

SINGLE SERIAL: Accelerated Strategies for Spatial Systems Thinking in the First Year Studio

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INTRODUCTION

Design takes time. It is a non-linear, hyper-complex process that commands rigor, precision, and responsibility as well as empathy, poetry, and imagination. Teaching design is not an easy task. Teaching the design process to others for the first time is a design challenge.

Researching, ideating, abstracting, developing iterations, thinking critically, constructively critiquing, collaborating, cooperating, editing carefully and understanding the competitive nature of creative disciplines, not to mention basic design vocabulary, tools and communication skills, are all design fundamentals that need to be taught within usually compressed time schedules.

Is it possible to expedite design learning without compromising quality? How might we accelerate a process that requires time for reflection and evolving of ideas?

This paper will present 'Single Serial,' a beginning design pedagogy, exploring structure, sequencing, and timing.

BACKGROUND

Single Serial was implemented as the pedagogy for the Basic Design Studio: the first year, first semester studio of the Bachelor of Environmental Design program at the School of Architecture at the University of Hawai'i at Mānoa. This course was taught during the Fall 2016 and 2017 semesters as the only architecture foundation studio currently offered in the state of Hawai'i and the entire South Pacific region. The course is also open to all undergraduate majors seeking spatial design knowledge, and on occasion serves as an introduction to graduate students enrolled in the Doctor of Architecture program with backgrounds in other fields not related to design.

A few complications emerge from these facts. A single instructor with the aid of several graduate teaching assistants conducts the course with an approximate 1:80 teacher-student ratio. Spatial constraints result in a room operating in multiple modes, from classroom to workspace to gallery. Subsequently, a cornucopia of personalities, moods, backgrounds, ages, and languages populate the space. Clear communication, valuable feedback, individual learning, and maintaining focus are the main challenges.

APPROACH

a) Individual Learning, Team Critique

Single Serial focuses on the individual relationship and exchange between each student and the design problem. This personal learning process is critical in the formative years of design education when students are not yet cognizant of their strengths or weaknesses and are still learning fundamentals. Nevertheless, the studio operates in teams, where small and large group discussions occur on a daily basis and individuals are encouraged to articulate both their own and their peer's work. A new format emerges where a critique can happen in front of eighty, twenty or five students in the same studio session.

b) A Choreography of Assignments

A sixteen-week semester, meeting twice a week corresponds to twenty-nine days or one hundred sixteen contact hours. Time is carefully curated and composed through a choreography of assignments, communicated through a series of written prompts and diagrams.

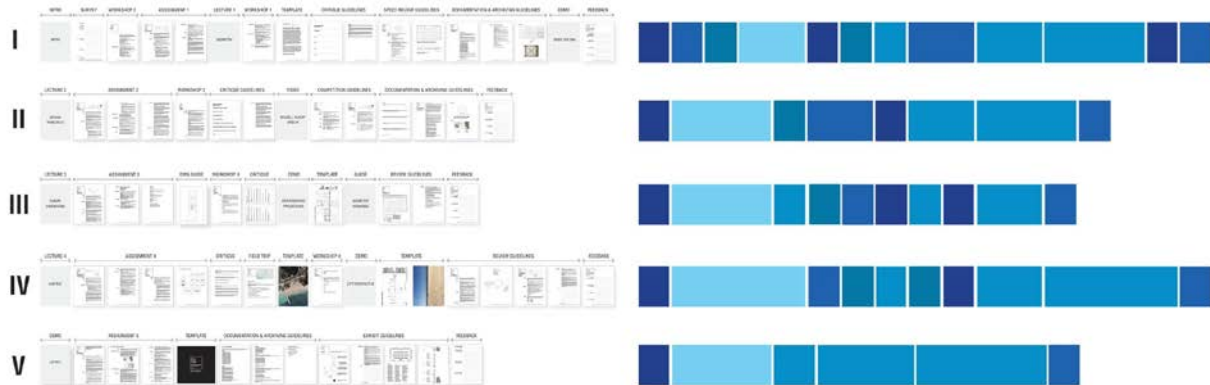


Fig. 1. Choreography of Assignments Diagram

Descriptive information, such as learning objectives, tasks, requirements and specifications are distributed ahead of time. Prescriptive documents, such as format, layouts, and templates are shared on time, as they clarify instructions for pin-ups, reviews documentation and archiving.

