The Unsiloing. Design Theory + Praxis

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ABSTRACT

While design education and practice are increasingly specialized, even hyperspecialized[1], synchronous with technological advancements and robust building systems, contemporary wicked problems of climate change, social inequities, and land use development practices require additional designers who work between disciplines to develop emergent fields of study. Interdisciplinary and transdisciplinary design are critical in undergraduate education and professional practice as they promote diverse typological responses, rather than advocating for physical and nonphysical artifacts nested within traditional disciplinary boundaries. This integrated approach to design responds to complexity through the development of new theoretical frameworks and diversity of perspectives informing the design process. While this approach manifests in professional practice at firms like Heatherwick Studio, Weiss/Manfredi, James Corner Field Operations, and Bjarke Ingels Group, to name a few, it has yet to inform undergraduate education.

Since the Bauhaus, examples have emerged of early education intentionally "un-siloing" design fields and integrating traditional disciplines.[2] Elusive, however, are present design pedagogies conceptualizing that future specialization is optional. Many programs initially organize design studios generally, and later require students to select a specific design field such as urban design, landscape architecture, architecture, industrial design, graphic design, and so on. While this form of design education is critical, it should not be the sole framework as it limits future architecture, engineering, and construction (AEC) professionals to collaboratively problem solve for appropriate solutions. This model compels team members to advocate for their disciplinary and contractual scope of work, which may not produce the most appropriate solution for end-users and environmental conditions.[3] In an AIA report researchers found that collaborative, integrated project delivery (IPD) methods promote sustainable results and allow for increasingly aggressive goals as team members are incentivized to increase overall project success.[4] Germane to contemporary design practice focused on collaborative responses to real world complexities, an interdisciplinary undergraduate design degree that does not suppose students later specify an area of study is requisite.

This paper explores interdisciplinary and transdisciplinary design education and practice through interrogating existing design pedagogies, exploring a series of university case studies, interviews with design practitioners, and investigation of a specific university's undergraduate program where integrated design methods are being explored, tested, and refined. Contemporary design work requires specialization; however, in the wake of hyperspecialization, design pedagogy should additionally promote problem solvers between siloed industries and those working to develop emergent theoretical frameworks. This interdisciplinary and transdisciplinary educational shift more acutely aligns with the demands of design practice aimed at highly collaborative processes and divergent typological responses to stubborn problems.

TERMINOLOGY

Multidisciplinary : 2 or more individuals from different fields or disciplines collaborating on a project or problem. Each individual works within the scope of their discipline. (e.g. an architect produces drawings from which an engineer designs a mechanical system. Complete drawings are then passed to a contractor to construct the project.)

Interdisciplinary : 1 or more persons work within 2 or more fields or disciplines analyzing, synthesizing, and harmonizing links between disciplines into a coordinated and coherent whole. An individual may be an expert in multiple fields and contributors are not tied to disciplinary boundaries. (e.g. an architect and landscape architect closely collaborate on a constructed wetland. Because of the close collaboration, no entity can discern where work from one discipline ends and the other begins.)

