

Pedagogical Shifts and Multi-Institutional and Interdisciplinary Partnerships During the Covid Era to Address Climate Challenges and Enable Community Engagement

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As the world locked down in the 2019 Spring term, what seemed like a short-term adjustment to digital synchronous and asynchronous course delivery soon became a longer-term modality, ultimately re-shaping the entire following academic year. Since then, pedagogical shifts to digital platform options facilitated classroom learning for those unable to attend in person. In step and perhaps more so than ever, the past academic year has proven not only that digital teaching can extend far beyond the classroom, but also that community engagement can be successfully accomplished in meaningful ways, despite social distancing measures, to enable students to learn sought-after and up-to-date methodologies and practices that increase student sensibilities and awareness of the web of issues surrounding community design, particularly in the face of climate challenges. In the 2020 Fall term, the non-profit ReMain Nantucket began conversations with faculty members from various universities to frame a multi-institutional and interdisciplinary effort to connect community experts and residents to academics and their students to each other, collectively addressing the growing climate challenges facing the town of Nantucket, Massachusetts.

Professors from the five participating academic institutions jointly developed a lecture series which highlighted national academic leaders and local professional experts. The interwoven learning experiences allowed students to understand how resilient design, cultural identity, environmental factors, the structural inefficiencies in urban and building codes intersect with climate-related challenges, such as sea-level rise and storm surge, and with social challenges, such as affordable housing. Mid-term and final presentations to local and national experts, and academic leaders, preceded an in-person public forum where students presented their proposals to the community of Nantucket. Through this multi-faceted integrated course delivery format, students had an opportunity to interact directly with residents, government leaders, non-profit groups, and climate and preservation advocates, further nourishing their learning experience. The course outcomes varied—from typological design proposals, to

masterplans, policy toolkits, and adaptation action strategies. The cross-pollination that resulted from this interdisciplinary and multi-institutional course format serves as a successful pedagogical precedent, illustrating how commitment to the student learning process, integration of teaching with opportunities for experiential learning through curricular and co-curricular activities, and through guided learning outside of the classroom can result in students developing “practical intelligence.” Such exposure to the practical application of knowledge is integral to ensuring student preparedness for effective and meaningful careers. Educators can collaborate to better connect formal and informal pedagogic methods, which translate theory into knowledge, through coursework and curricular opportunities, incorporating real-world experiences, even during the restraints of the COVID Era. This joint course model allows students to search for innovation and knowledge precisely at the intersections of topics and viewpoints, through engaged discourse and the utilization of traditional and innovative tools; in this manner creating occasions for them to build practical expertise, skills, and know-how, attuned to the climate realities before them, while strengthening their design-thinking and creative practices and community engagement approaches. These acquired skills can yield hyper-localized solutions for communities to complex challenges in the short-term and in the long-term, result in future climate leaders.

1. INTRODUCTION: WHAT IS KNOWN?

It is not new to acknowledge that the complexities introduced by the climate crisis to the design and consideration of our built environment will require innovative thinking and novel approaches. Such approaches must be nurtured by a relevant architectural education; therefore, educators need to be attuned to the evolution required in architectural pedagogy that will cultivate the skills, perspectives, and characteristics of practitioners needed to respond to challenges and identify pathways forward. Climate change necessitates a hyper-localized approach to design—consideration of the specific site, landscape, vulnerabilities, and resources—and the utilization of both technical and practical knowledge. The disruptions caused by the COVID-19 pandemic to traditional pedagogical components of the architecture studio and classroom across the globe are seen, in this paper, as

a catalyst for new digital teaching experiences, and these in turn offer insights into creating classroom learning opportunities for architecture students that can be used beyond the pandemic context.

Addressing the climate challenge requires a cross-disciplinary, and potentially, a multi-institutional approach. For design practitioners faced with imminent or already-arrived threats of climate change, this approach is gaining traction. Climate adaptation requires speaking to problems with new pedagogical and professional frameworks, in turn involving more efficient and thorough processes. This paper argues that such collaborative methods will be required by practitioners moving forward, and architecture pedagogy must therefore evolve to foster within students the capabilities needed for effective climate leadership. A case study is presented from a course held in Spring 2021 at the University of Miami's School of Architecture, in conjunction with other universities and institutions, all invited by local nonprofits to collaborate with each other and the local community in response to growing climate challenges faced by the coastal town of Nantucket, Massachusetts. The ensuing interdisciplinary, multi-institutional, and multimodal course format serves as a successful pedagogical precedent, as it illustrates how commitment to the student learning process, integration of teaching with opportunities for experiential learning offered by curricular and co-curricular activities, and through guided learning outside of the classroom can be layered and result in students developing "practical intelligence", thereby enabling their potential to become effective contributors to the challenges of the 21st century.