Resources such as lectures, readings, guides, and demos are delivered just in time, which allows for necessary adjustments resulting from the progress of any particular group. Daily spontaneous assignments or informal charrettes occur within set time frames and serve as introductions, transitions, and re-caps.

Lastly, at various points throughout the semester, there is a moment to stop and assess progress through evaluation tools that allow students to analyze their work, the work of their peers or the assignment itself.

The score of the pedagogy operates as both single and multiple, rigorous yet flexible, fast and slow (see Fig. 1).

c) A Project of Projects

A series of frameworks were designed to guide students through a series of independent, yet sequential exercises that encourage the development of a coherent body of work, in spite of divergent explorations and/or creative failures (see Fig. 2).

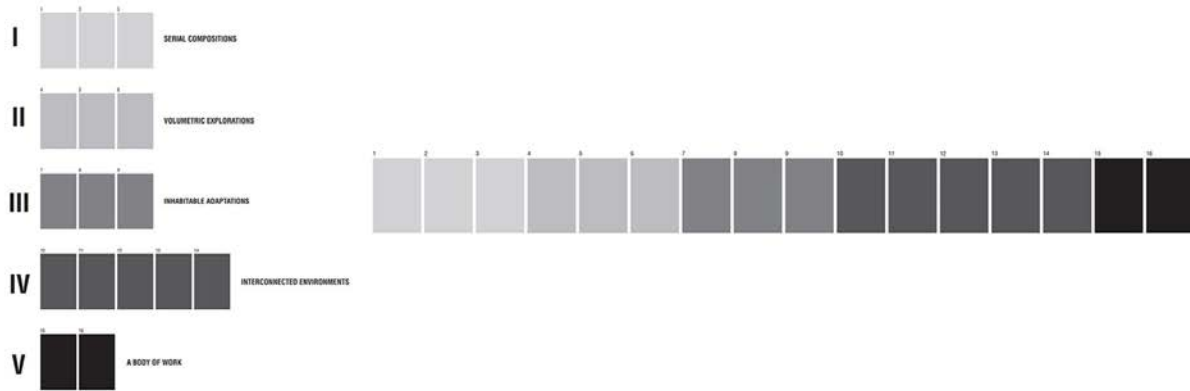


Fig. 2. Project of Projects Diagram

A series of rigorous but abstract exercises: Serial Compositions, Volumetric Explorations, Inhabitable Adaptations and Interconnected Environments, focus on systems thinking and serve as generative devices for finding a design language.

Several principles guide this pedagogy:

- Encourage creativity, curiosity, and the joy of discovery.
- Promote responsible judgment and discourage arbitrariness.
- Develop a disciplined and rigorous design approach.
- Project the importance of craftsmanship and the connection between thinking and drawing/making.
- Establish a foundation for conceptual sophistication and critical thinking.
- Develop an understanding of relationships of parts to whole.
- Introduce systematic thinking and problem-solving skills.
- Work is evaluated through the following criteria:
 - Breadth: Extent of the project’s investigation and development. Ability to generate multiple concepts and test different ideas.
 - Depth: Conceptual sophistication and critical thinking. Ability to create complex, thoughtful, innovative proposals with multiple readings.
 - Evolution: Continuous, consistent and visible progress and active participation. Ability to improve and evolve an idea. Ability to successfully use and translate critique to advance the work.
 - Craftsmanship: Quality of the work and fulfillment of the requirements. Ability to make a neat, clean, precise object or drawing. Including both originals and documentation (photography, scanning) of all deliverables.

PROJECT I: SERIAL COMPOSITIONS

“Geometry is the invisible scaffold that at once controls the distribution of parts, but disappears in the final building” (Allen, 2009, p.219).