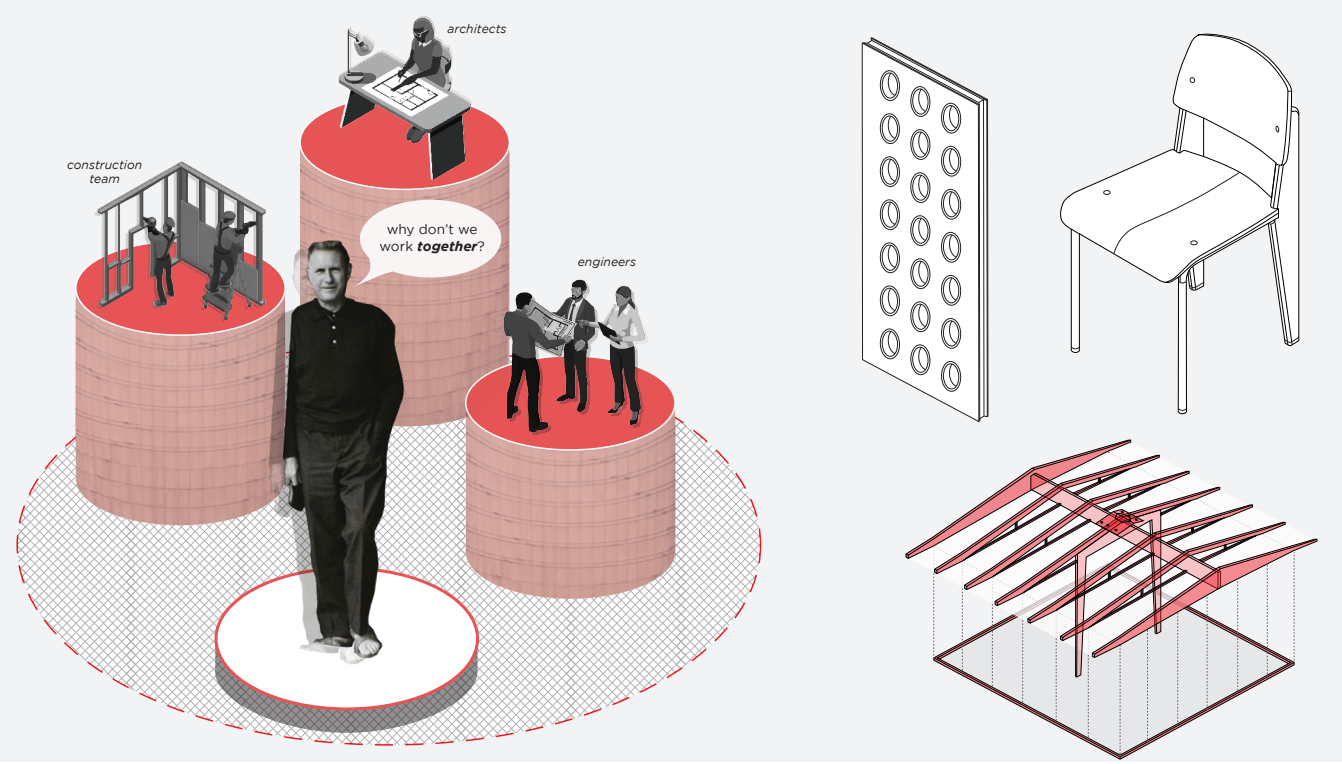


Figure 1. *Jean Prouve, Interdisciplinary Architect.* Jennifer Smith + Hailey Osborne

Transdisciplinary : 1 of more persons work within 2 or more fields or disciplines. Through working within overlapping disciplinary boundaries, emergent fields of study and new theoretical frameworks develop. (e.g. landscape urbanism – a phrase developed in the mid-1990s, describes a theory of urban design arguing that the city is constructed of interconnected and ecologically rich horizontal field conditions, rather than the arrangement of objects and buildings. A new theoretical framework and field of study emerges.)

Hyperspecialization : Hyperspecialization within markets and economies implies that a larger process is broken down into smaller pieces. An individual then takes over one of these smaller pieces and builds their expertise in that vertical. Adam Smith's "Wealth of Nations," published in 1776, famously described that the division of labor would be one of the central drivers of economic progress.

INTRODUCTION : THE RESILIENT "UNSILOING"

Today's undergraduate students are tomorrow's practitioners, and they have their work cut out for them if we can collectively turn the tide for the planet. Climate change, unstable weather patterns, rising seas, and unsustainable land-use development practices influence the in¬creasing frequency and damage of natural disasters, habit loss, displacement, and chronic health conditions, to name a few. Many of these challenges reside within the designer's domain - the built environment. However, design disciplines, due to hyperspecialization, are limited in their ability to work collaboratively and interdisciplinary for a more resilient future. An interdisciplinary approach is critical as it ensures partnerships between sectors are effective as compromises can be made for all parties without sacrificing goals. The issues in front of us are complex and layered with wick¬ed problems – problems that are extremely difficult to solve due to incomplete, contradictory, and changing requirements, some of which are challenging to observe and measure. There are no single solutions to these problems, and they require systematic and interdependent efforts at various scales, over time.

Presently, architects, contractors, landscape architects, and interior designers advocate for their area of expertise and contractual scope of work to manage risk exposure, meet financial goals, and potentially gain recognition within professional organizations. For example, while we collectively recognize the interdependence of systems such as stormwater management, erosion mitigation, and integration of pervious surfaces, it may be challenging to convince clients of comprehensive environmental goals. Furthermore, project goals may expand or contract a discipline's contractual scope of work and revenue streams, eroding opportunities for collaboration. The American Institute of Architects (AIA) is focusing on this concern through advancing their standard family of contracts. The C102 Teaming Agreement provides legal language for "different types of firms across the industry [to] collaborate more fairly and efficiently." This is not only

