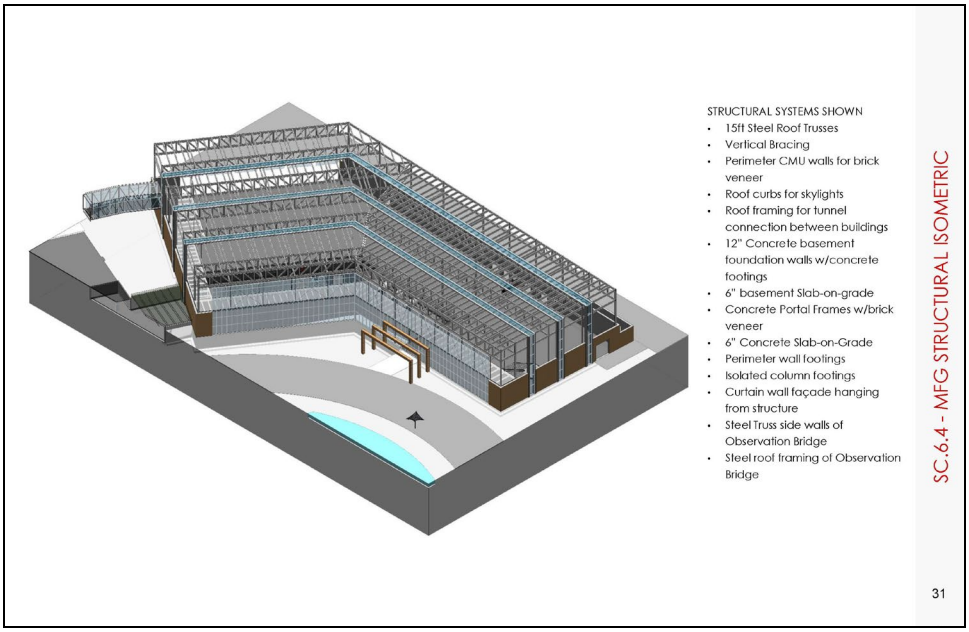

Figure 1. Example of structure framing design, student work submission, Ben Dowery, Spring 2023.

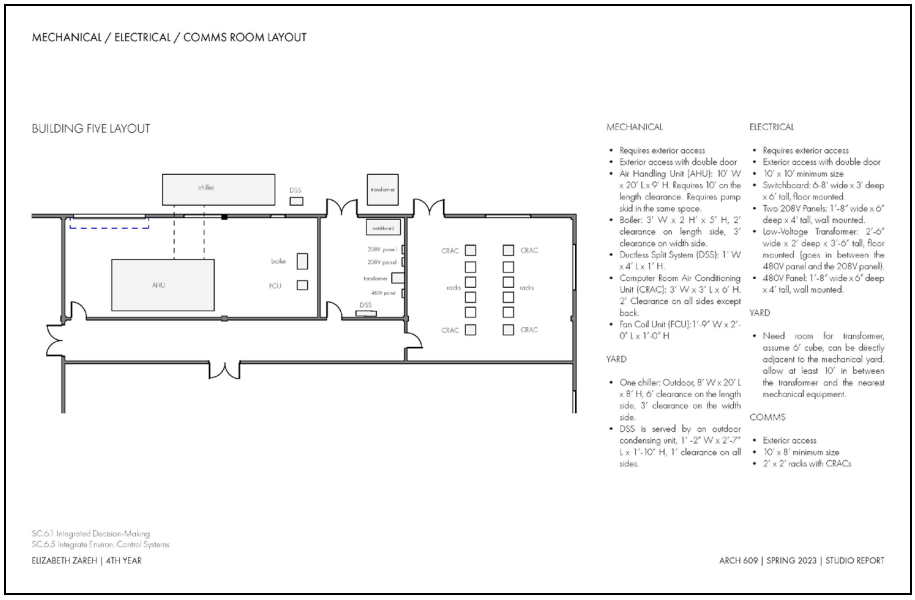

Figure 2. Example of mechanical, electrical, and comms room design, student work submission, Elizabeth Zareh, Spring 2024.

CONSIDERATION FOR THE COLLABORATIVE STUDIO

Although the M.Arch education at KU is immersive with scaffolding of skills to be taught at each year level, we do rely on internships to provide the "real life" experience of working at an architecture firm. The logistics of trying to bring a firm to help with a studio is largely not considered due to the amount of time and effort put forth by the firm without any compensation. There is also the issue that not all architecture firms have in-house engineers, so that would be an added effort to coordinate. Based on research of the topic of experiential learning, Kolb describes this as, "Learning is the process whereby knowledge is created through experience transformation."[7] Another consideration for the studio was the idea that design in the professional world is iterative with a feedback loop from consultants and so the studio embraced the concept of "Designing some student learning activities that mirror the 'messy' ways in which learning takes place in the workplace."[8]

STUDIO WORKFLOW

The second week of the semester, the class went on a site visit to Wichita with the Burns & McDonnell architects and the civil engineer. About three weeks after the initial site, we had an online meeting with our three architects and all the consultant teams including structural, mechanical, electrical, and civil. Each consultant team made a ten-minute presentation explaining what they did and how they would be a part of the project. The following week, the students presented their schematic design ideas to the architects and consultants at the Kansas City Burns & McDonnell office. For most, the structural engineer feedback was helpful at this point in the project. About three weeks after this review, the midterm review was held in-person at the Burns & McDonnell office. During this review, the students were further along with their design and were ready for more specific feedback. The critiques by the architects and consultants were more detailed and directive to their designs. Two weeks after the midterm review, we had a follow-up session online with the Burns & McDonnell consultants. This offered the students a chance to ask questions and show proposed changes to their project design. One month after this session, we had our first online, one-on-one session with the consultants and students. This was by far the most intensive interaction since the

projects were nearly fully developed and students were eager to finalize design details. Our final review as in-person at the Burns & McDonnell office.

Figure 3. Site visit to Kansas Aviation Museum, 1/23/23, photo by author.

Program

Spring 2023

Students designed a new building for the existing Kansas Aviation Museum (KAM) complex near McConnell Air Force Base in Wichita, KS. The new building was to complement the existing structures on or near the museum site and celebrate the history of aviation in Kansas with an emphasis on Wichita. The following is an overview of the program:

Aircraft display - Indoor and outdoor display area Students will research aircraft manufactured in Kansas with an emphasis on aircraft made in Wichita. The museum will display a minimum of 20 different airplanes. A minimum of 10 aircraft will be displayed in an interior display showroom, and a minimum of 10 aircraft will be displayed in an outdoor display area. Indoor and outdoor displays will be swapped annually, and students should find a solution for aircraft relocation. Students could pick aircraft to be displayed but must include the following 5 aircraft: Longren Flyer, B-29 Superfortress, Wichita Tractor, Boeing Next Generation 737, and B-52 Stratofortress.

Education 300-person auditorium - 15 sf per person

- 300 fixed seats
- Stage with wheelchair access – 25% of seat area
- Storage – 300SF
- Camera and Sound control room – 300SF

(4) K-12 field trip classrooms - 800 sf

Public support Lobby / reception - 2000-3000 sf

Locker / coat room - 50 lockers and coat room for 100 people

Cafeteria - seating for 100 people and support kitchen
Gift shop - 800 sf Restrooms - determined by building code
Visitors Center - 500 sf
Administration Office space for admin staff, curators, and maintenance crew
• (4) Private offices - 120 sf each
• (16) Workstations - 48-64 sf per person
• (1) conference room for 20 persons
Airfield maintenance equipment storage - 1500 sf
• Must have exterior access to airfield with 10’x10’ Overhead Door Building Support - location and size to be confirmed with engineers
Building Support - location and size to be confirmed with engineers
Mechanical, electrical, communication, and fire riser rooms
Circulation 20% of the total sf

Figure 4. Student work submission exterior rendering Kansas Aviation Museum, Ben Dowery, Spring 2023.

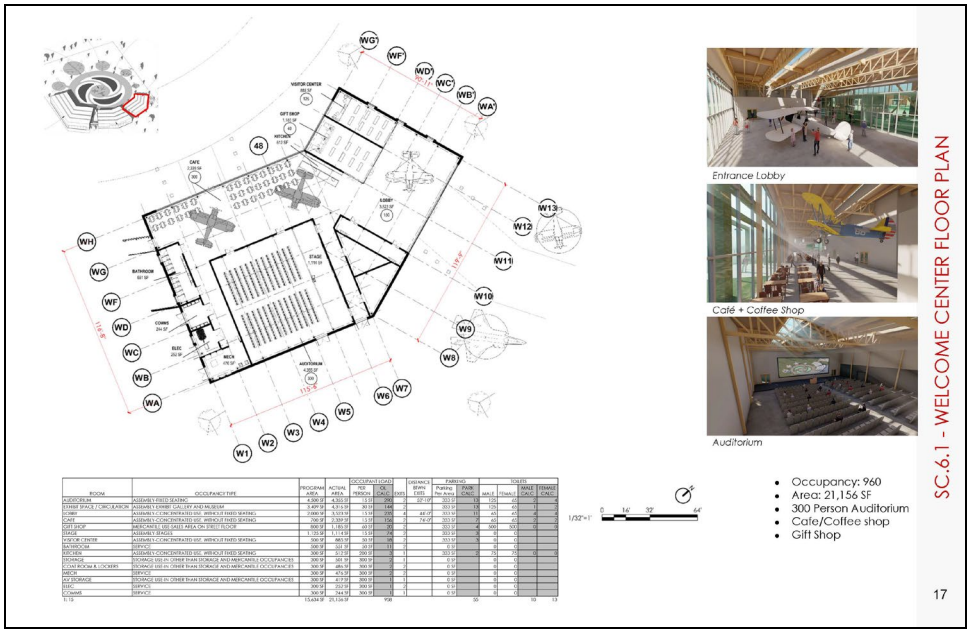

Figure 5. Student work submission interior renderings and plan Kansas Aviation Museum, Ben Dowery, Spring 2023.

Spring 2024

In Spring of 2024, we changed the program to be a training facility due to the report of the United States Government Accountability Office Report to Congressional Committees "Aviation Workforce: Current and Future Availability of Airline Pilots and Aircraft Mechanics".[9] We named the facility the "Aviation Academy" and located it just east of the Wichita Dwight D. Eisenhower National Airport.

The Aviation Academy focused on three aspects of flight: the pilot, the aircraft maintainers and the airport traffic controllers. Students of the Aviation Academy would learn in many settings including the traditional classroom, virtual reality labs, flight simulators, a mock control tower, and a high bay maintenance hangar. The new facility should provide everything the trainees need for the duration of their course, which is 12-18 weeks. There will also be full-time staff on site to teach, market and develop the courses.

Pilots

(4) Standard classrooms for 12-16 students
(1) Virtual reality classroom for 4-6 students
(7) Simulators pods
(1) Large wide-body aircraft (B777 or similar)
(2) Medium narrow-body aircraft (B737 or similar)
(4) Small jet aircraft (Citation CJ3 or similar)

Airplane Maintenance Technicians

(2) Standard classrooms for 12-16 students
(6) Workshops - 600 SF each
(1) Part Repair Shop
(1) Sheet Metal shop
(1) Paint and finish shop

(1) Fabrication shop
(1) NDT (Non-Destructive Testing) Shop
(1) Avionic Shop
Tool Storage - 1000 SF
High bay hangar with access to the airfield
Sized to fit a wide-body aircraft - B777 or similar
(1) 10-ton bridge crane
Paved apron for inspection, washing and de-icing
Large enough for (2) B777 planes
AEG storage (6000 SF)

Airport Traffic Controllers

(1) Control tower - 90'-0" tall
(2) Standard classrooms for 12-16 students
(1) Virtual reality lab for 4-6 students

Auditorium

100-person auditorium - 15 sf per person
• Storage – 300SF
• Camera and Sound control room – 300SF

Support

Lobby / reception - 2000 sf
Reception desk with waiting area with seating for 15
(3) private offices
(20) work stations for school admin
Cafeteria - seating for 100 people and support kitchen
Locker rooms and showers- near the hangars
Restrooms - determined by building code
Break rooms for each group
Library / study space

Administration

Office space for each group must include
(8) Private faculty offices - 120 sf each
(1) 20 person conference room
Shared break room
FAA Open Office with (4) work stations
Building Support - location and size to be confirmed with engineers
Mechanical, electrical, communication, and fire riser rooms

Circulation

20% of the total square footage

Site Design

Landscaped public entry with walking path
(200) parking spaces
Aircraft tow lane from the taxiway to the outdoor training area
(1) Outdoor classroom for 12-16 students
Aircraft apron / tarmac for (1) small (1) medium aircraft

Figure 6. Student work submission exterior renderings Aviation Academy, Elizabeth Zareh, Spring 2024.

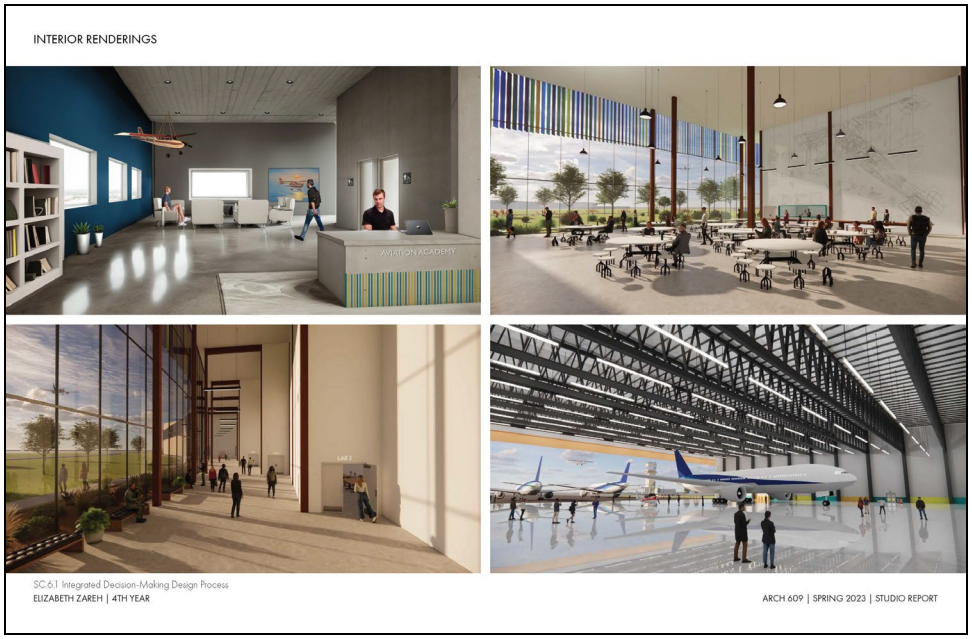

Figure 7. Student work submission interior renderings Aviation Academy, Elizabeth Zareh, Spring 2024.

Studio Outcomes

Students were assessed individually through the preparation of a "Studio Documentation" report. This report is prepared as an 11"x17" landscape-oriented document of no more than 40 pages. The report has a cover page, project overview, and table of contents at the beginning. The following pages address the design process beginning with preliminary studies of Wichita including demographics, history, zoning, etc.... The first section of the design documentation showed schematic design ideas as sketches, models, and diagrams, followed by design development, then final presentation materials. The drawings included, but were not limited to:

- Floor plans
- Site plans – including parking requirements, water retention, plantings, and exterior lighting
- Building and wall sections
- Elevations
- Renderings - interior and exterior
- Construction details of the exterior wall assembly
- Building system diagrams or plans (structural, plumbing, HVAC and fire-protection)
- Egress and American with Disability Act (ADA) diagrams[10]

CONCLUSION

An exit survey was conducted asking the students to provide comments regarding their learning in the course. For the question of what was most beneficial of the class for them, students identified the experience as being useful for a variety of reasons ranging from getting professional feedback on their designs to learning about the different building systems in a more detailed manner. Students also noted that they were able to network and felt more connected to the professional community. One student summarized the experience as follows, "This collaboration was the perfect transition piece between our typical school experience and our next steps into the real world. Collaborating with professionals in this capacity taught me things that I will never forget, and I think it shows in my portfolio.

NOTES

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TEACHING METHODOLOGIES FOR DISSEMINATION OF WORK OF MINORITY ARCHITECTS

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INTRODUCTION

The state of Kansas, USA has no known examples of documented architecture designed by a Black/African American licensed architect in any of the three major collections for this research. Award-winning architect, Charles McAfee, practiced in Wichita, Kansas opening his office in 1963. This project was planned to bring the work of Charles McAfee to a broader audience, and to teach students how to complete historic architecture documentation work. The first phase recorded all remaining buildings/structures of his work in the Kansas database with proper recognition to him as the architect. The second phase entails selecting one building to fully document as per Historic American Building Survey guidelines.

The architecture profession in the United States has largely consisted of white male professionals since the creation of the American Institute of Architects (AIA) in 1857. In the *AIA Membership Demographics Report 2022* it notes that just 26.2% of its membership is female. Only 2% of licensed architects are Black/African American and Black/African American women are just 0.2% of that total.[1]

Since there is a small percentage of practicing Black/African American architects, the representation of their work is very limited. For emerging architecture students, lack of representation in the work is unequal and recognition of Black/African American architects is challenging to find. There are three comprehensive resources used to document historic architecture of significance. The first is the National Register of Historic Places. Typically, buildings tend to be thought of as “historic” in the United States when they reach the fifty-year old mark. Buildings completed as recently as 1975 are eligible for listing in the National Register of Historic Places. The second resource is the Historic American Building Survey (HABS) which is a national database housed in the Library of Congress. The HABS program was begun in 1933 through a unique partnership of the National Parks Service (NPS), Library of Congress (LC), and the American Institute of Architects (AIA).[2] The third, which is specific to Kansas, is the Kansas Historic Resource Inventory (KHRI). The KHRI is both a searchable database and interactive map of Kansas to locate structures that have been surveyed, and those listed on the State and/or National Register of Historic Places. These three collections house the bulk of documentation and research of historic buildings accessible to all people interested in learning about the built environment.

Context

If a person knows the name of at least one American architect, it is likely Frank Llyod Wright. Located at 255 N. Roosevelt, Wichita, Kansas, Frank Lloyd Wright designed "Allen House" and was completed in 1918.[3] The house is large, 4000 square feet, and considered one of the last designed in the signature Prairie style made famous by the architect. The original owners of the house were prominent journalist and Statesman Henry J. Allen and his wife Elsie J. Nuzman Allen, who was active in local art organizations. The Allen's were referred to Frank Lloyd Wright by their close friend William Allen White of Emporia, Kansas. The house, no longer used as a residence since 1947, is now a museum. Though one of the only Frank Lloyd Wright houses in Kansas, the Allen House joins a plethora of house museums across the country celebrating the architecture of Frank Lloyd Wright.

The Allen House provides the prototypical image of what historic architecture "is". The preservation of this building also exemplifies the methodology of preservation as it has been traditionally practiced in the United States. Sites are recognized based on three areas of significance: architectural, historical, and cultural.[4] Structures only need one, but most have two or all three. The Allen House is considered significant architecturally since it was designed by Frank Lloyd Wright, and historically significant in relation to the prominent family who hired him.

The decisions to select these buildings for listing, or designation create the narrative of what "good" architecture looks like and what history is considered "significant" enough to preserve. The decisions to omit prominent Black/African American architects from listing or designation excludes their work from the history of architecture, and the narrative of those who inhabited the buildings and neighborhoods.

Located just 2.4 miles northwest of the Allen House, the Eubanks Residence modestly sits, unknown to any database of history or architecture. It is not listed on any historic register, there are no widely published photos of the house, and no crowds of folks awaiting docent tours. It is decidedly smaller than the Allan House, but its fine proportions and mid-century design are uncompromised.

The Eubanks Residence was designed by licensed Kansas architect Charles McAfee. McAfee was born in California in 1932, but moved to Wichita, Kansas as a child. The Eubanks Residence is one of the first buildings completed after his practice opened in Wichita in 1963. This project won the Kansas Chapter American Institute of Architects First Honor Award and the Federal Housing Administration First Honor Award both in 1964. To understand the value of this honor, the other winners of the Federal Housing award in 1964 included I.M. Pei, Mies van der Rohe, and Skidmore Owings and Merrill (SOM).[5]

Redlining

The disparity in the preservation of the Allen House and the Eubanks Residence is understood most visually by maps created in 1937. The implementation of the federal government's Home Owners' Loan Corporation between 1935 and 1940 was at the time a method to reflect "mortgage security" visualized by a color-coded map.[6] The highest grade being an "A" and lowest a "D" which were considered "hazardous". "Redlining" cities was a systematic disinvestment in neighborhoods specifically targeting Black/African American communities. The practice was outlawed with the passage of the 1968 Civil Right Act, but the impact is still very present.

For reference, the Allen House is in B-1 (right next to A-5) and the Area Description specifically states as "Favorable Influences" the area has "College Hill Park, good schools, churches, community center, restrictions".[7] The term "restrictions" is colloquial for covenants that prevented Black/African Americans from living in that area.

The Eubanks Residence is in the area noted as D-2. The construction of the home pre-dates the 1968 Civil Rights Act outlawing redlining. The "Area Description" for this location lists "none" for favorable influences and for "detrimental influences" lists "The heavy negro concentration of Wichita".[8] Most of the early architecture identified as designed by Charles McAfee is located within the "D" bounds of Wichita either prior to the 1968 Civil Rights Movement, or within a decade after.

PROJECT SCOPE OF WORK

Brief Biography Charles McAfee

Charles McAfee was born on December 25, 1932 in Los Angeles, California to Arthur J. McAfee, Sr. and Willie Anna McAfee. His mother was from Waxahachie, Texas.[9] McAfee's parents settled in Wichita, Kansas where they raised three children.[10] He graduated from East High School in Wichita. McAfee went to the University of Nebraska in Lincoln, Nebraska and played basketball on scholarship against the request of his mother.[11] His parents sent him to the University of Nebraska to escape racial discrimination in Wichita, Kansas, but McAfee encountered racism on the basketball court and in his architectural courses.[12] Before graduating in 1958, McAfee received a job offer from Paul Williams, a leading African American architect and another offer from a firm on the east coast. He then returned to Wichita and subsequently opened his own office later named Charles F. McAfee, Architects-Engineers-Planners.[13]

McAfee was a prolific architect in Wichita, Kansas from his firm onset of 1963. His projects ranged from single family houses to commercial buildings. Though prolific in Wichita, he was not designing larger buildings as noted by Jack Travis in 1993, "I know Charles McAfee and Don Stull are as gifted and as capable as any architect in this land, and yet not one high-rise building in this country has been designed by an African American architect."[14] McAfee was active within the architectural community. He was one of 45 charter members for the National Organization for Minority Architects (NOMA), and was awarded the prestigious Whitney Young Award from the American Institute of Architects (AIA) in 1999.[15]

Charles McAfee had three daughters with his wife. Two of his daughters, Cheryl and Charyl are architects and worked with their father beginning in 1980s and now reside outside of Kansas.

Documentation Scope

The project to document the work of Charles McAfee was driven by the need to record his buildings in an accessible database and allow for current and future scholars to have easy access to his work. Having students be a part of the research broadens their understanding of the work and teaches them how to properly document historic resources. The project was divided into two phases. The first summer (2022) was a reconnaissance survey of all the work in Wichita, Kansas completed prior to 1981 to be uploaded into the KHRI database. On the second summer (2023), one building was selected for complete drawing documentation.

Prior to survey work, the parameters of the survey had to be defined. It was determined that only the work in Wichita, Kansas would be surveyed based on that city being the home of the architect and having the largest concentration of his work. The timeline for inclusion of buildings was 1963-1980. These dates correspond to the beginning of McAfee's practice until his oldest daughter, Cheryl McAfee (the first female African American/Black licensed architect in the state of Kansas), joined the practice. Historic resources are typically included on the KHRI database only after they are fifty years old. Since the survey work of McAfee is planned to be an ongoing project, we included structures that do not meet the fifty-year age at this moment. We also had to locate the addresses for most of the buildings. The Kenneth Spencer Research Library has a "Kansas Collection" in which Charles

McAfee has a small folder with his portfolio and resumes. The portfolio has names, drawings, and descriptions of the work, but many had no addresses. Several properties were located by corresponding with Charles McAfee and by speaking with other property owners of known buildings.

Considerations for Student Inclusion

It was important that the documentation work included students. Experiential learning is an important part of architecture education.[16] This consideration came from recognizing architecture history books, and the typical survey courses at universities tend to deliver content based on accessibility to information.[17] In the Journal of Architectural Education article *The Canon and the Void: Gender, Race, and Architectural History Texts*, the authors analyzed textbooks covering architecture history from 1980 – 2004. In their conclusions, it is noted "The almost total exclusion of African American architects in the texts analyzed here poses new challenges to authors revising these works and to scholars writing future architectural history surveys. One hopes for greater coverage of African American architects and their contributions especially in future surveys of twentieth-century architecture and American architecture, since that is when their most solid body of work began to emerge." Teaching students how to do documentation and surveys would, in turn, give them the tools to continue this documentation work. Another aspect of importance was that the students would be learning "real life" skills which would be valuable to them from a professional development standpoint. It was also important that the students be paid for their work. This work was funded by the KU Racial Equity Fund Grant, and this allowed for hourly rates to be provided to the students.

Methodology Summer 2022

The work completed in summer of 2022 included two undergraduate students, Monet DeFreece and Brittany Perez. The KU Racial Equity Grant provided funding to pay them for their work and travel to Wichita, Kansas. Using the portfolio of work of Mr. McAfee as a guide, 11 buildings were identified as potential sites prior to starting the site visits. Each building was surveyed in person, one student would take photos while the other student filled out the KHRI database form. Then the students would switch roles for the next building. We met with some, but not all property owners. The property owners all received a mailing prior to the survey to let them know about the project and when we would be on site. Our outcome for the first phase was uploaded to the KHRI database by the students. We also identified several buildings that would be potential subjects for the HABS project to be completed summer 2023.

The 11 structures were surveyed included the following:

- Eubanks Residence, designed in the modern style and completed in 1963. Winner of the Kansas Chapter American Institute of Architects First Honor Award and the Federal Housing Administration First Honor Award both in 1964
- Jackson Mortuary, Wichita's longest running black-owned enterprise. Designed in the modern style and completed in 1965
- McAdams Park structures including the pool, picnic pavilion, and concessions structure. Designed in the brutalist style and completed in 1969. 1970 annual merit award, AIA, Kansas Chapter
- Wichita State University Ulrich Museum of Art, 1975 Annual Merit Award, AIA, Kansas Chapter 1975 Honorable Mention, Central States Regional Architectural Competition, St. Louis, MO
- Calvary Baptist Church, designed in the brutalist style
- Family Consultation Services designed in the modern style
- Mefsec Recreation Center (Lynette Woodard Recreation Center) designed in a modern brutalist style

- Peterson Elementary School designed in the brutalist style
- Mclean Elementary School designed in the brutalist style

Figure 1. Photograph of Jackson Mortuary building 6/2/22, photo by author.

Figure 2. Photograph of McAdams Park Concessions building 6/2/22, photo by author.

Figure 3. Photograph of Wichita State University Ulrich Museum of Art building exterior (left) and interior atrium (right) 6/2/22, photo by author.

Figure 4. Photograph of Calvary Baptist Church building 6/2/22, photo by author.

Methodology Summer 2023

2022 and 2023. Monet DeFreece and Brittany Perez were hired as Undergraduate Research Assistants for both summers, and Jonathan Wagner, a photography student, and Ifeloju Olusanya a PhD candidate in Architecture were hired for their services in summer 2023. We selected McAdams Park as the site to make measured drawings of one of McAfee's structures.

Parcels of for this park were acquired in 1901, 1941, 1946 and 1980.[18] This is a wooded park located near the downtown area, formerly referred to as McKinley Park, and renamed in 1966 to honor

Emerson McAdams, a former city policeman who served 27 years as director of McKinley Park.[19] This park is located across the street from Jackson Mortuary still within the formally redlined area of Wichita.

The park facilities were enhanced in 1968 due to the construction of a canal along the east edge of the park and the construction of the highway system over the canal. The new program included the concession structure with new baseball diamond, swimming pool with bathhouse facilities and the picnic shelter all design by Charles McAfee.

This is the pavilion or picnic structure in the park. We selected this for our documentation since it was about the right scale for us to draw it with the amount of time and students we had working on the project. This steel structure is in the modern style, and the columns match the ones at the Jackson mortuary and are emulated in the concrete columns of the concessions building.

The students made hand drawn notes at the site and then translated those drawings into Autodesk AutoCad drawings.

Figure 5. Photograph of McAdams Picnic building 6/2/22, photo by author.

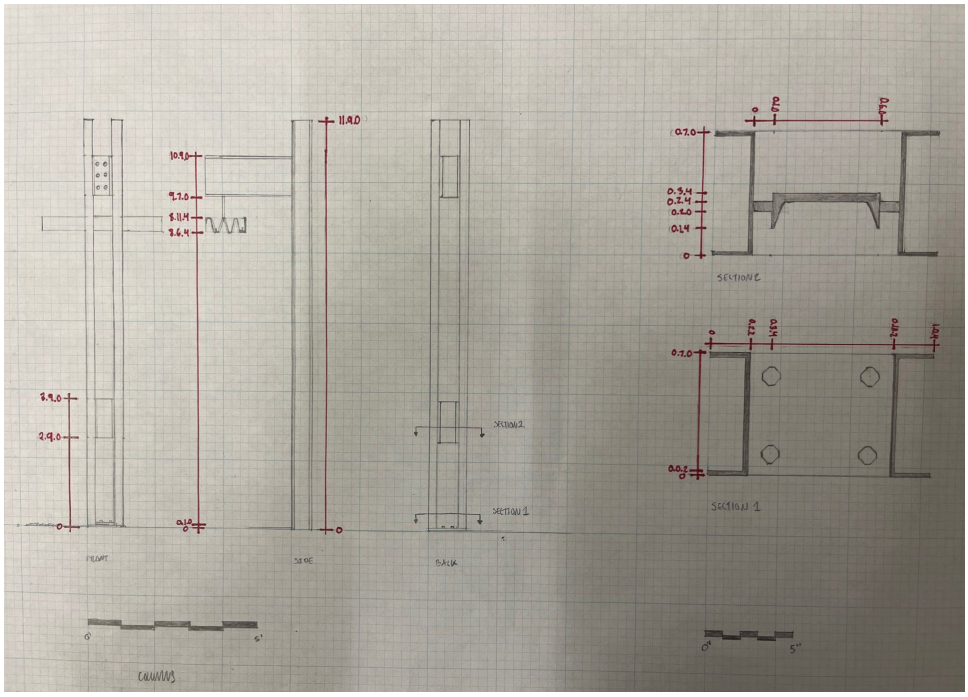

Figure 6. Photograph of McAdams Park Picnic building field drawing by Brittany Perez 5/30/23, photo by author.

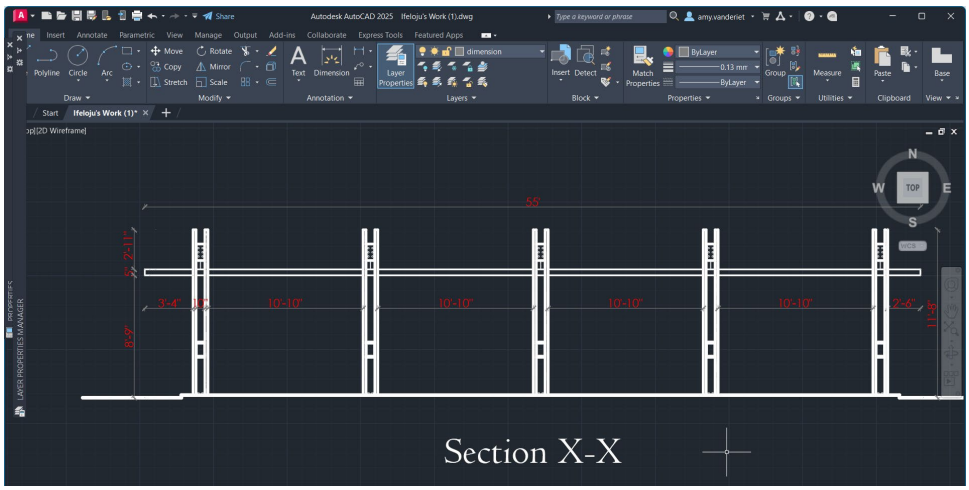

Figure 7. Photograph of McAdams Park Picnic building AutoCad drawing by Ifeloju Olusanya 2/14/24, screen shot by author.

Survey and Documentation Challenges

Survey and documentation of historic buildings has many inherent challenges. Since we are outside, weather can impact our ability to survey. The picnic area had been heavily used with trash and food debris spread about. We had to clean the area before we could take photos or measurements. We followed the HABS guidelines for survey,[20] and so were required to use large grid paper which was challenging to keep flat in the wind. Travel coordination and timing was also challenging to plan with student schedules, classes and other work obligations. Translating the hand drawn notes and sketches to AutoCad was also difficult. Most current architecture students utilize the Autodesk Revit program for drawings. AutoCad isn't currently taught at our school, so I had to teach them the program for

them to make the drawings. Jonathan Wagner, the photography student for the project, also faced some challenges with following the HABS photography guidelines.[21] These guidelines mandate large format photos which required him to obtain the necessary equipment. This type of photography is also not typically taught at our school, but fortunately Jonathan had taken the one elective offered of this style of photography.

CONCLUSION

The outcomes of this project ranged from incremental to national impact. An unexpected benefit of hiring students is the opportunity for me to provide mentorship and guidance outside of the classroom setting. Monet DeFreece continued her research and became a McNair Scholar which I was able to be her mentor for. I also specifically hired multiple students so that they could find peers interested in similar areas of study. Brittany, being a year older than Monet, also led a mentor role.

We were able to document 11 structures for the KHRI database and input that data. In doing so, we also rectified previous surveys which had some of the structures but listed the architect as "unknown". This was the first time that the KHRI database had structures included by a licensed Black architect. The picnic structure documentation was completed and is currently being formatted by Ifeloju Olusanya for submission to the Charles E. Peterson Prize which is organized under the National Park Service's Heritage Documentation Programs (HDP). This prize is meant to "…annually recognizes the best set of measured drawings prepared to HDP standards and donated to HDP by students".[22] Once the documentation is submitted, it will be the first from Kansas in the HABS inventory documenting the work of a licensed Black architect.

NOTES

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[10] McAfee, The HistoryMakers Digital Archive. Session 1, tape 1, story 6, Charles McAfee talks about his two siblings.
[11] McAfee, The HistoryMakers Digital Archive. Session 1, tape 2, story 4, Charles McAfee describes his parents' reaction to him playing basketball at the University of Nebraska in Lincoln, Nebraska.
[12] McAfee, The HistoryMakers Digital Archive. Session 1, tape 2, story 5, Charles McAfee talks about racial discrimination in his architecture class, pt. 1.
[13] McAfee, The HistoryMakers Digital Archive. Session 1, tape 2, story 7, Charles McAfee details the early years of his career.
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DESIGN RESEARCH | RESEARCH DESIGN: A NEW MODEL FOR EXPERIENTIAL LEARNING IN THE DESIGN DISCIPLINES

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INTRODUCTION

The history of internships as central and critical models for education in the design disciplines is long and predates the university milieu. While today's design education formats are appropriately multivalent, complex, and interdisciplinary, a new, experiential learning model that rethinks traditional 'practical experience' is in order – especially in the current context of virtual learning. The unique Design Research Internship Project (DRIP) is a curricular initiative designed to model a new, high-impact teaching practice for senior undergraduate students. Rooted in the rich tradition of practical internships in architectural education, DRIP depends on critical participation by partnering design practitioners; at the same time, it sets itself apart from customary internships by specifically engaging practice-based research in the professional milieu. Beginning from the presupposition that multifaceted research is intrinsic to everyday design practice, it looks to bridge academic knowledge with professional practice, and in so doing, defines for students models of design research that advance lessons from academic studios into multivalent research problems in live projects. Designed to provide students with a critical, hands-on educational experience almost entirely outside the classroom, DRIP calls on their developed skills and knowledge to undertake design research projects defined by host firms and informed by realities of professional practice. As an academic internship, DRIP asks whether it can expose students to architectural design as a form of scholarly research, position this work in the larger discipline, and in turn provide the rich community of design professionals resources to linger on research questions that can elevate their current, past, and future work. Examining case studies of applied research produced from this academic-professional partnership during the last three years, a strong argument for closing the gap between theory and practice emerges.

DRIP's PLACE

Context is critical. Specifically, the academic context, the professional context, and the disciplinary context of this program provide the necessary parameters for it to thrive as a truly hybrid teaching model. Unique across Canada, the pedagogical positioning of the University of Toronto's BA Architectural Studies program is what allows DRIP to define models of design research that use professional projects to advance lessons from design studios and course work into multivalent, and

sometimes interdisciplinary design research problems. Combined with the opportunity afforded by the concentration of some of the country's most recognized design practitioners at the University of Toronto's doorstep, DRIP finds itself in a new category within the long history of design internships. At a time when apprenticeship was the only form of educating an architect, there was no distinction between theory and practice. It was understood that in the act of doing one engaged in the art, science, and history of the discipline, while fully appreciating its political engagement and power. Specifically, in architectural education, scholars have explored alternate methods which include experiential learning, or 'learning by doing' as a way of developing understanding and making meaning. When internships are considered as part of a complex system of learning, design students recognize that "making sense of experience is not something detached from action, but rather something that is made in action."[1] Further, when this experience is embedded in the explicit practice of design as a form of scholarly research rather than 'practical project experience' the internship has the capacity to bridge academic knowledge and investigation with design practice and execution.