Geometry surrounds us. It has been the subject of inquiry of designers and builders since the beginning of civilization and continues to be a topic of investigation in architectural discourse today spanning both digital and physical realms. Our objects, buildings, and cities are all defined by it.

The first project focuses on the fundamentals of geometric composition in two dimensions and forms the foundation of every subsequent assignment. Students are tasked with designing a series of abstract

configurations that explore ideas of form, space, and order using basic geometric constructions with a compass and a straight edge. It is not a mathematical, but rather a spatial problem.

This project presents three main challenges: "abstracting" when students are predisposed to allegorical thinking; operating with a limited analog toolset, when fast, automatic, digital devices populate the classroom; and developing analytical reasoning to explain decisions when the natural instinct is impulsive, often resulting in arbitrariness.

In addition to the evaluation criteria presented above, this pedagogy offers the students a Design Criteria Framework which serves as a guide for critique, self-evaluation, and discussion or description of the work. The set of criteria evolves with every assignment and begins with the following basis:

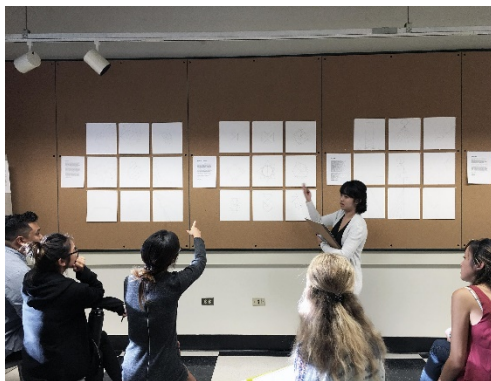
1. Components: The definition of design elements, their characteristics, and variations.
2. Logic: The strategies utilized to arrange components. The relationships between elements and the space offered by the boundary.
3. Craft: The execution of the work in terms of refinement, accuracy, and precision.
4. Set: The succession and arrangement of drawings and relationships between them.



Fig. 3. Serial Compositions by Micah Axalan Fall 2017

Three sets of iterations structure the design process. The first drawings explore single geometries and their relationship to the canvas, a white 10"x10" square paper. Conversations center on the selection of the element, its characteristics, components, positioning, and orientation (see Fig 3).

The second set of drawings investigates three geometric figures related to each other. This sequence must depart from an attribute identified from the first study and focuses on relationships between elements, hierarchies, similarities, and variations.



The third set increases complexity with compositions of ten or more geometric figures. These drawings center on repetitions, operations, border and boundary conditions and the beginning or end of a drawing.

Fig. 4. Serial Compositions Review Fall 2016

'Serial Compositions' introduces the importance of the relationship of parts to whole at various levels: between geometries, between drawings within a single study, and ultimately between all three iterations which

form a set of nine drawings (see Fig.4). This exercise also offers an underpinning for a conceptual framework based on the abstraction of space in advance of scale or context.

PROJECT II: SPATIAL EXPLORATIONS

"Order without diversity can result in monotony or boredom. Diversity without order can produce chaos. A sense of unity with variety is the ideal. These ordering principles are used as visual devices that allow varied and diverse forms and spaces to coexist perceptually and conceptually with an ordered, unified and harmonious whole" (Ching, 2007, p.338).

The translation of space from two to three dimensions and from shapes to forms is influenced by the understanding of the basic elements that define space: points, lines, planes, and volumes; the dimensional and relational properties of form, the opportunities offered by a particular material and the restrictions of a specific boundary. Nevertheless, the fundamental debate lies in finding order.

Many authors have speculated on rule sets and strategies to organize space, from linear, radial or grid structures that operate as closed systems, to clusters and Field Conditions, described by Allen as "bottom-up phenomena, defined not by overarching geometrical schemas but by intricate local connections " (Allen, 2009, p.218).

'Spatial Explorations' continues to focus on the organization of parts, the relationships that occur in between them and the ultimate search for the identity of the whole. This exercise presupposes that elastic strategies have the most potential for development of a design language as they can be explored, adapted and transformed without affecting character.