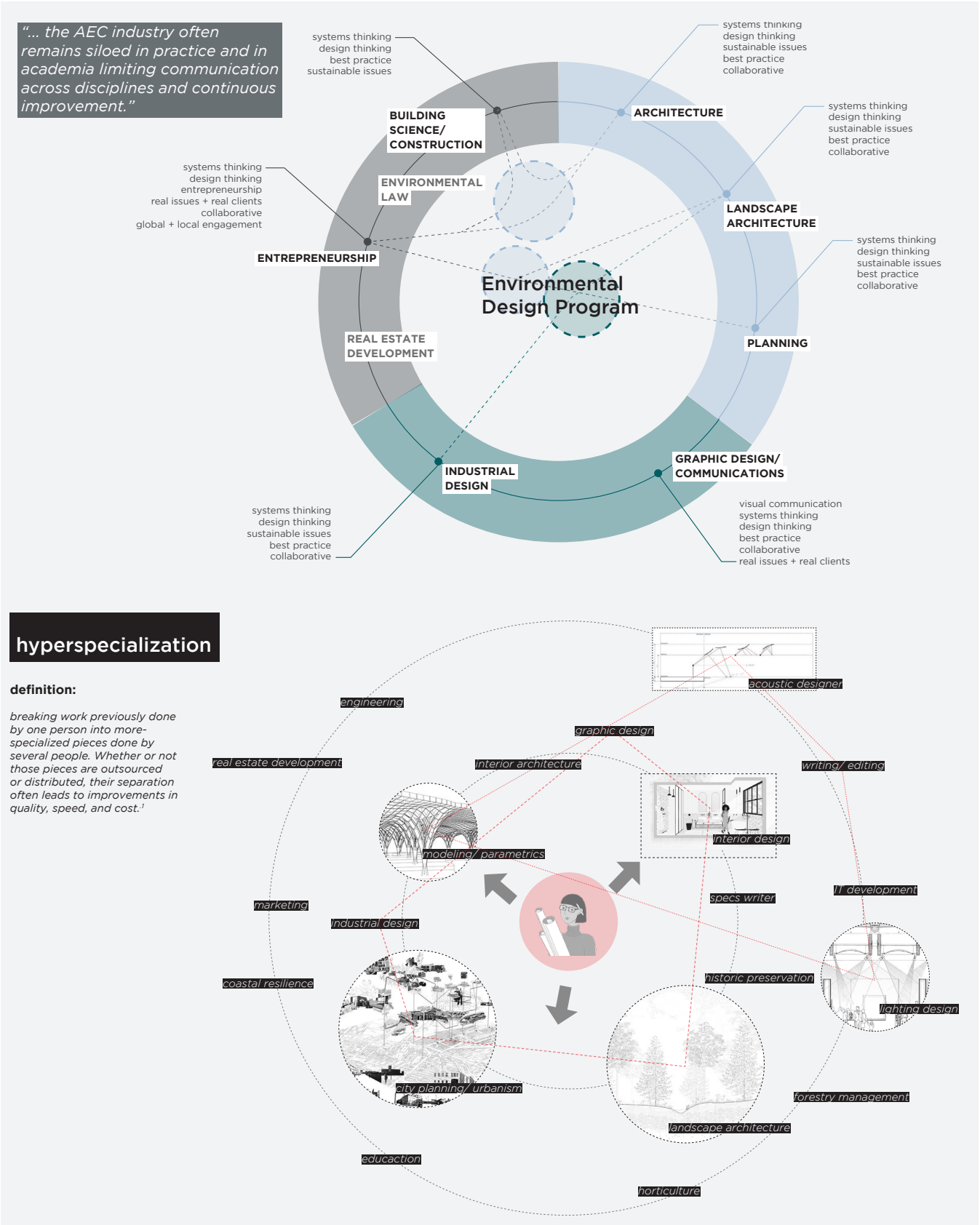


Figure 2. *Hyperspecialization + Environmental Design as a multi- and interdisciplinary program.* Jennifer Smith