2. THE KNOWLEDGE GAP TO BE FILLED: WHAT IS THE UNKNOWN?

With the increase in the social, environmental, and economic challenges facing communities, a reflection point for pedagogy across disciplines has emerged in which educators are identifying and arguing for new pedagogical methods to adequately prepare students to effectively address challenges in future professional roles. This section will introduce a number of recent arguments for the evolution of architectural pedagogy that respond to the challenges of the day. As the environmental crisis is embedded within and will have implications for all sectors of society, this paper surveys existing arguments posed in support of a broader pedagogy as relates to the role architects increasingly need to play in a changing globalized world, as well as highlighting particular approaches to pedagogy that prepare architecture students to address climate-specific design challenges. The approach ultimately argued for in this paper builds off this ongoing conversation for a more effective, transdisciplinary, and collaborative educational experience for students.

Pedagogy needs to further evolve to better prepare students to address new societal and environmental realities, recognize global challenges, while simultaneously, learning to craft hyper-localized responses to community requirements. Gamez (2018),

argues for the need to integrate global studies in architecture curriculum to help "students understand their roles in an increasingly urbanized and resource challenged environment" (217). Palipane et al. (2019), also addressing growing social complexities and the need for critical design responses, identifies that "key pedagogical challenges include how to design a studio curriculum that embeds more general disciplinary skills and knowledge while engaging in complex contextual issues" (378). Studio projects offer opportunities for students to engage in a hands-on manner with urgent challenges that localities are facing. In considering how emerging architects address specific environmental questions, Raab (2019) argues that students now require "knowledge of larger environmental systems" and a corresponding transformation in curricula is required to foster understanding among students of the dialectical relationship between architecture and the surrounding environment. The context that students are now required to understand has expanded, and course development, research, and pedagogy must reflect this shift. In a recent article, Antonini et al. (2021), put forward an argument for experience-based models for architecture teaching experiences to better prepare students to engage in real-world climate challenges in their future professions.

The growing requirements of practitioners cannot be addressed by one field alone. To introduce students to social and environmental complexities, and to foster a critical approach to local conditions while remaining cognizant of global issues, architectural pedagogy must evolve to allow for more interdisciplinary and transdisciplinary offerings, and for increasing opportunities for institutional collaboration—bringing together the strengths and questions that different academic units and institutions hold. For this argument, interdisciplinary is defined as different academic disciplines working together to integrate disciplinary knowledge and methods toward developing and meeting shared research goals through a synthesis of approaches (Kelly, et al., 2019). A transdisciplinary approach is defined as different academic disciplines working with non-academic collaborators to integrate knowledge and methods (ibid.), also in the pursuit of meeting shared goals and developing a new, holistic approach.

3. RATIONALE/HYPOTHESIS: HOW AND WHY SHOULD WE FILL THE GAP?

Moving beyond disciplinary silos, this process requires co-developing courses across academic units or institutions and fields, resulting in course material offerings with a more comprehensive approach to tackling climate challenges and community engagement, thereby providing a precedent students can refer to and mirror later when addressing real-world challenges across the trajectory of their careers. The urgency of responding to climate change necessitates drawing insights from various approaches and frameworks.

This interwoven pedagogical structure draws inspiration from how practitioners themselves have evolved their orientation to become more multidisciplinary—in which various disciplines