Pedagogical Context

Learning as an interactive process continues to be a significantly practised and studied aspect of architectural education. So much so that numerous professional and pre-professional programs across North America and Europe require some form of 'practical work experience' for degree completion. Much has been studied about the virtues of experiential learning at the undergraduate level, and more specifically how these might not only hold but expand in architecture education in particular. Research in this field also includes questions of effective preparedness for the profession, however most recently this scholarly work has included more precise questions around experiential, live learning styles in a time of virtual technology.

A common launching point in this study stems from Kolb's *Experiential Learning: Experience as the Source of Learning and Development* first published in 1984 which makes a case for 'concrete experience' as an essential part of a powerful education loop that includes 'active experimentation,' 'abstract conceptualization,' and 'reflective observation.'[2] The definition of internships in this work becomes interchangeable with 'concrete experience;' and, even if there is a broad range of interpretations/definitions of student internships, they are consistently considered a 'high-impact educational practice.'[3]

It is when experiential learning, as in the case of DRIP directly engages design as a form of scholarly research in the applied phases of a professional project, that a new model emerges. We link theory with practice and bridge the academic milieu with professional practice. Critical to this pursuit is an understanding that practice-based research leans heavily on graphic work, such as drawing, inherent in architectural production to produce knowledge "as a method of investigation, as a form of dissemination, and also as a focus of study."[4]

Academic Context

It has been difficult to find a program like DRIP in the North American context. Programs that share a few characteristics with this internship model are found inevitably at the graduate, professional degree level, such as those found at University of Miami, Clemson University, University of Minnesota, and University of Detroit Mercy. Most are designed as a segue into professional practice as a critical practice. The pedagogical positioning of the University of Toronto's BAAS program, rooted in the liberal arts milieu,[5] is the only one of its kind across Canada and it's where we find unique opportunity to not only bridge academic research with professional practice, but for students to gain hands-on experience with a practice-led research problem.

Further, the non-professional nature of this Architectural Studies program, affords its students' deeper indulgence in the conceptual and historical underpinnings of architecture, landscape architecture, and urban design disciplines without the burden of pre-professional requirements. At the same time, the opportunity for experiential learning seems critical for exposing and engaging these same students to how this knowledge and modes of inquiry are intrinsic to professional practice.

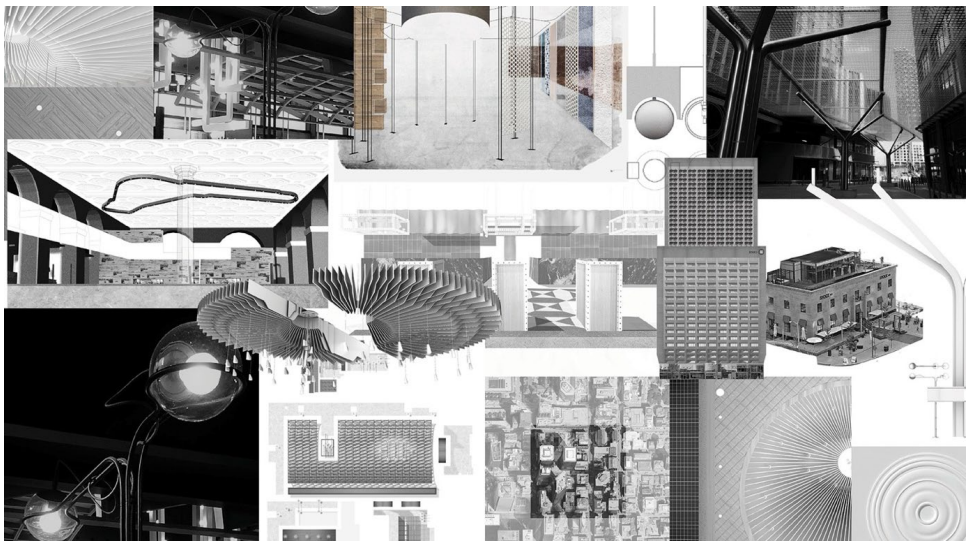

Figure 1. Collage of samples of student work produced in DRIP Pilot, 2021.

Professional Context

In 2020, the American Institute of Architects identified the need for architectural research that enhances the value of design and professional practice knowledge.[6] It has identified various areas of research that need investment and prioritization within architectural culture. The call for actions outlined the impacts of architectural research studies, including a better understanding the impact of architecture and the profession of architectural practice can have beyond buildings and includes the necessity of disseminating this exchange of findings within the profession. Two of the AIA Research Agenda's main call for actions are: "Prioritize research within the architecture core competencies and firm culture, starting in school and continuing in practice;" and,

"Continue and expand dissemination of research and promote exchange of findings, as well as methodologies and failures."[7] In 2014, the RIBA had gone further by defining design research in practice as pertaining to one of two categories: (1) research activity carried out specifically to inform or evaluate a building/project, for example during the client briefing process or POE (post occupancy evaluation;) and (2) a broader category of research that encompasses all the work done to gather, evaluate, interpret and share information in the course of the design and construction process. It further defines a research project as any research that is done by architects and others, in practice and academia, outside the scope of an architectural project that assumes one or more of these types.[8] A list of potential methods and modes of research that can be conducted within the framework of architectural, landscape, and urban design practices that the RIBA put forward[9] provide a guideline for defining details of each DRIP internship.(Figure 2)

Figure 2. Typologies of research in practice that guide defined DRIP internships.

DRIP's SHAPE

As an academic internship, DRIP selects, matches, and places students with partnering firms to undertake a defined design research project intrinsically linked to each host firm's ongoing professional work that calls upon students' academic skills and knowledge. In so doing, it sets itself apart from pre-professional and professional internship models that prioritize practical experience as a degree requirement. Critical to DRIP's format is the following:

01.

Designed to expose and engage undergraduate students in applied design research that is intrinsic to design practice, and to give this work academic consideration.

02.

An academic internship where student interns receive a full course credit and are compensated directly by their host firm in the form of a lump sum stipend.

03.

The format depends on participation of partnering practitioners that define a design research project to be undertaken by their hired intern(s.)

04.

The format also depends on a simultaneous academic component in the form of a weekly seminar that positions for students models of design research in the larger discipline.

05.

This seminar also guides each intern's production of a research record in the form of a final DRIP Document, submitted to both the Faculty and their host firm.

06.

Student interns are covered by the University insurance policy while working off campus and agree to a non-disclosure agreement and code of conduct with the University.

07.

In turn, partnering practitioners enter into an agreement with the University's Governing Council to acknowledge the parameters of responsibility for the internship.

Virtually DRIP _ Pilot Project

In 2021, while still pivoting to largely remote learning due to restrictions imposed by the pandemic, I launched an intensive internship with twelve BAAS students at my practice, Giannone Petricone Architects in Toronto. The research question: *Can we find inherent meaning in designed objects as inseparable from the specifics of their context?* In other words, by removing it from the specifics of its context, it loses meaning. Students worked as a group and individually to propose the framework and first entries for an Atlas of Light Operations. (Figure 1 & 3) The DRIP Pilot was instrumental in not only becoming familiar with the talents and skills of the Daniels Faculty's undergraduate students, but also in creating a visual manifestation of this capacity to present to potential practitioners.

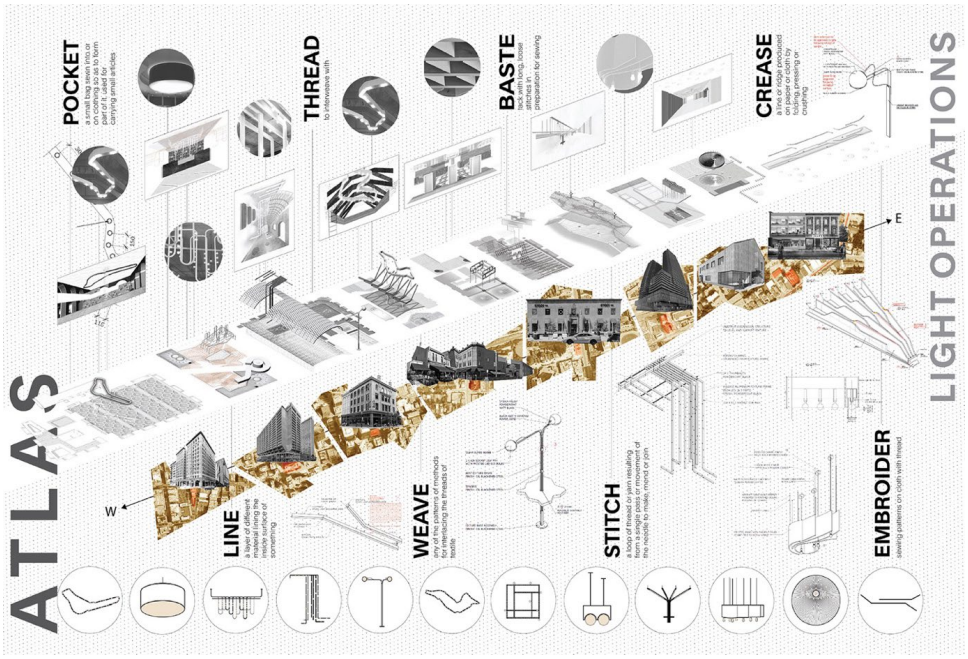

Figure 3. Table of Contents, Atlas of Light Operations produced by DRIP Pilot students, Christina Lin, Christopher Law, Danah Owaida, Janet Ma, Jiachen Du, Kathryna Cuizon, Lhanzi Gyaltsan, Maya Freeman, Mega So, Negar Mashoof, Sally Chiu, Sarah Janelle, in 2021 under the direction of Pina Petricone. As a group, students conceived of the Atlas' organization and strategic system of representation. Further, each student unpacked and re-presented their assigned light fixture accordingly, in 2D and 3D drawings.

Partnering Practitioners _ Defining Design Research

DRIP's hands-on, collaborative experience is directed by a design research project defined to contribute to ongoing professional projects of inquiry. It is also dictated by a six-week timeline, the duration of the Design Research Internship. The list of partnering firms is curated for diversity of practice models, and value-driven enterprise which inevitably leads to a robust range of research questions, methods, and parameters within the context of each practice. As elaborated by Ray Lucas, most DRIP design research projects are rooted in the idea that "architectural research uses the tools of architectural production as a means for describing, theorizing and explaining … bringing the results of research closer to the design process."[10] DRIP presents to potential partners a questionnaire to aid in the definition of the internship project which inherently allows for both 'methodology-led' research (begins with an established research method) and 'theory-led' research (begins with a framework of understanding.)[11] Finally, DRIP is designed to bring value in the form of architectural research and

academic knowledge to practice, and in-turn expose senior Architectural Studies students to the critical role design research can play in architectural challenges and opportunities of our time.

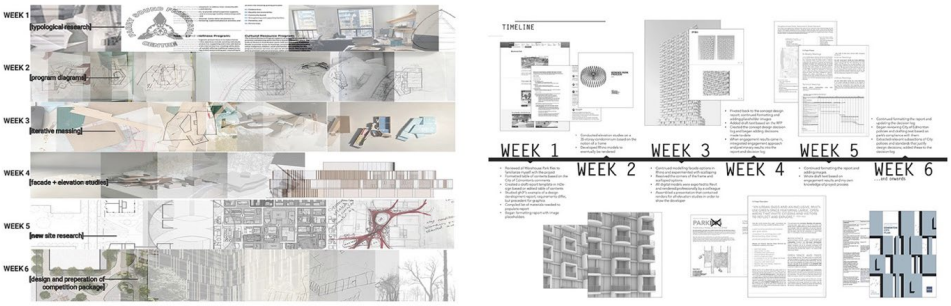

Figure 4. Left: DRIP Timeline by Ariel Clipperton, 2023 Teeple Architects DRIP Intern. This internship created content, research, and graphic design for the Concept Design Report of Warehouse Park in Edmonton, Alberta. Right: DRIP Timeline by Orly Sacke, 2022 gh3 Architects DRIP Intern. This internship developed 3D to 2D typology research through physical iterative modeling as well as collaborations with indigenous designers and community members to develop responsive formal and programmatic design options.*

Academic Seminar

The Academic Seminar is a critical component of the Design Research Internship Project to close the feedback loop necessary for students to position their internship work among multivalent models of design research, among precedents from the global context of scholarship and of practice, and among the pursuits and portfolio of their host firm. It also allows them to speculate on the broader societal impact of their work. The seminar environment, for example, gives students the opportunity to collaborate, exchange ideas and share findings with peers during a 'positioning with precedents' exercise.

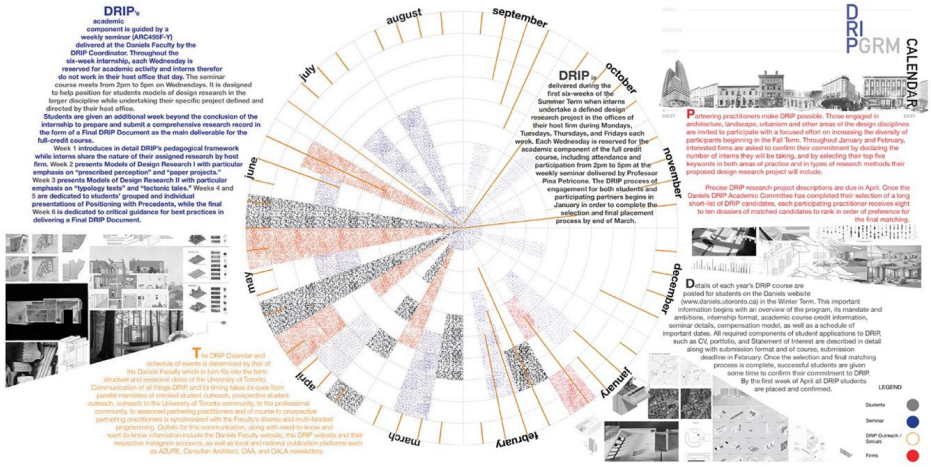

Figure 5. DRIP Yearly Calendar graphically presented by month and colour coded for student activities, for seminar activities, for communications activities, and for practitioner activities.

DRIP's OUTCOME

DRIP embraces the opportunity to educate senior BAAS students not only with academic and technical skills but also with an understanding of how design research is at the core of value-driven practice. This work also helps to expose students to the reaches of design as a 'thinking by doing' enterprise that is not devoid of cultural, social, and economic responsibility. Examining the first three years of DRIP delivery, we see the clear emergence of research models that can be defined by a primary research method, even if each is multivalent in their tools of investigation. It is difficult to name all here, and equally difficult to elaborate each, however the following eight prominent design research typologies offer an telling cross-section of DRIP's 65 internships so far.

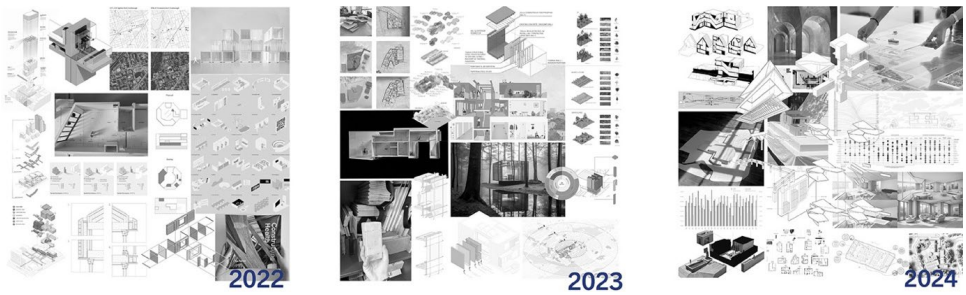

Figure 6. Collage of samples of student work produced in DRIP 2022, DRIP 2023, and DRIP 2024.

Typological Diagramming

Example: (Figure 7) The construction details of mass timber buildings that comprise WZMH's project portfolio were critically documented through diagrammatic methods. Both new and existing structures were represented using detail codification methods with an aim to highlight unique innovations and aspects of each project, making the subtleties of timber building methods discernable and understandable to a wider audience through exploded axonometric diagrams.

Archival Documentation

Example: (Figure 7) Design concepts, research, and existing representation techniques were analysed and documented for six Batay-Csorba residential projects. Completing one case study per week of the six-week internship, the intern created a consistent series of unfolding diagrams for each house adapted to the typological nature of each case.

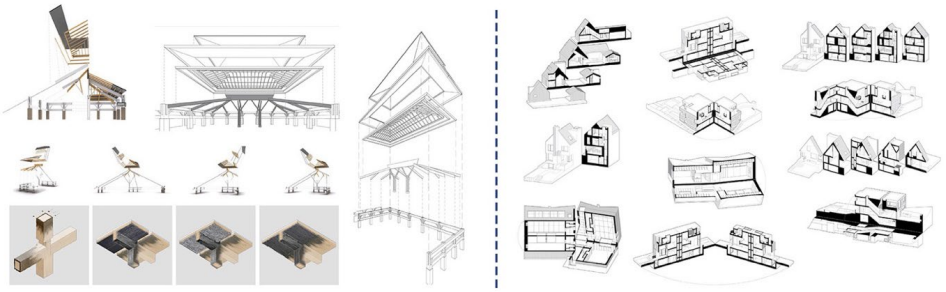

Figure 7. Left: Example of Typological Diagramming. WZMH Architects DRIP 2024 Intern Alyssa Tao develops a resource for the firm's approach to building with timber. Right: Example of Archival Documentation. Batay-Csorba Architects DRIP 2024 Intern Timothy Fung documents a collection of post- occupancy residential projects.

Site Analysis

Example: (Figure 8) This work is driven by a core interest in connecting heritage issues to wider considerations of urban design, and to a broader set of cultural values that provide perspective to ERA's work. The overall site analysis of Allen Gardens traced the sun and shadow qualities along existing paths, while tracing its urban and historical evolution of development including planting and precedents.

Testing Tools

Example: (Figure 8) This research explores, compares, and tests different AI-led software options for refinement of processes, and develops an integrated methodology that complements the firm's existing 3D, VR, and documentation workflows. The work resulted in a comprehensive, illustrated document designed to streamline workflow efficiency through advanced process automation, and integrate new AI technologies into the fabric of architectural practice.

Figure 8. Left: Example of Site Analysis. ERA Architects DRIP 2023 Intern Thea Freer collects, organizes, and evaluates historical and present-day attributes of Allan Gardens. Right: Example of Testing Tools. Lebel & Bouliane Architects DRIP 2024 Intern Ruijie Liu creates a workflow tool kit which compares the strengths and attributes of a range of AI platforms.

Critical Cataloguing

Example: (Figure 9) This DRIP project began with the two main questions concerning how we learn and how a designed environment can respond to/participate in/not hinder those best practices. Interesting, unique built examples within each typological reference group were used to identify 45 learning space typologies to create a catalogue of best learning space typologies. Critical to this collection are the hybridized devices that propose an innovative model.

Proof Of Concept _Modeling

Example: (Figure 9) This work developed new model-making techniques that balance abstraction, detail, and conceptual essence of the design using the following methodologies and processes:
01: Deployment of iterative design methods with physical prototyping and digital modeling.
02: Testing and documentation of materials and construction assemblies.
03: Active development of precedent research in the context of production.
04: Conceptual drawing based on architecture norms.

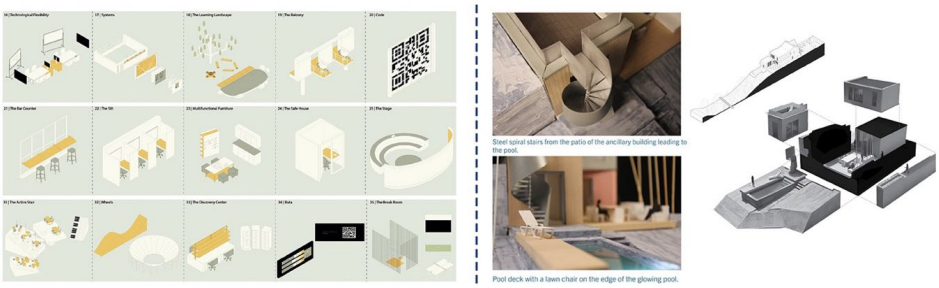

Figure 9. Left: Example of Critical Cataloguing. ZAS Architects DRIP 2022 Intern John Wu constructs a catalogue of effective learning spaces for the firm's innovative educational projects. Right: Example of Proof of Concept _Modeling. Denegri Bessai Architects DRIP 2024 Intern Kaede Sato developed model-making techniques that tested spatial arrangements in ongoing residential projects.

Historical Tracing

Example: (Figure 10) This work investigates and documents the heritage of early under-documented Black churches located within the borders of the Ward, a former neighbourhood in downtown Toronto. Via an interactive site model, the project also explores methods to deliver heritage research in a pedagogically accessible way, challenging the inaccessible format and language of text-based reports in which heritage research is often presented.

Iterative Tracing _Rendering

Example: (Figure 10) This internship developed visualization techniques to serve the iterative design process of a sports complex as a comparative devise to aid in design decisions. This work of iteration, annotation, collaboration, and archiving was developed in parallel to physical modelling in the studio which together continued to inform the design beyond this initial research.

Figure 10. Left: Example of Historical Tracing. ERA Architects DRIP 2024 Intern Camilla Hoang traces lost heritage of seven,19th Century Black churches via an interactive site model, illustrative diagrams, and curated images. Right: example of Iterative Tracing _Rendering. Williamson Williamson Architects DRIP 2023 Intern Adrian Yu generates real time renders to fuel a collaborative, iterative design process.

CONCLUSION

DRIP acknowledges the recent development of design research in the arts as an instrument to connect architectural practice and education[12] and thrives at the intersection of learning, research and practice. The speculation that we can close the gap between theory and practice for Architectural Studies students via an academic internship that engages practice-led research projects with acquired knowledge and skills, depends on the following understandings.

01.

Practice-based research utilizes the typical means of architectural production such as drawing, modelling, diagramming, mapping and visualization to produce knowledge and outcomes in response to research inquiries. When students are invited to engage design as a form of scholarly research within the applied phases of a professional project, learning goes beyond the technical, and beyond the technique.

02.

Design research is a core competency that begins to develop at the undergraduate level, unburdened by pre-professional requirements. Students learn that design is a form of thinking.

03.

Inherent to design practice is critical inquiry that assumes a range of research methods customized for the advancement of projects, controlling their impact on the world, and the dissemination and exchange of knowledge. Internships with predefined practice-led objectives allows consideration beyond the design project itself.

04.

Closing the loop in the academic milieu is essential. The simultaneous positioning of experiential learnings in the larger disciplinary and scholarly context is crucial for the exercise of tethering for students, theory with practice.

NOTES

[1] Lara Mackintosh, "Learning to Change Together," *The International Journal of Arts Education* 8, no. 3 (2014): 57–70, https://doi.org/10.18848/2326-9944/cgp/v08i03/36168, 57-70.
[2] David A. Kolb, *Experimental Learning: Experience as the Source of Learning and Development Second Edition* (New Jersey: Pearson Education Inc., 2014), 33.
[3] George D. Kuh and Carol Geary Schneider, *High-Impact Educational Practices: What They Are, Who Has Access to Them, and Why They Matter* (Washington, DC: Association of American Colleges and Universities, 2008), 11.
[4] Ray Lucas, *Research Methods for Architecture* (London: Laurence King Publishing, 2016), 176.
[5] "Bachelor of Arts, Architectural Studies," Daniels, accessed March 14, 2025, https://www.daniels.utoronto.ca/programs/undergraduate/bachelor-arts-architectural-studies.
[6] "AIA Architectural Research Agenda." The American Institute of Architects AIA. Accessed December 10, 2022. https://content.aia.org/sites/default/files/2019-05/ AIA_Research_Agenda_2019-2020.pdf.
[7] "AIA Architectural Research Agenda." The American Institute of Architects AIA. Accessed December 10, 2022. https://content.aia.org/sites/default/files/2019-05/ AIA_Research_Agenda_2019-2020.pdf.
[8] "Architects and Research-Based Knowledge: A Literature Review" Royal Institute of British Architects RIBA 2014. Pdf.
[9] This comprehensive list of research methods conducted in practice include: *Primary Research, Data Collection, Ethnographic Research, Mapping Data, Literature Review, Exhibition, Workshops, Digital Representations, Publication of Research, Architectural Writing, Photo Documentation, Archival Research, Typological Research, Precedent Study, Prototyping, Material Research, Diagramming, Rendering, Drawing, Digital Modeling, Physical Modeling, Computational Design Research, Interdisciplinary Research, Construction Research, Schedule Analysis, Technology/Software Research, Post Occupancy Evaluations, Sustainability Analysis.* from: "Architects and Research-Based Knowledge: A Literature Review" Royal Institute of British Architects RIBA 2014. Pdf; "Research in Practice Guide" Royal Institute of British Architects RIBA 2013. Pdf.
[10] Ray Lucas, *Research Methods for Architecture* (London: Laurence King Publishing, 2016), 175.
[11] Ray Lucas, *Research Methods for Architecture* (London: Laurence King Publishing, 2016), 11-14.
[12] Ayse Zeynep Aydemir and Sam Jacoby, "'Design Research and a Shift in Architectural Education and Practice,'" *EAAE-ARCC 2nd VALENCIA INTERNATIONAL BIENNAL OF RESEARC IN ARCHITECTURE* 2 (2020): 1426–36, 1431.; Halina Dunin-Woyseth and Fredrik Nilsson, *Design Innovation for the Built Environment: Research by Design and the Renovation of Practice* Michael U. Hensel ed. (Abingdon, Oxon: Routledge, 2012), 38-40.

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RADICALLY AUTHENTIC: HOW FIELDWORK REDEFINES DESIGN EDUCATION

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INTRODUCTION

This thought experiment examines fieldwork as a counterpart to conventional landscape architectural design education that focuses on hypothetical proposals. Rather, I propose a hyper real, a hyper local, and a hyper material approach to learning. Fieldwork, as creating a transformed reality, foregrounds context, people and process. I will be outlining contemporary learning objectives and experiential learning theory, and pair that with student learning through three built projects.

Fieldwork in academia, bridges creative research and professional expertise. However, in North American academia, fieldwork, as actualized projects, takes on a more difficult role. It is neither conceived of as pure academic research, nor as professional practice and dissemination of project findings is often absent in academic writing. I argue here that fieldwork is a) creative research and b) is fulfills state of the art learning objectives. I have ventured into other ways to disseminate research findings: through lectures and conferences, workshops, multi-generational learning, community engagement, and community service and found that fieldwork is dissemination of knowledge.

Fieldwork as pedagogy transcends speculative realms,[1] emphasizing the art of making and realization. By engaging stakeholders, fieldwork–as design research–becomes a mode of dissemination, merging reality with imagination through practical application. This approach fosters strong links between academia and the external world. Field studies also highlight the significance of engaging with specific sites, contrasting the transient nature of installations with the concept of permanence. Embracing interdisciplinarity, in-situ exploration incorporates multi-age learning under academic leadership, using engaged production to understand context. Installations and workshops conducted at venues like the Cincinnati Contemporary Art Center and collaborations with faith-based organizations spaces exemplify this approach, leading to the dissolution of traditional pedagogical structures.

Fieldwork cuts across various disciplines, advocating for inclusive pedagogy and the use of inverted classrooms to enhance student agency. It critically assesses traditional educational paradigms, promoting critical thinking and diverse modes of delivery. By exploring how we conceptualize school, fieldwork as research aims to provide a deeper understanding of emerging, evolving, and established educational philosophies. It emphasizes inclusive pedagogy, critical thinking in teaching and learning, and representation in creative pedagogy, particularly within the arts, humanities, and design. The goal is to redefine educational practices and foster a more integrated and dynamic learning environment.

Context

The learning and research environment in landscape architecture in the United States has changed since the COVID-19 pandemic of 2020. This change corresponds with a moving away from a modernist approach toward an understanding of landscapes as influential actors in the climate change discourse. Landscapes are understood as dynamic environments with attention to ecology, equity, community, and labor. This shift coincides with a more inclusive approach to admission practices, program curricula, and expanding the traditional focus on Western European and North American literature and landscapes. Pedagogical strategies of inclusive learning, engaged learning, and interdisciplinarity are now starting to be integrated in program curricula. As faculty conduct research, courses and research topics coincide and cannot be understood as separate. Aspects of fieldwork have historically been part of research and education in the United States,[2] but fieldwork as the construction of designed landscapes less so.[3] In design education, fieldwork is a reality-based alternative to speculative studio- and drawing-based learning.[4] Artificial Intelligence can no longer be separated from the learning process and will be integrated in all aspects of life, blurring boundaries between the assisted, the synthetic, and the real. However, fieldwork as 'project making' is inherently authentic; influenced by real-world parameters of materials, construction and labor, fieldwork is by nature original.

LITERATURE REVIEW

Bloom's taxonomy of 1956 provides a helpful sequence in studio and seminar-based learning and remains relevant today. The 2010 addition of creativity topping the pyramid, highlights the importance of creativity as the end goal. Creation, as the production of new or original work, includes active verbs of design, assemble, construct, conjecture, develop, formulate, author, investigate; all verbs that are related to fieldwork. Creating built projects requires the imagination of scenarios, material applications, assembly methods, process, collaboration structures, and problem solving. Bloom's taxonomy is helpful in students' learning processes, and equally so, in the process of conceiving and developing ideas that lead to construction. Bloom's taxonomy provides an educational framework currently promoted by centers of higher education, such as The Institute for the Advancement of Higher Education at Vanderbilt University,[5] Cornell University's Center for Teaching and Learning,[6] and The Ohio State University Drake Institute of Teaching and Learning.[7] Bloom's taxonomy leads in the learning process to a scaffolded approach in course sequence and assignments where smaller exercises build toward greater complexity.[8] This is a helpful in experimental fieldwork because a constructed environment requires material knowledge, out-of-the-box thinking, process, and collaboration. Therefore, fieldwork doesn't stand alone; it can only be built upon a knowledge foundation as the base for successful creative production.

The foundational text of experiential learning theory, as developed by Kolb in 1984,[9] underpins engaged and student-centered learning[10] that is a fundamental to current educational learning methods. Despite it being published forty years ago, the content of this text is remarkably recognizable and relevant; not only from the perspective of engaged learning and pedagogy but also informing the process of making landscapes. Fundamental to this theory is the notion of engaging in process that integrate fluctuating external influences and project requirements. "Ideas are not fixed and immutable elements of thought but are formed and re-formed through experience."[11] Similarly, in real-world applications, process is fundamental to innovative project outcomes and requires fully engaging in the process that leads toward a physical manifestation of an idea.

1.	Learning is best conceived as a process, not in terms of outcomes
2.	Learning is a continuous process grounded in experience
3.	The process of learning requires the resolution of conflicts between dialectically opposed modes of adaptation to the world
4.	Learning is a holistic process of adaptation to the world
5.	Learning involves transactions between the person and the environment
6.	Learning is the process of creating knowledge

Figure 1. Kolb's Learning Characteristics

The following three case studies in material research in landscape architecture establish correlations between Kolb's experiential learning theory and fieldwork. While each project can be evaluated through all of Kolb's six characteristics (Fig. 1), specific learning characteristics are paired with each project. Highschool, undergraduate and graduate students are involved in these projects

Tektōn (after Zaha, after Malevich)

Tektōn is the creation of rammed earth sculptures exhibited at the Contemporary Arts Center (CAC) in Cincinnati, Ohio from September 2023 to January 2024 (Fig. 2). This collaboration with Abu Dhabi-based artist Rand Abdul Jabbar was part of *A Permanent Nostalgia for Departure: A Rehearsal on Legacy with Zaha Hadid*, an exhibition celebrating the 20th anniversary of the building. Material research, a cost estimate, working methods and assembly processes were developed over the summer of 2023 prior to the start of the fall semester. The detailing, construction process, and labor was further organized with students in the context of a design studio that experimented with material qualities in the lived environment. The execution of this project occurred with graduate students in landscape architecture at the Ohio State University's Knowlton School in Columbus and in collaboration with students at the University of Cincinnati's College of Design Architecture Art and Planning program, thus expanding collaboration, engaged learning and dissemination of knowledge.

Tektōn is paired with Kolb's first and second characteristics: "learning is best conceived as a process, not in terms of outcomes,"[12] and "learning is a continuous process grounded in experience."[13] Complex design and material research led to a scaffolded method embedded in the learning process consisted of many components: material research: clay; design and structural research through model making (Fig. 3); formwork research: materials, construction technique, assembly process, cost; testing: iterative mockups of rammed earth mixtures; material processes: grinding and mixing (Fig. 5); spatial control: dust protection; design layout; shipping constraints: constructing formwork at Knowlton and shipping to Cincinnati; process of assembling the formwork; construction process of compaction/ramming; workflow: organizing mixing stations, tasks, and sequence; space organization: work in the tight space of the loading dock and gallery; compaction and layering; coordination and teamwork; reversed process of unpacking and unveiling.[14] These processes occurred in the context of communication with the artist, exhibition curator, CAC director and staff, the Zaha Hadid Foundation in London, and stakeholders at the University of Cincinnati, and Ohio state University across three continents and five time zones–highlighting the social-material complexity of this project.[15]

To facilitate high-impact learning, students were offered leadership in certain tasks and students undertook tasks that they felt comfortable with. Based on prior experience with woodwork, one student was confident in taking the lead in designing and constructing the complex wooden structures–the formwork-which would receive the clay-sand-water mixture. These boxes were complex, needing to withstand the outward forces of ramming, while guaranteeing a smooth interior after dismantling, further complicated by the construction in Columbus and shipping parameters to

Cincinnati (Fig. 3, 4, and 5). Therefore, the design was a reversed process, starting from imagining how the boxes would be unpacked, and thus needed to be constructed. Under the team lead, two other students engaged in that process, and through continuous communication, they made collective decisions and adjustments. Their ability and willingness to listen to each other and respect each other's contribution to the discussion was a good example of collaboration and communication. Throughout the process, students remained alert in adjusting the process to real-world spatial and time constraints.

Students requested that the remainder of the studio was dedicated to rammed earth techniques. Some international students were familiar with rammed earth techniques and were eager to continue this experience in studio. The exchange of knowledge about carbon footprints, local use of materials in construction practices, and this project occurred also with other communities. A lecture at the University of Cincinnati, and presentations to elementary school students and Cincinnati visitors at the CAC, combined with hands-on workshops on rammed earth technologies broadened dissemination. Therefore, the process of learning and the exchange of knowledge becomes multi-dimensional and multi-generational.

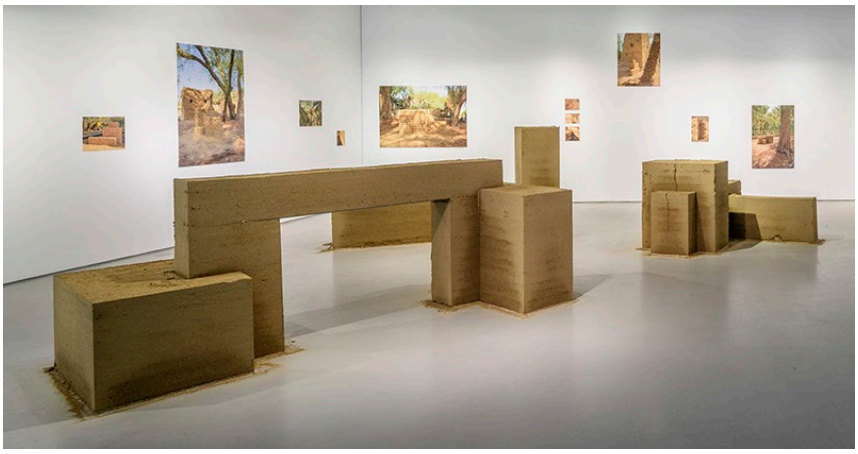

Figure 2. Exhibition view of Tektōn (after Zaha, after Malevich)

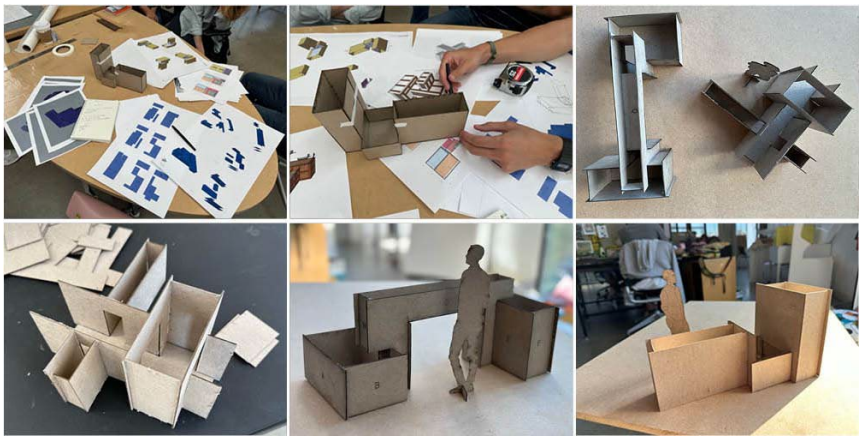

Figure 3. Scaffolded learning: design research on formwork

Figure 4. Formwork construction process

Figure 5. Grinding clay in the loading dock; mixing station and installation process in the gallery

Scarlet Jungles

Kolb's third characteristic of the process of learning requires "the resolution of conflicts between dialectically opposed modes of adaptation to the world."[16] The case study Scarlet Jungles outlines different ways of how students are engaged in conflict resolution while establishing and engaging with this landscape. Scarlet Jungles is an experimental forest plot researching design and experiential parameters of seedling trees.[17] This research diversifies much needed urban green infrastructures and urban forestry practices. Scarlet Jungles is located on The University of Ohio's Waterman Farm. As a dynamic and iterative design practice, students are involved in all aspects of its development and care: they participate in site location, site design, planting, site and plant care, measuring, documentation, and representation; these hands-on activities are integrated in a yearly recurring seminar with the same name (Fig. 6). Scarlet Jungles is used in other courses for site drawing and analysis and has become a precedent for green infrastructure projects in Central Ohio. The objective of the seminar is to familiarize students with the creative and dynamic aspects of urban forestation practices (Fig. 7). In 2018, this was the first course offered at the Knowlton School where students have a voice and engagement in the production of a designed landscape; its recurrence as a course and continued enrollment is a measure of appreciated by students and faculty.