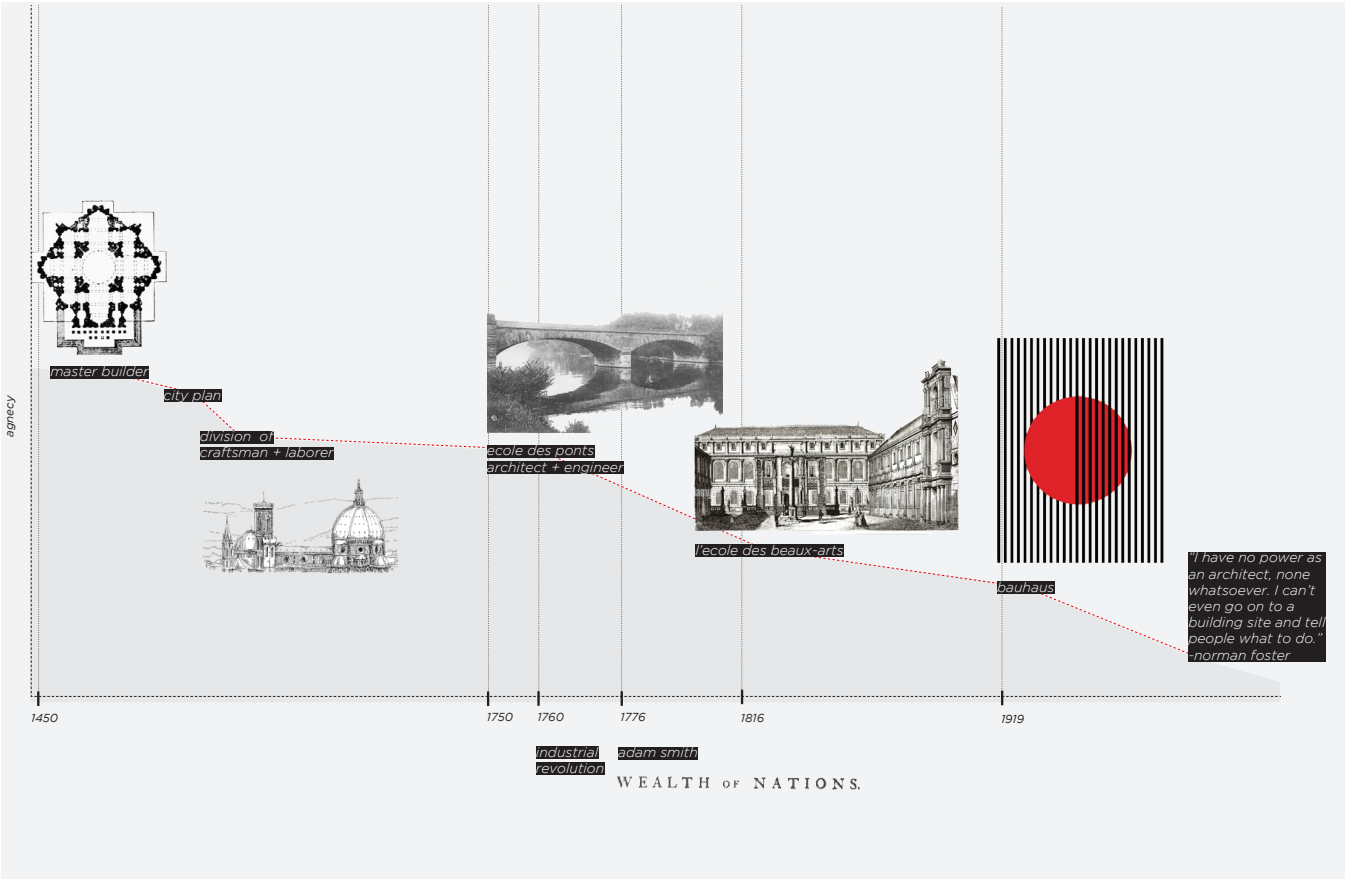


Figure 3. *Timeline illustrating the division of labor within architecture + reduced risk and agency.* Jennifer Smith

beneficial for industry professionals seeking complex projects, it additionally indicates a professional shift toward more collaborative, interdisciplinary models.

International award-winning design firms like Heatherwick Studio, Field Operations, Weiss Manfredi, Alloy Development, and Barke Ingels Group (BIG), to name a few, have been intentionally working in an interdisciplinary manner for decades. They recognize and celebrate: 1) the overlapping work within various design professions (via iterative process, foundation design considerations, divergent and convergent thinking, etc.), and 2) holistic, systemic approaches to design challenges. Many of these firms offer multiple industry services including architecture, landscape architecture, urban design, industrial design, infrastructure revitalization, and real estate development. For example, the work of Weiss Manfredi aims to "broaden the definition of architecture and search for opportunities to consider, both in physical and disciplinary terms, a larger territory for [design] expression." The architecture firm responsible for Seattle Olympic Sculpture Park develops design responses where landscape, architecture, infrastructure, and art are integrated. Not only does Olympic Sculpture Park provide needed public space and waterfront access in the heart of Seattle, it restores a brownfield and threatened ecosystem. Furthermore, Field Operations works "from the scale of the city to the scale of a seat" acknowledging that designing across scales not only informs the design process, it creates holistic responses for communities. Many of those in leadership at Field Operations have an interdisciplinary background in urban design, city planning and landscape architecture. Interdisciplinary design is at the forefront of professional practice, however, this level of disciplinary collaboration is only beginning to inform undergraduate design education.