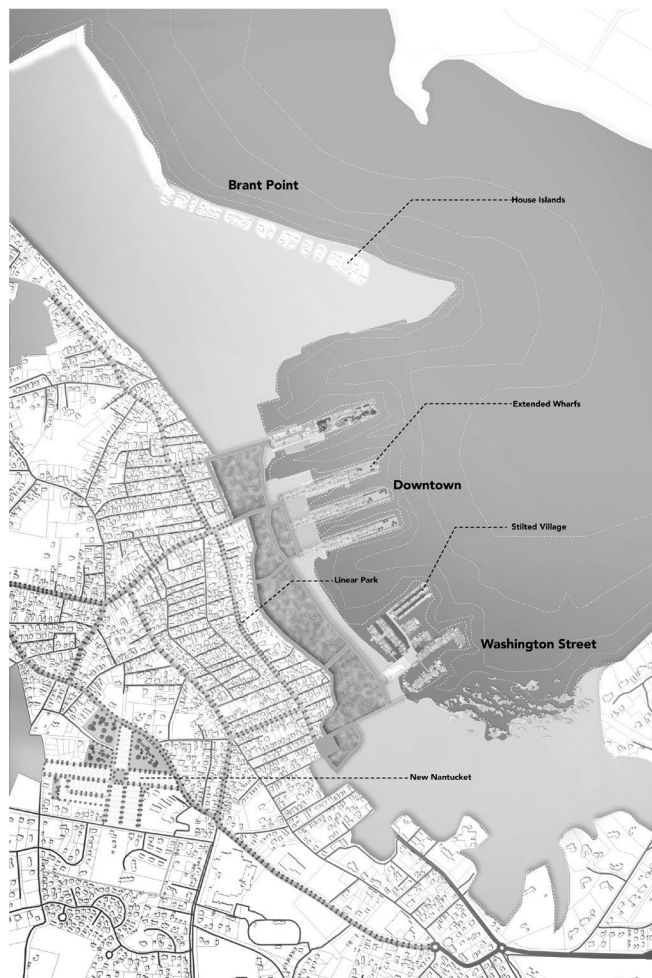


Figure 1. Master Plan of the proposed design toolkit for Nantucket (source: University of Miami Nantucket Challenge team).

work together and draw from their disciplinary knowledge in parallel, though not necessarily conducting research in an integrative manner (Kelly et al., 2019)— and collaborative, and Schools of Architecture in locations facing pressing and urgent climate-related questions do not have a choice but to evolve. As such, the proposed framework for the evolution of architectural pedagogy is one that is interdisciplinary, inter-institutional, and utilizes multiple modalities (online, in-person, site-specific study). The Nantucket Challenge emerged out of the urgency facing one coastal town, Nantucket, to bring innovative approaches to thinking and acting in the face of sea level rise. The project, and the University of Miami's involvement, is presented as a case study that shows how this knowledge of where pedagogy needs to go is being generated through practice.

4. METHODOLOGIES: WHAT DID WE DO?

A. Background

The shift in teaching modalities abruptly introduced by the COVID-19 pandemic for much of the 2019-2020 and 2020-2021 academic years led to new digital options that allowed teaching

to extend beyond the classroom. It was in this context that the non-profit group, ReMain Nantucket, launched its project “Envision Resilience Nantucket Challenge,” which aimed to “inspire the community to imagine a future that is adaptive in the face of sea level rise by bringing together the insights of local experts, the innovative thinking of graduate students and the stories of people who call the Island home” (EnvisionResilience.org). ReMain Nantucket is an island-based organization whose goal is to “envision and empower a prosperous future for the heart of Nantucket” (remainnantucket.org). The organization's director, Cecil Barron Jensen, and Communications Specialist, Claire Martin, contacted the leadership of the Florida Climate Institute for guidance and partnership in assembling a team of faculty and multidisciplinary teams of graduate students from five leading design universities.

The teams were tasked with reimagining Nantucket Harbor and the surrounding neighborhoods to respond to new sea-level rise projections. The participating universities were: Northeastern University, University of Florida, Harvard Graduate School of Design, Yale University, and the University of Miami. The course focus, content, and invited guest speakers were decided and coordinated among participating faculty members. The University of Miami course was a three-credit, special problem elective and most other institutions offered instead a six-credit design studio. Faculty and students participated in weekly online lectures from local and regional experts followed by discussion sessions, comprising the bulk of the course content. The Challenge culminated in presentations from the five institutions to a multidisciplinary jury of experts, and weeks later, an in-person public presentation on the island.

B. Methodologies

Technological

The project brought numerous opportunities and challenges to learning and cross-collaborating on a digital platform. The benefits were due in large part to the unique tools available to collaborate and work toward the proposed design and master plan. One such tool is the online platform Miro, a free online whiteboard that allowed the team to work in real-time on design solutions. This platform provided the opportunity to replace typical in-person “charrettes”. Students used the virtual boards to collaborate and share information, posing problems and working toward the best design solutions. The team also relied on Miro boards for crit sessions. The information, analysis, and each step of the design process was documented in one place, which illustrated the three given project sites and connected them to create a masterplan for the entire city.

