Living Surfaces: Defying Walls

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ABSTRACT: *The potential to program the Wall as a Living Surface, addressing the needs and demands of its users to respond to the current context for a better quality of life, can provide benefits in many aspects. By reinterpreting the questions using three critical frameworks: social, cultural, and physical, one can deconstruct the Wall as a provocation: Can a wall act as a building element and an element of play: interactive social exchange? Can new tools and technology provide alternate tactics? How can we encapsulate resilience using low-cost modular approaches incorporating human-centered design strategies?*

Many small-scale creative efforts to foster tangible urban change, inspired by the Tactical Urbanism[1] movement, have succeeded. Cities today have become experimental grounds to test ideas using inexpensive short-term tactics as playful provocations that generate social interactions and promote critical discourse. Within this realm, design-build pedagogy in the classroom is an opportunity for students for meaningful social engagement and community building, thus expanding the role of education as a participatory practice-based design research and fabrication lab.

This paper offers evidence-based outcomes as students in Tactical Urbanism class at Kennesaw State University explored ways to redefine and reconstitute the typology of Walls as a Living Surface with new programmatic opportunities defying the traditional notion of Walls separating public and private realms. Responding to the needs of Math Club's desire for a Book Nook that also creates a boundary of sorts in the outdoor greens, students explored how a Wall can act as a Living Surface, an assemblage for various functions: seating, pop-up library, and collaborative spaces.

The course follows a rigorous process to achieve outcomes that can stand up to public scrutiny for a product ready for on-site installation and real-time testing by citizen-users in a public space as a testament to the project's efficacy. Teachings that engage real-life matters of grave importance allow upper-level students to practice design and making skills in the service of citizen-users within the urban realm. Pedagogically, design-build is an excellent alternative method to give students real-life experience of project scope from conception to designing to prototyping: testing scalar mock-ups to actual fabrication and deployment, whereby the students' engagement with materials, tectonics, and tools and techniques gives them design feedback that is critical to the creative process as attested by Richard Sennett in the book The Craftsman.

KEYWORDS: Walls, Living Surfaces, Tactical Urbanism, Architectural Installation, Design-Build

INTRODUCTION

> Architecture is the physical form which envelops people's lives in all the complexity of their relations with their environment.[2]

Inspired by the work of Rem Koolhaas in *Elements of Architecture*[3], this proposal aims to reconstitute the typology of *Walls as a Living Surface* addressing the needs and demands of its users by reinterpreting the questions to respond to the current context for a better quality of life using three critical frameworks: social, cultural, and economic platforms. Can a wall act as a building element and an element of play: interactive social exchange and a surface to grow food? Can new tools and technology provide alternate tactics? How can we encapsulate resilience using low-cost modular approaches incorporating human-centered design strategies?

Building upon recent research explorations, the Tactical Urbanism class[4] explored various ways to program the 'Wall as a Living Surface' that can provide benefits in different aspects. It can be a system of a series of rotating panels as an assemblage that provides many interactions, such as a screen to bring in light, as a threshold to open/close a living room, or as an interactive device for social exchange: library or book nook for cooperative interactions. It can be suitable for vertical gardens offering the user group opportunity to generate income, which is essential for economic independence. It can also function as a space filled with light, color, and sound where all senses are invigorated, providing hope, resilience, rejuvenation, and a safe zone for its users.

Figure 1: Wall as Vertical Garden | Tactical Urbanism 2019

1. DESIGN PROCESS

The Tactical Urbanism 20225 project scope is in response to KSU Math Club's desire for a pop-up library to showcase math books - to allure students to interact with the subject without being intimidated or overwhelmed. To begin the process: students were challenged to think beyond the traditional notion of the Wall - to redefine its construct as a multi-faceted assemblage to respond to user needs. Traditionally, Walls act as boundaries/dividers/thresholds – physically separating public and private realms. Within this most simplistic definition of a wall, how do we, as architects and design students, begin to explore and challenge the Wall to hold an array of experiences through diverse functions?

1.1 Exploring vertical surface

The leap from theoretical drawings and models to represent architecture within a design process leads to a disconnect between the notion of constructability in making things. The nature of the class translating conceptual ideas to real-life assemblage necessitated students to work in teams to develop initial ideas. The class prompt for the first exercise was to interrogate the 'Walls as Vertical Surfaces' that can hold functions while creating a boundary of sorts.

Precedent Study | Each team had to find three innovative precedents of Walls similar in scale and program to learn how their form, materiality, and construction work as a temporary structure within the public space. For the exercise, selected precedents were: Serpentine Wall6, Serpentine Summer House7, BookWorm Pavilion8, and Story Pod9.