The Design Criteria Framework is further developed and refined:

1. Components: The definition of a family of elements based on each student's ongoing investigation. The reasoning for shapes, number of repetitions and the discrete variations of dimensional properties (width, length, height, angle).
2. Logic: The relationship in between elements in both two and three dimensions, including but not limited to elements in tension, vertices to vertices, edge to edge, parallel and perpendicular connections (parts to parts) and point of origin, position within the imaginary cube, orientation, rotation in three dimensions, relationship of positive and negative space (parts to whole). The reasoning for repetition and placement of all elements and subcomponents.
3. Craft: The execution of the work taking into account the properties, advantages, opportunities, and challenges offered by each material.
4. Set: The association to at least one aspect from the previous study. The correlation between iterations. The narrative that supports all design decisions.
5. The project is structured in four iterations that are presented during four back to back studio sessions. Models are constructed by hand and bound by an imaginary 10" x 10" x 10" cube.



Fig. 5. Linear Studies Fall 2017



Fig. 6. Planar Study by Hunter Wells Fall 2017

Linear studies offer an opportunity to define translations from two to three dimensions. A two-dimensional cube can remain as such in three dimensions but also has the opportunity to become a prism. This dimensional wire-frame realm redefines a line. A line with dimension reveals the moment of connection, between the linear components themselves and between geometric forms, also shaped by lines (see Fig. 5).

Planar studies composed of 1/16" thick chipboard continue the investigation of additive transformations. This prompt inherently suggests the omission of components to reveal space. Connections between planes go beyond surfaces that touch and pose opportunities for intersections and perforations (see Fig.6).

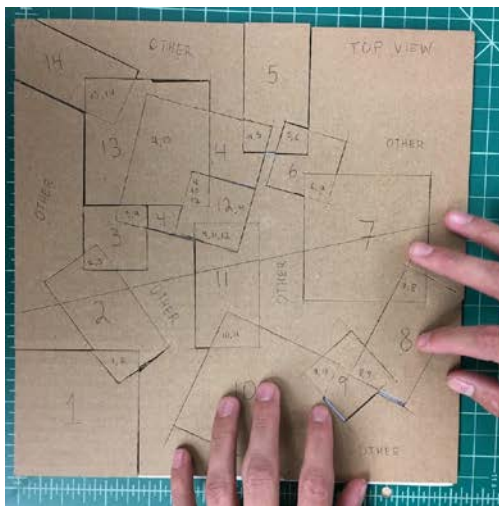


Fig. 7. Volumetric Study by Hunter Wells Fall 2017

The third iteration presents a shift from additive to subtractive transformations, converting solid spaces into sequences of voids. Compositions are initiated with a 10" x 10" x 10" solid cardboard stack. This exercise requires the invention of methods for cutting, carving, and imagining space from inside to outside. The notion of a section is introduced as models are composed of two interlocking pieces, which reveal the volumes inside (see Fig 7).

The sequence results in a final hybrid model requiring the use of all three materials applying learnings from each of the previous investigations (see Fig.8).