Outside of the multiple local resources, all institutions and students participating in the Nantucket Challenge were given the opportunity to listen to weekly virtual evening lectures from experts practicing in various fields and different parts of the world. Professionals with intimate knowledge of Nantucket

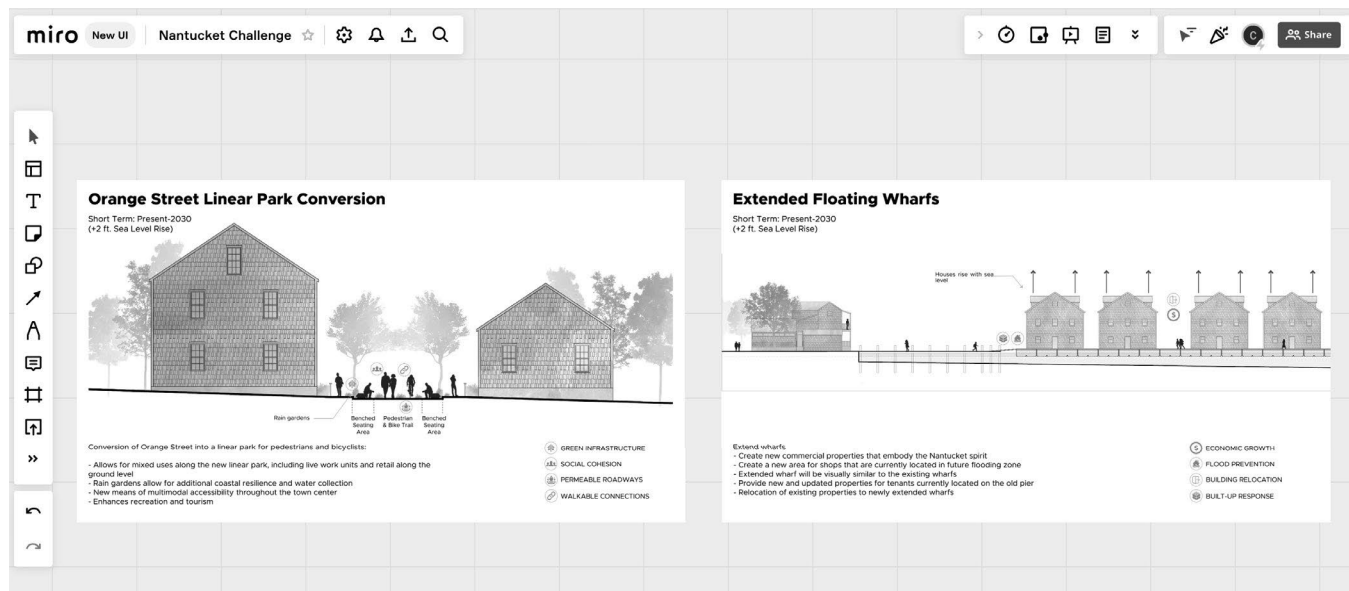


Figure 2. Design proposal sections within with the Miro online whiteboard platform (source: University of Miami Nantucket Challenge team).

lectured about its history and existing architecture, urbanism, infrastructure, and natural conditions. Other lecturers provided examples of successfully implemented projects addressing sea level rise and flooding that included design interventions and policies for historic preservation and affordable housing, all of which helped guide the proposal. These lectures were held with all teams, faculty members, advisors, and project coordinators participating, via the digital platform, Zoom. While this type of learning experience was advantageous because it allowed lecturers from all over the world to participate, and sessions could be recorded and therefore accessed at any time, it also proved challenging trying to foster dynamic and fluid collaboration amongst all participants.

As the pandemic precluded the possibility of visiting the site before embarking on the project, the information provided during the weekly lectures was essential to understanding the realities of the place and to proposing suitable and practical solutions to the threats from climate change. Even more helpful, however, were weekly meetings with the project's advisors, held purposefully after the lectures so that students could ask questions related to the content presented. While these more intimate sessions offered an opportunity to gain insight from local experts about the site, its history, its challenges, and potential solutions, it was difficult for the team to take advantage of them due to scheduling conflicts. Ultimately, the lectures provided the theoretical framework to address climate adaptation, while the advisor sessions provided the practical framework that it requires.

Interdisciplinary

Proposing a design framework on an island like Nantucket, which has rich history and a traditional design aesthetic cherished by its residents, required a thorough analysis of site and

place. Focusing on the place-based design was a central factor, ultimately, reflected in the team's attention to a wide array of topics including historic preservation, environmental conditions, architectural and landscape design, and economic development. The team's varied backgrounds included knowledge in Architecture, Urban Design, Urban Planning, Civil Engineering, Graphic Design, and Real Estate, all of which contributed to a well-rounded proposal.