This course is offered during the fall semester with classroom lectures and discussions, and exterior fieldwork and field trips to nurseries and forest production sites. But during the covid pandemic, when courses were cancelled or taught online, Scarlet Jungles became a pedagogical refuge. Because it had space that allowed to maintain six feet distances, it could be used as an outdoor classroom. The design of the landscape incorporated "circle rooms;" open spaces that could be used in various ways, and one of these rooms acted as a classroom, made possible by log seats provided by farm management (Fig. 8). Subsequent years continued this appreciated method of teaching all classes outside and at Scarlet

Jungles, and, through word of mouth, more students wished to enroll than seats offered. Its success was further measured through Student Evaluation of Instruction.

An ongoing predicament is focused on the meaning of production and the undervalued role of environmental research over agricultural research. At the core of conflicts lie differences in what pertains to agricultural and environmental research; these conceived notions of priority research have spatial and material consequences. From an aesthetic and pragmatic perspective, the farm uses landscape fabric to suppress weeds in their vegetable production areas. Because its location near an artery, the farm required that weed suppressing fabric be used at Scarlet Jungles; as "weeds" would not be an appropriate sight from the road. Students consider the spontaneous herbaceous ground cover part of the ecological system of the forest plot, but fabric was installed, covered with mulch, in which the seedling trees then were planted.

The Waterman Agricultural and Natural Resources Laboratory fosters research on the future of food, agriculture, and the environment, and "advancements at Waterman promise to unlock a more sustainable future for our food systems and natural resources." [18] Its resources and location near campus make this a unique space for this research as it is easily accessible by students. Students and faculty with the farm manager searched for spaces on the 300-acre farm where this forest could be established. Although the experimental forest objective adheres to Waterman's environmental goal, farm leadership considered that it would take space away from agricultural production, so it was challenging to select a plot of land for this purpose. The solution was to select a space bordering a stream so that the forest plot became a riparian buffer, capturing agricultural runoffs before entering the stream. A condition of establishing this research was to formally agree that the trees would be removed if farm direction deemed other uses. Students were part of these negotiations.

A few years later, a new director requested a meeting to present this research. Students were an integral part of this discussion where it was argued that we consider moving the forest to another, "more appropriate," site. Shortly after, the director's attention was dedicated to expanding the agricultural buildings, so moving Scarlet Jungles was no longer a priority. As Scarlet Jungles was created with one-year-old seedling trees, the trees were small when planted, but as each year went by, the trees grew, and some are now 18' tall, making moving the forest more challenging, both physically and politically, and which will certainly be faced with resistance by students and school leadership.

Figure 6. Planting and measuring of Scarlet Jungles

Figure 7. Spatial, material, and seasonal qualities

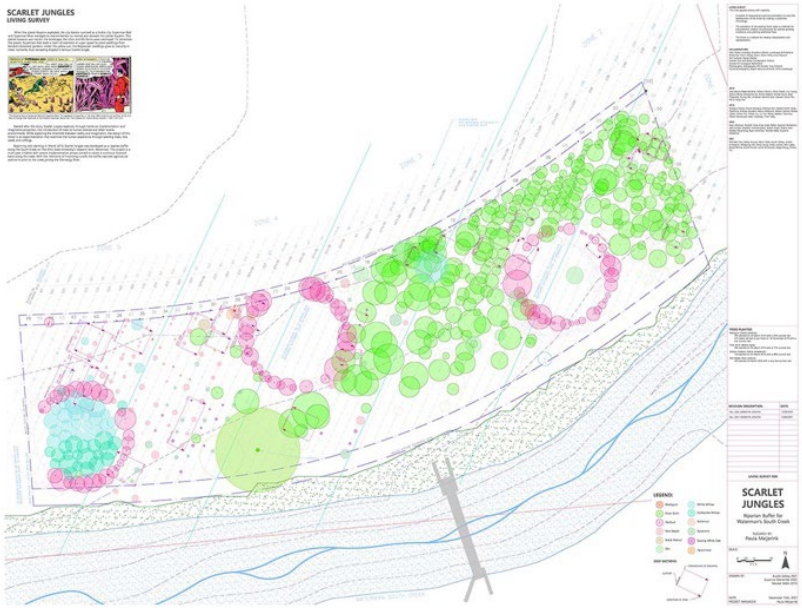

Figure 8. Designed forested landscape

Trees for All People

The case study Trees for All People is paired with Kolb's fourth, fifth, and sixth characteristics: "learning is a holistic process of adaptation to the world"[19], "learning involves transactions between the person and the environment"[20], and "learning is the process of creating knowledge."[21] Trees for All People underscores the interface between community engagement around equity, fieldwork, and learning.

Trees for All People is a collaborative program focused on community engagement that examines green infrastructures and urban forestry practices from the perspective of equity. It collaborates with municipal, non-profit, and faith-based organizations, and is integrated in design studios at the undergraduate and graduate level in landscape architecture. Recent outreach efforts are with high school students as community service. Research, design, community engagement, knowledge sharing and knowledge building is embedded in its collaborative structure (Fig. 9).

Kolb's "adaptation to the world" correlates here with examining the relation between urban green infrastructures and demographics and distinctions in urban tree canopy across cities in the United States that affect people in formerly redlined neighborhoods. Trees for All People develops local projects with the underprivileged community of the Columbus Southside therefore directly intervening in the uneven distribution of trees that affect the health and wellbeing of its residents. Its community engagement places an emphasis on awareness and resilience. Trees for All People's projects are direct transactions between people and the lived environment; these take the form of student-resident interactions; engagements with residents on a personal level through direct communication, interviews, presentations, and planting (Fig. 10). Kolb's notion of holistic learning is conceived of as learning embedded in a collaborative structure where students engage with residents, church communities, Columbus Parks and Recreation leadership, and non-profit organization Green Columbus.

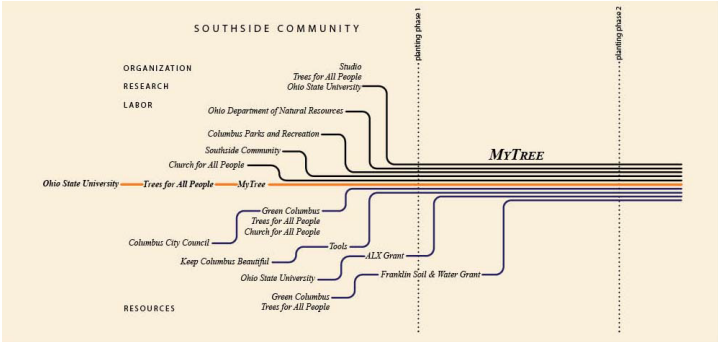

Figure 9. Organizational structure and stakeholders

Figure 10. Community members and students collaborate with residents

CONCLUSION

Fieldwork is authentic. As research and as learning, no two types of fieldwork are ever the same. The engagement with stakeholders, site and material parameters, and cultural perceptions form an array of contextual conditions that are unique to any project and leads to complex learning environments and high impact learning that prepare students for their future as designers.

Fieldwork is dissemination. Engaging in fieldwork that leads to a transformed reality, requires collaboration with varying stakeholders, and in this exchange, knowledge is advanced and shared. Students are engaged stakeholders in this ensemble; so are residents, community partners, municipal officials, and university staff and faculty. Therefore, fieldwork is the production and dissemination of knowledge.

NOTES

[1] The values of projective design are discussed in Chapter 12: Elen M. Deming and Simon Swaffield. *Landscape Architecture Research. Inquiry, Strategy, Design*. (Hoboken, New Jersey: John Wiley & Sons, 2011), 205-222
[2] Deming and Swaffield, 115
[3] Deming and Swaffield, 119
[4] Deming and Swaffield, 205
[5] "Bloom's Taxonomy," Vanderbilt University, The Institute for the Advancement of Higher Education (AdvancED), accessed February 27, 2025. https://www.vanderbilt.edu/advanced-institute/ and https://cft.vanderbilt.edu/wp-content/uploads/sites/59/Blooms-Taxonomy.pdf
[6] "Bloom's Taxonomy," Cornell University, Center for Teaching Innovation, accessed February 27, 2025. https://teaching.cornell.edu/resource/blooms-taxonomy
[7] "Bloom's Taxonomy," The Ohio State University Michael V. Drake Institute for Teaching and Learning, accessed January 26, 2025. https://drakeinstitute.osu.edu
and https://teaching.resources.osu.edu/glossary/term/blooms-taxonomy-0 0
[8] The "Backward Design" strategy to course development leads to a scaffolded course and assignment structure. This method is taught by the Course Design Institute during their syllabus development sessions; see The Ohio State University Michael V. Drake Institute for Teaching and Learning, accessed March 15, 2025. https://drakeinstitute.osu.edu/our-programs-and-services/all-who-teach/course-design-institute
[9] David A. Kolb, *Experiential Learning: Experience as the Source of Learning and Development*. (Englewood Cliffs, NJ: Prentice Hall, 1984). Accessed March 4, 2025.
https://learningfromexperience.com/downloads/research-library/experiential-learning-theory.pdf
[10] Engaged learning is conceived of as inverted classrooms where students actively participate in the learning process; advised by the Course Design Institute, The Ohio State University Michael V. Drake Institute for Teaching and Learning, accessed March 15, 2025. https://drakeinstitute.osu.edu/our-programs-and-services/all-who-teach/course-design-institute
[11] Kolb, 26
[12] Kolb, 26
[13] Kolb, 27
[14] For details on process, see "Tektōn (after Zaha, after Malevich)", Knowlton School, May 3, 2024, accessed March 15, 2025. https://knowlton.osu.edu/news/2024/05/tekton-after-zaha-after-malevich
[15] Knowlton School, "Tektōn (after Zaha, after Malevich) Landscape's Paula Meijerink and students engage a Legacy in Dirt," *Oculus*, 2024
[16] Kolb, 29
[17] Named after a Superman story: "The Amazing Story of Superman-Red and Superman-Blue." Script by Leo Dorfman, art by Curtis Swan and George Klein. Reprinted in *The Greatest superman Stories Ever Told*. Greatest DC Comics Stories, Volume 1. 1987, 207-214
[18] The Ohio State University, Waterman, College of Food, Agricultural, and Environmental Sciences, "Building Momentum at Waterman," accessed March 15, 2025.https://waterman.osu.edu
[19] Kolb, 31
[20] Kolb, 34
[21] Kolb, 36

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THE VALUE OF SKETCHING AND ARCHITECTURAL STUDY ABROAD: MORE THAN JUST GELATO

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INTRODUCTION

What is the value of hand sketching, observational drawings and the architectural study abroad experience? How does the process of creating analytical drawings deepen critical thinking and enhance historical understanding? And why is this relevant to the formation of the contemporary architecture student?

The study abroad experience often connotes loose curriculum, pedagogy and engagement, and a surface-level appreciation for the historic fabric of a foreign city. In a digital world of computer visualization, the benefit of the observational sketch forces students to slow down the process of visual analysis and translate historic ordering principles, massing and volume through their own hand. By flipping the classroom and connecting data-driven observations with analytical sketching and diagramming, students can connect building practices across time and space to make the most of the study abroad experience. This paper will outline three assignments for achieving deep critical thinking and engagement from the classroom to the site. Relying on the work of William H. Whyte, Kevin Lynch and Christopher Alexander, students observe, measure, and analyze successful public spaces in order to bring these design techniques back to their own practices in studio and beyond. The study abroad experience represents a unique touchpoint within our 5-year M.Arch curriculum that focuses on translating experience to paper, however this method is taught and practiced from beginning design to graduate level studio.

The Value of Sketching

The study abroad experience is one of the pinnacle, defining moments in any young architecture student's life. The moment that the hours they spend sitting in a dark classroom looking at slide after slide of historic buildings and learned precedents becomes reality. Standing in the portico of the Pantheon for the first time gazing upward at the oculus flooding the spherical volume of space with light can be an emotional, if not spiritual, experience. That kind of moment is difficult to record but necessary to remember it vividly.

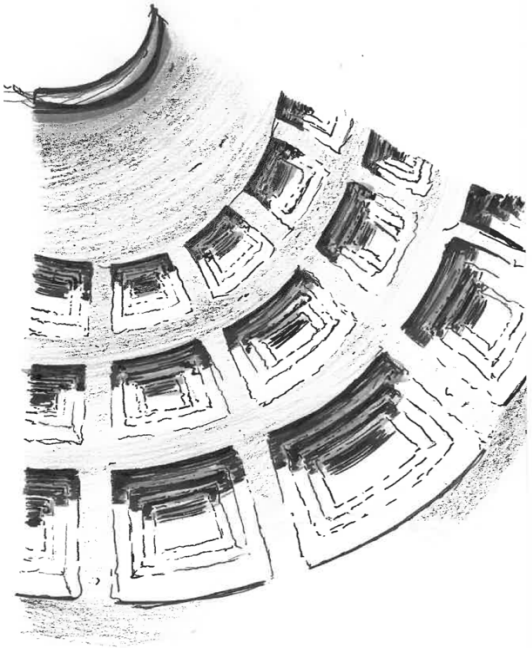

Figure 1. Pantheon, Rome, Italy sketch by Javier Otero, CBU Student, 2018

It is arguably the most memorable moment along the academic path. Much of this, of course, is because of the in-depth immersion into a new culture, place, and language.

There are many perks, the best of course when traveling to Italy would be the gelato…but of course it is more than just gelato. As Tadao Ando states, "To truly understand architecture, you must experience space with your own five senses. Travel is a dialogue with yourself that takes you away from the inertia of daily life and deepens your thinking. As you travel, you lose all that is unnecessary and come face to face with your naked self. This makes a person stronger."[1]

As evidence shows, many of our celebrated architects at one point or another traveled to deepen their thinking and documented their experience. To enable students to adequately record, reflect, and make sense of such an experience, we use the hand-sketch as the tool to document what is seen and understood. As consistent in many architectural schools, the hand-sketch is a very common tool for communication. In this presentation we will be discussing and validating using sketching as an analog tool to develop and reinforce the design process as well as highlighting curriculum content and student examples. The student's ability to value, or invalidate, this tool has significant implications on their work and most importantly on their critical thinking. Martin Heidegger said, "every motion of the hand in every one of its works carries itself through the elements of thinking, every bearing of the hand bears itself in the element. All the work of the hand is rooted in thinking."[2]

As architectural designers we solve ill-defined, wicked problems that require synthesizing multiple contingencies that sometimes complement but often resist each other. Our ability to use critical thought and abductive reasoning is vital. The key to high level resolutions is high level thinking.

Juhani Pallasmaa states in his book, *The Thinking Hand*, "Recent anthropological and medical research and theories give the hand a seminal role in the evolution of human intelligence, language and symbolic thought…the extraordinary evolution of the human brain may well have been a consequence of the evolution of the hand. Aristotle asserted that humans had hands because they were intelligent." [3]

Additionally, Frank Wilson in his book, *The Hand: How Its Use Shapes the Brain, Language, and Human Culture* says, "any theory of human intelligence which ignores the interdependence of hand

and brain function, the historic origins of that relationship, the impact of that history on developmental dynamics in modern humans, is grossly misleading…"[4] The analog product of the hand-drawing bridges this intimate level of thinking of the brain and hand relationship with the language of architecture. It is a cyclical and intimate relationship…we see, we sketch, we think.

The intimate mode of drawing in this way is an investigation of the world around us as well as a means of 'what could be.' Le Corbusier called it an "intimate investigation." In this way it is vulnerable. This is a state more than any other that we have encountered the most resistance from students. In our program at California Baptist University, we work with many students that have never been challenged to think abductively or encouraged to sort information to find the best solution. They tend to be technologically ill-equipped in many cases as well. Often being vulnerable is the last mode they are willing to engage.

For this reason, we are dedicated to the importance of hand sketching and hand drawing as an integrated tool for teaching and output. We have a 5-year Master of Architecture program that offers 4 years of undergraduate work and 1 year of graduate studies completed in sequence. Our freshmen learn to draft, sketch, and model by hand with computer tools strategically introduced in the second-year studio courses that focus on translating between digital and analog output, learning to use the digital as a tool that acts as an extension of the hand.

This type of analog to digital translation is prevalent in every other design studio of the program integrating observational and creative hand-generated output at the outset of a project and threaded between every phase. Despite this intentional integration of hand to digital process, students prefer the comfortability and familiarity of the computer.

However, we have found that instead of using the digital tools as an extension of the brain and hand relationship to enhance the intimate observation and vision of the designer, which they are created to do, the computer is used as a "solely beneficial invention" as Pallasmaa states that has liberated any human imagination. Instead of an intimate investigation based on direct haptic connection, there is a false sense of precision, finiteness, and quick resolution that the computer offers sterilizing the profound possibilities of student work. Pallasmaa continues, "the hand drawing is a mimetic moulding of lines, shades and tones, the computer drawing is a mediated construction" and one that creates a distance between the maker and the object.[5]

As a way of mediating this ever-increasing reality that we face in the academy, the study abroad program is placed after the third year of the design studio sequence as a way to reinforce and slow down the sometimes hostile takeover of the digital encroachment. As stated previously, the hand drawing is the language of architecture and the purveyor of critical thought. It is used during the study abroad program as a way of thinking that encompasses a consistent regiment of on-site engagement, immersion, and perception of place. Similar to many other architectural study abroad programs and architects that have traveled the world to find inspiration, the way we sketch through this global engagement builds a habit of recording impressions of the world around them to be imprinted in their brain, serving as a 'catalog' of inspirations for 'what might be' in future idea and project generation.

Whether we are using drawing as a tool in the design studio or on site, we focus on two ways that it can reveal critical thinking. The first way of thinking is how a drawing reveals what we *understand* about the subject being recorded (analytical drawing) and what we *experience* (experiential drawing), capturing the tangible and intangible aspects of the subject often accompanying its surroundings through perspectival vignette.

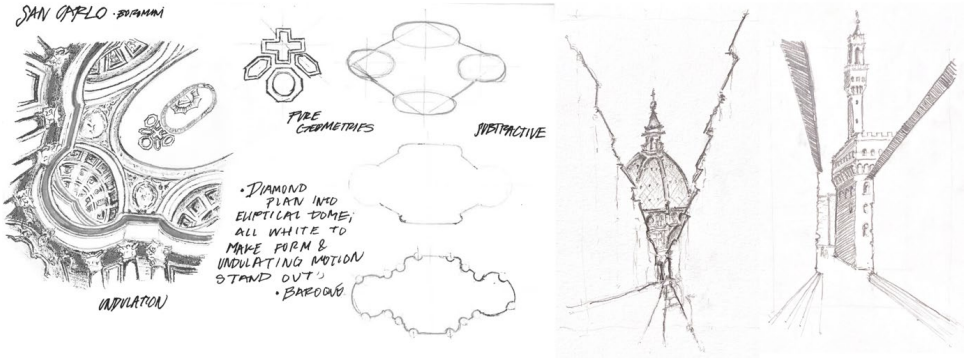

Figure 2. Analytical and Experiential Drawing, San Carlo alle Quattro Fontane, Rome, Italy by Javier Otero, CBU Student, 2018 and Florence, Italy by Susan Duemer, CBU Faculty 2016 and 2018

The Value of Architectural Study Abroad

Following the third year of the program, students spend 5 weeks traveling, observing, sketching, and immersing themselves in Italian art and architecture. During the semester leading up to studying abroad, students take a semester long preparation class that connects the dots between history and theory with the objective of developing their skill set of both sketching and thinking. We begin with the history of sketching and representing space for a little background and to set the stage. The surviving lodge book of French master mason, Villard de Honnecourt provides a good example to illuminate the medieval design process, where each page is a combination of text and image, small scale details for plate tracery or gargoyle design, as well as large scale tower facades and simple gear and pully system machines for moving materials on site. Reading the sketchbook provides a narrative of medieval design process.

We see various modes of representation, from orthogonal drawings, section cuts, and an attempt at perspective seen in a sketch of Reims cathedral.[6] It is not a true perspective. The sides do not recede towards a central vanishing point or axis, horizontal and vertical elements are not altered, and a few elements like arches and the width of the exterior buttresses are distorted the wrong way. We assume that this follows a mode of representation and a well-developed tradition that made sense to Gothic builders and master masons. The important point for the students is to see the function of the sketch as thinking tool, not just a mode of representation.

Early Renaissance drawings followed these Gothic conventions until the discovery of linear perspective, reinforced by the Vitruvian revival of *De Architectura* that described three types of architectural drawings- plan, elevation, and a version of what we call perspective, or *scaenographia*. These methods are recognizable to the contemporary designer as standard drawing tools introduced in the freshman year of architecture school. What this really represents is the shift in the function of the sketch. The medieval drawing was a tool for thinking and design while the measured Renaissance drawing was a tool to communicate dimensions and functioned as an early construction document. Even Leon Battista Alberti opposed the use of pictorial representation that modeled light and shadow because it communicated ideas unnecessary for construction.[7] If we fast forward a few centuries, the introduction of digital sketching tools has actually severed this thread. We are actively working to reclaim the value of hand sketching as a tool for thinking and understanding space.

These are a few assignments used for achieving deep critical thinking and engagement from the classroom to the site. In anticipation of the wonderfully lively experience of Italian piazzas, students read a few excerpts from Christopher Alexander's, *Pattern Language*, specifically, 61. Small Public

Squares, 124. Activity Pockets, 114. Hierarchy of Open Space, and 123. Pedestrian Density. The most frequently received comment is always, “oh, you weren’t wrong about all the walking,” but the second most frequently received comment has to do with the magic of public spaces, largely absent from our American cities, and certainly noticeable on many scales in Italy.

The ultimate goal of study abroad programs is, of course, training students how to fully experience architecture, how to analyze and understand it, and how to incorporate something they’ve experienced into their own design practice. To achieve this, we practice some basic observation and analytic diagramming. The first thing we learn from Alexander is that there is a sweet spot dimension for designing public space. When the diameter of a public space exceeds 70 feet, it is deemed “too large [and] they look and feel deserted.”[8] From a few aerial views of Piazza Signoria in Florence, Italy, the students sketch the surrounding urban fabric in solid-void, a rudimentary Nolli map of sorts, to understand the relationship between open piazza, solid buildings, and narrow paths through the city.

From this basic map we note the “activity pockets” found in this piazza in the form of restaurants, cafes, and gelato shops, naturally found around the edges of a public square, as described by Alexander. These pockets of activity should alternate with paths and points of access that bring circulation to every edge. This combination of paths and activities alternating around the edges of a not-too-large public space encourage people to “pause and get involved” which creates a lively and successful space.[9]

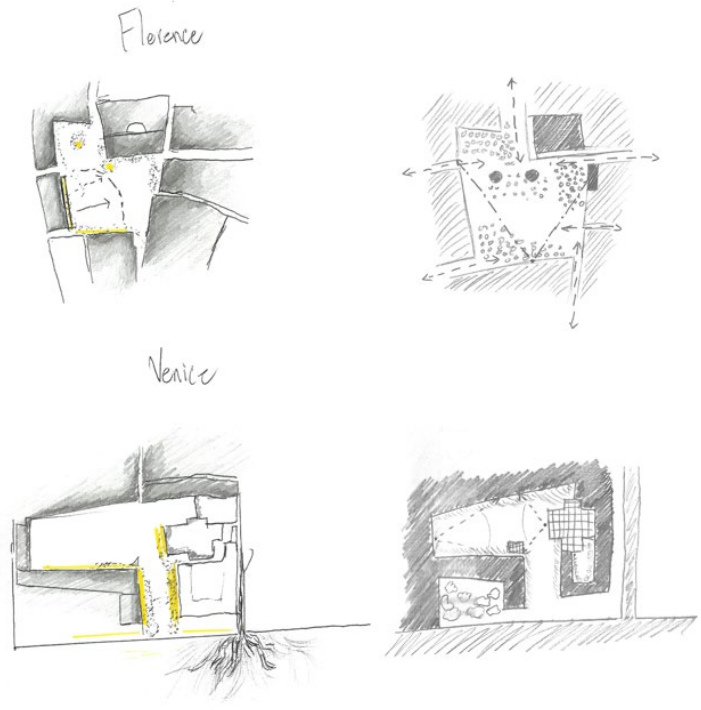

Figure 3. Diagrams of ‘activity pockets’, sketches by Kenny Harvey and Mario Medina, CBU students, 2024

The last layer adds a “hierarchy of open spaces.” The goal here is to encourage pedestrians to linger by creating some level of safety. Alexander explains that “people always try to find a spot where they can have their backs protected” and have a nice view looking into a larger space.[10] The cafes with outdoor seating pushing into Piazza Signoria allow visitors to sit with their backs to the buildings that form the edges of the piazza while providing views into the larger center and the surrounding historic

buildings. Multiple paths bring pedestrians into the piazza, providing plenty of circulation and again ensuring a successful public space. We repeat this exercise with images of Venice, which exceeds the maximum 70 foot dimension, but is the outlier of examples Alexander describes in his text.

We practice this during the spring semester, several weeks before the students land in Italy. To put this into immediate action, we turn to William H. Whyte and *The Social Life of Small Urban Spaces* to look at local public space at the smaller scale where we consider the function and success of benches, chairs, fountains, and shade. The students are assigned to one of twenty different spaces located on the California Baptist University campus ranging from ledges flanking large open lawns, to small groupings of chairs and tables tucked between academic buildings. They follow the practice outlined by Whyte and must sit and observe for one solid hour…without their cell phones. They count the number of people using, siting, and lingering in the space every 15 minutes. They measure the depth of ledges, count the number of chairs, and are forced to slow down to really observe the use of public space. They draw conclusions about what makes public space successful and hone the sketching skills they bring with them to Italy. Once on site, they certainly create beautiful renderings of iconic monuments, but they also produce sketches that apply these tools to the historic buildings they observe.

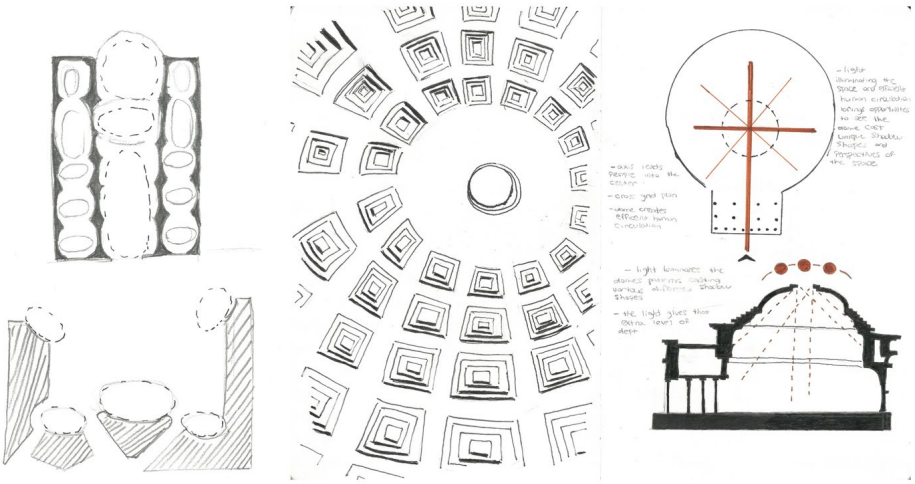

Figure 4. Analytical sketches by Audrey Literral and Martin Cavillo, CBU students, 2024

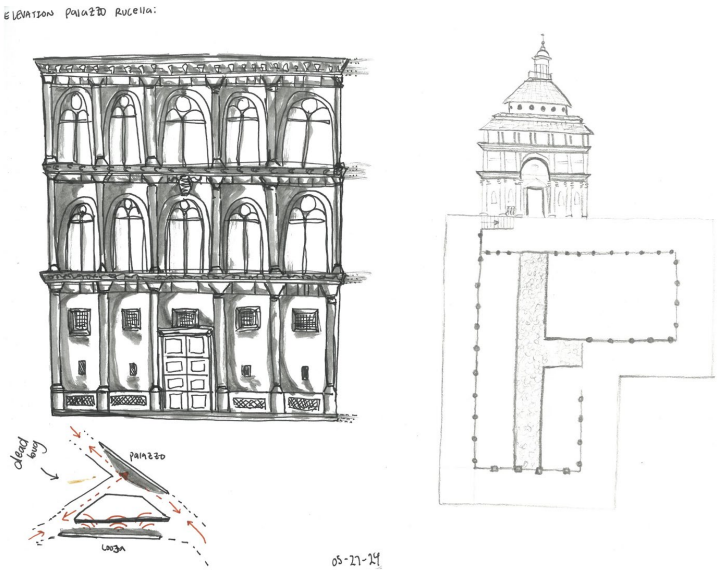

Figure 5. Analytical sketches by Chloe Slemmer and Crystal Jimenez, CBU students, 2024

The Value of Hand Sketching in the Design Process

As a capstone to the integration of hand sketching within the program overall, one graduate level studio uses the process of hand sketching and making as the primary tool in the design process. This studio addressed the intersection of well-being and architecture and encouraged students to investigate the psychological and physiological implications of the designs they proposed for a Maggie's Center in Newport Beach, California. The typology, Maggie's Centers, which are primarily located in the UK, are cancer support centers designed at an informal 'domestic' scale where people can draw on practical, emotional and social support when needed in their cancer journey. The scale and intentional home-like design positions itself as the 'antithesis' to the typical hospital.

The arc of the course is based on the theory of Colin Rowe and Fred Koetter in *Collage City* which addresses the sustained morphological debate and tension between architectural solutions that respond to and resist their circumstance. The process students took was an interpretative method in which the contradiction of a thesis and its antithesis is resolved through synthesis.

The multi-step process of the project began by asking students to develop an autonomous form by researching and understanding cancer at its fundamental level, interpreting their findings through identifying an abstract visual language that communicated the methods of its growth and treatment. The sequential drawings were generated by hand and completed in graphite wash on vellum. All models were built by hand, with the material chosen by the student, as seen in Figure 6.

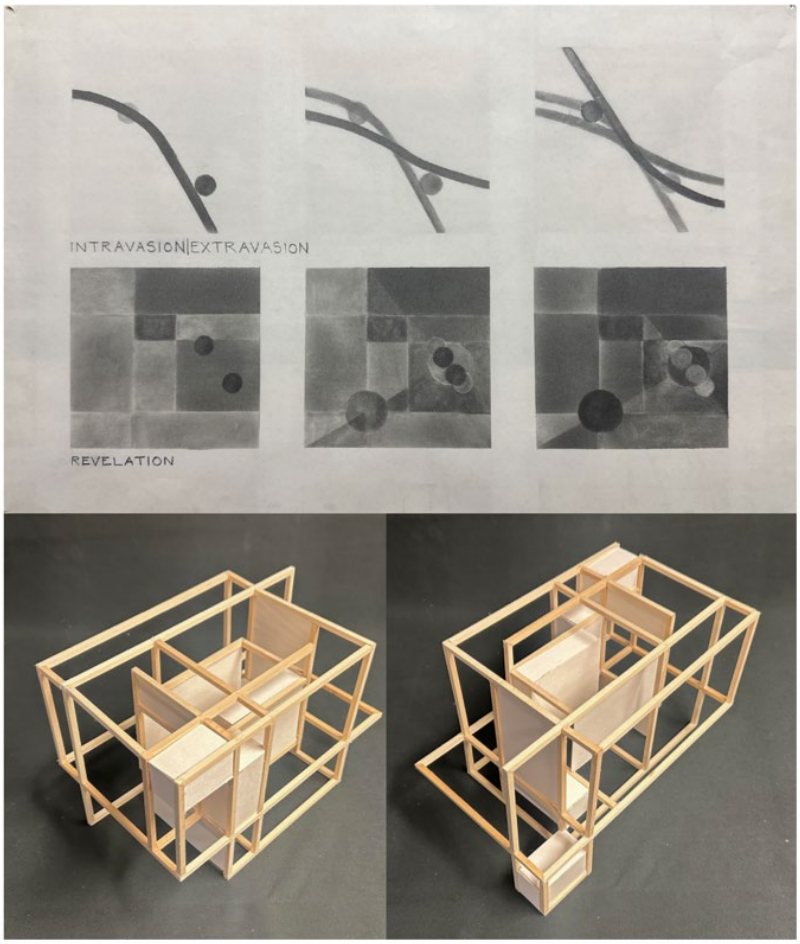

Figure 6. Abstract Language Study , ARC510 by Josh Dicken, CBU Student, 2024

In the Conceptual Design phase, students engaged in the process of hybridizing two dialectical forms – the autonomous form (the abstract language study, an independent and ideal – an end in itself) with an instrumental form that was defined as situated and pragmatic – a means to an end. The terms used for the instrumental process varied but were related to program, environmental, and specific site circumstances.

Once students generated three form amalgamations, they attempted to synthesize into one vision for the project, embracing the tension that existed between how the variation in languages respond and resisted each other. Throughout the conceptual to final process students explored representation tools that hybridized digital and physical/hand-drawn methods.

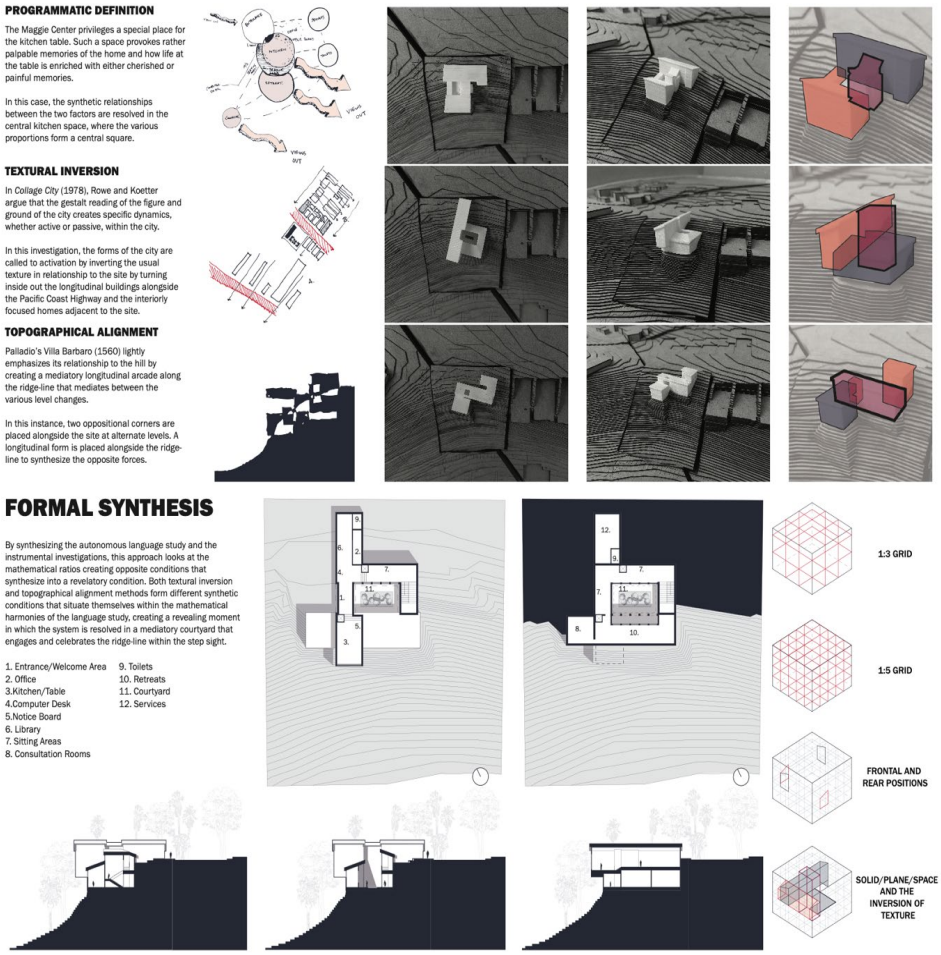

Figure 7. Conceptual Design for Maggie's Centre, ARC510 by Josh Dicken, CBU Student, 2024

This student landed on a version of a courtyard project and took a deep dive into hand-drawing exploration. He started by looking at multiple precedents and analyzing their use of a courtyard organization which you can see in Figure 8.