Figure 2: Precedent Study

1.2 Design exploration | artifact

The design brief called for a temporary modular wall to be deployable with programmatic outcomes: i) a climate-controlled bookshelf to hold 20-25 books, ii) seating, and iii) interactive study areas. Drawing inspiration from the precedents listed above, they were then to represent their findings using creative representational tactics to start the conversation - as an 8" x 8" wall sectional artifact that illustrated their definition of the Wall as a component-based kinetic modular system that adapts and functions on multiple levels. The exercise of scaled physical model-making challenges students to develop conceptual ideas to develop scalar models as testing several different design iterations. The following narrative outlines the process and highlights how the project moves beyond representational artifacts to constructability, engaging form, and materiality as an iterative tool to make critical decisions as assemblies, details, and systems are formalized in the act of making a feedback loop.

The class was divided into two groups to begin the process, where each group communicated their initial design concepts by creating 1'=1/16" or 1'=1/8" models. As the design developed, the feasibility of the proposals was tested through a change in scale. The next step was to produce 1"=1'-0" models to test modularity, assemblage, ergonomics, and ease of construction. The first team proposed 'The Summit,' a design that used a waffle structure strategy for the building. The ribs run in horizontal and vertical directions for the design's structural integrity. The intent was to use the space between the ribs to filter light through the structure and storage for the books. Through this tectonic strategy, the team created an organic shape that responded to the site by weaving the form through the foliage. The initial 1/16" inch models were used to test the waffle strategy and design its massing. This model failed to answer the dimensions of the horizontal and vertical layers to place books and comfortable seating. It also questioned the constructability; in the following iterations, it was tested through modularity and scale of the design in terms of fabrication materials/equipment

constraints. The change in scale 1'=1"-0" in the following study models allowed a closer observation of fabrication tactics and material takeoffs. The design was more intentional regarding dimensions and how it would respond to the human body.

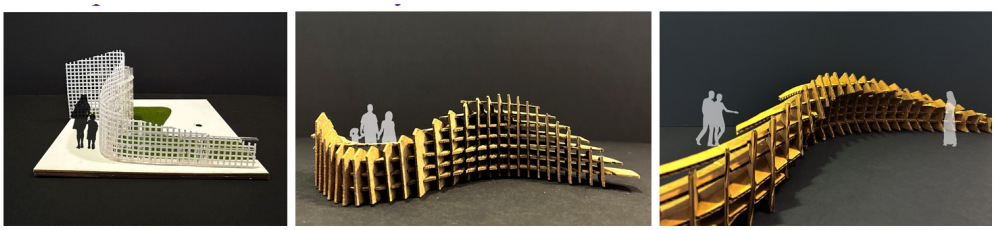


Figure 3: Group 2 | Waffle Nook

Another team, using the Fibonacci spiral as a formal language, discovers through experimentation of scale that this particular design iteration, expressing verticality through its material makeup, needs to be revised for constructability. By fabricating a segment of the overall design in a scaled manner, several questions arise about joinery, material selection, ergonomics, and budget. Gathering the feedback from the results, each team refines its designs at a larger scale. The group using the Fibonacci spiral as a concept shifts the verticality-based design language to a horizontal arrangement through the representation of stacking. This configuration is analyzed by extending the scale upward and expanding the model's focus to experiment with connections and form. By scaling the physical models' representational focus, solutions to the questions at hand begin to arise in an apparent resolution that aligns with the program requirements. The students found that the proportions of the storage units for the math books were successful ergonomically for a broad range of users. Another successful takeaway is that the horizontal configuration was found to be more aesthetically pleasing to the eye for the occupants as a play in the scalar distribution of the material in the z-axis affects the overall appearance of the structure. Other takeaways in the feedback loop hinted towards the need for another series of scalar testing's, such as construction practicality and segmentations through modularity, which ties back to the program requirement of transportability.