UNIVERSITIES OF THE FUTURE : INTEGRATED DESIGN EDUCATION

At Auburn, the Environmental Design program is reconceptualizing how undergraduate design education teaches: 1) foundation design theory, 2) interdisciplinary design methods, and 3) advancing beyond a generalist position to intentionally work within the overlap of design disciplines. Positioned as intentionally anti-specialist, the curriculum acknowledges that a more resilient future necessitates education of professionals who, rather than specialize, work as collaborative project managers finding shared value between disciplines. This is accomplished through the program's hybrid-studio teaming projects, diversity of design faculty, and multidisciplinary design students.

Interdisciplinary education is valuable within a design degree as it is a studio-based model fostering reconceptualization of schemata, working at multiple scales across various systems, and supporting iterative problem solving through the integration of divergent and convergent thinking. A myriad of professionals traditionally unrelated to design education have been learning from and incorporating design processes into their curriculum over the past decade. The Harvard Business School, for example, offers a course called "Design Thinking and Innovation," and a quick internet search illustrates many higher-education degrees offer some form of design-thinking education. Professionals benefit from integrating the design thinking process as many contemporary challenges in the constructed landscape emerge from siloed responses struggling to innovate systematically. Designers, due to their education and training, are rigorously prepared to respond to complexity. Building upon historic examples of the Bauhaus and Ecole des Ponts (a school established in 1747 that trained engineers to think like architects), as well as contemporary higher-education programs and design firms, there is evidence that interdisciplinary design education is requisite.

While interdisciplinary design education is crucial for a resilient future, it is incongruent with Western economics, risk management, and many higher education models. Adam Smith foretold the economic benefits of the division of labor in his contribution to the economics' cannon of literature - The Wealth of Nations. First published in 1776, it reflects upon early economics of the Industrial Revolution, the division of labor, productivity, and free markets. All of which continue to influence modern economies and the rise of hyperspecialization. Likewise, higher education is governed by specialized degrees nested within programs, schools, departments, and colleges. Various degree programs hold expertise within or "ownership" over areas of study such as entrepreneurship, design-thinking, health, urban design, sociology, and so forth. While these concepts are embedded within a multitude of fields, the financial models and bureaucracy of higher education lend themselves to specialization. Lastly, as construction projects have increased in scope and complexity, so have their contractual counterparts in an effort to facilitate risk management. For the project architect, alone, there are over 200 different legal forms and agreements available from the American Institute of Architects (AIA) Contract Documents. While this represents a needed increase in professional support and definition around roles and responsibilities, risk management, by nature, limits interdisciplinary work. An interdisciplinary design education has its obstacles within existing institutions; nevertheless, integrated design methods produce more holistic and sustainable artifacts, systems, and processes.

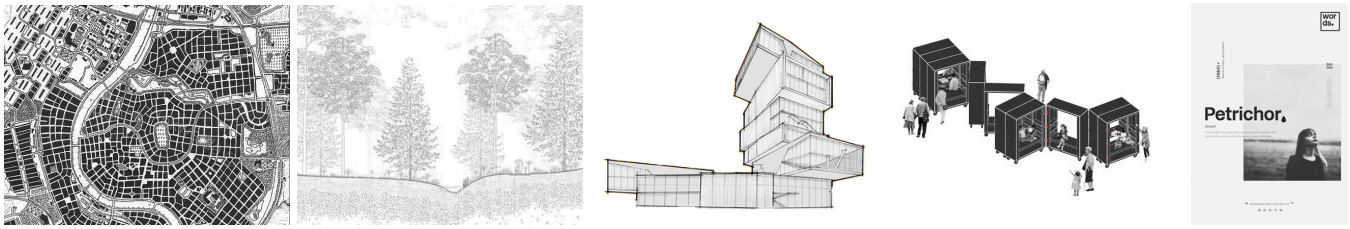
Structure

Nested within the College of Architecture, Design and Construction, the undergraduate program integrates the design disciplines of architecture, interior architecture, landscape architecture, industrial design, and graphic design as well as students with the aim of joining construction firms upon graduation. An undergraduate student can also participate in the program through a minor, incorporating other design and non-design related disciplines such as interior design, finance, marketing, engineering, and so forth. In the future, there is hope of integrating the newly created minor in real estate development to more holistically integrate professionals focused on the built environment. For the reasons listed previously, it is advantageous to teach design methods including iterative process, divergent thinking, and problem solving across scales and systems to a range of students. For example, ENVD senior, Aubrey Sanders, aims to attend graduate school for city planning and has a portfolio of design work ranging from urban design, landscape architecture, and interior design projects. Design projects are limited in scope and allow students to practice within a range of design disciplines while recognizing their interdependence.