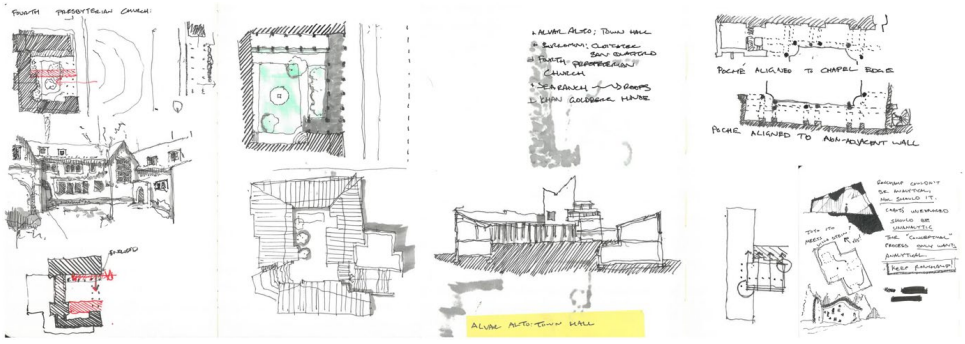

Figure 8. Schematic Design: Precedent studies for Maggie's Centre, ARC510 by Josh Dicken, CBU Student, 2024

Figures 9 and 10 exemplify the student's design decisions organizationally and experientially made through hand sketching at the schematic and design development phases.

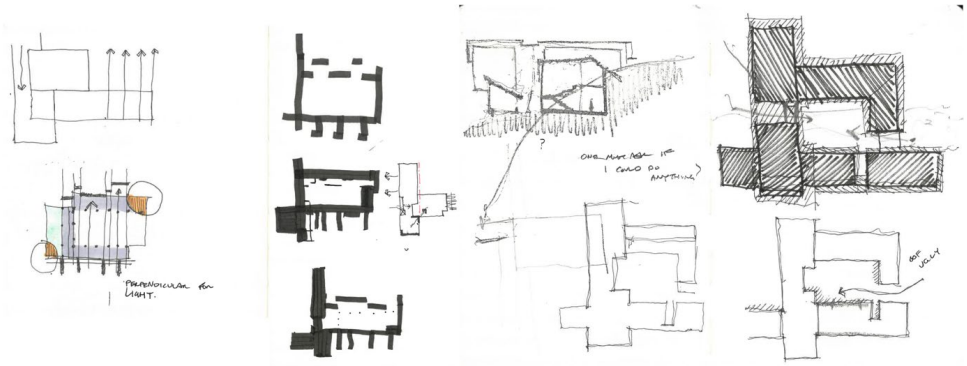

Figure 9. Schematic Design: Courtyard studies for Maggie's Centre, ARC510 by Josh Dicken, CBU Student, 2024

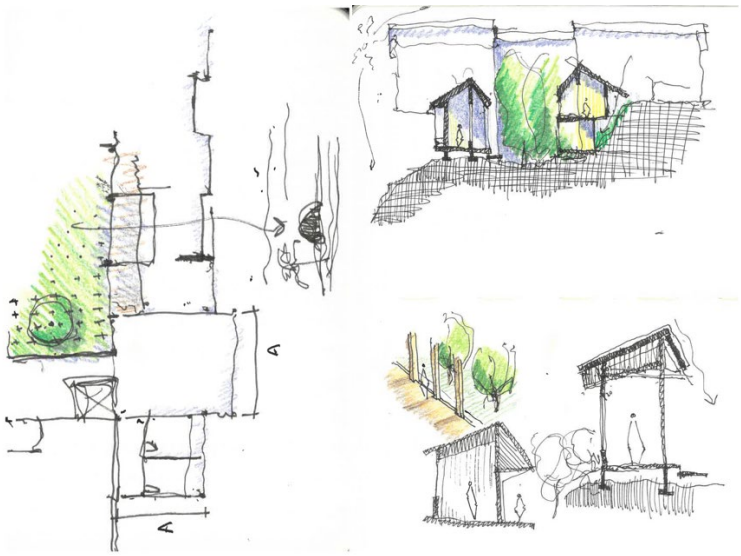

Figure 10. Design Development: Experiential studies, ARC510 by Josh Dicken, CBU Student, 2024

These images show only a small sampling of his course sketchbook. which you can see in the next several slides which is an excerpt of his course sketchbook. Through the use of sketching, with some hand-made modeling, he was able to develop each aspect of the project using both analytical and experiential drawing techniques innately resolving the "courtyard" design successfully.

CONCLUSION

With intentional integration of hand drawing as a primary tool in the design process the student achieves a deeper level of critical thinking. We believe this is not a foundational level tool but as this paper has discussed, it is vital at all levels of the curriculum.

NOTES

[1] Matthew Hunter, *Tadao Ando: Conversation with Students* (Princeton: Princeton Architectural Press, 2012), 14-16.
[2] Martin Heidegger, "What Calls for Thinking," in *Basic Writings* (New York: Routledge, 1977), 357.
[3] Juhani Pallasmaa, *The Thinking Hand: Existential and Embodied Wisdom in Architecture* (Hoboken: Wiley Publishing, 2009), 32-33.
[4] Frank R. Wilson, *The Hand: How Its Use Shapes the Brain, Language, and Human Culture* (Vancouver: Vintage Books, 1998), 7.
[5] Pallasmaa, 32-33.
[6] James Ackerman, *Origins, Invention, Revision: Studying the History of Art and Architecture* (New Haven: Yale University Press, 2016), 3.
[7] Ackerman, 12.
[8] Christopher Alexander, *Pattern Language* (London: Oxford University Press, 1977), 311.
[9] Alexander, 602.
[10] Alexander, 558.

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A BIO-INSPIRED APPROACH TO CRITICAL THINKING: INTEGRATING DAYLIGHTING WITH A BIO-INSPIRED DESIGN PROCESS

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UNIVERSITY OF MINNESOTA, USA

INTRODUCTION:

This paper explores a "bio-Inspired" design research collaboration between a team of educators from architecture, biology, and computer science at the University of Minnesota. It considers how biology can inform design thinking, processes, and outcomes to enhance ecological and health benefits for humans, other species, and the planet. Bio-inspired design frameworks – such as biomimetic, biomorphic, biophilic, bioclimatic, and others – look to biological models, processes, and systems for strategies to expand design thinking in response to the ecological challenges of our day.[1] The design approach discussed in this paper integrates these frameworks with a six-step *Bio-Inspired Design Process* that was adapted from a *Biomimetic Process* developed by engineer Pierre Emanual Fayemi et al.[2] The design process has been reframed from "biomimetic" (mimicking biology) to "bio-inspired" (drawing design inspiration from biology) to provide greater flexibility to designers in translating biological strategies from various bio-design frameworks. The six-step process represents a sequence of iterative design explorations that guide practitioners in integrating lessons from biology and nature into design. It enables designers to translate design challenges more accurately into biological terms, deepen biological accuracy, and structure the translation of biological strategies into design concepts. A case study of a series of bio-inspired daylighting design interventions to an existing building is used to illustrate how the six-step bio-inspired design process and select bio-inspired frameworks can be used to inform and shape critical design thinking, methods, and outcomes to enhance biological inspiration in design education and practice.

Bio-inspired Daylighting Design Definition

The term "bio-inspired" is used as an umbrella phrase to include the numerous ways in which biology and nature can inform daylighting design thinking and methods. Six common bio-inspired approaches to daylight include: biophilic, bioregional, bioclimatic, biomimetic, biomorphic, and biomaterial perspectives (see Table 1). While interconnected, each approach provides a unique opportunity to foster connections with nature, biological systems, and environmental forces to enhance experiential, health, and ecological benefits. While the six approaches are distinct, there are common and overlapping design issues and priorities related to place, site, and environmental forces, form, and

materials. The research method employed in the case study interventions included the integration of all six perspectives, in various combinations. Bio-inspired definitions and example daylighting strategies of the six bio-inspired approaches are included in Table 1.

BIOPHILIC **Connections to nature for health & well-being**	**BIOREGIONAL** **Respond to regional forces, nature, and systems**	**BIOCLIMATIC** **Respond to site & climatic forces**	**BIOMIMETIC** **Mimic nature's form, process, systems, materials**	**BIOMORPHIC** **Mimic nature's forms (subcategory of biomimetic)**	**BIOMATERIAL** **Utilize materials derived from living organisms (plants & animals)**
Daylight Goals Daylighting to provide connections to nature for health, experiential, and ecological benefits. [3]	**Daylight Goals** Daylighting to celebrate the unique qualities of region and place, including climate, culture, flora, fauna, landscape, topography, water, ecological systems, etc. [4]	**Daylight Goals** Daylighting response to site and bioclimatic forces: Sun, wind, daylight, humidity, solar radiation, precipitation, etc.[5] Daylight integration with passive solar & natural ventilation.	**Daylight Goals** Daylighting strategies inspired by biology and nature's biomimetic form, process, systems, and materials.[6]	**Daylight Goals** Daylighting forms inspired by nature. 1) Anatomical Biomorphism: inspired by human anatomy, 2) Vegetal Biomorphism: inspired by plants, 3) Zoomorphic Biomorphism: inspired by animals.[7]	**Daylight Goals** Daylighting relationship to "natural" material selections, particularly those derived from living organisms such as plants and animals.[8] Emphasis on minimally processed, non-toxic, cruelty-free, biodegradable, materials, etc..[9]
Strategies - Daylight emphasis on health and wellbeing. - Siting, form, and envelope for views & connection. - Envelope and sensory experiences. - Luminous properties of materials, forms, details. - Atmosphere appropriate to program - place.	**Strategies** - Daylight emphasis on regional conditions for siting building form, and envelope. - Optimize the specific qualities and connections to the region, site, landscape, flora, fauna, and ecological and natural systems.	**Strategies** - Daylight response to specific site and micro-climate forces and conditions. - Integration of passive strategies for light, heat, air. - Diurnal and seasonal conditions. - High-performance and renewable systems.	**Strategies** - Daylight emphasis on lessons from biological forms, processes, systems, and/or materials to inform design across scales. - See also Biomorphic.	**Strategies** - Daylight emphasis on biological form to inspire massing, section, and details. - Subcategory of Biomimetic.	**Strategies** - Daylight emphasis on luminous properties of structure, materials, and details. - Minimally processed, healthy materials. - Consider luminous qualities of reflectivity, absorption, transparency, translucency, etc.

Table 1. Comparative summary of daylighting goals and strategies for six bio-inspired frameworks.

BIO-INSPIRED DAYLIGHTING DESIGN METHODOLOGY

The design team has collaborated with colleagues in the field of biology to develop a six-step *Bio-Inspired Design Process* that was adapted from a *Biomimetic Process* developed by engineers Pierre Emanual Fayemi et al. Bio-inspired design frameworks – such as biomimetic, biomorphic, biophilic, bioclimatic, and others – look to biological models, processes, and systems for strategies to expand design thinking in response to the challenges of our day. The design process has been reframed from "biomimetic" (mimicking biology) to "bio-inspired" (drawing design inspiration from biology) to provide greater flexibility to designers in translating biological frameworks beyond biomimetic design.[10] Working with biologists, the six-step design process enables designers to translate the design challenge more accurately into biological terms, deepen biological accuracy, and structure the translation of biological strategies into design concepts (Figure 1).

The team found that the bio-inspired design process was not linear, and that clustering two phases of the six-step process was consistent with the back-and-forth process of design inquiry, moving forward with explorations and often circling back to reconsider previous stages. In that spirit, the overview of the bio-inspired daylighting design process and the six-step methodology are summarized below as clustered steps (see Figures 1-2):

Steps 1-2: Defining the design problem and "biologizing" the problem (identifying the daylighting goals and design intentions to improve the quality and quantity of daylight in the Ecology Building on the University of Minnesota campus).

Steps 3-4: Identifying and selecting biological models that could inform the improvement of daylighting in a dark multi-story underground space.

Steps 4-5: Evaluating biological models and translating them into daylighting design interventions.

Step 6: Testing the design interventions and evaluating the qualitative and quantitative performance.

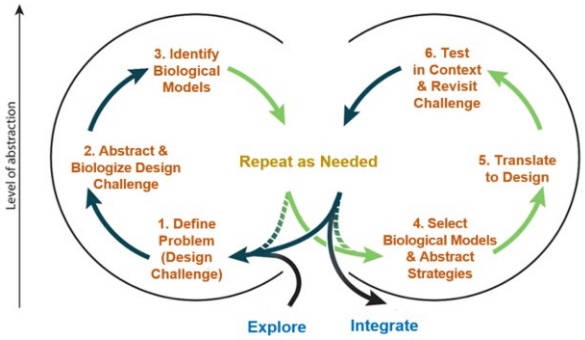

Figure 1. Six-step bio-inspired design process (after Fayemi et al).

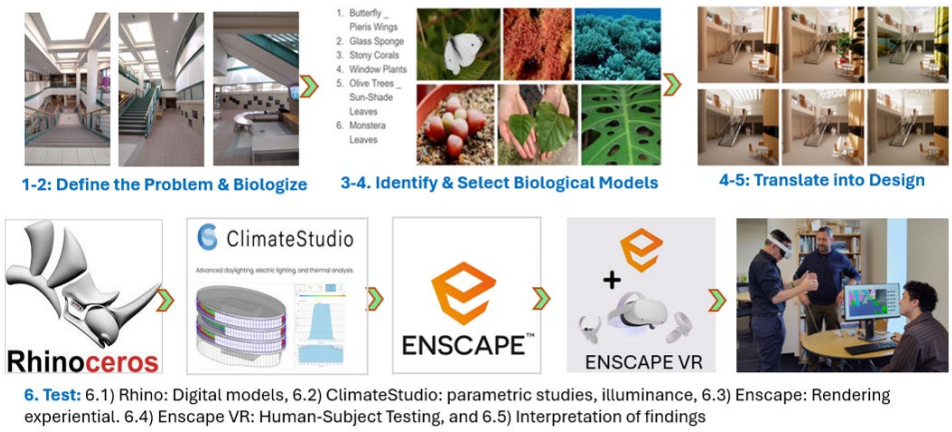

Figure 2. Translation of the six-step bio-inspired process for daylighting design.

Steps 1-2: Define the Problem, Abstract, and Biologize

The team identified the Ecology Building as the case study building as it houses the College of Biological Sciences, is home to the biological colleagues on the team, and it is a representative university building with poor daylighting and opportunities to improve the quality of the space and reduce electric lighting requirements. The upper entry level and lower subterranean community space of the Ecology Building occupy a two-story volume that is currently under-utilized on both levels, as they are dark and unwelcoming spaces during much of the day and year. The design challenge is to

harness daylight from the west and north facades and the skylight on the upper-level entry (which is at grade), and to borrow light from the upper level to the subterranean lower-level community space. The upper level has limited daylight access from a shaded west façade, modest north façade, and translucent conical skylights. The only access to direct sunlight is in the afternoons in summer as there are multi-story portions of the building to the east and south.

In situ illuminance levels were taken and base case illuminance and glare studies were conducted using ClimateStudio (a daylight and energy analysis tool) to define the existing conditions, which were later compared to iterative design interventions using integrated bio-inspired design strategies (Figure 3).[11] The in situ and base case analyses confirmed poor quantitative lighting conditions on the lower level throughout the year and during the winter months on the upper level. Base case simulations illustrate that illuminance levels in the upper and lower spaces are significantly below the Illuminating Engineer Society's (IES) lighting standards for visual tasks (Figure 4). Even the task-related Category C (the lowest) was not met during most of the year (space where tasks are occasionally performed: 100-200 lux). Subsequently, illumination for more robust visual tasks were also not met, such as Category D (performance of visual tasks of high contrast or large size (200-500 lux), or Category E (performance of visual tasks of medium contrast or small size (500-1000 lux).[12]

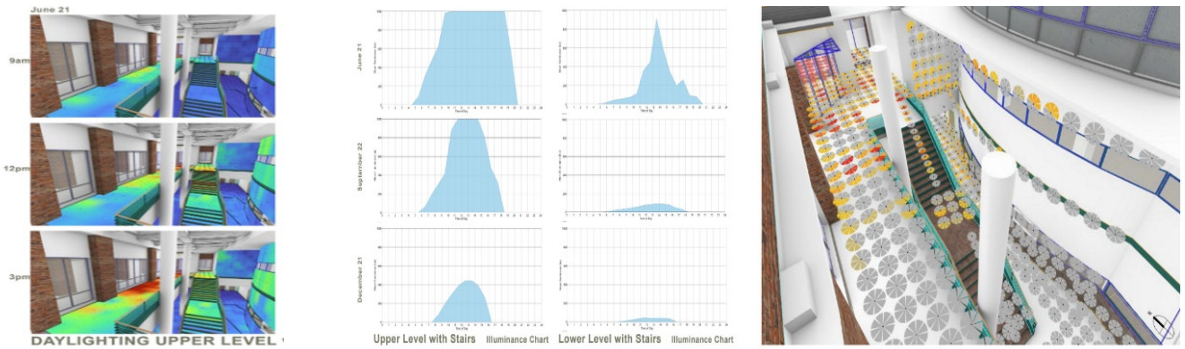

Figure 3. Example base case assessment using Climate Studio for seasonal illuminance and glare.

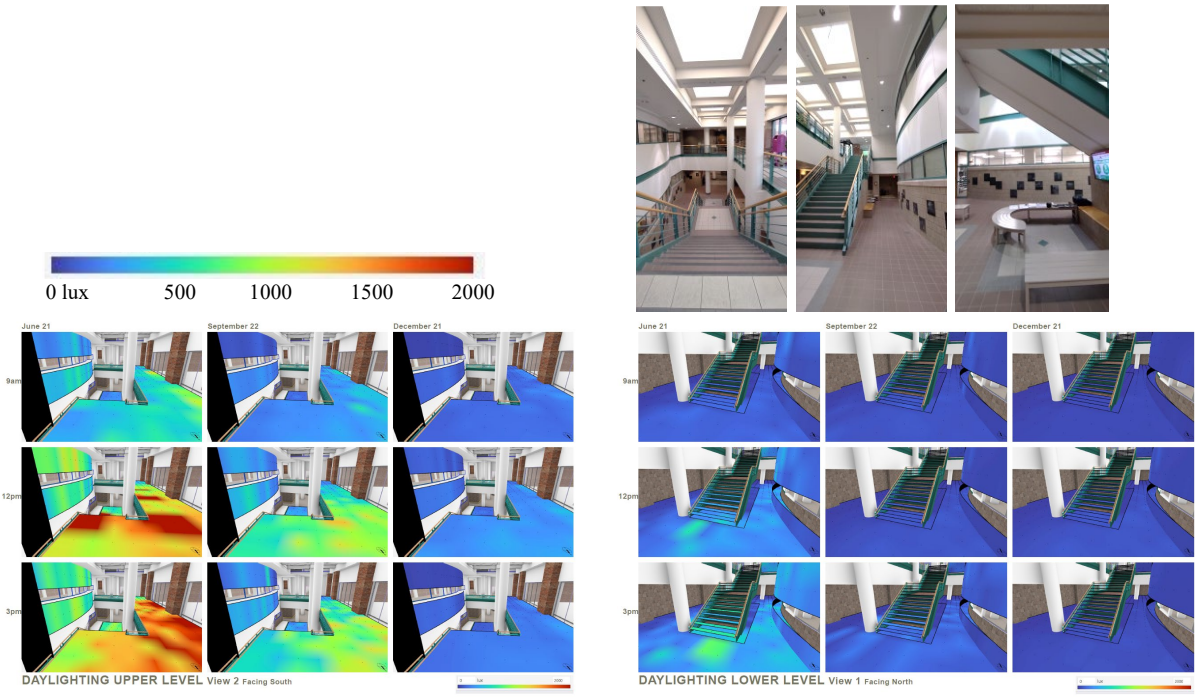

Figure 4. Top: photos of the Ecology Building.
Bottom: Base case ClimateStudio illuminance studies: Left Upper level looking south;
Right: lower level looking north.

Daylighting design goals were defined to optimize daylight on both the upper and lower levels to meet practical levels of illumination, enhance views of the site and sky, and create a welcoming and relaxing atmosphere. The existing base case assessments provide a comparative assessment for quantitative and qualitative design interventions.

Steps 3-4: Identify and Select Biological Models

Bio-inspired daylighting design strategies focused on interventions to the existing glazing (improved visual light transmission and thermal performance), materials to enhance daylight distribution and connection to "natural materials," and modest architectural interventions to the skylight, stairs, and floor-to-ceiling heights. The bio-inspired design challenge was to consider how to foster biophilic connections to nature in a space with limited access to the site and sky and to explore how nature and biological models could inspire biomimetic daylight design strategies to gather and redistribute daylight to the lower level. The design priorities include the integration of both biophilic and biomimetic approaches, including integrating biophilic design strategies to foster connections to the site and nature on both the upper and lower levels using Terrapin's 15 Patterns of Biophilic Design (Table 2) and exploring biomimetic strategies from the Biomimicry Institute's online tool "Ask Nature" to seek inspiration from biology on nature's ways of harvesting daylight and redistributing daylight to the subterranean lower level (Figure 5).[13]

The biophilic approach involved selecting six of *Terrapin's Patterns of Biophilic Design* to inform iterative daylighting interventions, including from Table 2 below, in the *Nature in Space Patterns* column, numbers 1 "Visual Connection with Nature" and 6 "Dynamic and Diffuse Light."; In the *Nature Analogues Patterns* column, numbers 8 "Biomorphic Forms & Patterns" and 9 "Material Connection with Nature", and in the *Nature of the Space Patterns* column, numbers 11 "Prospect" and

12 “Refuge”. The biophilic patterns informed daylight and design strategies that were also integrated with biomimicry strategies for iterative daylighting interventions to the skylight.

TERRAPIN’S 15 Patterns of Biophilic Design		
Nature in Space Patterns	**Nature Analogue Patterns**	**Nature of Space Patterns**
1. Visual connection with nature 2. Non-visual connection with nature 3. Non-rhythmic sensory stimuli 4. Thermal & airflow variability 5. Presence of water *6. Dynamic & diffuse light* 7. Connection with natural systems	*8. Biomorphic forms & patterns* *9. Material connection with nature* 10. Complexity & order	*11. Prospect* *12. Refuge* 13. Myster 14. Risk/peril 15. Awe

Table 2. Terrapin’s 15 Patterns of Biophilic Design (italics identify the select patterns).

The biomimetic approach involved working with biologists from the College of Biological Sciences to guide the identification and selection of biological models that were appropriate for the design challenge and goals. The Biomimicry Institute’s “Ask Nature” online resource was used to identify six biological models that could possibly inform biomimetic daylighting strategies (Figure 5). After assessment of each biological model, the window plant was selected as the most promising species to abstract and translate into daylighting and architectural design strategies (Figure 6). The window plant combines a light capturing lens and an infrared filter at the top of the plant to gather light which is then scattered to the lower portions of the plant through water and photosynthesizing cells.

Figure 5. Identification and selection of biological models and example translation into design.

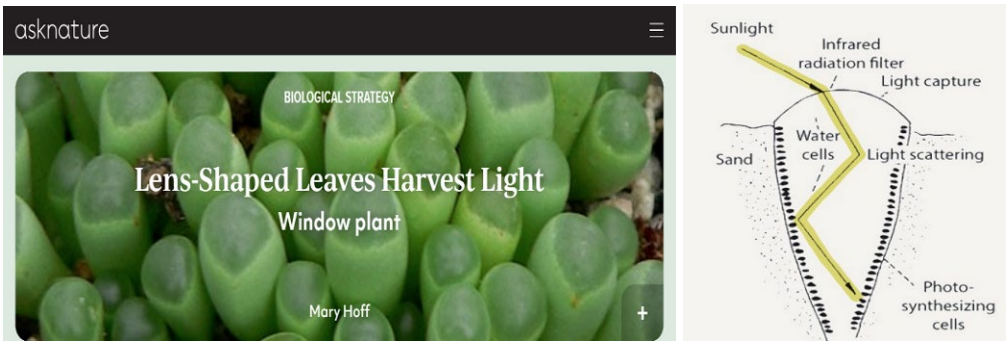

Figure 6. The Window Plant was selected from the Biomimicry Institute’s “Ask Nature” resources to inform the design of the skylights and to bring daylight to the subterranean lower space.

Biological Model: Window Plant[14]		
Trait	**Function**	**Mechanism**
The top of the plant has a domed lens that is light permeable located above the ground surface. Subterranean vertical void below the dome with water and photosynthesizing cells along the vertical sides.	The domed lens functions to minimize surface area exposed to the arid conditions of the desert environment. The surface has spectral selectivity of light that passes through to the interior to allow for photosynthesis.	The top of a window plant's stem is transparent, allowing sunlight to pass through into the stem below. The waxy surface filters out the highest-energy light, allowing only about 10 percent of the total light into the plant, preventing the insides from overheating. The interior surfaces are both absorptive (for photosynthesis) and reflective to bounce light around the space of the stem.
Design Implications		
Scales of application Room: Consider the shape and form of the room below the skylights to reflect light to the lower subterranean space. Roof and Ceiling: Consider inverting the form of the roof to gather light and redirect it down to the lower space. Window Apertures: Consider the design of the skylight to gather, reflect, and selectively filter daylight to lower space. *Materials* Consider spectral selective glazing systems to maximize visible light into the space across the visible light spectrum Consider highly reflective surfaces that reflect light directionally.		

Table 3. The biological attributes of the window plant and design interpretations.

Steps 4-5: Abstract and Translate to Design

During the design phase, the team developed over 90 design interventions using three levels of consideration: 1) modest interventions to glazing type and characteristics in the west windows and skylights along with new materials with varied color and surface attributes; 2) moderate interventions including removal of the dropped ceiling plenum on the lower level to increase floor to ceiling heights, alterations to the stairs risers and balcony railings to provide better visual connections to the upper levels and to foster greater access and distribution of daylight, and new materials and surface treatments, including plants and nature murals; and 3) significant alterations to the skylight form, materials, and detailing.

The biophilic design strategies employed interventions to enhance the view to the upper-level west windows (glass railings, transparent risers, a smaller code-compliant stair); introduction of wood materials, strategically located plants, nature murals, and light-colored surfaces; increased floor-to-ceiling heights; and organic skylight forms to bring views of the sky and indirect and direct daylight into the upper and lower spaces (Figure 7). The biophilic strategies were combined with a series of biomimetic skylight interventions using the Window Plant as a biological model to try to bring daylight more effectively into the lower-level subterranean space. Various biomimetic skylight configurations and details were tested, based on the window plant using a light-capturing skylight combined with reflective lightwells of various depths and configurations to focus and redistribute the daylight to the lower level (Figure 8). Select comparisons of the biophilic and biomimetic strategies are found in Figure 9.

Figure 7: Example biophilic design interventions to enhance connections to nature.

Figure 8. Example biomimetic design intervention based on the Window Plant.

Figure 9. Comparative strategies: Left: example biophilic interventions; Right: example biomimetic interventions

Step 7: Test and Revisit Design Challenge

Using ClimateStudio, illuminance levels were evaluated for each of the 90 design interventions under clear and overcast skies for select times of the day and seasons (typically 9:00 a.m., 12:00 p.m., and 3:00 p.m. during June 21, March/September 21, and December 21). Strategic glare and contrast studies were evaluated seasonally during the afternoons, which is the only time direct sunlight can reach the west windows and skylights and provide problems for visual and thermal comfort. From a quantitative perspective, the biophilic daylight interventions successfully increased illumination levels on the upper and lower levels throughout the year, with supplemental shading needed during the summer afternoons to prevent solar heat gain (Figure 10). The biomimetic skylight interventions improved illuminance levels and daylight distributions during the summer, spring/fall, and winter on the upper levels, with supplemental electric lighting needed during the winter months on the lower level (Figure 10). Direct or reflected glare in the afternoons through the west façade and skylights would be mitigated with interior supplemental shading on all strategies.

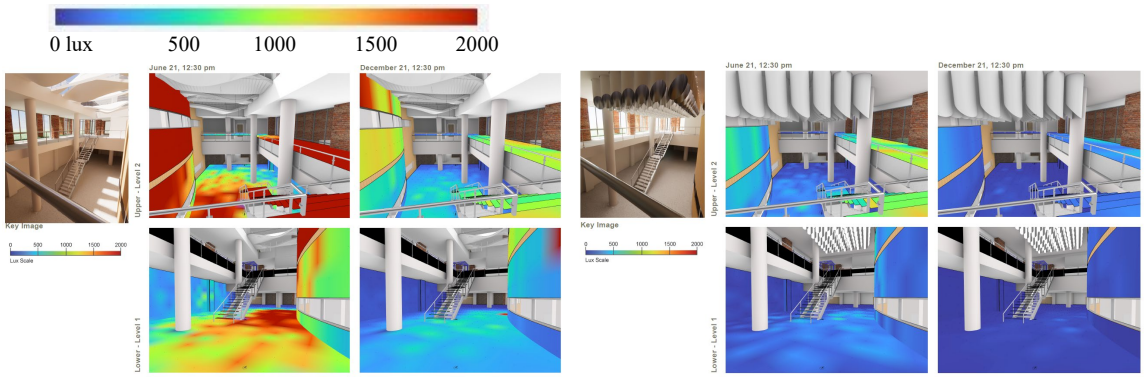

Figure 10. Top: Base Case illumination levels (existing building); Left: Example biophilic skylight (solar control in summer) and Right: Example biomimetic skylight (electric in winter on lower level).

Next Steps: Virtual Reality Testing

To evaluate the qualitative implications of the biophilic and biomimetic design interventions, fourteen models across the three levels of design intervention (modest, moderate, and significant) were selected to be brought into Enscape Virtual Reality (VR) for human subject testing.[15] Expert team members from computer science are working with the team to finalize configuration of the select design interventions into an immersive VR environment. The assessment criteria and methodology have been approved for human subjects testing by the University of Minnesota's Institutional Review Board. Human-subjects testing will evaluate biophilic and biomimetic performance criteria from an experiential standpoint. A select number of users will be invited to the VR Lab to experience the different design models in the VR headset, during and after which multiple subjective and objective measures of their physiological and psychological states will be obtained. Results of this phase of the study will be correlated with results from similar real-world studies to elucidate the extent to which immersive VR technology is capable of being effectively used to assess the positive impacts of bio-inspired design. The team anticipates completion of this phase of the research during the coming year.

CONCLUSION

The conclusions and next steps for the bio-inspired daylighting research are summarized below:

1. *Translating the Six-Step Bio-Inspired Process into Daylighting Design*: The original six step bio-inspired design process adapted from Fayemi et al. was effectively translated into a bio-inspired approach to daylighting utilizing Terrapin's 15 Patterns and the Biomimicry Institute's "Ask Nature" tool for biological models (Figures 1-2).
2. *Quantitative Assessment Using Rhino and ClimateStudio:* The pairing of typical design tools such as Rhino and Enscape with ClimateStudio for quantitative daylighting analysis is easily facilitated. ClimateStudio daylighting assessment of illuminance levels, glare, and contrast can be integrated either between or after daylighting design studies using Rhino and Enscape qualitative renderings.[16]
3. *Qualitative Assessment Using Rhino and Enscape*: Qualitative visual assessment of the quality and atmosphere of design interventions can be assessed qualitatively using iterative Escape renderings during strategic times of day and seasons. This study chose a nine-square format for timelapse studies to provide visual assessment of the daylighting interventions during the morning, mid-day, and afternoon on the summer solstice, spring and fall equinoxes, and winter solstice (9:00 a.m., 12:00 p.m., and 3:00 p.m. on June 21, March/September 21, and December 21).
4. *Next Steps: VR Qualitative Assessment*: The next phase of the design research using Enscape VR and human-subjects participant testing will add a further level to the understanding of the experiential benefits of bio-inspired daylighting and bio-inspired design in general.

ACKNOWLEDGEMENTS

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OPERATIONAL STRATEGIES: NEW MODELS OF THINKING "THROUGH" THE ARCHITECTURE CLASSROOM: METHODOLOGICAL PROPOSALS FOR AN ALTERNATIVE PEDAGOGY ON ARCHITECTURE

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INTRODUCTION

This article documents the trajectory of the "Laboratory through Architecture" course of the Master of Architecture at the Universidad de los Andes. Part of the program's foundation courses are structured around research lines that address professional and academic performance problems in architecture. The proposal projects these lines toward a perspective of programmatic, technological, and social innovation. The laboratory develops research skills in students, promoting their autonomy in the use of methodological resources.

The course structure provides guidance and support, fostering students' independence and critical thinking. The methodology divides each weekly session into two parts: formative and purposeful. The first part is led by a professor or guest expert, and the second part is led by the students, who work on content and developments autonomously and in person.

The work methodology addresses the complexity of the comprehensive project and the design of strategic research systems by analyzing cases in a cultural heritage context, addressing the nature of the new intervention in buildings of high heritage value.[1] Group research encourages debate, the exchange of ideas and contributions from different perspectives, setting expectations, and developing one's own resources. Students participate in feedback of comments and observations to their peers, socializing group work, and addressing research dynamics and multidisciplinary proposals.

This course fundamentally focuses on the construction of collective intelligence. The three-hour weekly sessions, which are organized in programmatic blocks, address specific content. The course is divided into four modules: Images, Diagrams, Analogies, and Tactics, which consolidate the tools necessary to understand the research processes through the architectural project.

Figure 1. Interdisciplinary work session with Alex Gumbel, guest photographer. University of los Andes, February 2024. Contemporary design methodologies require mechanisms capable of producing system integration based on transdisciplinary approaches.

Theoretical-logical framework

From an advanced research sequence perspective, we traced a line that addresses the variability of project systems, identifying and elaborating architectural problems, and implementing and developing complex proposals. We work on the design of a strategy in an integral project within a multidisciplinary framework (Fig. 1). Different approaches to real situations will be developed throughout the course, and the architect's response will be constructed as one of the possible tactics that make up advanced development strategies.[2]

The course develops methodological and conceptual keys to address and establish complex project strategies. The approach responds to the integrative value of three key aspects: systemic, technical, and integral.[3] It fosters a collaborative approach to strategy design in an integral project within a multidisciplinary framework. Throughout the course, students develop different approaches to projects where the architects build responses as other possible tactics that make up advanced intervention strategies.

Based on this theoretical framework our research aims to better understand the meaning and role of different project methodology in Operational strategies, Project methodology, Design thinking, Systemic design, and Transdisciplinary narratives.

Specially, the course methodology proposes analogy as a pedagogical tool to strengthen conceptual and project processes in the diagnosis and ideation stages.[4] Analogy is a comprehension activity that, like many others, helps students to actively use knowledge that goes beyond the limits of what the teacher has taught and builds new knowledge.[5] Analogies have multiple functions in the teaching process. However, they fundamentally serve to compare, represent, or explain a content or thematic axis through processes where two similar attributes in different beings or things are put in tension or relation.[6]

Research “through” architecture involves discovering alternative systems and approaches to conventional research methodologies, using architecture itself as a space for innovation. This approach breaks the usual alignment in architectural research, which traditionally involves processes of analysis, synthesis, and critical review focused on the justification of architectural objects. This

laboratory seeks to define a new research framework, intersecting systems and methodologies that allow for expanding interpretations and activation strategies for new architectures.

Through tools and processes

Four transversal modules have been tested in relation to the architectural project: images, diagrams, analogies, and tactics. Each of these modules implies a transdisciplinary approach to architectural design.

The image serves as a research instrument and a creation methodology, the diagram as a codification strategy and definition of operational structures, analogy as a method of approaching non-architectural references, and tactics as a proposal for a systemic approach.

The students, divided into groups, were given the task of redefining a heritage building in the city of Bogotá, characterized by its "broken" vocation, guided by four exercises that would allow them to understand, abstract, and simulate an action strategy adapted to the complex reality in which these buildings are immersed.[7] For the four exercises, the students incorporated a concept chosen at random from the book "Six proposals for the next millennium" by Italo Calvino[8] and later adapted by Saiz in "The industrialized house, six proposals for this millennium".[9] The approximations are Lightness, Speed, Accuracy, Visibility, Multiplicity, The art of starting and the art of finishing. The concept served as a guide in reading the context and creating the project strategy, offering a key that gave rise to unexpected questions and solutions, different from what usually arises in a project in which the approach is by static and traditional methods. Each module was closed with a presentation and a free-structured text.

THROUGH THE IMAGES

The first exercise focused on using images as a tool for documentation and research. Live drawing was the first approach to the context, allowing details, moments, and colors to flow in a direct axis between eye-hand-blank paper. This flow allowed me not only to capture images but also to understand the context's dynamics by immersing myself in it.