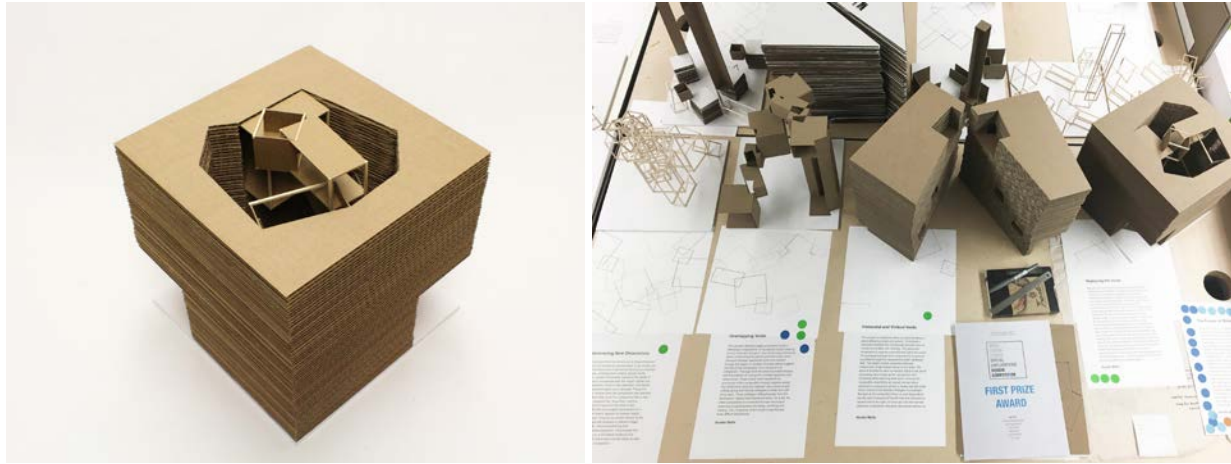


Fig. 8. Hybrid Study and Final Review by Hunter Wells Fall 2017

'Spatial Explorations' is an analog introduction to architectural three-dimensional space defined both virtually and literally by vertices, lines, planes, and masses of material. It intrinsically explores notions of gravity, weight, balance, opacity, translucency, permeability, light and shadows. The exercise continues the development of each student's unique ordering system and conceptual framework by connecting thinking to making. Models are accompanied by drawings, diagrams and short written descriptions communicating intent and ideas behind the compositions, culminating in a studio design competition and celebration of space.

PROJECT III: INHABITABLE ADAPTATIONS

"Space is empty volume with the potential to be occupied. The occupant can be an individual a group or even an object. Habitation is the defining attribute of architectural space" (Eckler, 2012, p. 204).

The term 'built environments' is used to describe all the man-made spaces we inhabit. It is primarily everywhere we live, work and play. The human dimension is what distinguishes architecture from other spatial artforms. From the Egyptians to Vitruvius, to da Vinci, to Le Corbusier, artists, architects and builders have related 'building' to anthropomorphism, ergonomics, human proportions, and scale.

This project continues the student's study of geometry and order while introducing them to the human dimension. Based on previous hybrid models, space is re-imagined as 'occupied' by people sitting, standing and navigating through the structure.

Dimensions of architectural elements such as ceilings, floors, walls, stairs, seating; of the spaces in between these components; and apertures, portals, thresholds defining inside and outside are explored.

Two additional parameters are added to the Design Criteria Framework, which is distributed as a simplified list:

1. Components: Clear definition of design elements avoiding elements that do not belong.
2. Logic: Strategies for connections between materials, components, and subcomponents. Strategies for repetition and aggregation.
3. Craft: Evidence of an accurate and rigorous process (no shortcuts).
4. Set: Correlation with previous studies. Development of a unique, harmonious design language.

5. Human Dimension: Response and sensibility to the proportions, scale, and needs of human beings and their ability to move through space.
6. Spatial Quality: Atmosphere, effect, influence, feeling generated by the architecture.