The program is eight semesters and focuses on foundation design concepts born out of the Bauhaus Basic Course. Early courses focus on color theory, composition, materiality, research visualization, abstraction, and form-making. Later courses center on research, industry-specific seminars, and developing built environment theoretical frameworks for appropriate and contextualized artifacts, systems, and processes untethered to traditional disciplinary boundaries. Courses are taught by Environmental Design faculty with pedagogical interests in: 1) interdisciplinary and transdisciplinary design, 2) foundation design education, and/or 3) industry-specific fields of study within architecture, landscape architecture, construction, graphic design, urban design, and more. Environmental Design students have additive interests within the built environment, and a focus on foundation design education, interdisciplinary design theories and methods, as well as opportunity to slightly specialize is congruent with trajectories. Just as one-third of architecture graduates do not pursue traditional architecture practice, many Environmental Design students diverge upon graduation pursuing a range of interests. For example, summer 2022 graduates in an Environmental Design senior capstone course pursued professional positions and graduate programs in landscape architecture, construction, and architecture. Over the last five years, ENVD students have pursued graduate programs and professional practice in law, real estate development, industrial design, architecture, landscape architecture, construction, communication design, and historic preservation. This is valuable for the reason that graduates are trained to work collaboratively and be co-advocates in future work.

Foundation Design Education

Foundation design education is reinforced in almost all environmental design courses as a common thread between design disciplines. Foundation design, as mentioned previously, is born out of the Bauhaus Basic Course and focuses on color