Photography was later used to approach and investigate the object of study, searching for the remains of authenticity, the remains of the documentary, the remains of values that made photography shape the view of architectural space.[10] With the help of a photography teacher, the students produced a photographic essay of three photos each, accompanied by a text to narrate the history of the building and its reality through the sensitivity of each group.[11]

Figure 2. Photographic essay, Paloquemao market square. February 2024.
Photography was utilized to explore and investigate the subject of study. Paloquemao market square workgroup: Daniela García, Daniela Loaiza, Zayra Baquero.

Paloquemao Square text, narrating the history of the building photoessay (Fig 2.):

"The Plaza de Paloquemao resembles an encyclopedic novel due to its multiplicity of stories, characters, and relationships. The plaza functions as an infinite network of connections, each

workstation as an individual microcosm, housing a unique story and connecting with other workstations, generating a multiplicity of stories that intersect with various stimuli, interactions, and interpretations.
The concept of lightness/visibility/multiplicity has put a lens through our eyes when observing the object of study. This concept has helped us clear our gaze of "academic" prejudices and interpret dynamics already seen in other ways, in other words, to imagine new stories. We have asked ourselves new questions or maybe the same ones with different words". Paloquemao market square workgroup: Daniela García, Daniela Loaiza, Zayra Baquero.

THROUGH DIAGRAMS

The second exercise focused on understanding the actors and users of the building through the abstraction of the dynamics and the object.[12] To address this perspective, we work from the diagram. The diagram as a graphic structure of thought associated with an architectural procedure. As Federico Soriano[13] says, a diagram today is architecture. It is not a scheme, a simplification, a preparatory drawing that needs to be translated into a specific language or discipline. It is directly the structure, the space, the form, the material that constructs it. The architectural diagram, from this perspective, will become a project strategy.
The students began the abstraction by creating a discursive image through a collage (Fig. 3). The collage was then used to inspire the transformation of the object of study into a dynamic diagram, which read the relationships between actors and space in the present and the visions of these dynamics "towards the future."

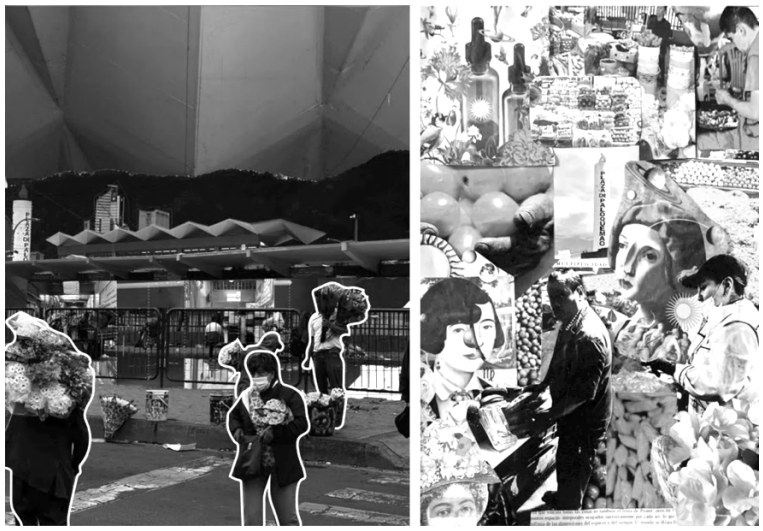

Figure 3. Collage, Paloquemao market square. February 2024. Paloquemao market square workgroup: Daniela García, Daniela Loaiza, Zayra Baquero.

"From diversity comes multiplicity, multiple forms of reproduction, and the multiple offering of products in multiple ways to the future consumer who in the end, and possibly without knowing it, will end up being part of the square and carrying its flows through the city, spreading the essence of the square everywhere, and making it infinitely urban and social, interweaving urban relations with bohemian and artistic ones." (Extract from the final delivery text written by Daniela Loaiza, Zayra, and Daniela Garcia). From the discursive image of the Paloquemao Market Square collage to the final diagram representing the flows and dynamics of the square (Fig. 4).

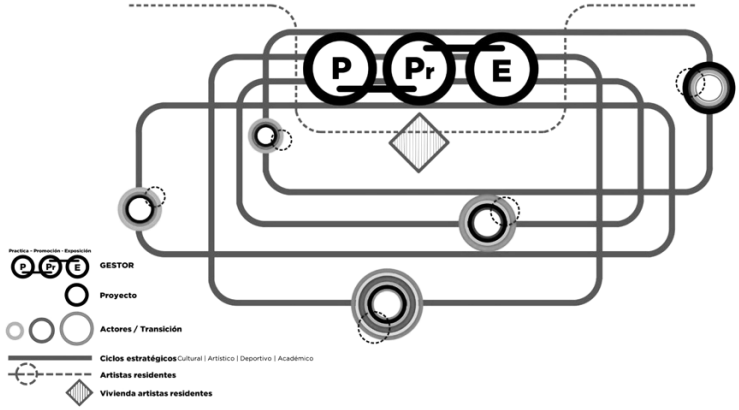

Figure 4. Paloquemao market square, interaction diagram. March 2024. Paloquemao market square workgroup: Daniela García, Daniela Loaiza, Zayra Baquero.

Another example, extract from the final delivery text written by Roberta Longo, Angela Espinel, Andrés Mendoza, shows the connection from the discursive image of the Sabana Train Station discursive image to the final diagram representing the flows and dynamics of the station (Fig. 5):

"According to Saiz, who reinterprets the word visibility by applying it to architecture, images (i.e., buildings) built from words (i.e., processes) work best. The processes we envision for La Estación Sabana are bottom-up processes. This process means opening the doors of the microcosm enclosed by this impenetrable wall, inviting new actors who can give this place an identity—a collage of different identities.

It is nighttime. The streets of Los Mártires are scary, but through the window, you can see lights coming from the Sabana station. What is going on? Is it a party? A rave? Is it a shadow show? The lights call me; they make me leave the house, face the dangers of the street, and I get to the door. A person who looks like me asks me what the word is. I tell him the first thing that comes to mind, and he lets me in. The rest of the story is only for those who dare to dare and imagine something different."

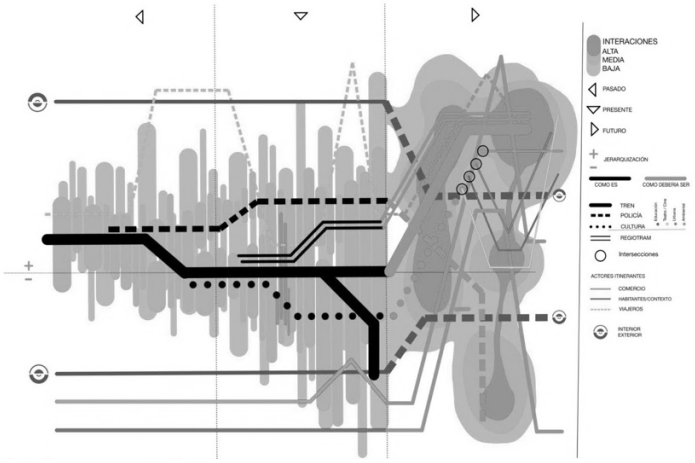

Figure 5. Sabana train station, interaction diagram. March 2024. La Sabana train station workgroup: Roberta Longo, Angela Espinel, Andrés Mendoza.

THROUGH ANALOGIES

In the third exercise, the analogy tool was introduced to approach the project from a different point of view. According to A. Muñoz Cosme, in the book El Proyecto de Arquitectura, the theory of syntactical thinking, based precisely on analogy, allows the conscious use of a pre-conscious mechanism consisting of free associations between completely different objects.[14]

By exploring non-architectural references, students could observe their subject from a different perspective and propose a vision for the future inspired by solutions from various fields outside architecture. Each group participated in a class designed for students intrigued by the course and received advice and ideas from outsiders who were encountering the object of study for the first time. The exercise involved constructing conceptual models to investigate the free associations that emerged from these non-architectural references.

As an example, by developing the Jorge Eliecer Gaitan Center proposal, the workgroup found special significance on the fog (Fig. 6):

"The fog is a counter-monument capable of unifying all these disparate elements in a single container and generator of ideas. Thus, we arrive at our absurdity: The fog forest, which sows water in its context, resists oblivion. This forest that is born from and plays with light reveals what is hidden so as not to be forgotten. In this way, it is revealed that political and environmental discourse converges in the forest as resistance to oblivion, a bastard and syntactical discourse that seeks to mold democratic atmospheres in this building." (Extract from the final delivery text written by Manuela Convers, Julián Guio, Julio Martínez).

Figure 6. Jorge Eliecer Gaitan Center project, development based on the analogy of fog. Artifact "Democratic atmospheres - between the forest and human narratives". April 2024. Jorge Eliecer Gaitan Center workgroup: Manuela Convers, Julián Guio, Julio Martínez.

THROUGH TACTICS

Concluding the course, the fourth exercise aims to "draw conclusions" by developing "tactical" strategies through a systemic and multidisciplinary approach (Fig. 7) which allows the transfer of the essential concepts of Donella Meadows[15] about how to intervene in a system from the foundations of systemic thinking to an updated projection of the principles of design thinking.

The various strategies created by the students primarily involve changes in building management, the introduction of new participants and uses, and the use of interactive diagrams to convey the idea of a building not as a static, "material" space, but as a dynamic environment activated by the people who inhabit it, as Jacobo García Germán explains in the approach of operational strategies in architecture, linking generic space and the construction of relationships.[16]

Additionally, beyond the written text and final presentation of each module, students were encouraged to utilize different media to express their developed strategies. This could include a photo essay that summarizes their plan or a poster imagining a new inauguration of the building along with its scheduled activities (Fig. 8). In this regard, the workgroups implemented different strategies for reading and writing places, following the guidelines proposed by Klake Havik: Description, transcription, and prescription.[17]

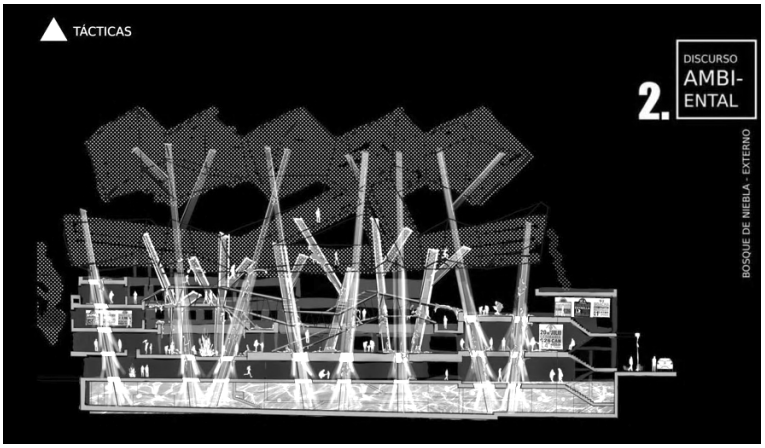

Figure 7. Jorge Eliecer Gaitan Center, tactical proposal. Self-produced cloud forest. May 2024. Jorge Eliecer Gaitan Center workgroup: Manuela Convers, Julián Guio, Julio Martínez

Figure 8. La Sabana Train Station, tactical proposal. Program of activities and workshops to activate the space. May 2024. La Sabana train station workgroup: Roberta Longo, Angela Espinel, Andrés Mendoza.

FINDINGS

The discussion on the role of research and representation systems in architectural creation and production is revitalized every time a new instrument proves helpful in expanding the boundaries of the discipline. This relationship is manifested when the nature of architecture is defined in terms of a specific medium, which defines the character of the projects it produces. This is the case with paper architecture, diagrammatic architecture, or, more recently, parametric architecture, which uses mathematical models and algorithms to consider data as project material.

In this context, the definition of project systems is comprehensive or becomes confusing due to its multiple definitions. This ambiguity dilutes the meaning of the system and the project objective as it overlaps with different approaches to forms, systems, schemes, spaces, structures, and strategies. These imprecisions in the objectives and methodologies of the systems blur both the terms and their potential as instruments, as explained by Sarah Beckman, and Michael Barry, when addressing innovation as a learning process.[18]

The indeterminacy of project systems, or their resistance to being defined in terms that are transversal to the disciplinary approaches of architecture, has proven problematic for constructing a coherent discourse. However, this indeterminacy has also allowed for the opening of speculative scenarios of great interest. The idea of a design practice that encourages open and itinerant thinking was attractive in replacing tendencies denying systemic approaches' capacity to propose. The interest in exploring new ways of researching, designing, and representing architecture arose as a response, setting the agenda for our students, who adopted new work systems to subvert old design paradigms.

This interest in new ways of designing and integrating approaches has been exceptionally provocative in the laboratory. It offers an opportunity to test new design strategies and conceptualize professional practice under new guidelines, motivated by the spontaneity of research processes and the desire to free the architect from absolute control over design outcomes. For the students, this meant that the research process "through" architecture took on a new meaning.

The intentions of the laboratory converge in the aspiration to overcome the limitations of traditional research. Despite the differences in this debate, the students appropriated the various systemic approaches to construct a discourse, and an analytical proposal aligned with their interests, stimulating, transforming, and providing content to their intervention proposals and research practices. Incorporating the notion of research "through" the project into the disciplinary work was not exempt from theoretical correspondences linked to debates and conceptualizations of other areas of knowledge. Each approach raised a debate loaded with theoretical and practical content, allowing each image, diagram, analogy, or tactic to be considered a device capable of subverting the Cartesian research logic, being more flexible and controversial than conventional analyses of architecture.

CONCLUSION

Contemporary design methodologies require mechanisms capable of producing system integration based on transdisciplinary approaches, as opposed to static systems. A project is no longer just about focused design but also about transversal operational strategies.

This design laboratory for the master’s degree in architecture at the Universidad de Los Andes has experimented with tools and instruments that diversify research processes through architectural projects, integrating design thinking approaches with transversal readings on theories and strategies for project thinking in architecture to develop these methodologies.

We conclude that, primarily, these interconnected systems, images-diagrams-analogies-tactics, are a project in themselves. The result is in fact a methodology of dynamic processes synthesized through compression, abstraction, and simulation. Transforming project strategies means transforming how we look at things.

Secondly, it means seeing architecture as an assembly of extensible capacities and energies, not as an inert, moldable object.

We think that today, the figure of the designer and the architect can no longer be formulated solely as a producer of objects but as a strategist of design processes. Therefore, the conclusions of the research developed in the workshop could be summarized in three key aspects:

1. The potential of non-disciplinary approaches in architectural research, focusing on how experimental laboratories can be utilized to research "through" architecture and design.
2. Traditional pedagogical systems for research in architecture often lack the flexibility needed to explore practical approaches to contemporary architectural dynamics and concepts.
3. It is essential to incorporate diverse methodological strategies in architectural research to enhance the impact of project processes.

From here on, consequently we propose some ideas for the future: Primarily, analyze the feasibility of transferring methodologies from postgraduate laboratories to undergraduate teaching environments, which could allow for an expanded methodology. Secondly, explore how project methodologies can be adapted to adopt new strategic design processes that foster greater creativity and diversity. Finally, propose a redefinition of architecture and the role of the architect based on these innovative methodologies.

NOTES

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[3] Laura Guzmán. *Notas sistémicas, Pensamiento Sistémico.* Bogotá: Editorial Uniandes, 2022.
[4] For Camilo Muñoz Cadena, implementing analogical processes as a classroom strategy implies a process in which the student's mind moves from a conscious state to his subconscious mind. The author suggests that graphic analogies allow the student to have a visual reference and carry out conceptual analysis processes simultaneously, recording the image in the mind and, with it, the concept.
[5] "The use of analogies appears linked, on the one hand, to learning in the conceptual field, as an aid in understanding abstract notions."
[6] Alfonso Muñoz. *El proyecto de Arquitectura concepto, proceso y representación.* Barcelona: Editorial Reverté, 2008.
[7] Three working groups were organized during the course, each developing a proposal around a selected building. Jorge Eliecer Gaitan Center: Manuela Convers, Julián Guio, Julio Martínez.
La Sabana Station: Roberta Longo, Angela Espinel, Andrés Mendoza.
Paloquemao Market: Daniela García, Daniela Loaiza, Zayra Baquero.
[8] Italo Calvino. *Seis propuestas para el próximo milenio.* Madrid: Editorial Siruela, 1985.
[9] Pablo Saiz. *La casa industrializada, seis propuestas para este milenio.* Madrid: Ediciones Asimétricas, 2023.
[10] Foncuberta, *La camara de Pandora: La fotografía después de la fotografía.*
[11] Excerpt from the descriptive text of the working group on the Eliecer Gaitan center: *"Through its eyes and behind the trees, an enormous mass unfolds, observing us calmly and with a deep hunger for lightness, for movement. From the abundant cold of its deafening silence, it gathers a concert of skilled artists, pigeons, insects, and rodents. There is no other option than to try to get to know it from the outside because it has a barrier that is imperceptible from the focus of an insect, but from our contrasting size, it is a limit that separates the inside and the outside. That colossal volume cries out loud from the shadows: Why do I exist? What do I exist for? Like a thinker immersed in philosophy, it pursues its still elusive lightness, becoming an endless search."*
"Where does a sleepy and heavy body go? What value does an entity have that has lost its speech? Its interior is filled with dead time, memories, and unfinished plans, with moss, dust, and cobwebs." Jorge Eliecer Gaitan Center workgroup: Manuela Convers, Julián Guio, Julio Martínez.
[12] Nigel Holmes. *Infographic Design: Visual Storytelling with Information and Data.* Philadelphia: Gingko Press, 2021.
[13] Federico Soriano, and Dolores Palacios. "El modelo, MODELS." *Revista Fisuras* 20-2, 2020.
[14] Muñoz, *El proyecto de Arquitectura concepto, proceso y representación.*
[15] Donella Meadows. *Leverage Points: Places to Intervene in a System.* Charleston: The Sustainable Institute, 1999.
[16] Jacobo García. "Estrategias Operativas en Arquitectura, técnicas de proyecto de Price a Koolhaas." In *Estrategias Operativas en Arquitectura, técnicas de proyecto de Price a Koolhaas*, by Jacobo García, 220-242. Buenos Aires: Nobuko, 2012.
[17] Klaske Havik. *Urban Literacy: Reading and Writing Architecture.* Rotterdam: Nai010 Publishers, 2015.
[18] Sara L Beckman, and Michael Barry. "Innovation as a Learning Process: Embedding Design Thinking." California Management Review 50-1 (2007): 25-56.

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THE ALLEGORICAL VISUAL CONSTRUCT

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INTRODUCTION

Architectural drawing has long been more than a technical exercise: it is a medium for storytelling, critique, and speculation. In its various forms, drawing allows architects to test, theorise, and reimagine architecture beyond the constraints of physical construction. This is particularly true for allegorical drawing, which employs symbolic narratives and metaphorical imagery to challenge architectural conventions and explore the broader cultural, social, and philosophical dimensions of architecture. Unlike conventional drawings that serve to document or construct, allegorical drawings operate speculatively, they do not seek to confirm reality but rather to question, critique, and project alternative possibilities.

This paper examines the role of the allegorical visual construct in architectural pedagogy and speculative design. It argues that allegorical drawing transforms architectural education by fostering interpretative, critical, and conceptual skills, equipping students with a visual vocabulary that extends beyond functionalism to abstraction, symbolism, and commentary. By exploring drawing as speculation, critique, and architectural inquiry, the paper situates allegorical drawing in historical and theoretical context, outlines methodologies for integrating it into architectural studios, and discusses how this practice improves students' thinking, imagination, and production.

Through literature review, case studies of student projects, and reflective discussion, this study demonstrates how drawing allegories advance architectural thought and contemporary practice. Allegorical drawing is a tool for ideation and investigation, enabling students to probe deeper questions about the discipline, from memory and identity to ecology and power structures. By transforming the act of drawing into a generative and critical medium, students can challenge dominant narratives, speculate on possible futures, and engage in architecture as a discursive and intellectual endeavour. In doing so, allegorical drawing not only enriches architectural education but also positions architecture itself as a fluid, interpretive, and culturally engaged practice.

Historical and Theoretical Foundations of Allegorical Drawing

Allegory, broadly defined as the expression of one idea through the imagery of another, has deep roots in art and architectural theory. It is fundamentally a 'procedure in which one 'text' is read through another', transferring fragments of meaning from an original context to a new one.[1] In medieval times, allegorical art was often didactic, intended to instruct through symbolic stories. Contemporary allegory, however, shifts focus to the viewer or reader's role in meaning construction, treating interpretation as transitory and culturally contingent,[2] rather than presenting a single fixed

message, an allegorical architectural drawing invites multiple readings and active engagement. As Jonathan Hill observes, allegory in design cultivates an 'interpretative potential of ambiguity', formulating meaning by appropriating and recombining fragments.[3]

In architecture, drawing has long served as the principal medium for investigating allegorical ideas. The Italian Renaissance concept of disegno, which encompasses both drawing and design, placed drawing at the heart of architectural innovation. Giorgio Vasari's establishment of the Accademia del Disegno in 1563 underscored this, affirming that since the Renaissance, the history of architecture has been inseparable from the history of drawing. Early architectural drawings often carried symbolic content alongside spatial information. Architects such as Giovanni Battista Piranesi and Sir John Soane used drawing to convey allegorical themes. Piranesi's Carceri d'Invenzione ("Imaginary Prisons"), fantastical prison scenes, have been interpreted as allegories of boundless labyrinths of the mind. Similarly, Sir John Soane's 1830 drawing of the Bank of England in ruins serves as a cautionary allegory on the impermanence of institutions.[4] These and numerous other examples illustrate how architects have historically relied on drawings to project possible futures for architecture or reconstruct its past. Whether speculative or analytical, drawings serve as more than mere representations: they operate as tools for envisioning unbuilt worlds, challenging existing paradigms, and critically engaging with historical narratives.

Theoretical discourse on allegorical representation gained renewed momentum in the 20th century. In the late 20th century, there was a revival of allegorical thinking in design and representation. Postmodern architects often juxtaposed past and present references in almost allegorical fashion, layering historical motifs with contemporary forms. Rem Koolhaas explicitly employed allegorical drawing in formulating his manifesto *Delirious New York* (1978). In that work, Manhattan's architectural history is depicted through fantastical illustrations—a ghostly Coney Island, a hidden skyscraper of urban programmes—which operate as allegories of urban phenomena and theoretical propositions. Koolhaas 'used allegorical drawings to theorise his thoughts' about the city,[5] blending text and image to construct a 'retroactive manifesto' for Manhattan. Similarly, Bernard Tschumi's Manhattan Transcripts (1981) interweaves plans, photographs, and comic-like sequences in an allegorical mode, mapping events and narratives within architectural space as a form of design inquiry. These visionary works, often classified as 'paper architecture', affirm that allegorical drawings function not merely as artistic fantasies, but as critical tools for architectural theory and speculation.

Another significant thread is the notion of drawing as a mode of design research and philosophical inquiry. Penelope Haralambidou's exploration of the "blossoming of perspective" suggests that allegory and figuration in drawing foster creative discovery. By framing visual perception as a form of language, allegorical drawings extend the 'rational space' of design, embracing imagination and ambiguity as integral to the creative process. She argues that architectural design extends beyond the construction of buildings, functioning as a form of visual literature or philosophy, a method for analysing spatial concepts and their relationship to behaviour, perception, observation, and imagination. This perspective aligns with a long-standing tradition in which architects use drawing and writing in tandem as parallel modes of inquiry, as seen in the treatises and sketchbooks of Renaissance theorists like Sebastiano Serlio and later figures such as Le Corbusier. Allegorical imagery serves as a conduit between abstract thought and architectural form, allowing designers to visualise the invisible. It enables architects and students to map conceptual ideas (for example, charting notions of time, memory, or ideology) or to comment on social and environmental issues through metaphor. Indeed, in recent decades, architects such as Daniel Libeskind (in his Micromegas drawings) or contemporary collectives like Design Earth have crafted elaborate allegorical drawings

to critique and reimagine the world. Design Earth's speculative drawings, for instance, use surreal sectional cuts through the planet to depict climate change and infrastructural systems, inviting the audience to complete the narrative and reflect on planetary futures. In these works, every element of the drawing carries meaning beyond itself, much like props on a stage that contribute to an overall story. The resurgence of allegorical drawing today, both in practice and academia, reflects a recognition that complex global challenges and theoretical questions can be powerfully addressed through visual metaphor and narrative constructs.

METHODOLOGY AND PEDAGOGICAL FRAMEWORK FOR ALLEGORICAL DRAWING

The pedagogical framework for allegorical drawing is rooted in an iterative and exploratory methodology that foregrounds drawing as both an analytical and speculative tool. Within this approach, drawing is not merely a representational device, but an active mode of architectural inquiry, one that engages narrative, symbolism, and conceptual abstraction to reveal latent spatial and material conditions. This methodology is particularly supported by the Inscriptive Practices and Future Processes, a research-led group that I lead at the Manchester School of Architecture, which provides design students with structured, yet experimental ways to engage with the processes and methodologies of drawing.

At its core, this pedagogical model encourages students to treat drawing as a generative act—constructing meaning rather than merely documenting form. Through workshops and iterative exercises, students use allegorical drawing to explore spatial ideas that transcend conventional representation. This framework bridges historical references, contemporary discourse, and digital experimentation.

Lebbeus Woods supports this view, describing drawing as an "instrument of spontaneous experimentation, fluidity of thought, and mobility of invention."[6] For Woods, drawing is not passive but an active tool of inquiry and visual activism—an idea that aligns with the studio's role in fostering symbolic, imaginative, and critical architectural thinking.

A key aspect of this methodology is its emphasis on process over finality. Students are encouraged to embrace ambiguity and develop drawings that operate as open-ended systems rather than fixed solutions. The group's support extends to the exploration of various mediums, including hand-drawing, collage, digital modelling, and hybrid representational techniques that incorporate text, image, and diagrammatic thinking. These methodologies are scaffolded by theoretical readings and precedent studies, drawing from figures such as Piranesi, Boullée, and Lebbeus Woods, as well as contemporary practitioners who challenge the boundaries between architecture, art, and philosophy.

Moreover, the pedagogical framework fosters critical engagement with drawing as a site of inscription and transformation. By embedding the allegory into drawing practices, students learn to use visual narratives to encode layered meanings, reinterpret spatial conditions, and challenge dominant architectural paradigms. The speculative nature of this approach aligns with the broader ethos of Inscriptive Practices and Future Processes, which seeks to cultivate new ways of thinking about architectural representation and its role in shaping future spatial possibilities.

Through this methodology, allegorical drawing becomes a powerful means for students to develop their architectural voice, articulate complex spatial ideas, and engage in a broader theoretical discourse. By positioning drawing as an intellectual and projective act, the framework not only enhances students' representational fluency, but also equips them with a critical and speculative lens for navigating architectural design, research, and practice.

ENHANCING CREATIVE THINKING THROUGH ALLEGORICAL DRAWING

Allegorical drawing has proven to be a powerful tool for boosting creative and critical thinking in architecture. By its nature, this approach forces a departure from purely pragmatic problem-solving and invites speculation and interpretation. One immediate benefit is the stimulation of lateral thinking[7]– because students begin with external, unexpected sources (a medieval allegory, a sci-fi tale, etc.), they make novel connections between ideas and forms, leading to innovative, nonintuitive design moves. Working in this mode also nurtures abstraction and metaphorical reasoning. Students learn to distill complex social or philosophical issues into spatial metaphors, translating text into an image and the idea into a form. This process heightens their ability to conceptually think about the role of architecture. For example, engaging with Calvino's Invisible Cities can inspire students to reimagine invisible infrastructures or emotional landscapes through architectural expression. As Calvino writes, "You take delight not in a city's seven or seventy wonders, but in the answer it gives to a question of yours"[8] (Calvino, 1974, pp. 44)—a reminder that design is as much about posing conceptual questions as offering formal solutions. Allegory amplifies the stakes of studio exploration, often addressing themes like time, memory, or utopia that challenge students to think beyond the conventional.

ALLEGORICAL DRAWING IN ARCHITECTURAL EDUCATION

Within the design studio, allegorical drawing encourages students to move beyond conventional representation. By engaging in metaphor and symbolism, they develop a conceptual vocabulary that bridges architecture with art, literature, and philosophy. As Nat Chard argues in Instruments of Uncertain Occupation, much architectural knowledge is tacit— "we know more than we can tell"—and drawing can be a tool to construct, not just document, such knowledge.[9] Allegorical drawing aligns with this view, allowing students to surface unspoken insights through speculative imagery. It becomes a process of discovery—revealing deeper meanings rather than simply representing form or function.

Student Case Studies

Synchro[City] by Saylah Hussain, Bachelors Architecture 2020, Birmingham City University, UK
RIBA Bronze Medal Nomination

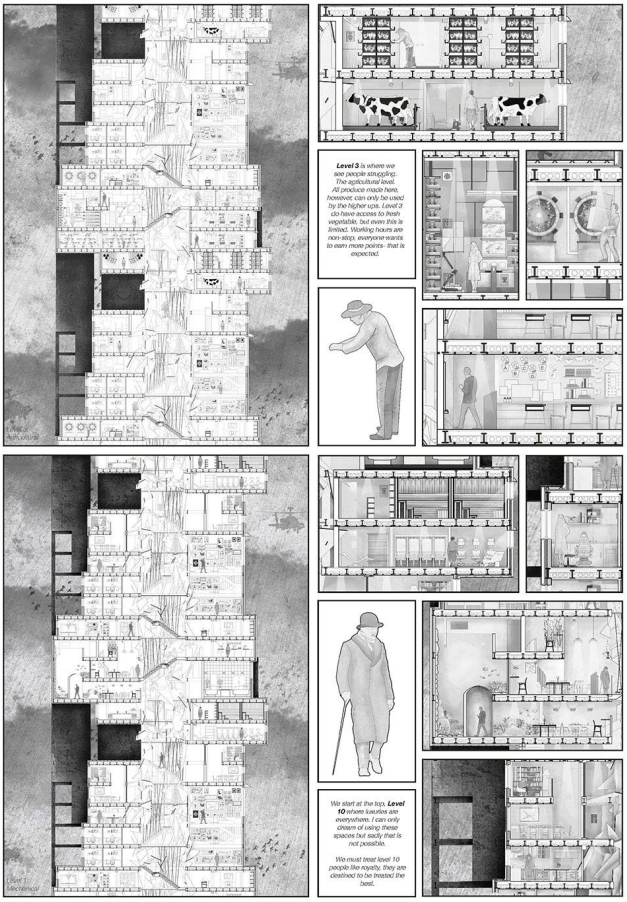

Figure 1. Synchro[City] by Saylah Hussain, 2020.

Set in a dystopian vision of 2052, this project envisioned a future where austerity has deeply fractured social sustainability, exacerbated economic divides, and eroded communal life. Within this oppressive landscape, an urban resistance movement emerges that challenges rigid economic structures through speculative spatial interventions. The project's allegorical drawings, Figure 1, serve as a critical medium to visualise this struggle, mapping the tensions between control and subversion, restriction and resilience, decay, and reconstruction.

Rather than presenting a static dystopia, the drawings unfold as a narrative of defiance, capturing the evolution of clandestine networks, repurposed infrastructures, and ephemeral spaces of resistance. They depict an underground architecture of protest: hidden passageways, reappropriated urban voids, and adaptive structures that transform the rigid city grid into a more fluid insurgent spatial system. These interventions reimagine architecture as an act of subversion, where citizens reclaim, hack, and reconfigure their environments to counteract imposed economic constraints.

GoodFish by Sadiyah Tijani, Masters Architecture 2024, Manchester School of Architecture, UK

Figure 2. GoodFish by Sadiyah Tijani, 2024.

GoofFish (Sadiyah Tijani) – A narrative-driven architectural intervention that critically engaged with the challenges faced by Ghana's fishing communities, this project explored the intersection of ecological preservation and cultural continuity through allegorical drawing. By weaving together spatial storytelling, environmental strategies, and traditional fishing practices, the intervention seeks to address the socioeconomic vulnerabilities of coastal communities while envisioning a resilient and future-orientated framework. This intervention goes beyond static architectural representation, using allegorical drawings, Figure 2, to encode the rhythms of daily life, seasonal cycles, and the lived experience of the fishing community. The drawings capture the fluidity of the seascape, the choreography of fishing techniques, and the spatial logic of coastal settlements, positioning the intervention as both a symbolic and functional response to pressing environmental and social concerns.

A Post Colonial Journey into Filmic Imaginary by Ebrahim Variava, Masters in Architecture 2024, Manchester School of Architecture, UK
RIBA Silver Medal Nomination

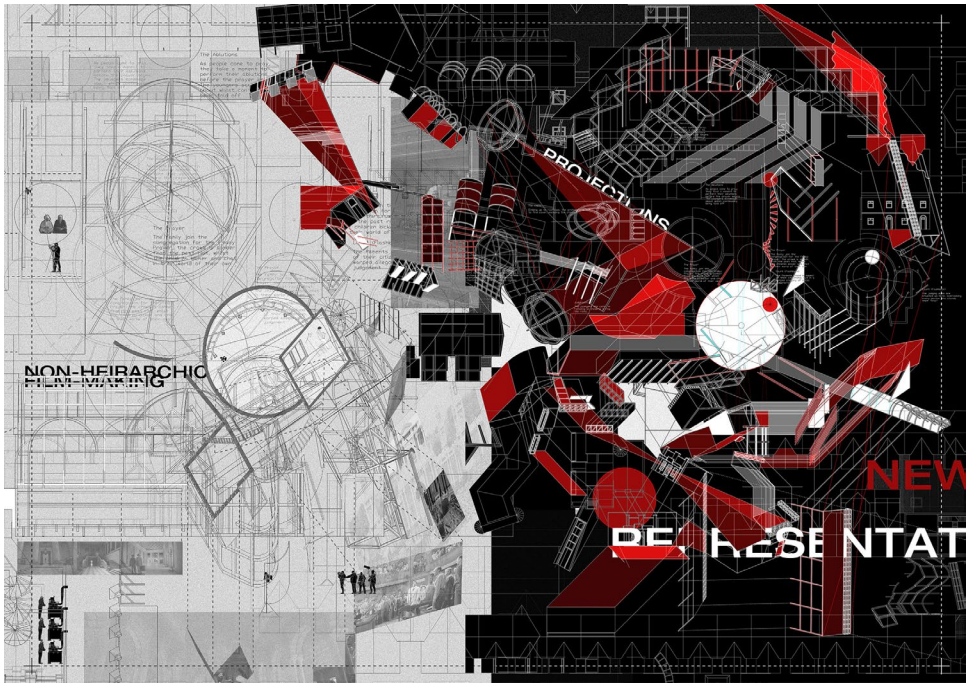

Figure 3. A Post Colonial Journey into Filmic Imaginary by Ebrahim Variava, 2024.

This project is a cinematic exploration of fragmented post-colonial identities, using spatial notation and montage as architectural tools to reconstruct displaced memories and hybrid cultural narratives. Rooted in the diaspora experience, the work interrogates how postcolonial subjects navigate a world where identity is constantly in flux, shaped by historical dislocation, cultural erasure, and the tension between memory and constructed narratives.

Inspired by the language of cinema, the project employs filmic montage as an architectural method, layering disjointed sequences, superimposed frames, and spatial cuts to reflect the fragmented nature of identity. The allegorical drawings, Figure 3, function as a kind of cinematic palimpsest, revealing moments of rupture, transition, and transformation.

The Reconstructed Orient by Mayce Arebi, Masters in Architecture 2024, Manchester School of Architecture, UK

RIBA Silver Medal Nomination

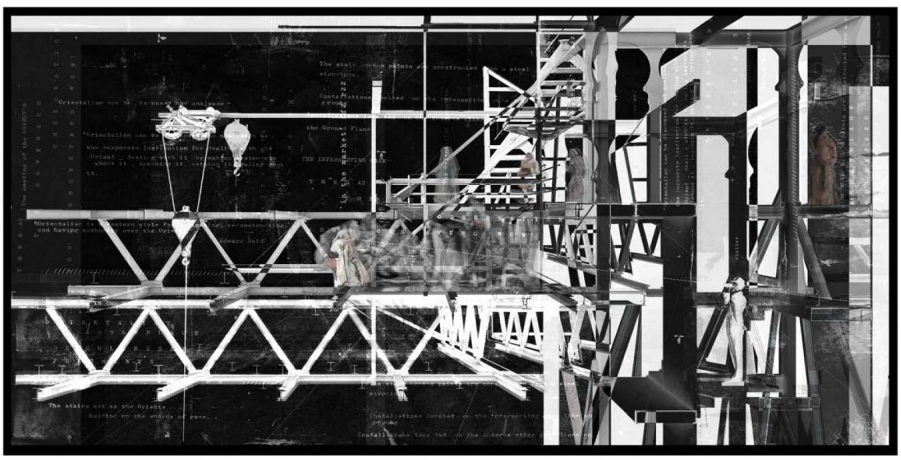

Figure 4. The Reconstructed Orient by Mayce Arebi, 2024.