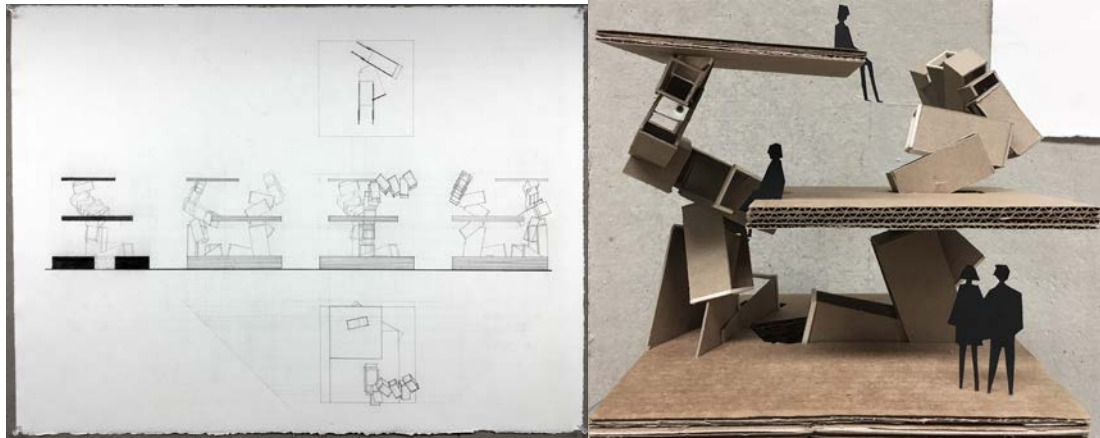


Fig. 9. Orthographic Projection drawing and study model by Micah Axalan Fall 2017

This project follows a process of discrete refinement instead of divergent explorations. A series of demos and workshops guide the students through drawing a set of related orthographic projections, and isometric drawings at two different scales. A series of objects, openings, and spaces are measured, including the studio environment itself, to understand scale in proportion to the human body. A final iteration presents a new set of drawings and models of the inhabited structure at 1/4"=1'-0". (see Fig 9).

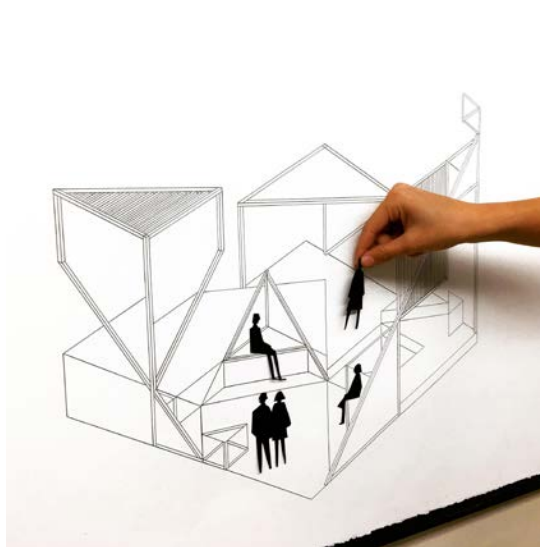


Fig. 11. Isometric drawing by Sara Hyun Fall 2016



Fig. 12. Final model by Hunter Wells Fall 2017

'Inhabitable Adaptations' is an exercise of multiple translations, from scale-less to inhabitable, from abstract to functional, from model to drawing, from 3d to 2d and, from object to space.

PROJECT IV: INTERCONNECTED ENVIRONMENTS

“When a system is taken apart it loses its essential properties, if I bring an automobile into this room and disassemble it, although every part is in this room I don’t have an automobile because the system is not the sum of the behavior of its parts, it’s a product of their interactions” (Ackoff, 1994).

'Interconnected Environments' provokes the students with program and context. The previously abstract, yet inhabited structures, acquire a role and place in a dense urban environment on the island, between the city and the beach.

A new set of complications emerge when these constructs are re-imagined as Beach Pavilions, challenging the previously developed systems and conceptual frameworks.

What is the ideal location for the pavilion on the site? How should the structure be perceived as one approaches the site? How do people enter and move through it? How do visitors experience the space? In order to answer these questions, two topics are examined.