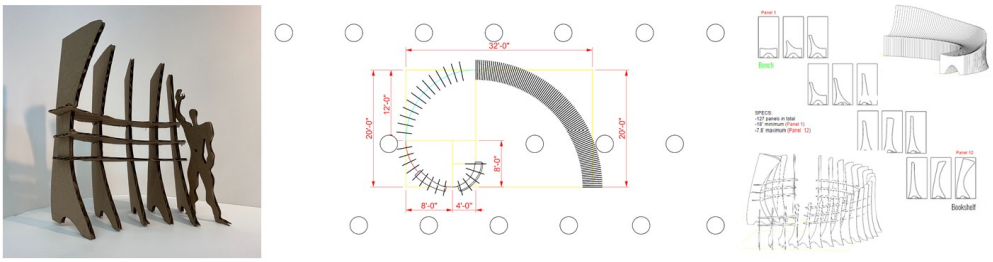


Figure 4: Group 1 | Fibonacci Nook

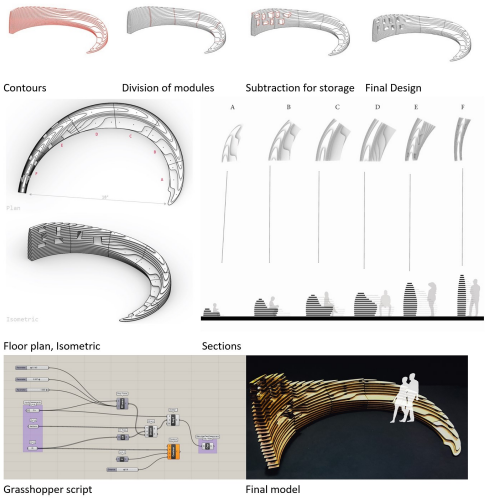
The jury consisted of an experienced design-build professor10, a structural engineer11, and a community engagement manager12 engaged in public space activation projects. Having her as part of the jury gave students a real-life perspective on how temporary and modular small-scale projects have excellent prospects for activating public space. After much deliberation, the jury selected the Fibonacci Book Nook to move forward based on its conceptual integrity and design-build strategy, i.e., construction, deployment, transport logistics and budget.

1.3 Final design development

After selecting the Fibonacci Nook design, the class came together to undergo another iteration in which they combined the strengths of both proposals to move forward. The Fibonacci Nook had a more robust concept and ease of assembly than The Summit project. The Fibonacci Nooks modular system can be broken down into segments for custom arrangement and offer a simple construction and transportation process. The ergonomic components used on The Summit Project were incorporated into the Fibonacci Nook. The idea was to integrate seating and storage as components of a wall system at varying heights to generate a form that fulfills functional requirements as desired. The design concept is a mathematical sequence derived from the proportions of the Summation Sequence, better known as the Fibonacci sequence, connecting it to the mathematics building. Its growth ratios can be found in nature, especially on the site. The pine trees on the site express this sequence of growth directly.

The conceptual design was reinforced using a stacking strategy as horizontal profiles of wood with spacers accommodated structural and programmatic requirements: seating, interactive spaces, and books. The grasshopper script derived the final form as a topographical gesture slowly rising from the landscape into a wall with rectangular openings to create a sense of porosity and functionally hold books. These openings are

lined with acrylic panels to protect books from elements and security. Material, transportation, joinery, human comfort, and more decisions occurred during workshops. The class regrouped into three teams to refine the final design into a feasible design-build project. After the groups teamed up to answer the programmatic requirements and fabrication, they created a 1'=1' scale model to refine testing and finalize the design.



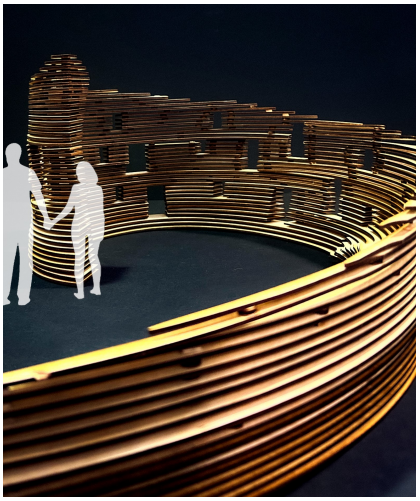


Figure 5: Final Design Development | Fibonacci Nook

1.4 Mockup and testing

Strategically the Fibonacci curve was divided into five modules, with a specific number of wood profiles stacked. This approach aided in transportation and the constraints of the lab equipment. Students collaborated for the remainder of the semester, working out design details such as tectonics, material selection, ergonomics, fabrication schedule, and budget limits. Volunteers were recruited from NOMAS and KSU Math Club.

A full-scale mockup tested the design's efficacy: joinery, structural integrity, ergonomics, assembly, finishes, and transportation logistics. Students used the mockup to test the strength of the structure from shearing or breaking. For the mockup, students employed square spacers for stacking the wood profiles as a system with 1⁄4" rods to align the shapes precisely to each other. From the initial test; they discovered that the 1⁄4" rods were too thin during assembly and decided to use 3⁄4" rods for the final installation. During this process, the class switched from square to round spacers. Friction would move the square spacers, and they would lose their alignment. The feedback loop proved fine-tuned fabrication details, as attested by Sennet. Another lesson from this scaled mock-up was the transportation of the modules. Each layer consists of ¾" inch-thick plywood sheets; the weight made transporting them difficult after stacking them. Therefore, the shop drawings for the bottom sheets had square cutouts that would lighten the sheet's load without compromising the module's structural integrity. Now the project was ready to move into its final phase.