The Reconstructed Orient is a critical deconstruction of Orientalist narratives in museum spaces, reclaiming representation through feminist architectural interventions. This project challenged the entrenched colonial gaze embedded in Western institutions, interrogating how museums have historically framed and fetishised representations of Muslim women and the so-called "Orient." By dismantling these constructed narratives, the project reclaims agency over representation, proposing speculative spatial interventions that disrupt, recontextualise, and ultimately redefine the way these histories are displayed and understood. Allegorical drawing, figure 4, plays a pivotal role in reimagining the museum as a counter-narrative space.

BROADER IMPLICATIONS FOR ARCHITECTURAL THOUGHT AND PRACTICE

A key implication of this pedagogical approach is that it reinforces architecture as a deeply intertwined cultural practice with other disciplines. Bringing literature, philosophy, or ecology into the design studio mirrors how some contemporary architects work. For example, the design collective Design Earth uses allegorical drawings to merge environmental science with architectural speculation, addressing issues like climate change through visual narratives. Such speculative proposals expand the agency of architects, enabling them to engage in public debates and imagine alternative futures beyond the limits of conventional practice.

Allegorical drawing also challenges the prevailing modes of architectural representation. In an era dominated by photorealistic renderings and the advances of A.I, the layered symbolism and deliberate ambiguity of allegorical images offer a vital counterpoint. A powerful narrative drawing can serve as the conceptual catalyst and differentiator of a project: a compelling image with a story can capture imaginations and differentiate a design in competitions or publications. In fact, unbuilt visionary drawings that tell a story often circulate widely in architectural media, evidence of the strong appetite for designs that engage the imagination.

The resurgence of allegorical drawing in architecture resonates with contemporary theory's renewed focus on experience, narrative, and meaning. By practising allegorical representation, architects acknowledge that buildings communicate beyond function—conveying values, contradictions, and layered cultural messages. In this context, Perry Kulper emphasises the "generative potential of architectural drawing"[10] and the way his work resists reductive clarity—an "architecture of ideas" composed through layered, relational, metaphorical mapping rather than purely functional depiction. His approach underscores that drawings can operate semiotically—not simply illustrating form, but acting as narrative constructs that produce knowledge. Allegorical visual constructs are thus part of a broader movement to reclaim meaning in architectural form, reminding us that architecture has semantic and epistemological dimensions: it can be a language and a means of inquiry.

Finally, embracing allegory requires care. There is a fine line between rich, layered meaning and arbitrary form-making. Allegorical design must establish a legible connection between its conceptual source and its architectural outcome. While the studio offers a space to test these ideas, successful allegory must still serve real-world needs. As students become practitioners, their fluency in this mode may help shape a more symbolically articulate built environment.

CONCLUSION

Allegorical drawing emerges from this study as a vibrant pedagogical and creative practice that enriches architectural education and discourse. Its historical and theoretical foundations show that the allegorical visual construct is not a radical departure but rather a re-centering of architecture's enduring engagement with narrative and symbolism. The methodology outlined demonstrates that, with guidance and clear frameworks, students can harness allegory to produce innovative designs that

transcend conventional studio outcomes. The process sharpens their intellectual agility – blending analysis with imagination – and yields drawings that operate on multiple levels: aesthetically captivating, conceptually profound, and narrative-rich.

For educators, researchers, and practitioners, the takeaway is that integrating allegorical drawing into design pedagogy can cultivate architects who are thinkers and storytellers, not just problem-solvers. In an era where the challenges we face – from climate change to social inequality – demand leaps of imagination and moral insight, the capacity to engage speculative scenarios is invaluable. Allegorical drawings serve as a kind of laboratory for ideas, where unbuilt visions can provoke dialogue and inspire new directions. They allow architecture to project visions of what could be, functioning as a form of applied imagination that can prefigure change.

Ultimately, the role of allegorical drawing in speculative architectural design is one of empowerment: it expands the toolkit of representation and ideation available to architects. As this practice gains traction, we may see a richer architectural landscape where buildings – and even unbuilt projects – speak in allegories, engaging the public not only through physical presence but through the stories they tell. The allegorical visual construct stands as both a pedagogical strategy and a visionary impulse, one that will continue to shape architectural thought and practice in meaningful ways.

NOTES

[1] Jonathan Hill, Immaterial Architecture (New York: Routledge, 2006), 45.
[2] Walter Benjamin, The Origin of German Tragic Drama, trans. John Osborne, London: New Left Books, 1977, pp. 159-161.
[3] Penelope Haralambidou and Jonathan Hill. Allegories of Architecture, 2007. Accessed February 13, 2025, https://www.domobaal.com/resources/penelopeharalambidou/penelope-haralambidou-jonathan-hill-domobaal.pdf
[4] Amin Ghaffarinejad. 2019. The Mansion of Adam: an investigation of the architecture of displacement. Accessed February 25, 2025, https://repository.tudelft.nl/file/File_44fd95f4-fc17-429c-89d4-25958db43209
[5] Penelope Haralambidou, "The Fall: The Allegorical Architectural Project as a Critical Method," in Critical Architecture, ed. Jane Rendell et al. (London: Routledge, 2007), 226.
[6] Rafik Patel. "The Drawn Revolution: Lebbeus Woods' Sites of Activism." In Proceedings of the Annual Design Research Conference 2019: Real/Material/Ethereal, edited by Laura Harper, 524-530. Melbourne: Monash University, 2020. 530.
[7] Daniel K Brown. Allegorical Architectural Project: Provocateurs, Propositions and Confrontations in Emerging Talents: Training Architects (London: Wiley, 2021), 122
[8] Italo Calvino, *Invisible Cities*, trans. William Weaver (New York: Random House, 1974), 44.
[9] Nat Chard. 2024. Accessed July 13, 2025.
https://drawingmatter.org/wp-content/uploads/2024/04/DMJ_No2_NatChard.pdf
[10] Perry Kulper. Drawing Architecture, A Conversation with Perry Kulper. Accessed July 13, 2025, Perry Kulper - WAI Think Tank

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DIDACTIC DESIGN: REIMAGINING ENGAGEMENT IN THE GENERAL EDUCATION CLASSROOM

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INTRODUCTION

A student-centered approach to course design ensures that the course's content, structure, and delivery evolve in concert with the continually changing characteristics of the student community. This paper examines how critical engagement is fostered in Appreciation of Architecture, a large-format general education course with an average enrollment of 200-250 undergraduate students. The guiding principle of the course is that students come first. This paper argues how exploring ideas in a deliberate, curious, and reflective way is a function of learning both in and by one's community.

The first section of the paper details how members of the class are invited to play a role in developing the course's structure. It examines how student feedback influences the ways in which the course unfolds, including ground rules for discussion and exam format. The second section demonstrates ways in which a low-pressure learning environment welcomes moments for nurturing peer-review and open-mindedness.

This paper concludes by positioning this approach in a contemporary architecture discourse centered on rigor, backwards design, and empathy. Ultimately, it argues that teaching should be viewed as a design project. This means, as teachers, it is imperative to keep iterating and to not be fearful of the unknown.

Paradigm Shift

In an essay for *Educational Research* called "Public Education and the Public Space," educational philosopher Maxine Greene reminds us that "education has to do with new beginnings and reaching toward what is not yet."[1] While some changes to education have been unfolding over decades, others have happened seemingly overnight. Since the late 1800s, there have been numerous attempts to provide insights and advice for classroom teachers. Today's classrooms, though still primarily academic, are no longer only "places where people meet for the purposes of giving and receiving instruction." [2] Over the past century, teachers have continued to structure classroom interactions to achieve academic objectives.[3] However, the factors which affect planning and course design have shifted to include considerations regarding how students might best learn.[4] Moreover, as research-based theories of how people learn have emerged, even more has happened within the learning science within the last few decades. For example, backwards design approaches have instructors articulating learning goals and assessment before considering content delivery.[5] Learning has come to

be understood as a process not a product that unfolds over time. Learning is also regarded as the direct result of how we interpret and respond to our experiences conscious and unconscious, past and present.[6] As a result, transmission modes of instruction in teacher-centered classrooms have been replaced with interactive discourse structures which include students' questions and initiatives. Increasingly "students desire authentic relationships where they are trusted, given responsibility, spoken to honestly and warmly, and treated with dignity." [7] It could be argued that this is another moment of change as seemingly overnight, remote learning, online learning, and generative-AI were upon us. For some educators, years of teaching experience worked against educators who found it difficult to adapt and embrace modernization and change. Thus, whether viewed as out of necessity or long overdue, the role of the educator is once again being reimagined.

The Design Challenge

Substantially altering the traditional relationship between teachers and students calls for a shift in the classroom focus from how teachers think to how students learn. This means classrooms should be viewed as communities, living, breathing, evolving ecosystems with layers of perspectives and experiences. Ideally, student-centered approaches to course design evolve in concert with the changing characteristics of the student community.

General Education

Perhaps one of the most challenging ecosystems to reorient toward a student-centered approach is the general education classroom at institutions for higher education. With enrollment often exceeding 200 students and sessions offered in large and uninspiring auditoriums customizing the general education classroom for each cohort may be viewed as a Herculean task. Reforming and improving general education and general education learning environments has been on the minds of leaders of American high education since the 1970s. In *General Education Essentials*, a publication by the American Association of Colleges and Universities (AAC&U), author Paul Hanstedt writes of general education's ability to be deliberate about "providing graduates with the wicked competencies they will need to be productive citizens in the world."[8] Similarly, on the potential power of general education, high education expert Paul Gaston warns:

Never before has there been so great a need for learned and adaptable citizens capable of taking apart and understanding complex problems, of identifying reliability and authority among the many sources of information, of appreciating the quantitative realties that may lie beneath the surface, of thinking creatively about solutions, of communicating to others the emerging results of their work, and of working with others to bring solutions into practice. [9]

Above all else, it is understood that at the heart of general education teaching is helping students build the knowledge, skills, and attitudes so that they can be recalled accurately and used appropriately in a new context at some time in the future.[10] Given its power to transform student agency, the general education setting should be seen as a place where students come first and thrive.

A STUDENT-CENTERED APPROACH IN A GENERAL EDUCATION CLASSROOM

This paper explores what happens when a student-centered approach is applied to the course design of a general education course at Louisiana State University. It details how the course's content, structure, and delivery evolve in concert with the continually changing characteristics of the student community. Operating under the assumption that motivating students to explore ideas in a deliberate, curious, and reflective way is a function of learning in and by one's community, the course incorporates activities and student-led initiatives that led to an open and calibrated learning environment for students.

The Context

Appreciation of Architecture (ARCH 2401)–the context of this study–is a general education (Arts) course at Louisiana State University. The course is also an approved Integrated Learning Core (ILC) course for inquiry and analysis. Integrative learning allows students to make simple connections among ideas and experiences and across disciplines and perspectives. The LSU Integrative Learning Core curriculum is designed to develop student abilities to transfer their learning to new situations and demonstrate a sense of self as a learner. The catalog description for Appreciation of Architecture points to a focus on "architectural concepts and principles; architectural vocabulary, style, symbolic form, characteristics, spatial character and refinements." [11] This course is an introductory course aiming to provide students with an introduction to architecture and encourage them to consider architecture's role in society over time from a broad cultural perspective. Students come to understand architectural works and practices not merely as buildings, but as expressions of the ideas and attitudes shared with the humanities, arts, and sciences. The course covers many aspects of architecture by exploring contemporary and historical building examples, drawings, models, and exhibitions as well as theoretical writings. Students are given the opportunity to examine the various ways architecture has responded to human needs and desires as well as the underlying social, cultural, and ecological conditions. While thinking deeply about these issues is at the core of the course, so is learning how to communicate thoughts and observations clearly and confidently. As such, the course includes exercises which have been designed to help students improve the way they articulate their ideas verbally, in written format, and when engaging with artificial intelligence.

Learning Objectives and Outcomes

This course's learning objectives focus on helping students gain a beginning understanding of the primary ideas and concepts underlying key buildings, constructed landscapes, and urban systems that constitute the diverse built environment. Students do so by recognizing architectural elements (e.g. cultural context, form, material, techniques) of significant constructions as well as understanding the diverse ways in which individuals and social groups engage with the built environment. In addition to identifying and defining key terms, and concepts, students are given the opportunity to visit and analyze a work of architecture and subsequently convey their observations by a writing assignment, a "love letter" to the building they admire.

Course Logistics and Demographics

Historically, course enrollment consists of 200-250 undergraduate students, some of whom are majoring in Architecture. Approximately 70% of enrolled students are freshman in their first semester of study. The remaining students are a combination of year levels, most commonly sophomores.

Pace

The course meets in person, three days per week. During the first meeting of the week, a theme is identified and paired with a wide range of examples from different parts of the globe and across disparate time periods. During the second meeting of the week, the course pivots to focusing on just two case studies from the built environment. Finally, the last session of the week focuses on making broader connections, prioritizing how the theme can be related the student's immediate surroundings, the buildings, art, and culture of southern Louisiana.

Inviting students to play a role

Given that student initiatives and ideas have the capacity to substantially alter the way in which the class unfolds, members of the class are invited to play a role in developing the course's structure. The following examples provide a view into the classroom designed in collaboration with students. When polled, students responded that they felt involved in what was being taught to a greater degree than the college average.[12] Engaging students to invest in the process has the power to strengthen the ability to learn, recall, and connect with the information conveyed.

Establishing Ground Rules

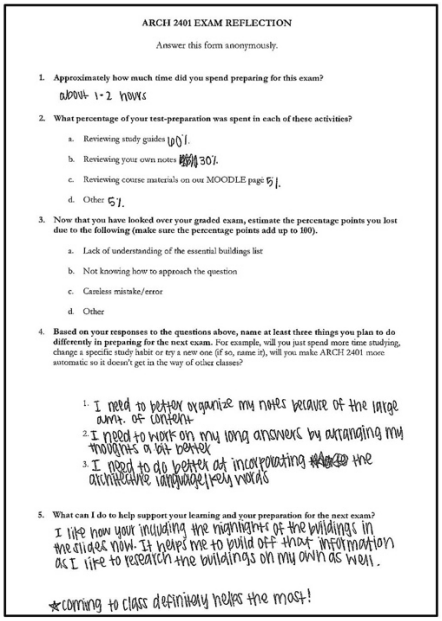
On the first day of class, students are invited to form small groups with people sitting nearby. They reassured that this activity is not part of a group project but rather a brief, in-class discussion. First, they are asked to talk a bit about themselves (e.g. name, major, anticipated graduation year, and hometown). Then, they are asked to think about the best learning environment they have experienced, and what made it great. They are also prompted to reflect on some of their worst learning experiences and what made them so difficult. The groups are allowed ten minutes to discuss, then they are invited to share ideas with the class. As students begin to detail successes and frustrations, the instructor develops a list of ground rules. These rules are posted on the course management page and referenced as the weeks unfold. The students create rules for themselves and the instructor. It is the process of co-authoring the rules that allows for the sharing of responsibility. The instructor is no longer the only voice responsible for maintaining the quality of the learning environment.

Assessment Design

A few weeks into the semester, a series of group discussions position students to help shape the structure and flow of in-class review days and to design their assessment. Four review days are built into the semester schedule. The review days aim to prepare students for each of the two exams, a midterm and a cumulative final. Students determine which aspects of the course content will be reviewed in detail and in which order. They are given a chance to anonymously indicate areas in which they need additional support, thus shaping the content and focus on scheduled review days. Then, the exam platform is shared with students. A mock exam is projected for all to view. Students share their preferences when it comes to how much information is presented at once. The instructor also models different features of the platform (e.g. typeface, size, color). Students' ideas and requests are incorporated into the exam design to the extent that it is feasible. This process is repeated in advance of the final exam.

Mid-semester Feedback

After the midterm exam, students submit an anonymous reflection. They are asked to disclose information about how long they studied or prepared for the exam and indicate where they lost the most points. The reflection asks students to list at least three things differently when preparing for the next exam as well as a general question about how else the instructor can support their learning – as illustrated in Figure 1. While end-of-semester course evaluations are indirect measures that assist in planning the next semester, receiving feedback in real time positions the instructor to calibrate to the class in the moment. Mid-semester feedback generates suggestions which range from proposing to increase the typeface size on slides to offering additional writing activities in preparation for the final exam. End-of-semester evaluations indicated that the students felt comfortable in the learning space because they felt that their unput was valued.



ARCH 2401 EXAM REFLECTION

Answer this form anonymously.

1. **Approximately how much time did you spend preparing for this exam?**
   about 1-2 hours
2. **What percentage of your test-preparation was spent in each of these activities?**
   a. Reviewing study guides 10%.
   b. Reviewing your own notes 30%.
   c. Reviewing course materials on our MOODLE page 5%.
   d. Other 5%.
3. **Now that you have looked over your graded exam, estimate the percentage points you lost due to the following (make sure the percentage points add up to 100).**
   a. Lack of understanding of the essential buildings list
   b. Not knowing how to approach the question
   c. Careless mistake/error
   d. Other
4. **Based on your responses to the questions above, name at least three things you plan to do differently in preparing for the next exam.** For example, will you just spend more time studying, change a specific study habit or try a new one (if so, name it), will you make ARCH 2401 more automatic so it doesn't get in the way of other classes?
   1. I need to better organize my notes because of the large amt. of content
   2. I need to work on my long answers by arranging my thoughts a bit better
   3. I need to do better at incorporating the architecture language/key words
5. **What can I do to help support your learning and your preparation for the next exam?**
   I like how your including the highlights of the buildings in the slides now. It helps me to build off that information as I like to research the buildings on my own as well.
   *coming to class definitely helps the most!

Figure 1. Post-midterm reflection.

CO-DESIGNING THE LEARNING ENVIRONMENT

Establishing and maintaining a low-pressure learning environment welcomes moments for nurturing peer-review and open-mindedness. Students in Appreciation of Architecture also play a role in determining the qualities of their learning environments. By contributing to the atmosphere of the classroom, the auditorium begins to feel more like a living room than a classroom. While on one hand, the purpose of the course is to introduce students to the subject of architecture, the course is also about highlighting connections to other disciplines and ways of life. The purpose of the course is to help students gain a perspective and to inspire them see the world in a different light.

Creating an atmosphere

Music, visual aids, and moments of levity are incorporated into the class each session. Music fills the auditorium space during the class transition window and first moments of class. This effectively allows students to get into a headspace in which they feel ready to engage with the course material. At times, students inspire the course material itself. At the start of the semester, students are polled about their top travel destinations. To the extent it is feasible, destinations are incorporated into course content. Additionally, the way in which students engage with content is considered. The course management webpage is rigged to resemble a social media platform rather than a traditional course page– as illustrated in Figure 2. The colorful reminders which populate the page are scrollable and discernible at a glance. Adding a touch of levity humanizes the learning process. Humor is incorporated into lectures. Some examples include architectural facts and architectural building failures. It serves as a level point of entry for students to learn about architectural principles and humor serves as a grounding element.

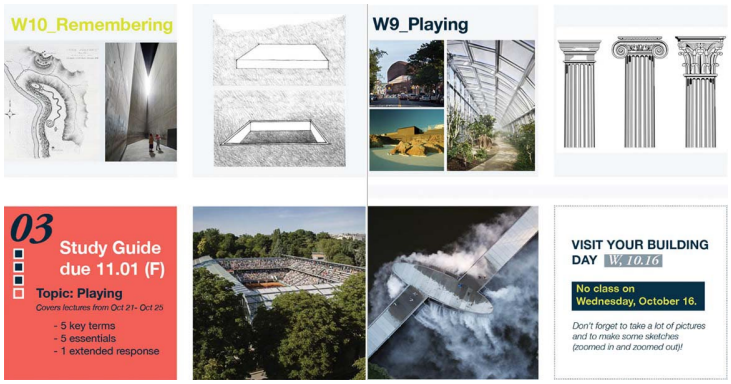


Figure 2. Course management page.

Creating a community

In an effort to view the class as a community, students complete an index card that lists their major, year-level, and hometown, they are also asked to provide thoughts on why architecture matters to them and to express their concerns coming into the class. They are also asked to describe something interesting about themselves (e.g. irrational fear, past experience, etc.). In an effort to help students view the sea of people in the room as a collection of individuals with unique stories as well as a community, responses are read aloud:

"In this room, we have bakers and someone who is named after the month they were born in. A ballerina, tattoo artist, longboarder, and a certified scuba instructor; dog trainers, and animal lovers; people with Golden-Doodles, snakes, and someone with 60 chickens, 25 ducks, one pig, and three dogs. Another member of this class has eight chickens, one alligator, and a snapping turtle. We have a former prom king in this class and someone who can complete a Rubik's Cube with their feet." [13]

A common concern for non-Architecture majors is lacking a background in architecture. Many are concerned about their time management skills. They communicate fears of becoming overwhelmed or falling behind in their coursework. Students wrote about architecture's ability to creates shared spaces that can impact how people feel. They believe it can tell a story. Some refer to it as a physical manifestation of form, culture, and community. Addressing concerns early on and gaining a clearer understanding of their impressions of architecture at the onset of the course and subsequent weeks, these fears are addressed by in-class activities that mimic exam essay questions, intentional pauses to the lecture which focus on notetaking strategies and tips. Student hobbies and interests are referenced as the themes discussed turn into expanded discussions regarding architecture's relationship with the arts and humanities.

Starting at home

Finally, a writing assignment calls for students to write a "love letter" to a building they admire. They are required to visit the building and document their visit in the form of a "building selfie" before developing a creative writing essay that assumes the perspective of someone walking through the building. During the weeks leading up to the project deadline, students are guided through a workshop that allows them to discover the capabilities and limitations of generative AI. Using the text-to-image feature, students import a caption they have written that describes a specific moment in the context of a building element or feature– as illustrated in Figure 3. They work iteratively with the AI tool, refining the text, until they achieve an image that closely resembles the original image taken at the building itself. This activity opens a discussion about AI as a powerful yet imperfect tool, one that generates information that is only as accurate as the information available to the platform.

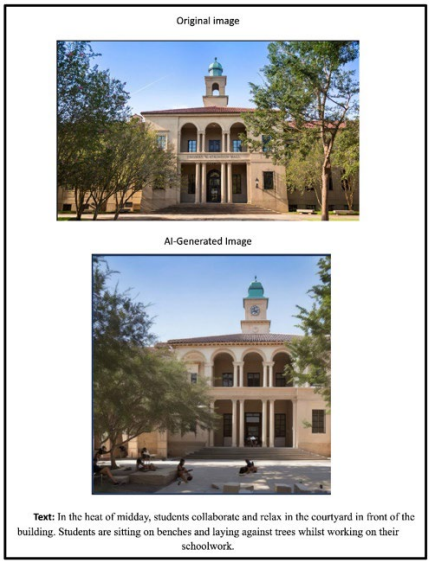


Figure 3. Text-to-Image Assignment, Student work (J. Morgan)

CONCLUSION

This has been a peek inside a student-centered general education classroom. Students enrolled in this course co-author classroom activities and are trusted to define and design their learning environment. The activities, discussions, and actions detailed in this paper should be viewed as experiments. They represent just some of the countless ways of strategies proposed and piloted over the past decades.

General education has the power to inform, excite, and prepare students to take on future challenges. Now more than ever, there is an urgency to augment the impact of these courses. As pedagogical approaches evolve, it is routinely more apparent that the structure and nature of these large-format courses should also be perennially renewed. In many ways, teaching should be viewed as a design project. There are parameters, but also opportunities and optimism embedded within each scenario. If instructors embrace the guiding principle that students come first, then the focus can shift from how teachers think to how students learn, and students may thereby become more invested in the learning process.

NOTES

[1] Maxine Greene, "*Public Education and the Public Space." Educational Researche*r 11, no. 6 (1982), 4.
[2] Willard Waller, *The Sociology of Teaching* (New York: Wiley, 1932), 8.
[3] Hugh Mehan, Learning Lessons: Social Organizations in the Classroom (Cambridge: Harvard University Press, 1979).
[4] Donald C. Orlich, Robert J. Harder, Richard C. Callahan, Michael S. Trevisan, and Abbie H. Brown, *Teaching Strategies: A Guide to Effective Instruction 9th Edition* (MA: Wadsworth, 2010), 102.
[5] Grant Wiggins and Jay McTighe, *Understanding by Design* 2nd Edition (Alexandria, VA: Association for Supervision and Curriculum Development, 2005), 13.
[6] Susan A. Ambrose, Michael W. Bridges, Michele DiPietro, Marsha C. Lovett, and Marie K. Norman, How Learning Works: 7 Research-Based Principles for Smart Teaching (CA: Wiley, 2010), 3.
[7] Mary Poplin and Joseph Weeres, Voices from the inside: A Report on Schooling from Inside the Classroom. (Claremont, CA: Institute for Education in Transformation at the Claremont Graduate School, 1993).
[8] Paul Hanstedt, General Education Essentials: A Guide for College Faculty (CA: Wiley, 2012), 24.
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[10] Diane Halpern and Milton Hakel, Applying the Science of Learning to the University and Beyond: Teaching for Long-Term Retention and Transfer in Change The Magazine of Higher Learning, July 2003, 37.
[11] ARCH 2401: Appreciation of Architecture course catalog description from the Louisiana State University General Catalog 2024-2025
[12] Data pulled from student evaluations report, Fall 2023
[13] Excerpts from Fall 2024 student index cards

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CHARACTER-LED DESIGN IN ARCHITECTURAL PEDAGOGY: ADVANCING INCLUSIVE AND COLLABORATIVE LEARNING ENVIRONMENTS

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INTRODUCTION – THE PREMISE

After a decade of practicing architecture, I began to feel disillusioned with the field. One key factor contributing to this sentiment was the tendency to view future occupants of buildings and the surrounding context as abstract entities within the design process. This approach often overlooks individuals' emotional and sensory experiences and deep connections to the unique characteristics of each place. This detachment from authentic human experience and disregard for context motivated me to seek a more thoughtful approach to design.

I also harbored ongoing concerns about the issue of persistent spatial injustice in South Africa, rooted in its colonial and apartheid history. Similarly, working in architectural academia, the #FeesMustFall[1] protests supported my concerns about a gap in architectural education where students were often taught to design spaces according to Eurocentric principles. This means that design approaches, spatial concepts, and aesthetic values were grounded in European traditions and did not always reflect the Global South's lived experiences, cultural practices, and environmental conditions. This persistent disconnect suggested that architectural education was not sufficiently addressing the regions' unique social, economic, and climatic contexts, leading to designs that were not fully relevant or responsive to local needs. This realization mirrored my professional experiences and raised questions regarding the relevance and depth of our curriculum.

Upon entering academia, the powerful experience of being encouraged to pursue further study enabled me to learn, expand my knowledge, contribute, and introduce transformative practices to the existing curriculum.

This paper presents Character-Led Design,[2] a narrative-based methodology I developed to enhance inclusivity, empathy, and collaboration in architectural design practices and pedagogy. By combining techniques from architecture and film, this methodology emerged as a response to the three key factors mentioned above.

The Turning Point

As an architect, I was involved in several projects in commercial practice. While working, I noticed a lack of consideration in the design process for the diverse and complex relationships among people, cultures, and the places they inhabit. These social complexities get stripped away in the design

process, leading to people and life being viewed as abstractions or simplified objects within the architecture. I realized that the feelings, emotions, memories, subjectivities, and temporal aspects associated with buildings and places are frequently overlooked during design processes and not evident in architectural representations. Representations of people are often included in architectural drawings; however, they typically serve to illustrate the scale and programmatic functionality of a space. While architects may customize their figure abstractions, these are generally an expression of the architect's identity and drawing style.

Studying further during the Master of Arts by coursework and research report in film and TV was a significant moment, especially in understanding about scriptwriting. I discovered that a character's emotions and development in a visual narrative are intricately connected to the places they inhabit. Each character exists in a specific setting that either reinforces or contrasts with their emotional state. This interaction is crucial for developing mise-en-scène, the visual composition within the frame. This insight in filmmaking emphasized the importance of understanding how people connect to a place. While architects can't meet everyone's needs, we should focus on incorporating empathetic listening into the design process. This perspective motivated me to rethink architectural education and how these concepts could be included in the curriculum.

This internal dialogue coincided with the #FeesMustFall protests, which started on October 14, 2015, at the University of the Witwatersrand and significantly affected students, staff, and the broader academic environment. During the protests, university students advocated for free tertiary education and a decolonized curriculum, emphasizing the urgent need for a critical transformation of the existing architectural curriculum.

"Our thinking as Africans has been undermined. We must have our own education from our own continent. We cannot be decolonized by white people who colonized us."[3]

The University of the Witwatersrand School of Architecture and Planning's curriculum is based on the British RIBA tradition and modernist Western thought, which has remained largely unchanged. This traditional approach often portrays architects as heroic figures while neglecting diverse contexts and lived experiences, leaving many Indigenous students feeling disconnected, especially post-apartheid. The #FeesMustFall protests underscored these grievances. Following South Africa's first democratic government in the early 1990s, efforts were made to eliminate apartheid's legacy from educational curricula, including removing racist and sexist content.[4] In 2015, a PhD study by Ariane Janse Van Rensburg[5] at the University of the Witwatersrand School of Architecture and Planning aimed to transform the curriculum through architectural tasks that enhanced academic skills, cultural discourse, and social cohesion, leading to improved engagement and learning outcomes in a diverse studio environment. However, despite these efforts, consistent transformation was minimal. The #FeesMustFall student protests called for decolonizing the curriculum. This activism encouraged our school to embrace change, resulting in the inclusion of Character-Led Design in a new first-year project in 2018. My personal experience with the #FeesMustFall student protests seen in Figure 1 amplified my understanding of the need for a more inclusive and alternative approach in both education and design, further motivating my exploration of ways to bridge the gaps I had identified in architectural pedagogy.

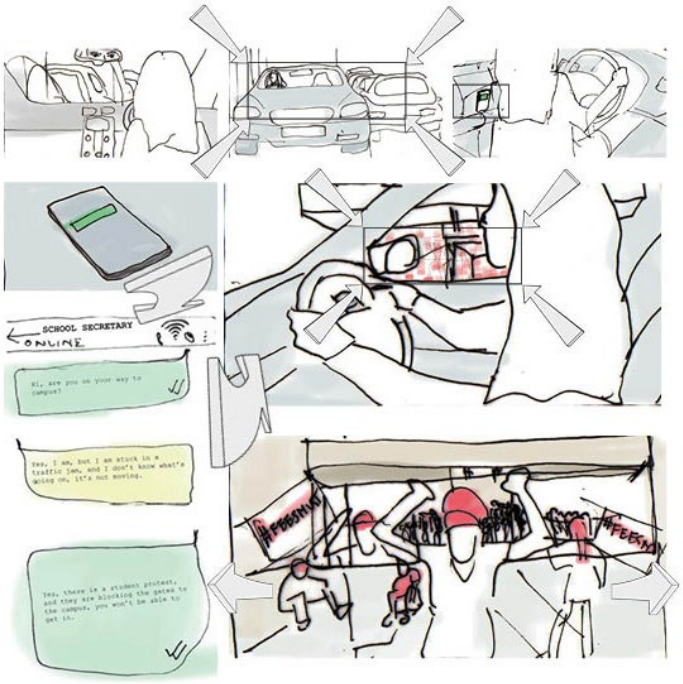

Figure 1. #FeesMustFall Storyboard by Anita Szentesi

The Major Shift

In 2018, a major shift in the first-year teaching team marked the emergence of Character-Led Design in a project called The Utopias Project seen in Figure 2. This change aligned with broader discussions on transformation and collaboration led by Dr. Sechaba Maape,[6] an advocate of Ubuntu,[7] an African philosophy emphasizing interconnectedness and mutual respect. Ubuntu embodies an African belief that individuals find fulfilment not in isolation, but as members of a larger community. Nelson Mandela[8] and Archbishop Desmond Tutu were well known dedicated advocates of 'Ubuntu' in South Africa.

"a person is a person through other persons"[9]

Under Dr. Maape's guidance, the studio embraced Ubuntu principles, fostering collaboration among staff and students, creating a more inclusive learning environment, encouraging the integration of emotional and cultural considerations into architectural education, and reshaping the traditional hierarchical structure.

Figure 2. The Utopias Project Performance Films, 2018, by Anita Szentesi

Reflecting on my identity as a white person in South African academia, I initially felt awkward and like an imposter, when engaging with Indigenous methodologies as seen in the reflective diagram, I created in Figure 3. However, discussions with Dr. Maape helped me recognize that confronting these issues is essential for change. This willingness is as important as having Indigenous role models in architectural pedagogy.

These factors, my disillusionment with practice and pedagogy, the impact of the #FeesMustFall protests, and the restructured teaching team, laid the groundwork for exploring new, empathetic, and collaborative methods in architecture, leading to my contribution of Character-Led Design.

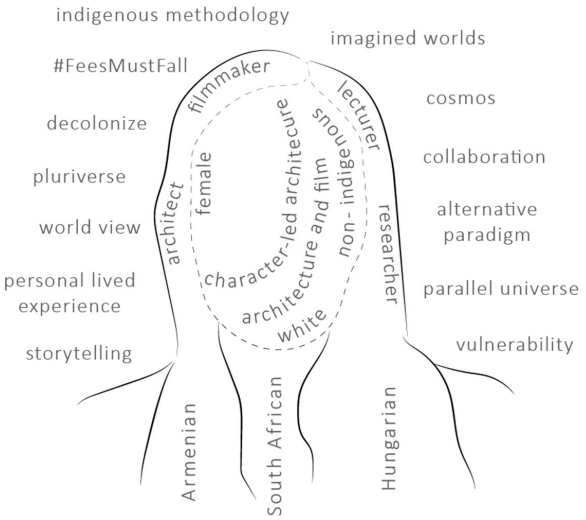

Figure 3. My Character Reflection by Anita Szentesi

Character-Led Design

The term "Character-Led Design" is inspired by character-driven narratives in screenwriting. According to Syd Field,[10] a character-driven story resonates with audiences because they invest emotionally in the evolving characters.

He states, “Character is the essential foundation of your screenplay.”[11]

Character-Led Design posits that architectural design informed by character perspectives can evoke emotional investment and foster a sense of ownership among students. Storytelling enables students to articulate their thoughts and feelings, with Linda Tuhiwai Smith[12] emphasizing its importance in Indigenous research. This connection between filmic screenplays and oral storytelling supports collaborative and socially conscious design,[13] a notion introduced by Arturo Escobar, which encourages people to consider how we reengage with the world in a collaborative, participatory manner.

Character-Led Design focuses on narratives that introduce conflict and climax, which is an entertainment-type narrative in the design process as highlighted by Sylvia Grimaldi, Steven Fokkinga and Ioana Ocnarescu.[14] These narratives help designers explore empathy and memory through personas. By incorporating these perspectives, designers can include diverse voices in their work.

This approach encourages educators to be facilitators, fostering an inclusive environment where students share personal stories and take ownership of their learning. An example of this kind of approach is the Action Archive[15] experiment by Meike Schalk, Sara Brolund, and Helena Mattsson, which seeks to enable participative modes of history writing to construct an active archive. Also, educators sharing their perspectives demonstrate vulnerability, openness and active listening, which is key for equitable knowledge exchange, as indicated by Estrella Sendra.[16]

The Potential of Film

Film's potential serves as a powerful medium for envisioning alternative ways of living and imagining alternative worlds and paradigms, a concept that resonates strongly with Walter Mignolo's notion of the pluriverse.[17] By engaging filmic narratives, designers can approach building design through fiction rather than traditional methods. Incorporating characters, including Indigenous figures, makes the process more relatable and reinforces that design should focus on the people who will inhabit these spaces.

Exploring a single location from multiple character perspectives reveals diverse stories and leads to a more narrative-driven architectural design process. This approach allows educators and students to examine various perspectives through storytelling. Additionally, films can communicate meaning without spoken language, engaging our subconscious. Urban environments in film often reflect our cultural values, as advocated by Richard Koeck.[18] Film unveils emotion, an ephemeral layer typically absent in architectural representations. This allows architecture to be conceived with emotion as a fundamental aspect of the design process, aiming to infuse empathy and understanding into the design.

THE PROJECT - ABANTUTOPIA

The project Abantutopia highlights the application of Character-Led Design in the first-year architectural studio. Dr. Maape created the title, which fuses the words Bantu, Ubuntu, and heterotopia.

Bantu[19] refers to a language family in Sub-Saharan Africa but also holds negative connotations from its use during apartheid to classify Indigenous people. Ubuntu, reflects community involvement.

The title suggests a community grounded in Indigenous knowledge systems that challenge imposed ideologies. Foucault's concept of "heterotopia"[20] describes spaces that exist outside conventional norms, offering alternative perspectives on societal organization. The term "topia" indicates a counter-narrative and counter-space that the project aims to achieve.

The Abantutopia Project involved both a group work phase and an individual design phase. Students collaborated to design a village focused on a shared goal while each created a unique structure that contributed to the village's overall context. A Project Brief was provided to guide their narratives and designs. Educators guided eight student groups. For the group work, student conflicts occurred in some groups as stronger members sometimes needed to support their peers. Due to this, educators faced challenges in assessing group marks for individuals.