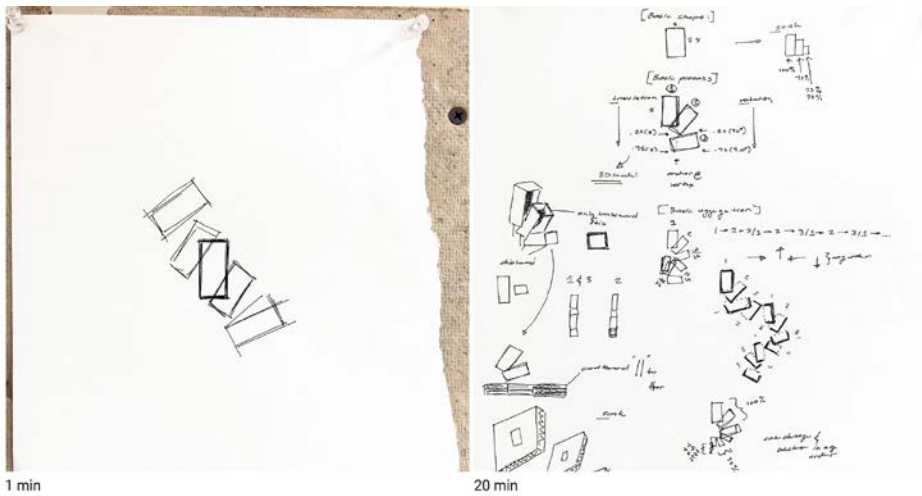


Fig. 10. Fast Diagrams by Micah Axalan Fall 2017

The first investigation is centered on reflecting on the essence of the project itself, and the refinement of concepts developed through the previous assignments. A rapid timed drawing workshop generates sketches and diagrams that serve as the point of departure for further evolution (see Fig.10).



Fig. 11. Site Field Trip Fall 2016

Subsequently, the studio focuses on the site. Models are transported and utilized for sparking the imagination, focusing and aiding observations (see Fig. 11). A Site Analysis Framework tasks the students with:

- Defining a position and orientation for the structure within the limits of the site. Considerations include identifying North, mountain (mauka), ocean (makai) and other site considerations specific to the location such as existing circulation on sidewalk, sand or water.
- Recording observations of the following variables: movement of the sun, shade, views, human behavior, and physical or natural surroundings.

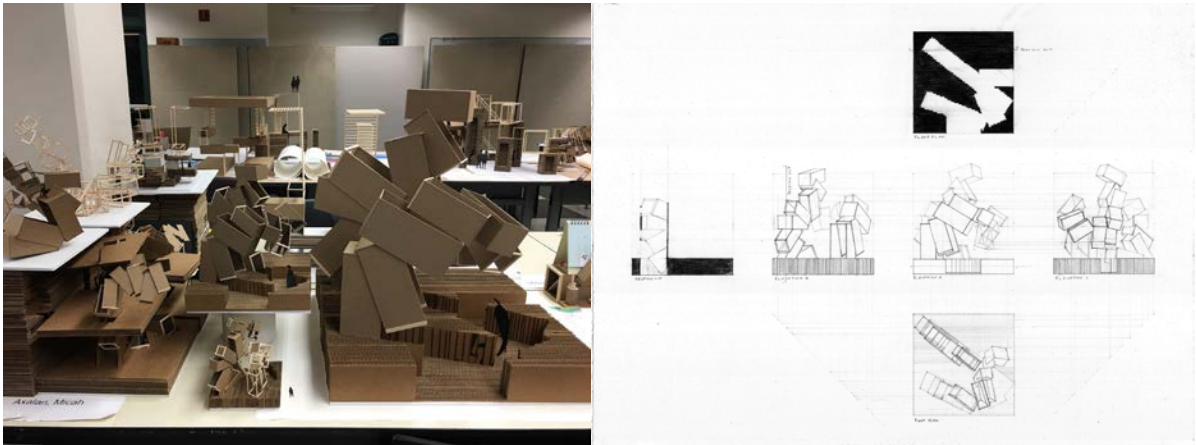


Fig. 12. Models and drawings by Micah Axalan Fall 2017

Projects are further developed through new tools and techniques including building large scale detailed models, drawing a two-point perspective and creating a collage to represent the project in context (see Figs.12,13,14).



Fig. 13. In progress two-point perspective Fall 2017

Fig.14 Collage by Micah Axalan Fall 2017

'Interconnected Environments' transforms context into a design prompt. Conceptual frameworks and design languages developed over the entire semester are now translated into a known, physical environment, bringing abstractions to reality.