Figure 6: Mock-up and Testing | Fibonacci Nook

1.5 Fabrication and assembly

Project management and schedule creation became the top priority as students organized themselves as an atelier, each playing a pivotal role. Each student was given a specific task based on their interest, from purchasing materials to coordinating with the woodshop for the fabrication schedule, preparing shop drawings, CNC loading-unloading, cutting tabs and spacers, route edges, sanding, drilling, prepping, painting, and

assembling. Students performed multiple tasks to keep to the timeline; each work stream was recorded on the lean board so that each member could independently pick up jobs left off by others – thus giving autonomy to the process for efficiency.
The organization was the key to the design-build aspect of such a project. Meticulously, all profiles were numbered during CNC fabrication and organized as woodshop modules. Once the module was cut and sanded, it went to the paint station and was finally stained and waterproofed before it was ready for assembly.

Figure 7: Process | Fibonacci Nook

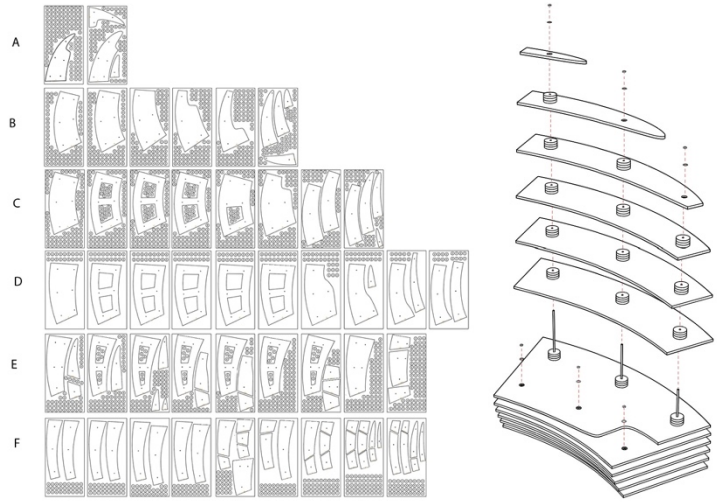


Figure 8: Shop and Assembly drawings

A design-build class of this nature expects commitment from students, and this was achieved through teamwork with upper-level thesis students leading the efforts. A test installation was deployed inside the architecture building due to weather constraints. It was a soft opening with the Math club, architecture students, faculty, and other guests enjoying the installation over good food, great conversations, and social exchange. In the final analysis, the Wall did prove the thesis it set out to prove: the Wall as a multi-faceted construct: a boundary, seating, library, conversational areas, and more.

CONCLUSION

Design can improve the quality of life of their users' needs and demands by reinterpreting the questions to respond to the current context. Challenging the basic assumption of in-town shelter as an alternative housing option for young adults and baby boomers - students in this course interrogate the basic assumption of housing typology by dissecting its elements as individual fragments: walls, floors, ceilings, and roofs through multiple filters. Through case studies and analysis, they strive to offer new meaning to age-old issues of building design, construction, and materiality by exploring innovative directions for an architectural outcome rooted in history and theory but employing contemporary strategies related to the modular design, materiality, construction

tools and techniques, programming, accessibility, smart technology, and sustainable practices that have a direct impact on users.

Evidence-based research of design ideas and strategies, when tested on a small-scale as tactical urbanism projects, have the power to be scaled up for various applications, including shelter, engaging social, cultural, and physical needs of its users for equity and resilience. Pedagogically, the design-build is an opportunity to prototype real-life projects engaging tools and techniques by looking at materiality and fabrication processes through environmental and sustainable metrics. In the words of Richard Sennett, "Making is thinking ... an enduring, basic human impulse, the desire to do a job well for its own sake." The final construct of the Walls as Living Surfaces as a design-build installation is a testimony to the design process as digital and analog methods work in tandem to move the project forward beyond representational artifacts – as a full-scale installation ready for deployment in the public space. These design-build projects catapult students' interest as independent research projects beyond the scope of the class that generates a life of their own beyond the classroom. These projects allow students to develop research as competitions and conference papers as they leap into the profession or pursue graduate work.

Figure 9: Opening Night Installation (Soft Opening)

Walls | Boundary Walls | Programmatic Elements

Figure 10: Evidence Based Research - Walls as Living Surfaces | Defying Walls

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