Project Brief

The Abantutopia Project Brief was like a Narrative Framework. The students were given a logline, a concise story summary defined by screenwriting expert Dan Calvisi.[21] The logline conveys the protagonist, their goal, and the central conflict while suggesting stakes and tone. A strong logline is a blueprint for the entire narrative and an engaging pitch for the audience.

'A group of visionaries creates a self-sustaining village on Wits Law Lawns, addressing critical issues and crafting a collaborative, alternative reality that challenges and redefines the existing reality.'

Narrative, Characters, Context and Design

Understanding the village vision's broader context was crucial to creating the narrative in the Abantutopia project as seen in Figure 4. This involved examining the location and identifying key issues affecting South Africa, particularly Johannesburg, Braamfontein, and the University. This understanding was vital for developing a relevant narrative that responds to the community's current realities.

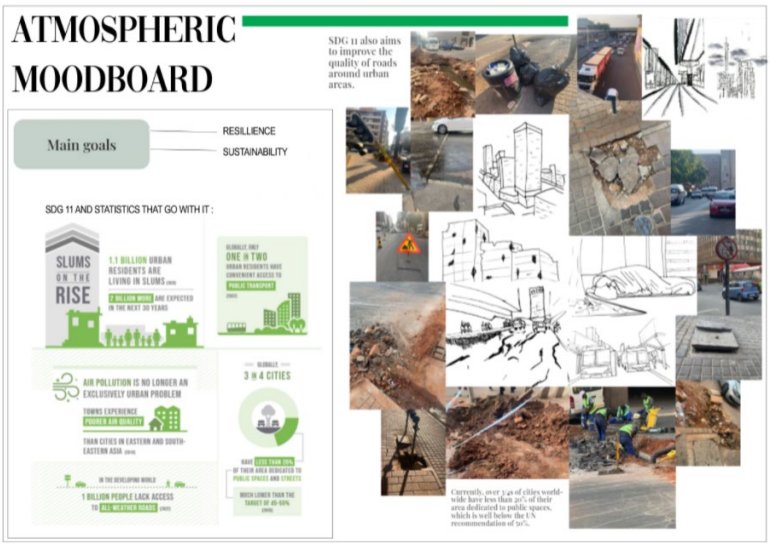

Figure 4. Atmospheric Mood Board Group Work for Abantutopia 2024 by Group 07 Students

The next step was to develop the characters' backstories and relationships within the community. Each member focused on the histories, motivations, and connections of four founding characters that they created, emphasizing their skills related to the village's key issue as seen in Figure 5. The group also discussed the setting and atmosphere to ensure alignment with the overall theme. This collaboration led to a cohesive narrative that showcased the characters' contributions while reinforcing community bonds. They further refined the story by incorporating feedback from peers and educators.

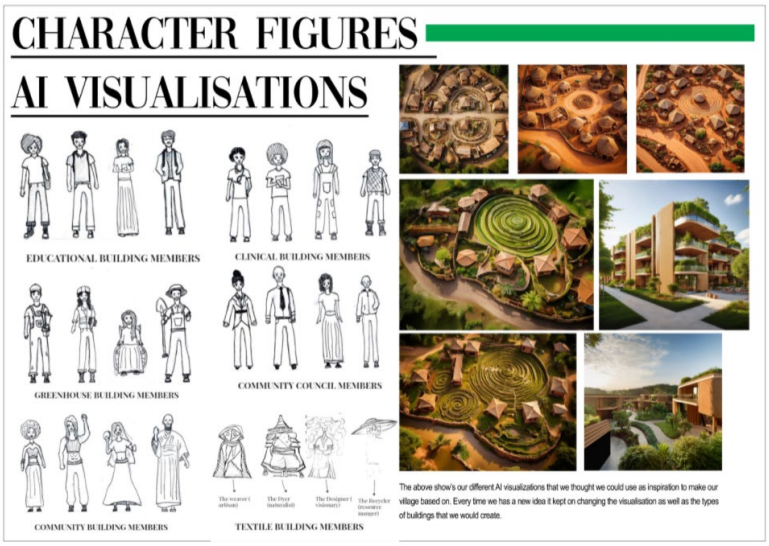

Figure 5. Characters and Visualisations Group Work for Abantutopia 2024 by Group 07 Students

The narrative's introduction of a non-human character added depth and complexity, prompting students and staff to reconsider human-environment interactions. By personifying the land as a living entity, it emphasized its importance in architectural design and acknowledged its non-human agency. This perspective, supported by Rosi Braidotti's[22] research, Bruno Latour's Actor-Network Theory,[23] and Donna Haraway's[24] concept of decentering the human by recognizing both the land and architectural structures as active participants, initially confused students but was ultimately seen as a

valuable addition to their design processes as seen in Figure 6. The following is a quote from one of the student's about working with their non-human being character:
'Characteristics and physical/abstract qualities that a character has can inspire the building in terms of shape, materiality and even function. Though it can sometimes be challenging to think up a character from scratch, I think that once it is strong it can be a great template to help in the design of the building. I took full advantage of the construction character in project 3 to the point where my whole design was inspired entirely by my character. I think I did so successfully. '[25]

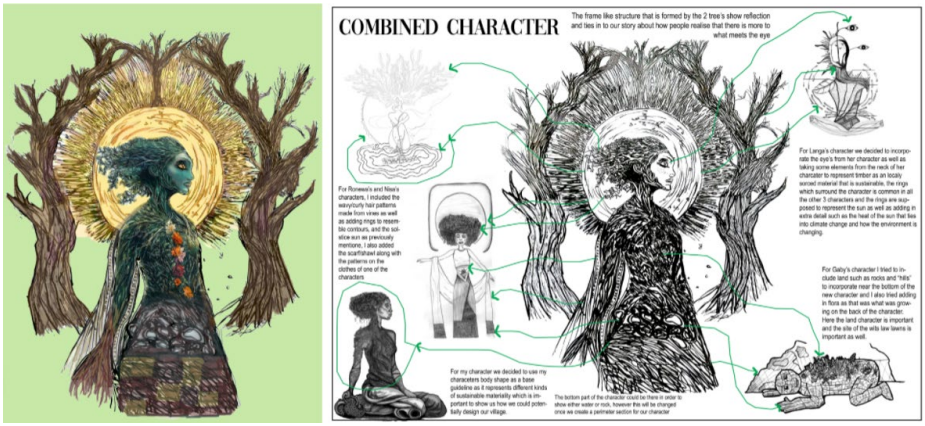

Figure 6. Non-Human Being Group Work for Abantutopia 2024 by Group 07 Students

The script structure introduced to students follows a three-act linear format, standard in Hollywood screenwriting and rooted in Aristotle's[26] narrative principles. This format begins with a character's journey, faces complications, and concludes with a resolution, also aligning with Joseph Campbell's Hero's Journey.[27] Students explored mythical stories from Europe and Africa, comparing their similarities and differences, and combining these into their scripts. In earlier projects, students acted out their narratives; in the latest, they animated them.
The Abantutopia narrative framework includes:
· Act 1: Introduces the reality of Wits Law Lawns in Braamfontein and presents the central issue and the main character/ or characters.
· Act 2: Delves into the issue and introduces an ally, represented by each student's non-human character. These characters evolve into a single transformative being, reflecting the site's challenges and transforming into a village structure.
· Act 3: Shows the new village as multiple dwellings, each representing group members, creating a cohesive community focused on resolving the issue. The conclusion highlights the village's potential for systemic change in its urban environment.
A storyboard maps this narrative as seen in Figure 7, capturing pivotal events and establishing the mise-en-scène. Storyboard frames reflect both personal and collective perspectives and are enhanced by architectural projections.

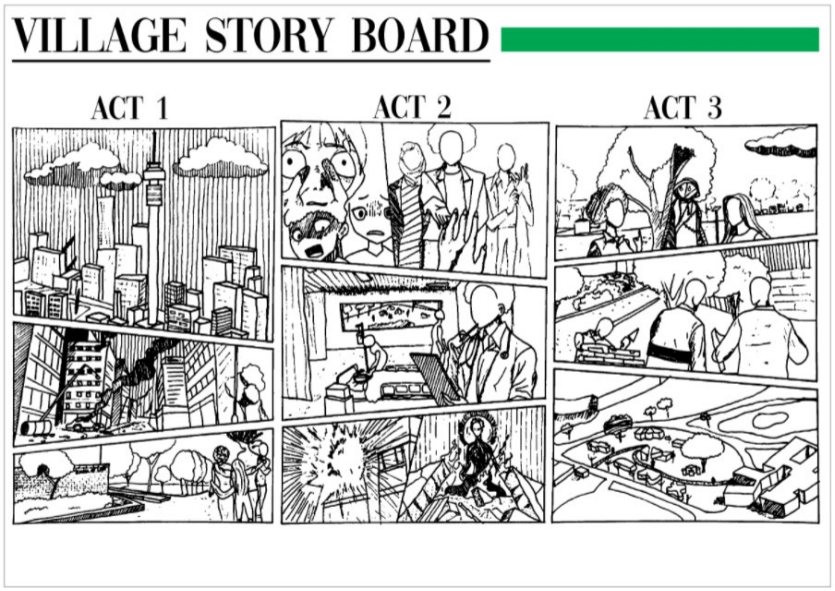

Figure 7. Storyboard Group Work for Abantutopia 2024 by Group 07 Students

The Group work formed the Village Vision, which became the project's foundation. Established principles and values guided decisions on shared facilities, design guidelines for each individual unit, building heights, materials, and landscaping, like an architectural mood board as seen in Figure 8.

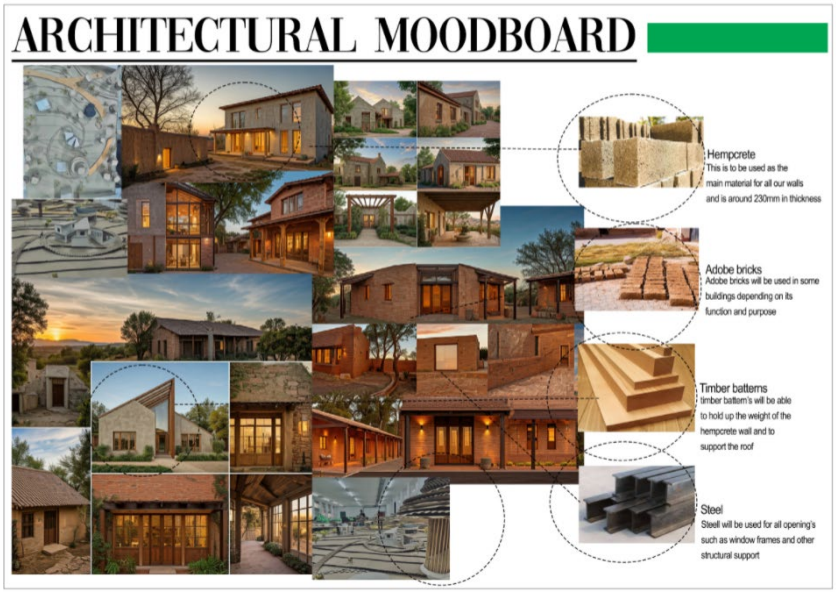

Figure 8. Architectural Mood Board Group Work for Abantutopia 2024 by Group 07 Students

The individual design phase of the project focused on designing double-story work-live units, as seen in Figure 9, born from the group's village vision established in the group work phase. Students incorporated their individual designs into the group settlement plan and model.

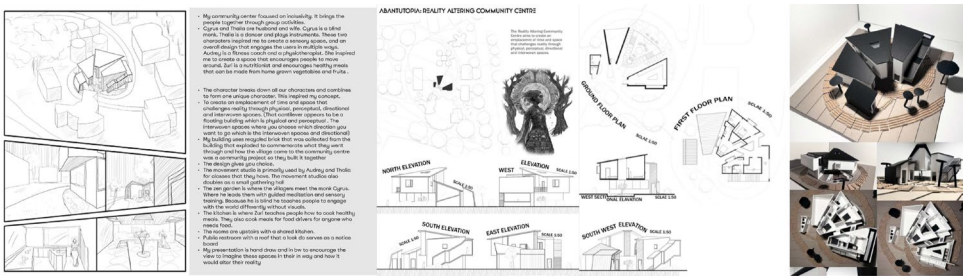

Figure 9. Individual Narrative and Design Work for Abantutopia 2024 by Group 07 Student

Analogue and Digital

Character-led design merges traditional architectural methods with digital tools. Digital methods such as scanning, digital editing, AI image creation, and filmmaking enhance techniques like hand-drawn architectural drawings and hand-made models.

Collaboration was essential in the Abantutopia Project. Analogue activities like drawing and building models encouraged teamwork in the studio, while weekly critiques focused on a shared model and site drawing, promoting ownership and collaboration among students and staff.

We encouraged the integration of AI tools like MidJourney[28] to enhance imagery in the design process. Previously, students relied on hand-drawn sketches and film stills for speculative architecture. While those methods were effective, we wanted to stay current with evolving technology.

Students began with hand-drawn sketches of characters and architecture, which they refined using AI platforms. They generated prompts and evaluated the AI outputs to check for preconceived notions or Western perspectives of South Africa, emphasizing the need to adapt AI results to local contexts.

Documenting their prompts and iterations helped students clarify their ideas and evaluate the AI's relevance. This positioned AI as a collaborative tool, emphasizing the students' role in guiding it. As a result, their understanding of digital tools improved, fostering critical thinking and ensuring their designs reflected South African cultural realities.

The use of Miro[29] as seen in Figure 10, adopted during the COVID-19 pandemic and an aspect I chose to retain, facilitated continuous engagement and peer learning in a virtual space and kept a record of the work. This democratized the critique process, allowing staff to contribute alongside students and fostering a team-based dynamic. The integration of analogue and digital workflows ensured meaningful participation for all students.

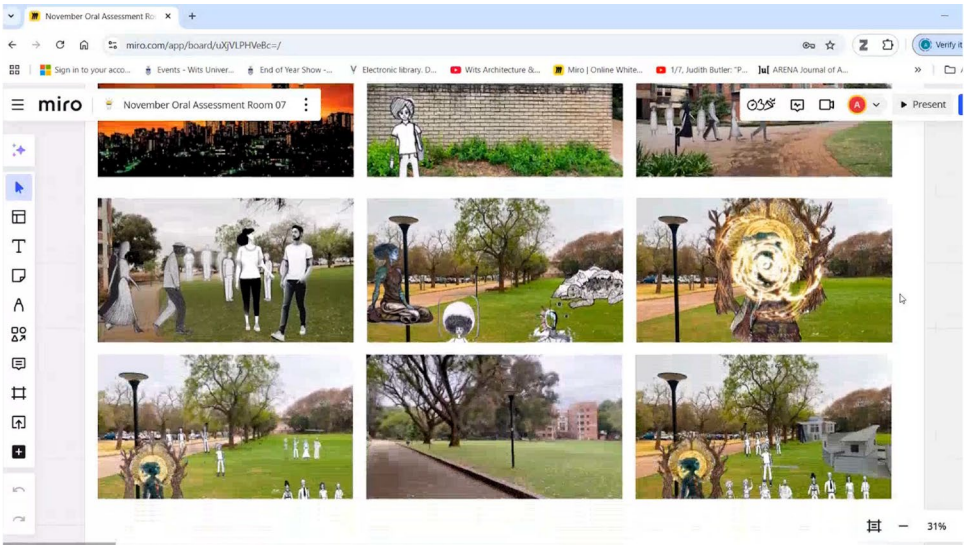

Figure 10. Screenshot of Miro Group Frame for Abantutopia 2024 by Group 07 Students

CONCLUSION

Character-led design was introduced to first-year students at the beginning of the academic year. Prospective students had to submit their matriculation results, complete an exercise, present a portfolio, and attend an interview, where they were often asked why they wanted to study architecture. Many cited inspiration from striking buildings in cities like Dubai and held traditional views of home design, envisioning separate rooms for families. When first introduced to character-led design, students were given a narrative structure and asked to write a script, which often led to confusion as they struggled to understand its purpose beyond traditional architectural concepts. Many followed prompts without fully grasping the exercise's intent.

As the course progressed, each project incorporated a narrative and characters. While most students enjoyed and understood this approach, some resisted it, focusing solely on traditional architecture. This resistance was reflected in their projects.

Near the end of each year, the first-year studio hosted a digital and analogue feedback session to gather responses from students during a class discussion and anonymously through an online questionnaire. This session unveiled that by the year's end, students recognized that they had evolved their designs through this narrative process and comprehended that the approach was not merely about imitating sources like ArchDaily or Pinterest but about participating in a creative, collaborative, and emotional design journey.

Many students, especially those who began this process in their first year, later recognized the value of character-led design during master's focus groups. They acknowledged its influence on their work and often integrated it into later projects, suggesting that character-led design was effective, even if its worth was only fully appreciated in hindsight.

While this teaching method demonstrated success, the overarching curriculum largely remained the same. Students tended to revert to a more traditional approach during their second and third years, leading to an inconsistent application of the character-led design method. It often wasn’t until their apprenticeships or postgraduate studies that students recognized the value of their first-year learning and how it influenced their growth as architects.

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MAP AS ARGUMENT: THINKING AND CONSTRUCTING GROUNDS

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INTRODUCTION

Landscape architecture often employs representational conventions borrowed and modified from various fields. Mapping (brought across from the spatial sciences) in addition to conventions of drawing - plan, section and detail (borrowed from architecture) are standard representational combinations in practice and educational settings. Of these, mapping is the often the first starting point of a landscape architectural project, a way of understanding the environment, landscape dynamics, social and economic dimensions of a place. Selecting, notating and scaling the map enables the comprehension and abstraction of dynamic landscapes. These processes of mapping aim to not only represent the landscape, but inform processes of making, of constructing the possible grounds for new conceptions of place. The significance of mapping practices is underscored by contemporary discourse in the discipline in which mapping is framed as both a creative and critical practice.

Following from this central role in practice, learning how to map is a fundamental component of landscape architectural education. This paper will explore mapping as a learning activity in a design studio through evaluating these mappings as a process of constructing an argument – where students are positioning themselves and their ideas in relation the dynamics of landscape. Putting forward an argument is often understood to occur through writing or in verbal presentations, in this case, constructing an argument through the map is presented as a key technique of the studio. Critical processes of mapping such as selecting scale, designing graphic notations and highlighting key landscape elements were engaged towards developing individual capacities to develop project briefs and establish key frameworks for design action. With the ambition to develop individualised practices related to Universal Design for Learning guidelines that enable "multiple means of representation"[1] for students. Maps will be shown that track student learning trajectories and the development of the project ideas and arguments. Showing the potential of employing modes beyond writing and speaking to develop skills for constructing arguments.

Landscape dynamics and mapping

Landscape is a dynamic set of conditions that form and reform continuously. The transitions in landscape are temporal, they may be fast – the turbulence of water – or slow – the gradual pressures of geological formation. They may be constrained by physical constraints or by selective pressures in the case of animal and plant species. To attempt to work within this complexity requires the

development of specific approaches of discernment and action, problematising processes of mapping to move beyond the static. The relationship of the map to the territory it seeks to represent is in kind of tension, where "the recursive communication between map and territory makes any metaphysical hierarchy problematic...they thus may become mutually constructive or destructive as in any relationship."[2]

A fundamental challenge for landscape architecture students is how to grasp, design and communicate the complexity of these territories in communication with the map. All the time keeping in mind that the map is not the landscape itself[3]. How to get started, find a position and move forward whilst being able to acknowledge that they cannot know, or map everything. It is an important challenge and one that will have relevance in their future professional lives as landscape architects. How much is enough to make an argument for a project or particular outcome, what is too little and how do the spatial, social and temporal pieces begin to come together within a learning environment bounded by its own timescales and constraints?

Mapping as argument

Despite their ubiquity in everyday life, maps are often underestimated or assumed to hold singular representations of space. Yet this is not the case, as Desimini and Waldheim point out "maps are too easily mistaken for objective depictions of a geographical condition, and their complexity often obscures the fact that they are, in fact, distortions."[4] Understanding the map as a form of altered representation allows parallels to forms of argument to be drawn. This distortion can be productive - "when a certain map appears to be persuasive rather than neutral, constraining rather than enabling, this is not to be considered a "problem" of planning communication but an inherent condition of it. The map sets – at least in part – the conditions of possibility under which meaningful and valid statements can be made."[5.] The mapmaker can then "deconstruct the world or part of it, then reassemble selected components",[6] a process that reveals the makers tendencies and priorities[7]. Considering the process making an argument as having an analogue in processes of mapping allows for the map to perform a double role in the development of student projects – that of demonstrating and understanding of the territory and at the same time, putting forward an argument for change or intervention.

The inherent distortions allow for the presentation of a particular view and set of relationships determined by the mapmaker. "These revisions situate mapping as a collective enabling enterprise, a project that both reveals and realises hidden potential."[8] The question of how the processes of constructing an argument– claiming, reasoning and evidencing might be conducted through mapping is deployed to unpack a series of design exercises over a number of design studios. With the aim to assist students in learning how to find their own ways into constructing a ground for design and developing project rationales.

CASE STUDY DESIGN STUDIO

This paper reflects on design exercises focused on mapping within studios taught over several years in which students were engaged in actively constructing the grounds (both spatial and theoretical) for their projects. Studio teaching is a standard practice in landscape architecture with often differing positions on what the ideal format and constellation of relationships held within is. For these studios the combination of conceptual and practical drivers as described by James Corner is closest to the ambition - "By using the term studio, I do not mean a workshop that simulates professional practice. Neither do I mean for studio to connote an arena that is the exclusive domain of academics. For me, the studio is a way of life for designers, it is a setting which admits and installs ideas. A studio is the

domain of creativity, production, and invention, a medium through which we attain a theoretical practice and a practical"[9]

The studio work discussed below are from classes that were comprised of students at different levels from first to third year of the Bachelor of Landscape Architectural Design and first year of the Master of Landscape Architecture at RMIT University. They were all loosely situated at territorial scales across Victoria, Australia, on the lands in the waters of the Wurundjeri Woi-wurrung and Eastern Marr people. Studio classes were scheduled twice per week for three hours with a group of around eighteen students in each studio. The assessment was divided into two components. The presentation of the project and a portfolio, both due at the end of semester and worth 50% each. Part of the learning design framework of the studio was that presentation and portfolio are complementary modes with different forms of communication and thus different forms of argumentation, but here I will focus on the sequence of learning activities focused on mapping as a more explicative device to build their projects towards communication through these modes of presentation and portfolio.

Mapping in action

The studios were designed to allow for a degree of open-ness and self-direction by students informed by considering "how do different actors – peoples, policies, tools, representations, learning environments and the rest - make possible different teaching and learning practices".[10] Part of the design process of the studio required students to use mapping to find the right place or places to act within the territory. To allow the process of mapping to bring forth a particular argument and to imagine through the map the role of the landscape architect to be one of setting up potential expressions and relationships over time students had agency to reveal, remove, amplify, redirect or what Kate Orff calls "unmaking".[11] Students were asked to make temporary, provisional changes that enact processes and transformation at micro – macro scales. Through the next section of student work examples, a sequence of student produced mappings will now be related to modes of argumentation to situate the maps as arguments and reflect on the projects that emerged from them.

Project: distorted boundaries

In their project, Lex explored Port Philip Bay (Nerm) and the interfaces between water and land. In this project the process of mapping revealed the tensions between the changing tides of the bay, the waterways in the surrounding areas, local governance overlaps and potential future incursions because of climate change. A recognition of the Indigenous land as a constant presence was also part of the agenda of the student. The first exercise as seen in Figure 1, asked students to bring these disparate parts of information onto the same page. By beginning to abstractly map the layers and selectively include layers of information, Lex found what were seen as drivers for change. It is here that the outline of what could become a form of *reasoning* began to emerge. This mapping itself was deliberately non-spatial, it did not attempt to locate these interactions in place, instead began by identifying elements that informed the physical reality of the site and clarifying their interactions.

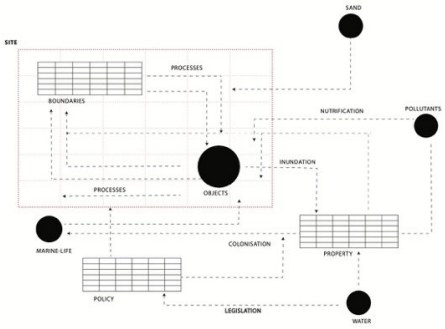

Figure 1. Mind map of drivers of transformation. Image Credit Lex Segal. Used with permission.

The next exercise found in Figure 2, asked students to express how these layers and elements were expressed spatially. Considering how they might be discerned over, underneath and sometimes in opposition to one another in the land and water of the bay and surrounds. By researching and transcribing spatial data from a range of sources the student begins to gather *evidence* for how the layers and interactions found in the first map impacted on the built and natural environment. Bringing together this information at the same scale reveals a new understanding of the relationships. What emerged for the student from this series of maps was a recognition that the marking of boundaries was a common to various processes and stakeholders and was a primary way that these interactions coalesced in space.

Figure 2. Boundaries of Port Philip Bay (Nerm). Image Credit Lex Segal. Used with permission. Top left: Indigenous ownership boundary. Top right: Urban growth boundary. Bottom left: Rail network boundary. Bottom right: Local council boundaries

In the next exercise illustrated by Figure 3, students were asked to design through the logic of the map itself using and deliberately distorting their findings from the previous maps. By placing and altering

control points along the edges of each map, Lex's distortions offer an alternative view of the territory. Shifting the map from a selection of what is to a projection or rather a *projective claim* of what might be. This opened a trajectory for the potential for the project to begin to the think about, draw and design boundaries differently. From a learning perspective these calculated distortions of the mapping allows for an active formation of site and place into a territory by students. It is a way of working between what is and what could be in a fluid and open-ended way.

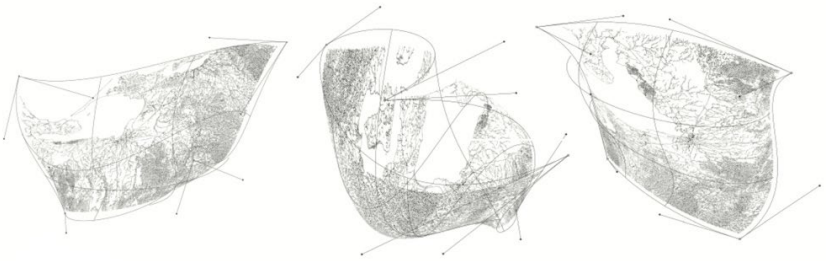

Figure 3. Distorting the boundaries of Port Philip Bay (Nerm). Image Credit Lex Segal. Used with permission.

The final stage in this mapping process is shown in Figure 4. This exercise requested a careful translation from the abstracted distortions of the previous mapping to the spatial realities of the place. For Lex, this integrated involved reorientating the map to be about fluid boundaries rather than static ones. Here the map becomes propositional, making extended set of *claims*. Lex argued that rather than defining the urban form by ground alone, a new watery ground could be constructed that embraced the changing boundaries of water to redesign the possibilities for the urban form. Various interventions that enabled retreat, recovery and reallocation were designed through these new and shifting boundaries.

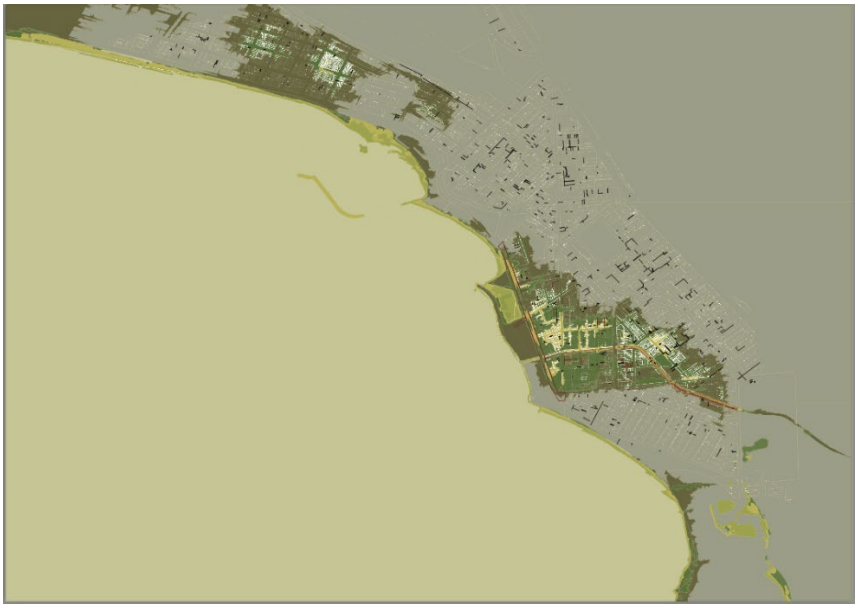

Figure 4. Temporal boundaries in Elwood, Port Philip Bay (Nerm). Image Credit Lex Segal. Used with permission.

Project: Foraging near and far

In this second project example, Renee explored the Otway-Colac Shire, a forested region located in south west Victoria. To find a way into the site each student was tasked with choosing a single species. Renee began mapping through the lens of the blackberry (Rubus sp.). The first mapping seen in Figure 5 was designed to reveal the movement and circulation of the selected species. Students were able to select any scale – but it needed to be one that they thought was most relevant to their project and species. Renee investigated the worldwide circulation of the blackberry, producing a large-scale map of blackberry movement across the globe. This began to form a *reasoning* that positioned the plants presence in the territory within a much larger timeframe and in relation to other movements social, economic and political.

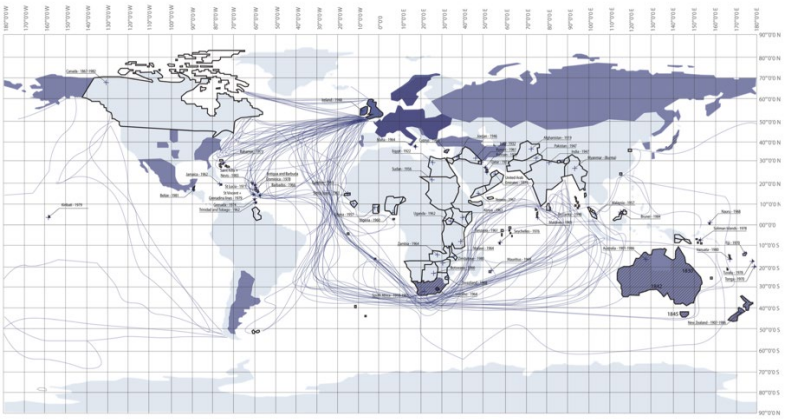

Figure 5. Foraging field guide. Global blackberry distribution over time. Image Credit Renee Boyd. Used with permission.

The next exercise guided students to determine specific moments or places within their territory that were of special relevance to their species. Renee cross referenced the global scale understanding of blackberry distribution and found *evidence* through recorded sightings of blackberry in the region using publicly available data and Inaturalist recordings as shown in Figure 6. This mapping allowed for a pattern of sightings to emerge that revealed relationships between the vectors of blackberry spread, trails and different forms of ownership.

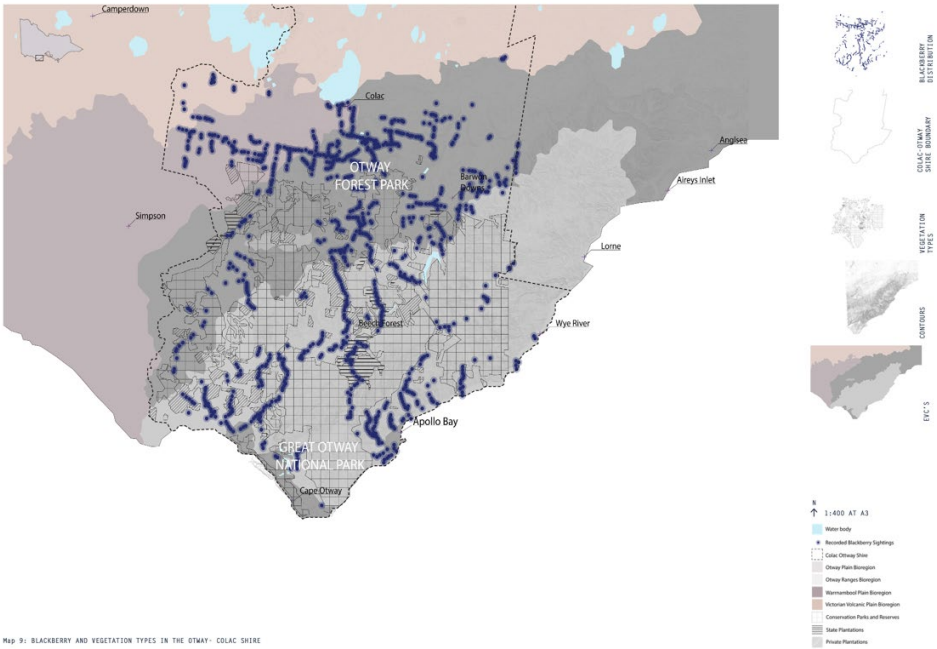

Figure 6. Foraging field guide. Blackberry sightings in the Otways. Image Credit Renee Boyd. Used with permission.

Here Renee returns to her original *reasoning* found in the global mapping of blackberry circulation. Shifting to become projective and propositional by making a central part of her project designing processes of circulation. Renee proposed a network of trails outlined in Figure 7 as a mode of distribution and a form of management for the blackberry, one that considered working with rather than resistance. The economic and social interactions were threaded through this mapping by a shifting trail network the enabled community to forage for blackberries and that the foraging was a means to curtail their spread. By pairing the new set of trails with a blackberry cookbook, Renee shared recipes and ways of preparing blackberries – reframing it for the larger community as a resource rather than something to be eradicated.

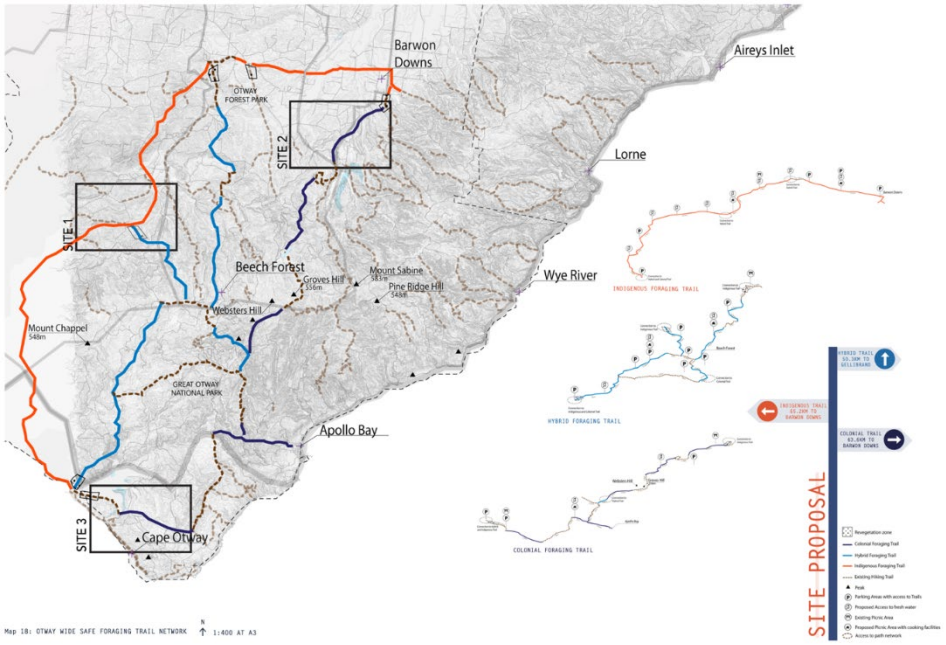

Figure 7. Foraging field guide. Foraging train network. Image Credit Renee Boyd. Used with permission.

CONCLUSION

Through these two student project examples a corollary between the processes of mapping and the components of making an argument has been made connecting the terms - reasoning, evidencing and claiming to specific actions and scales within the series of maps. The representational type of mapping has been traced and discussed across the timeline of the projects to show how "maps utilize a set of malleable yet rigorously defined representational techniques capable of persuasion, description and, above all, projection.".[12] That the development of the project and associated argument unfolds over the temporal scale of the semester. This sequencing enables students to determine for themselves the shape and scale of the argument and for that to change, strengthen and adapt across the 12 weeks of study. In these studios the selected and scaling of site and the form and type of design response is also part of the design of the project for the students.