In addition, a cultivated Design Criteria Framework, introduced gradually and repetitively, allows nuanced and sophisticated final conversations:

1. Components: A family of design elements, based on three-dimensional geometries, that form a spatial system.
2. Logic: Based on the role of every component and subcomponent, strategies for organization, order, and related operations including repetition, variation, subtraction and aggregation in all dimensions.
4. Craft: Evidence of an accurate and rigorous process, both physical, conceptual and digital. Clear ideas that have been explored in depth and breadth.
5. Set: The evolution of all previous studies into a unique, harmonious design language. An elastic spatial agenda that can be adapted and transformed without affecting character.
6. Human Dimension: Consideration of human proportions, scale and dimensional requirements as they encounter, enter and inhabit space.
7. Spatial Quality: Sensory perceptions, effects, and feelings generated by spatial and material attributes, such as composition, aperture, permeability and the relationship between spaces, inside and out.
8. Context: Attention to the specific character and value of a particular location and establishment of a unique position or point of view that holistically merges place and concept.

PROJECT V: A BODY OF WORK

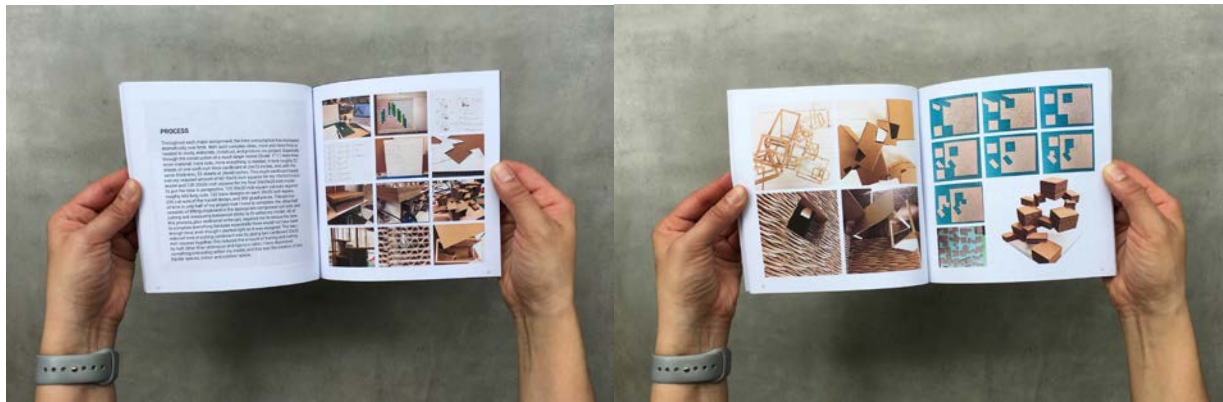


Fig. 15. Portfolio by Hunter Wells Fall 2017

The fifth and final project 'A Body of Work' asks students to assemble all previous assignments into a design portfolio. This creates an opportunity for fine-tuning narrative and analyzing their entire design process (see Fig.15). A few new tools are introduced, as students transcribe, edit and translate from physical to digital to physical; from disconnected thoughts to coherent statements; from experiences to learnings; and from series to single.

CONCLUSIONS

'Single Serial' offers a series of fundamental frameworks and methodologies that can be utilized in design pedagogies within diverse disciplines and on projects of various scales.

The overlap of individual learning and team settings creates a platform for constructive critique. Furthermore, the gradual introduction and utilization of design criteria build a sophisticated vocabulary and empowers foundation students to describe their projects with refinement and confidence.



Fig. 16. Various models photographed for exhibit Fall 2016

A balance between carefully timed descriptive and prescriptive prompts allows students both creative freedom and being able to focus on the work without being distracted or overwhelmed with boundless decisions. This rigorous yet flexible process establishes a rhythm of testing iterations, figuring out how to go about what to do, making decisions and moving forward despite design failures.

A project of projects builds complexity over time, leads to responsible judgment and conceptual sophistication. A final project focused on reflection, edition and curation reveal spatial narratives, agendas, conceptual frameworks, and design languages. The product of the studio is ultimately an archive of potentials.

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