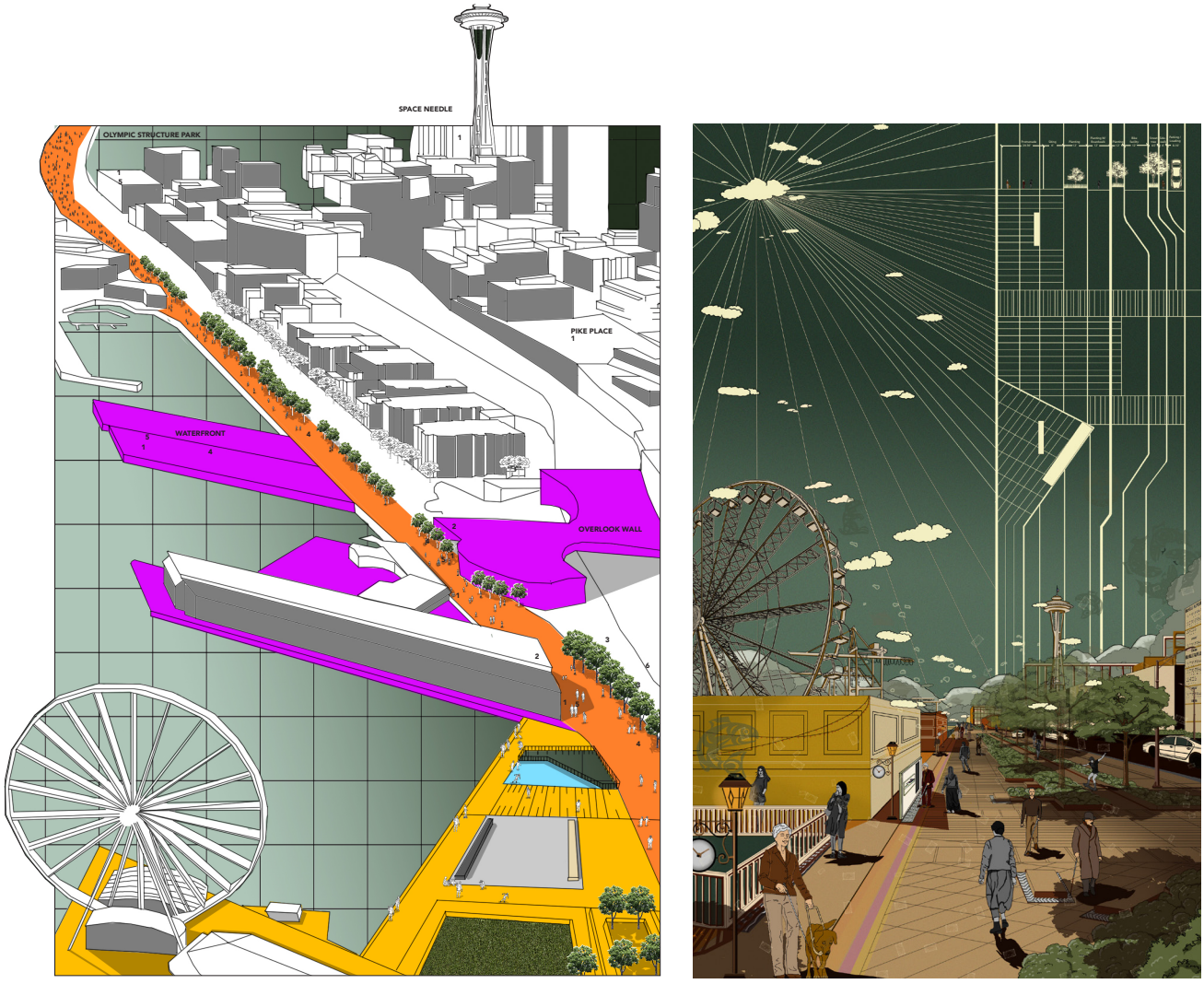


Figure 4. *S M L XL project responses : diverse typologies+ scales; Seattle urban design project.* Jennifer Smith + Kiran Bhelay

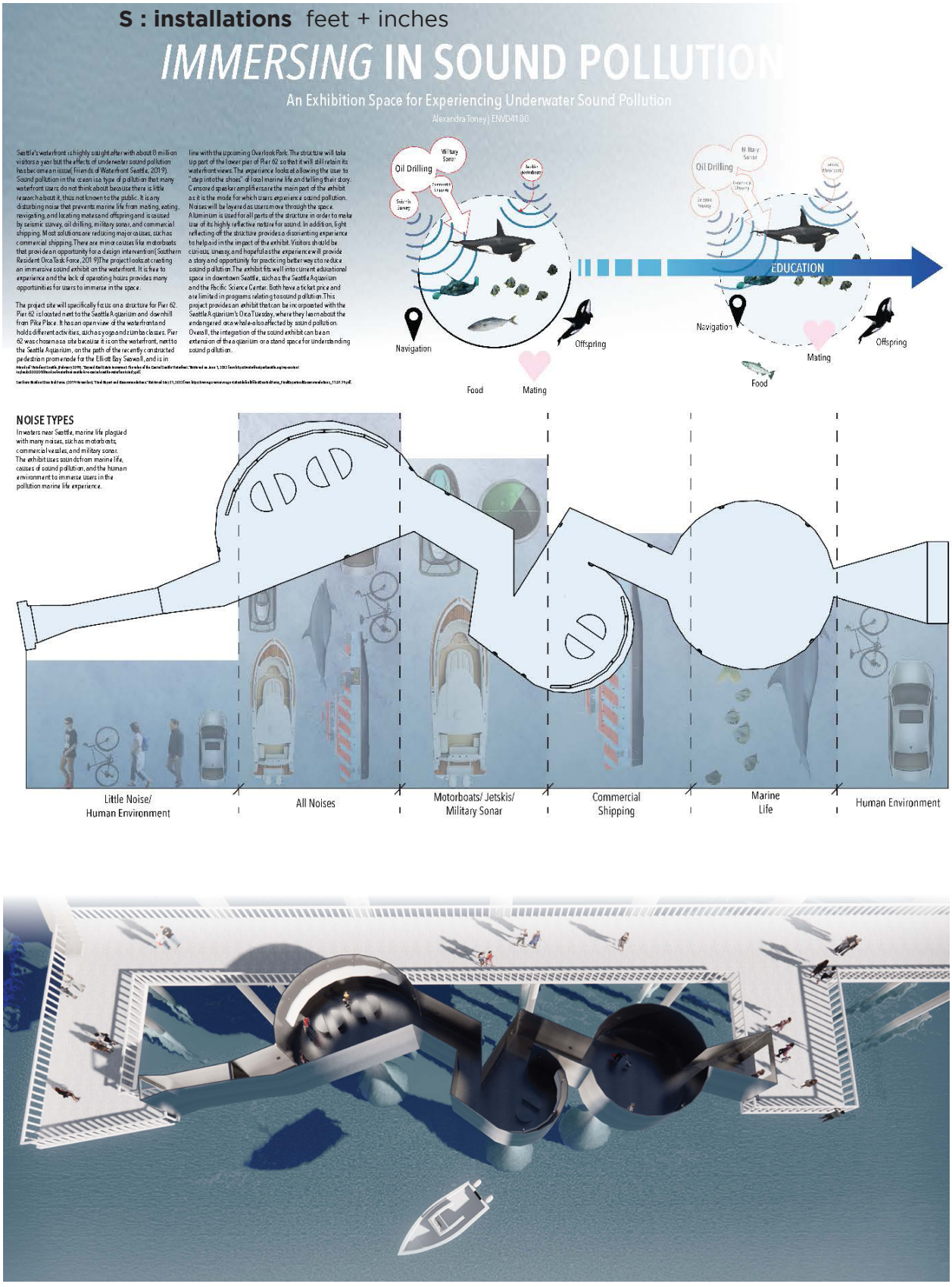


Figure 5. *S M L XL project responses : diverse typologies+ scales; Seattle sound installation.* Alexandra Toney