The representational scale, size and orientation of the map are all ways in which students can determine and develop their own agency within this representation type. Choice in notation, styles and modes graphic communication allow for students to interpret and re-present in ways that best reflect their thinking. As distinct from propositional plan, the map is useful as focus for learning as it is somewhat unstable, open and provisional. There is potential for multiple projects to emerge from each of the maps and a critical moment for students is deciding on which trajectory to follow. "Thus, mapping unfolds potential; it re-makes territory over and over again, each time with new and diverse consequences."[13] The map also offers a means for dialogue between peers and teacher and student that displaces the conversation from a review or feedback on only the formal or representational elements of a project towards the generation of possible narratives for exploration and expression. This helps to "instil in students a sense that, through design, they can contribute to the laying down of meaning and value in culture is to ask them to become more participatory in local and global affairs, more critical and reflective in terms of that participation, and more creative and active in changing the status"[14]

Constructing the argument through the map allows spatial thinking to inform and demonstrate the ideas, shifting the focus from verbal to visual artefacts. This allows for individualised and customised approaches to learning that are scaffolded through the conventions of mapping. The significance of this linking of mapping to argumentation is perhaps not so much for landscape architecture studio teachers, who might consider this practice as obvious if often understated. Rather the hope is that making explicit the processes of argumentation held within the representational type of the map, that it might offer teachers insight into how to design learning through other modes of representation allowing scope for students to form of position and argument through manifold representational types.

NOTES

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SPECULATIVE AND CRITICAL APPROACHES IN ARCHITECTURAL EDUCATION: USING GenAI TO EXPLORE INFORMAL MEMORY IN MUSEUM DESIGN

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INTRODUCTION

In architectural education, speculative design and generative AI (GenAI) offer new ways to foster critical thinking and creativity. While traditional pedagogy emphasizes form and function, contemporary challenges - such as digital culture and evolving memory practices - demand new approaches. A key shift is the redefinition of memory in spatial design. Architecture has long preserved cultural memory through monuments and archives,[1] but in the post-digital era, memory is fluid, shaped by digital interactions and participatory culture.[2] This calls for educational approaches that challenge institutionalized memorialization and engage with informal narratives. Unlike formal memory, which is typically preserved in monuments and archives, informal memory encompasses the lived experiences, personal stories, and transient recollections that shape a community's sense of identity.

This paper presents a university-level design course where students conceptualize a “museum for informal memory” through speculative design and GenAI. Through an exploration of digital tools in memory representation, students engage with speculative methodologies that question conventional architectural paradigms. In this course, 3D AI-generated symbolic souvenirs act as speculative artifacts, allowing students to explore architectural expressions of ephemeral and participatory memory. Designed through generative AI, these souvenirs serve not only as conceptual tools but also as provocations that challenge conventional notions of permanence, authorship, and collective memory in museum spaces. Grounded in critical design and AI debates[3] this study demonstrates how speculative exercises foster deeper engagement with issues of memory, identity, and spatial storytelling. Ultimately, this approach aligns with broader efforts to integrate future-oriented and inclusive methodologies into architectural education.[4]

THEORETICAL FRAMEWORK

Memory and Architecture: From Institutional Archives to Informal Narratives

Traditional architectural spaces dedicated to memory - such as museums, archives, and monuments - function as sites of historical preservation and collective identity.[5] These institutions have historically prioritized material artifacts and official narratives, reinforcing dominant historical perspectives while often marginalizing ephemeral, personal, and subaltern memories.[6]

However, contemporary digital culture challenges these traditional paradigms. The dematerialization of memory, facilitated by digital archives, interactive media, and participatory platforms, has led to more fluid, decentralized, and subjective memory practices. Manovich argues that electronic memory operates non-linearly, allowing for multiple interpretations and reconstructions of the past.[7] This shift has significant implications for architecture: rather than serving as static repositories of historical records, spaces of memory are increasingly understood as dynamic, interactive environments that evolve through user engagement and technological mediation.[8]

In response to these shifts, speculative design offers a methodology for reimagining how architecture can engage with informal and hybrid memory practices. By moving beyond institutionalized frameworks, speculative design allows architects to explore alternative spatial narratives that reflect the complexities of contemporary cultural memory.

Speculative Design in Architectural Education

Speculative design is a pedagogical approach that challenges dominant design paradigms, encouraging students to question existing systems and explore alternative futures.[9] Unlike conventional architectural methods focused on problem-solving within set constraints, speculative design fosters critical inquiry and scenario-building, allowing designers to engage with uncertain and contested futures.

Bendor & Lupetti emphasize that speculative design does not predict the future but provokes debate on its moral, political, and ethical dimensions.[10] Their study highlights its role in fostering critical reflection, engaging students with sociotechnical dilemmas, and questioning power structures. Despite its growing relevance, structured resources on teaching speculative design remain limited, underscoring the need for pedagogical models that integrate speculation, storytelling, and critical engagement in architectural education.

In this context, speculative design becomes a tool for rethinking spatial concepts at the intersection of architecture, technology, and cultural transformation.[11] By incorporating narrative techniques, fiction, and critical theory, it helps students develop frameworks that challenge conventional ideas of space, materiality, and representation.[12] This might involve crafting character profiles, timelines, and even short stories that contextualize their designs within imagined worlds. This use of narrative helps students move beyond purely formal considerations, prompting them to think critically about the human experience of space and the role of architecture in shaping cultural narratives. This is particularly relevant to memory studies in architecture, as it enables exploration of participatory, evolving memory spaces beyond static memorials, reflecting the fragmented, dynamic nature of cultural memory in the digital age.

Generative AI and Its Impact on Design Pedagogy

The rapid advancement of generative AI (GenAI) has introduced new possibilities for architectural creativity, representation, and conceptual exploration.[13] AI-powered design tools enable students to experiment with form, materiality, and symbolism in ways that challenge traditional modes of architectural production.

In the context of speculative design, GenAI functions as a creative partner, allowing students to generate unexpected design outcomes that push the boundaries of conventional representation. Recent research suggests that AI-driven design can serve as a catalyst for critical reflection, prompting students to interrogate the limitations, biases, and cultural assumptions embedded in algorithmic processes. This paper explores the transformative potential of GenAI in architectural design, particularly its ability to rapidly generate diverse form variations. Bendor & Lupetti further argue that

speculative design education requires students to engage with uncertainty and ambiguity, a process that aligns well with AI-generated experimentation.[14] They note that while speculative design encourages designers to challenge assumptions, AI complicates this process by introducing its own embedded biases and constraints. This interplay between human speculation and algorithmic creativity opens up new possibilities for rethinking authorship, agency, and spatial representation in architectural education.

In architectural education, AI is increasingly used not only as a form-generation tool but also as a method for conceptualizing spatial narratives.[15] In the case study presented in this paper, GenAI facilitated the abstract-to-concrete translation of informal memory by enabling students to use text-to-image generation tools. This allowed students to visualize their abstract concepts and iterate on their designs, bridging the gap between intangible narratives and concrete architectural forms.

COURSE STRUCTURE & METHODOLOGY

Course Objectives and Pedagogical Approach

The course was designed to explore the intersection of speculative design, generative AI, and informal memory, challenging students to critically engage with alternative approaches to museum design. Following Bendor & Lupetti,[16] speculative design was framed as a critical pedagogical tool that allows students to confront sociotechnical dilemmas and explore the political and ethical implications of design practice. This approach aligns with recent calls for more future-oriented, reflexive, and interdisciplinary design education.

The learning objectives were threefold:

1. Understanding speculative design methodologies as a means to rethink architectural conventions.
2. Engaging with AI-assisted design tools to explore the relationship between technology, authorship, and materialization.
3. Critically reflecting on memory and representation, considering how non-institutionalized, ephemeral, and subaltern narratives can be spatially reinterpreted.

To achieve these objectives, the course combined theoretical discussions, hands-on speculative design exercises, and AI-supported experimentation, allowing students to iteratively develop and challenge their ideas.

Course Structure and Key Assignments

The course unfolded in three phases, guiding students through an exploration of memory, speculation, and AI-assisted design. In the first phase, students engaged with the concept of informal memory and its spatial manifestations, critically examining how museums institutionalize memory and exclude alternative, personal, or subaltern narratives. Through lectures on memory in architecture, subaltern histories, and digital heritage,[17] they analyzed case studies of non-traditional museums, including counter-monuments and digital archives. As a key exercise, students selected an informal memory - either personal or community-based - and mapped its spatial, digital, and material dimensions, allowing them to reimagine how memory could be preserved and represented beyond conventional archival practices.

The second phase introduced speculative design methodologies and AI-assisted creativity to challenge traditional architectural frameworks. Students developed speculative narratives, imagining how their museum might function in a future shaped by evolving cultural, technological, or political conditions. They then translated these ideas into AI-generated souvenirs, using generative tools not as solution-driven design aids but as speculative provocations that raised questions about authorship, abstraction, and bias in architectural representation. A critical component of this phase was the application of the

Positioning Matrix proposed by Bendor & Lupetti,[18] which distinguishes between speculative projects that aim to raise awareness of sociotechnical dilemmas and those that anticipate plausible future scenarios. The matrix further differentiates between projects that provoke through unsettling and disruptive engagements and those that inspire by offering new perspectives and possibilities. Students were required to position both their museum proposals and AI-generated souvenirs within this matrix, critically reflecting on how their designs functioned as speculative narratives.

In the final phase, students synthesized their speculative research and conceptual exercises into a cohesive architectural proposal for a museum of informal memory. Through an iterative process of peer critique, sketching, and digital modeling, they refined their concepts, developing spatial diagrams, digital collages, and conceptual models that demonstrated how their museum would function as an active site of memory production and transformation. The course culminated in a final exhibition, where students presented their work as speculative artifacts, showcasing how architecture can embody ephemeral and participatory memory practices.

Methodology for Analyzing Student Work

The effectiveness of the course framework was assessed through a qualitative research approach, drawing from design research methodologies and critical reflection analysis.[19] Student design outcomes were analyzed in terms of their engagement with speculative narratives, informal memory, and AI-assisted representation. Final museum proposals were examined for how they reimagined memory beyond conventional archival practices, while AI-generated souvenirs were assessed for their ability to materialize conceptual ideas. In addition to design analysis, students submitted critical reflection essays detailing their experiences with speculative methodologies, AI interactions, and the challenges of representing memory through non-traditional forms.

CASE STUDIES OF STUDENT WORK

The following case studies showcase how students engaged with speculative design, generative AI, and informal memory in their architectural proposals. Each project explores alternative ways of representing memory, challenging traditional museum paradigms. By positioning their work within the Bendor & Lupetti matrix,[20] students critically reflected on whether their designs aimed to raise awareness or anticipate future scenarios, and whether they provoked or inspired audiences.

Case Study 1: “Museum of Memories” – A Living Archive of Personal Narratives

Concept and Design Approach

The “Museum of Memories” is envisioned as a dynamic, participatory archive where visitors contribute their personal experiences, emotions, and ephemeral recollections through three sensory modalities: sound, movement, and writing. Unlike traditional museums that preserve static artifacts, this speculative museum emphasizes the fluid and evolving nature of memory, offering an interactive space where past, present, and future memories converge.

The museum is divided into three key spatial zones:

1. Memory Recording Spaces – Visitors record their memories using voice recordings, motion-tracking sensors, and digital writing interfaces.
2. Memory Representation Spaces – The collected data is translated into digital and spatial installations, displayed on adaptive, movable walls that shift in response to visitor interactions.
3. Collaborative Creation Spaces – A series of workshops and co-creation labs allow visitors to reinterpret, remix, and reimagine existing memories, reinforcing the idea that memory is a collective and ever-changing construct.

Architecturally, the atrium acts as a central connective void, visually linking different memory layers. Vertical circulation through escalators and open-view corridors encourages visitors to engage with memory as a journey, rather than a fixed exhibition.

AI Integration and Speculative Design

Using generative AI, students created a multi-layered object resembling a stratigraphic formation - an abstract representation of accumulated personal and collective experiences. Each layer was algorithmically generated from soundwave patterns, motion-tracking data, and digital handwriting samples, transforming ephemeral traces into a sculptural artifact. This process raised critical questions about authorship, representation, and the distortion of memory in digital preservation. Rather than faithfully reproducing memories, the AI reinterpreted and abstracted them, mirroring the fluid and reconstructive nature of human recollection. Positioned within the "Raising Awareness + Inspiration" quadrant of the Bendor & Lupetti matrix,[21] the Museum of Memories encourages visitors to reflect on how personal and collective narratives evolve. Rather than provoking discomfort, it offers a poetic and participatory vision of digital memory preservation, blurring the boundaries between the material and the ephemeral to challenge conventional notions of memory storage in an era of digital mediation.

Case Study 2: "Culture Ignored" – The Invasion of Nature into Civilization

Concept and Design Approach

The project Culture Ignored envisions a future where nature reclaims built environments, reversing the conventional relationship between civilization and the natural world. Instead of architecture shaping space, the museum depicts an environment overtaken by natural forces, symbolizing the consequences of ecological imbalance and human intervention. Designed as a circular sequence of exhibition and interactive spaces, the museum forces visitors to navigate pathways shaped by nature's intrusion. The first hall is densely vegetated, highlighting nature's dominance over built structures, while outdoor routes are disrupted by trees, simulating organic unpredictability. A central courtyard reinforces the interplay between architecture and natural processes.

Materiality plays a crucial role in this speculative narrative. Reinforced concrete, metal, and glass - symbols of civilization - are designed for gradual decay through four stages: irregular forms shaped by rock formations, climbing plants accelerating erosion, a material gradient creating an illusion of decay, and tree roots disrupting circulation. Through this immersive experience, the museum challenges visitors to rethink the permanence of human structures and the role of nature in shaping cultural memory.

AI Integration and Speculative Souvenir

The project features an AI-generated biodegradable journal that embodies themes of decay, sustainability, and ecological resilience. Designed with recycled materials, bamboo fiber, plant-based ink, and compostable elements, the journal integrates seeds within its pages, allowing it to decompose and transform into plant life over time. This speculative intervention reflects the cyclical relationship between destruction and regeneration, reinforcing the museum's core idea that memory, like nature, is fluid and continuously evolving. Generative AI tools were used to explore material compositions, structural layering, and ecological interactions, introducing unpredictable variations that mimic the randomness of organic growth and environmental erosion. Positioned between "Provocation" and "Raising Awareness" in the Bendor & Lupetti matrix,[22] the project unsettles audiences by confronting them with the consequences of environmental neglect while fostering reflection on humanity's role in shaping the balance between the built and natural worlds.

Case Study 3: "META MEMORY" – The Digital Evolution of Human Memory

Concept and Design Approach

The "META MEMORY" Museum is a speculative exploration of how human memory evolves from an analog, biological process to a fully digitized, externalized phenomenon. The museum immerses visitors in a future where digital memory has become an inseparable extension of human cognition, questioning the boundaries between the self, technology, and identity.

The museum is structured around a central "memory core", inspired by electronic memory cards, reflecting the complexity of data storage and neural processing. The exhibition spaces are not static - they are fluid, adaptive environments featuring movable panels (3×3m grid systems) that reconfigure based on the needs of each digital installation.

To reinforce its speculative premise, the museum's lighting strategy plays a critical role:

•The majority of the building remains dark, enhancing projections, interactive screens, and holographic displays.

•Select areas, such as offices, the museum shop, and an event space, feature adjustable light panels that shift based on function.

•A skylight along the perimeter of the second floor allows a minimal, controlled influx of natural light, reinforcing the transition between the transhuman and posthuman sections of the exhibition.

AI Integration and Speculative Souvenir

Designed as a high-tech USB keychain in the shape of a minimalist human head, it symbolizes the brain's function in storing and retrieving memories. Its holographic metallic surface and illuminated neural circuit activate upon touch, mimicking neural activity. Constructed from chromium and translucent polycarbonate, it merges organic and technological aesthetics, reinforcing the speculative nature of externalized memory storage. Positioned between "Provoking" and "Raising Awareness" in the Bendor & Lupetti matrix,[23] the "META MEMORY" museum invites visitors to question the implications of a fully digitized self and the erosion of biological identity through technological augmentation. Rather than providing answers, it raises critical questions: Does memory remain human if stored externally? Can AI-driven archives replace emotional, subjective experiences? At what point does technological enhancement blur the line between human and machine?

DISCUSSION

The integration of speculative design in architectural education offers a transformative pedagogical approach, shifting students away from solution-driven methodologies toward critical inquiry and conceptual exploration. The case studies demonstrate how speculative assignments foster deeper engagement with abstract themes such as memory, culture, and posthuman identity. By challenging students to question architectural conventions, these exercises encourage them to view design not merely as a functional discipline but as a medium for social, cultural, and political discourse.

Artificial Intelligence played a crucial role in amplifying the speculative potential of student projects. The AI-generated souvenirs, in particular, functioned as tangible representations of speculative thought, bridging the gap between conceptual ideas and material manifestations. The use of AI tools also challenged students' preconceptions about authorship and design agency. Rather than relying solely on human intuition, students engaged in a collaborative process with machine intelligence, where algorithms influenced form, materiality, and aesthetic outcomes. This aligns with the broader discourse on AI as a co-creator in architectural design, expanding creative possibilities while also raising critical questions about the role of the designer in an era of computational creativity.

Moreover, AI's ability to generate alternative design scenarios and unexpected aesthetic outcomes reinforced the speculative nature of the projects.

CONCLUSION

This study highlights how speculative design and AI tools expand architectural education, moving beyond conventional problem-solving toward critical inquiry and future-oriented imagination. Through speculative museum projects, students engaged with memory, identity, and technology, using the Speculative Design Matrix[24] to structure their explorations. AI-assisted design further pushed creative boundaries, blending human intuition with algorithmic speculation. Rather than just a tool for efficiency, AI became a medium for critical reflection, helping students translate abstract concepts into material and visual form. These findings suggest that speculative and AI-driven approaches should be further integrated into architectural curricula, fostering designers skilled in conceptual, critical, and future-focused thinking. Future research could explore interdisciplinary collaborations and expanded AI applications in speculative architecture, reinforcing its role as a transformative pedagogical tool.

NOTES

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USING AI TO BRIDGE THE GAP BETWEEN TEXTUAL NARRATIVE AND VISUAL EXPRESSION: REFLECTING ON AN INTERIOR DESIGN STUDENT PROJECT

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INTRODUCTION

As Interior Design educators, we observed interior design visuals stripped of narrative and identity in the undergraduate design studio at a prominent South African higher education (HE) institution. We attributed this observation to technological determinism amongst students. To proactively encourage students to rethink technology's role as a tool in visualising interiors and restoring students' agency, a project was launched in 2020 in a second-year communication technology module. This project formed the basis of a continuous action research study, currently moving into its sixth cycle. The established student project commences by engaging in an introspective exercise and answering a self-discovery questionnaire that prompted the investigation into their 'designerly' identities. The textual responses subsequently guide the identification of imagery to support the composition of a visual manifestation of the self. We observe the transition between textual narrative and visual expression as a complex process that students struggled with in previous cycles of the project.

To assist students in analysing their textual responses in the fifth cycle of the project, they were introduced to the foundation principles of thematic analysis and used Open AI's ChatGPT as a data analysis tool to identify core themes in their responses to the questionnaire. Facilitators provided probing questions to assist students in developing prompts for ChatGPT. Students were exposed to the basics of data analysis and the rigour required for maintaining an ethical and transparent research practice. In this cycle of the research study, the researchers reflect on two data sources: the student's prompts and engagement with ChatGPT and the findings from a questionnaire to explore how the AI thematic coding process guides students in moving from a textual narrative to a visual expression of the self.

LITERATURE REVIEW

AI: An Overview of Global Debates

Ge and Fan[1] argue that design education cannot merely rely on familiar teaching and learning as it must remain relevant to meaningfully respond to the continuously increasing complexities afforded by the contemporary world. Ge and Fan position their argument within the context of the artificial intelligence (AI) discourse in design education and the scepticism surrounding this topic. Much of this scepticism in HE is rooted in fear of a decline in critical and independent thinking and problem-

solving abilities due to an over-reliance on technologies such as generative AI.[2] Many scholars also raise concerns about the loss of "academic integrity" with the use of AI.[3] This concern regarding academic integrity is validated by AI's ability to produce multimodal outputs from learned patterns by engaging various data sources.

Despite these concerns, authors like Perera and Lankathilaka[4] encourage HE to acknowledge and address these ethical concerns and, in doing so, educate students on how to engage AI meaningfully as an educational resource. Neumann et al.[5] also advocate for using AI, explaining that people who actively engage with AI technology will be more efficient than non-users. Consequently, HE should proactively engage in AI education and equip students to integrate human-technology relationships in their education, personal and work lives.

Ge and Fan's[6] research shows that AI technology in design education is predominantly used to generate multimodal content. Many AI multimodal content generators are readily available and accessible to the public. Convenient access and interaction of these generators present an opportunity for novices to 'produce design'. Amateur access to design production tools challenges the traditional boundaries of designers' professional expertise, creating uncertainty among design students and educators regarding their future roles alongside AI. Ge and Fan suggest design education is, therefore, profoundly impacted by the influence of AI and posit that students should not only be design experts but should be able to navigate "interdisciplinary integration, lifelong learning abilities, and foundational knowledge in AI and big data".[7]

ChatGPT's release in November 2022 (developed by OpenAI) sparked many global AI debates in the HE context. ChatGPT is a form of generative AI and is defined as a large language model (LLM) based on generative pre-trained transformers-3 (GPT-3). ChatGPT offers human-like dialectic abilities to untangle complex topics rapidly,[8] and its ease of interaction makes it a hugely attractive tool for novice AI technology users. ChatGPT can produce responses promptly and effortlessly, but its efficacy is directly linked to the "quality and quantity"[9] of prompts. Effective prompting, therefore, requires active and critical user interaction. However, even with informed user interaction, LLMs have also been critiqued for their inability to navigate nuance and context, particularly for specific domain knowledge.[10]

Crompton and Burke[11] conducted a systematic literature review that included a final 138 studies to map the AI landscape in HE from 2016 to 2022. Their study aimed to investigate the benefits and challenges of AI education within HE contexts globally. Their findings indicated that AI in education research is conducted across six of the seven continents (excluding Antarctica). However, there is an unequal representation across continents. The international perspective revealed an unequal distribution of research across continents. Their findings highlighted a paucity of representation of Africa, with only two per cent representation of the studies that formed part of the systematic review.[12] None of the studies reflected on the South African landscape at that time.

Curiosity Didn't Just Kill the Cat—It Trained the Machine Wrong!

As researchers based in South Africa, we note an increase in the active exploration of AI and its role in design education. This is evidenced in recent calls for research on the intersections between the physical and digital realms from prominent local and international design forums and organisations such as the Design Education Forum of Southern Africa (DEFSA) and the Cumulus Association. Both DEFSA and Cumulus foreground AI as one of the core themes to be addressed in the 2025 conferences in South Africa. These organisations present current and future focussed research in design education, research, practice and pedagogy, providing networked platforms for current debate and conversation amongst design educators and researchers.[13] The DEFSA 2023 conference, attended

by both authors, offered a few speculative mentions about the use and impact of AI in HE. Including the theme 'Design+ Digital Disruptions and Technology Integration' in DEFSA's 2025 call for papers likely indicates that shifts in technology and AI use in design education remain a prominent concern in the field.

We also note that several prominent South African universities, namely the University of Johannesburg, University of Cape Town, University of Witwatersrand, University of Pretoria, and Stellenbosch University, are actively responding to the AI discourse by publishing practice notes on the use of AI in academia. The publication of these practice notes signifies the institutions' acceptance of the increasing prevalence of AI technology by offering students and academics guidelines on how to ethically and effectively engage with AI. This stands in stark contrast to the prohibitive approach employed by some international educational institutions that have outright banned the use of generative AI, like ChatGPT.[14]

As Interior Design educators at a prominent South African HE institution, we similarly embraced this technological disruptor and experimented with AI, taking on the position that '*Curiosity Didn't Just Kill the Cat—It Trained the Machine Wrong!'*. We take the stance that uneducated curiosity about AI could potentially lead students to blindly rely on AI, oppressing their own creativity and critical thinking by being subjected to digital determinism. By offering this stance, we keep the original cautionary tone of the idiom "curiosity killed the cat" but update it for the AI focus, cautioning that students should not lose agency when engaging with this technology. The following section details our pilot introduction of AI as part of a well-established student project, which has been documented through an ongoing action research project since 2020.

THE STUDENT PROJECT AND THE ACTION RESEARCH STUDY

The student project was first developed in response to educators' observations of interior design visuals stripped of narrative and identity in the undergraduate design studio. We attributed this observation to technological determinism amongst students who value software mastery as a primary learning outcome, not a tool part of the design process.[15] The students' technological determinism angst was heightened during COVID-19. Due to higher education swiftly moving to remote online spaces, it removed students' access to specialised equipment and discipline-specific software available on campus. In many cases, students' technological access was limited to smartphones. This significantly affected second-year students, who were the last students to return to campus. During a typical academic year, second-year students would have been introduced to discipline-specific software focusing on creating digital three-dimensional models and visual representations of interiors.

The project was introduced through the lens of 'post-digital' thinking to counter digital determinism and to restore student agency.[16] Post-digital thinking does not oppose technological advancements but calls into question the technological deterministic discourse "accepting new technologies as progressive and inevitable".[17] The constrained access to specialised equipment and discipline-specific software presented an opportunity to first proactively encourage students to rethink technology's role in visualising interiors. Secondly, the project set out to restore affective practices, highlighting students' 'designerly' identity in their visuals. The project was introduced in 2020 in a communication technology module, which forms the basis of a continuous action research study, which will progress to its sixth cycle in 2025.

Action Research: Responding to the Student Project

Action research views knowledge as a living process generated from a practitioner's living and learning experiences. The action-reflection cycle of *planning, acting, observing, and reflecting*[18] leads the researcher through a series of ongoing and flexible cycles to generate knowledge *in* action *for* action. Figure 1 portrays a synopsis of the iterations across the various cycles of the research study and the changes implemented in response to each action-reflection cycle. The first cycle was initiated to address issues of technological determinism in the interior design studio. A reflective article for an institutional publication on innovation in teaching and learning[19] revealed new issues related to the student's 'designerly' identity. The subsequent four cycles focused on addressing this concern, with the results of cycles two to four submitted to a national publication. The review presented in this paper focuses on specific insights gleaned from the fifth cycle. Previous action research cycle reflections considered the whole process relevant to the output, i.e. the manifestation of the self as a post-digital collage. This reflection only considers ChatGPT as a data analysis tool and not its impact on the project's outcome.

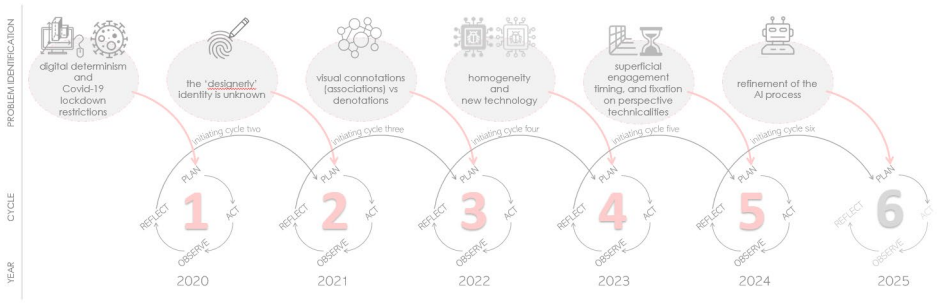

Figure 1. The action research study (cycles one to six).

Student Project Description

The overarching student project is currently presented in three phases, as shown in Figure 2. Phase A introduces a self-discovery questionnaire that focuses on three core topics: (i) the designer, (ii) personal preferences, and (iii) introspection, design process and design thinking. Phase B requires students to analyse their responses to the questionnaire and identify and select visuals and imagery that link to predominant themes in their textual responses, i.e., giving visual expressions to their text. Phase C of the project requires students to compose a manifestation of the self, using the visuals from the previous phases to compose and conceptualise a two-dimensional spatial visual through the process of collage.

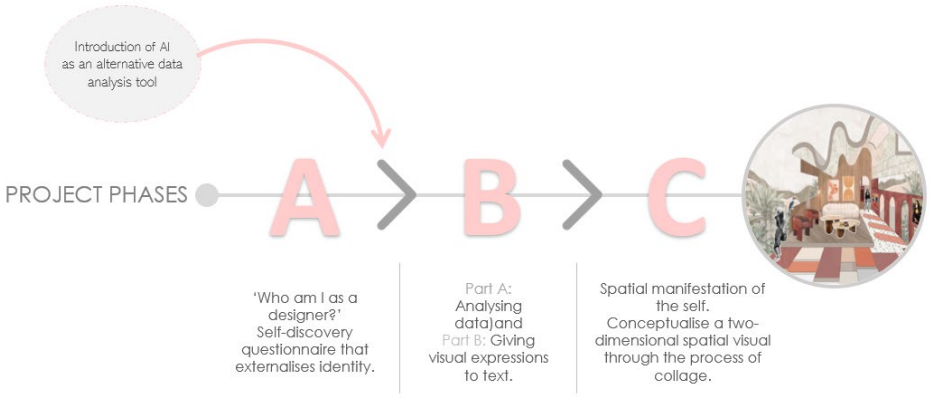

Figure 2. AI intervention as part of the project phases.

Preceding context to cycle #5

The self-discovery questionnaire was introduced in the second cycle of the study to address the challenges students faced in the first cycle in defining what constitutes their designerly identity. The questionnaires produced a body of textual data that students with little to no research analysis experience had to process in cycles two to four. Students were tasked to generate 'word clouds' from the data. The word clouds were employed as basic data analysis tools and assisted students in extracting predominant keywords/phrases from the textual questionnaire responses. These were used to source visual expressions, imagery, and symbols that could either be abstracted or used as literal depictions of identity constituents. We observed that students struggled to move from narrative informants to visual expression in the preceding cycles and that this complex translation process would require alternative and additional support in the fifth cycle.

Action Research Cycle #5: A return to first principles

'Plan and act'

In cycle five, we elected to remove the word cloud as a data analysis tool in response to two observations: (i) students increasingly relied on the autogenerated process of word cloud applications, reducing critical and reflective engagement in the process, and (ii) students identified keywords from the responses, without considering the context from which they were extracted. Upon reflection, we determined that the project offered an opportunity to explore AI as an alternative data analysis tool without derailing a well-established project.

OpenAI's ChatGPT was therefore introduced as a data analysis tool. Students were introduced to the core principles of thematic analysis and instructed to code their responses to the self-discovery questions by prompting ChatGPT. To kickstart the process, the project facilitators presented students with questions underpinning elemental thematic analysis: (i) *What patterns exist in your answers?*; (ii) *What are the commonalities?*; (iii) *Are there any hidden themes that you now discover looking at your information?*; (iv) *What of the information are outliers?*; (v) *Is this something previously unknown you discovered about yourself while completing this document?*; (vi) *What is unique to you as a designer and you as a person?*. We intended these to form the basis of students' AI prompts, although this was not explicitly stated. Students were required to submit all their AI prompts and responses as addenda to the final project submission to encourage ethical and transparent research practices. This was to ensure rigourous recordkeeping – a fundamental skill in ethical research practice.

'Observe'

Data for this cycle encompass field notes from the primary researcher, reflective memos from both researchers and a review of the submitted prompts. In addition, we obtained student feedback through a questionnaire (74% response rate). Students reflected on their use of AI in the project; and on the perceived benefits and pitfalls of using AI in the design process. We analysed the data thematically, including indicative direct quotations where relevant (P1 to P29 refers to the participant number).

'Reflect'

Initially, we assumed that students were actively using AI to analyse their responses to the self-discovery questionnaire. In the studio, we observed some students progressively developing better AI prompts, leading to keen personal insights that positively shaped the project outcome. Students seemingly made quicker and more astute discoveries *about* themselves *by* themselves. However, when analysing the prompts, it emerged that most students used AI in a rudimentary manner (as a search engine or language editing tool). The questionnaire responses confirmed this finding. Several students indicated that they did not use AI in the project, despite the instruction to do so. Non-users mentioned that AI could not assist them in a project based on personal interests and experiences, indicating that they "had all the relevant tools…without having to use AI". Only a handful indicated that they used it actively as part of the analysis process, citing that AI helped them to "think or realise things about myself quicker" (P27) and to gain a "full view" or "more in-depth analysis on [sic] my personal interests" (P20). In contrast to our initial assumptions about students' adoption of AI, several indicated that they had limited experience with using the technology before the project. One student stated that they "felt guilty to use AI because I thought it was cheating" (P3), while others expressed unease about the security of their personal information.

When asked about their use of AI after the completion of the project, students highlighted three main areas of application. First, they use AI as a research and concept-generation tool in the ideation phase. Students highlight efficiency and the potential to expand, elevate and organise their ideas as the two main benefits under this theme:

"…it can help with the thinking process, it can also suggest information that I didn't think about. In addition, I use AI as my research platform. So it can refer you to different links,
thus, shortening the amount of time spent on looking for information." (P28)

Second, students use AI as a communication or interpretation tool. Several students indicate that AI assists them in understanding briefs, or lecturers, better:

"AI can be used […] break down things for you […] because sometimes I don't understand my lecturer and I'm scared to ask questions so I jot down keywords and ask an AI platform/ google what those words mean in a design context and find myself understanding my work, making it more enjoyable for me." (P25)

Others indicate that AI helps them to communicate accurately with others, both textually and visually: "It helped and guided me to find the most accurate way to explain myself in a few short words and from there I could move on and design" (P13). Finally, some students use AI to assess, test or validate ideas:

"I have used it as a self-reflection tool, a "judge" for design ideas and concepts to know if I had to better them." (P18)

"[…] using AI as a tool in the design process could be much like speaking to a friend or a
lecturer, in the sense that you could ask it merely a few questions or opinions but not at all for it to take over your degree for you." (P27)

Students used AI more actively after the project, however, they still expressed hesitation about using the technology extensively in the design process. Responses highlighted the lack of accuracy and credibility in AI-generated information and its potential to inhibit creativity. Most students indicated that using AI extensively is “lazy” and that it might inhibit their “critical thinking” or the “unique ability that each designer has to formulate their ideas […] making the imagination dull” (P21) and likely giving rise to a “commonality in concepts or content” (P15). Students also mentioned the ethical implications of AI, including the risk of plagiarism and infringing designers’ intellectual property right, as well as the potential of false information to “defame others”. Several referred to the pitfalls of designers becoming “dependent” or “over-reliant” on AI: “There is a fear of becoming dependant [sic] on AI, therefore I try to limit the use of AI, only using it when necessary” (P6).

CONCLUSION AND RECOMMENDATIONS

Surprisingly, the project revealed students’ tentativeness regarding the use of AI in an academic context. We argue that this underscores the need for more projects that empower and support students to effectively and critically engage with AI in design projects. A prohibitive approach and an avoidant attitude toward AI in the HE context may result in the very dangers being cautioned against by many academics and researchers. It may result in uninformed students being overly dependent on AI without caution. Conversely, if students are apprehensive about AI, they will be apprehensive about exploring the technology and learning how to use it productively and ethically with individual and creative agency.

NOTES

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[2] Pethigmage Perera and Madushan Lankathilaka, "AI in Higher Education: A Literature Review of ChatGPT and Guidelines for Responsible Implementation," International Journal of Research and Innovation in Social Science 7, no. 6 (2023): 310, https://doi.org/10.47772/IJRISS.2023.7623; Ge and Fan,106; Michael Neumann et al., "We Need to Talk About ChatGPT: The Future of AI and Higher Education", in *Proceedings of the 2023 IEEE/ACM 5th International Workshop on Software Engineering Education for the Next Generation (SEENG)*, ed. Lisa O’Conner (Melbourne: IEEE Computer Society and Conference Publishing Service, 16 May 2023), 1–2, https://doi.org/10.1109/SEENG57375.2023.00011.

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[4] Perera and Lankathilaka, 313.

[5] Michael Neumann et al., "We Need to Talk About ChatGPT, 30–31.

[6] Ge and Fan, A Systematic Review of the Role of AI, 105.

[7] Ge and Fan, 106.

[8] Perera and Lankathilaka, AI in Higher Education, 307,309.

[9] Perera and Lankathilaka, 310.

[10] Perera and Lankathilaka, 310–311.

[11] Helen Crompton and Diane Burke, "Artificial Intelligence in Higher Education: The State of the Field," International Journal of Educational Technology in Higher Education 20, no. 22 (2023): 2,5, https://doi.org/10.1186/s41239-023-00392-8.

[12] Crompton and Burke, 8.

[13] “About DEFSA,” Design Education Forum of Southern Africa (DEFSA), accessed March 4, 2025. https://www.defsa.org.za/imagine; "About Us,” Cumulus, accessed March 4, 2025, https://cumulusassociation.org/about-us/overview/.

[14] Michel-Villarreal et al., Challenges and Opportunities, 2.

[15] Emmerencia P.M. Deminey and Elana van der Wath, "Visualising the Interior: Using Post-Digital Thinking in Interior Design to Restore Expressive Agency," in Teaching Innovation for the 21st Century: A Collection of UJ Teaching & Learning Vignettes, ed. Kirti Menon et al. (Johannesburg: University of Johannesburg, 2021), 23. https://web.uj.ac.za/digital-books/teaching_innovation/TeachingandLearningVignettes/book.htm.

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[17] Adam Matthews, "Design as a Discipline for Postdigital Learning and Teaching: Bricolage and Actor-Network Theory," Postdigital Science and Education 1 (2019): 415, https://doi.org/10.1007/s42438-019-00036-z.

[18] Jean McNiff, *Action Research: Principles and Practice.* 3rd ed. (Milton Park: Routledge. 2013), 56.

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