theory, composition, materiality, research visualization, abstraction, and form-making. This is initially taught in the first environmental design workshop where students focus on having a single concept manifest abstractly through various media and scales. For example, students start with learning analog drawing techniques by means of a large, abstracted graphite drawing. Ideas embedded in the drawing are then translated to a spatial physical model. Lastly, students create an organizational brand and graphic guide for their work, and represent final ideas on a printed affiche as they simultaneously learn required software. Artifacts are limited in complexity and allow students to congregate learning around design concepts. Additionally, the variety of project types integrate concepts from architecture, graphic design, landscape architecture, and more. Similar to many foundation studios, students learn how the design process permeates a range of disciplines, scales, and project typologies.

Interdisciplinary Design Methods

The Environmental Design program intentionally guides collaboration and interdisciplinary design through multiple hybrid studio-seminar courses. For example, ENVD 4010: Design-Thinking and Communication is taken during a student's junior year and focuses on end-user research, participatory design, and various typological responses to the same set of conditions. In groups of 3-4 students conduct site analysis and end-user research through primary and secondary research means, and produce graphic visuals communicating findings to stakeholders. Part two of the semester-long course introduces students to participatory design and civic engagement. Students co-design with end-users as this process more fully captures problems, opportunities, and the project scope, while also allowing students to engage locally. Starting at mid-term students begin the final portion of the course by designing a range of typological responses on the same site with similar constraints and goals. Projects may be temporal in nature, digital, architectural, landscape, or an exhibit installation. The variety of appropriate responses indicates a myriad of successful means responding to existing needs. This conclusion not only advocates for a diversity of design disciplines, it allows students to think even more divergently about how one might respond to complex conditions. This course design manifests in various forms throughout the Environmental Design curriculum.

Designing in the Overlap

Lastly, the capstone environmental design course introduces transdisciplinary design methods. As defined earlier, transdisciplinary design is where two or more disciplines collaborate closely so that disciplinary boundaries overlap and new theoretical frameworks emerge. Emergent theoretical frameworks influence professions and are catalytic for innovation.

ENVD includes this introduction in the final studio where students conduct a site visit to Seattle, and examine projects acting as an assemblage of traditional disciplines. Olympic Sculpture Park, Freeway Park, the Bullitt Center, Gas Works Park, and the massive Waterfront Seattle initiative are all examples, and they broadly include design considerations nested in urban design, landscape architecture, infrastructure revitalization, architecture, and ecology. One student, Alexandra Toney, developed an experiential installation exhibit along the Seattle waterfront to educate visitors on how adverse maritime noise impacts salmon migration, breeding, and endangered marine life. The enclosed installation hovers above the water and provides a sensory experience combining human and marine life sounds as well as their resultant impact on animal migration patterns. The project proposal intentionally integrates installation design, acoustics, educational theory, and life sciences. While experiential learning as an educational theory has existed since 1971 and experiential design has existed since ancient cave paintings and hieroglyphics, Toney's examination into their influence on spatial design and advocacy is profound. This example indicates the commencement of a theoretical framework that could be further developed in graduate school and professional practice.

CONCLUSION

Our global predicament demands we have professionals with a depth of knowledge and expertise in specific fields as well as those working between industries through interdisciplinary and transdisciplinary design methods. In a paper from Nature Sustainability, authors write that "interdisciplinary has proven advantageous for scholars who find themselves at innovative institutions that recognize the value of collaborative work." Many universities over the past decade have bolstered cross-disciplinary research centers including the Climate School nested within the Earth Institute at Columbia University as well as Arizona State University's Global Futures Lab, in alliance with the University of Washington and the Nippon Foundation, started a center focused on social equity and ocean sustainability. Initiatives like these are uniquely positioned to include transformations in career development and capitalize on grant and foundation funding streams focused on collaborative processes. We require design practitioners who are prepared to strengthen collaboration across industries and advocate for other disciplines because they commence professional careers with an understanding of the values and responsibilities related to interdependent fields. Untethered to disciplinary boundaries, design professionals work as collaborative project managers in the midst of complexity, fostering holistic design responses to stubborn problems.

ENDNOTES

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