The proposal consisted of thoughtful design changes that respected the existing character of the buildings and the urban built environment while also protecting them from the imminent environmental risks it is facing. The proposed design also considered real estate policies and zoning incentives that addressed the feasibility of the project and therefore added a practical element for a community that fully understands the dire climate reality that Nantucket is facing.

Multi-institutional Collaborations

Beyond internal team collaboration, the project provided the opportunity to work with and learn from the other participating university teams. As it was a competition, collaborating on the design proposals was not encouraged, but sharing knowledge about the different tools and data to study the site and understand its most pressing climate change challenges was beneficial for all teams. Part of this collaboration included a mid-Challenge review in which teams presented initial findings and ideas for the design proposal. This session was held virtually, providing an environment similar to the lectures, but with each faculty-student team presenting instead. These reviews allowed the project advisors and local experts to offer advice and suggestions for each team to work towards as they headed towards final design proposals. In this manner each participant gained additional insights of local realities, and datasets, while

gathering information potentially applicable to resilience efforts outside of the project.

The UM team, for instance, had benefited from consulting with other University of Miami (UM) faculty, including a coral and sea-grass expert at the UM Rosenstiel School of Marine and Atmospheric Sciences, a UM College of Engineering faculty member with expertise in coastal infrastructures, as well as a graphic design expert at the UM School of Architecture. After learning of different applications and specifications of engineering innovations created at UM—such as the “SeaHive” system, which can buttress seawalls and reduce storm surge wave action if employed to enhance coral reefs (SEAHIVE – Sustainable Estuarine and Marine Revetment by Prof. Rhode-Barbarigos)—the team incorporated them into the project’s ‘design toolkit’ proposal and shared this innovation with the other institutions and Challenge participants.

Connection to Climate Change and Coastal Urban Resilience

The shared resources, platforms, and weekly lectures enabled the team to create resilient design proposals specific for Nantucket. Still, the most helpful resource was access to the people who live and work on the island. Listening to locals provided a thorough understanding of Nantucket’s priorities and needs, which for the UM Team, resulted in the unique “adaptation toolkit” with solutions to tackle the island’s challenges. Some of the resilient design solutions included creating native, resilient, and edible living shorelines; combining various grey/green solutions; introducing permeable street adaptations to alleviate flooding and recharge the underground aquifer; and proposing a local benchmarking system for resilient building by establishing a minimum base flood elevation for new construction, wet- and dry-proofing existing structures, and retrofitting or moving historic buildings.

“Dwelling on the Edge”

by the University of Florida

“Away... Offshore... Adrift... Shifting Landscapes, Unstable Futures”

by Harvard GSD, Department of Landscape Architecture

“Transitional Ecologies: New Public Infrastructures for Nantucket”

by Northeastern University College of Arts, Media and Design; Architecture

“Nantucket Toolkit: Learning to Live with Water”

by the University of Miami

“Nantucket and Coastal New England: History, Threat and Adaptation”

by the Yale School of Architecture

Figure 3. Envision Resilience Nantucket Challenge participating institutions and their project names (source: envisionresilience.org).

The team proposed additional place-based adaptation and preservation actions and tools for Nantucket as short-, mid-, and long-term solutions. These actions consisted of enhancing the trolley system and improving transportation around the island, promoting walkability, social interaction, and encouraging micro-mobility; enhancement of the existing dunes for storm surge protection; expansion of the existing wharves to spur economic growth and further enhance flood protection for Nantucket’s central commercial district; and the conversion of one of the streets into a linear park to increase multimodal mobility and adding green spaces for permeability. All the solutions had resilience at the forefront, specifically to help battle Nantucket’s unique current and future threats and challenges. The team boldly and realistically suggested the edge of Nantucket would move inland over time and a new frontage could be crafted to be equally lively and attractive. In addition, the UM team produced a user-friendly pamphlet, outlining the main concepts and the proposed design toolkit to distribute at the forum to better communicate the project’s goals with the residents. They were well-received, and residents were appreciative of this effort, as it synthesized the project for their future reference.

5. PRACTICAL INTELLIGENCE: THE PRODUCT OF SYNERGISTIC ENGAGEMENT AND COLLABORATION BETWEEN ACADEMIC INSTITUTIONS, NON-PROFITS, AND LOCALS

The challenges resulting from the pandemic lockdown, particularly limiting in-person collaboration and discussion to work toward a design proposal for the Nantucket Challenge, were overcome with virtual meetings and workshops using various online meeting platforms and tools; admittedly only possible due to concerted and added efforts by the organizers and the faculty. In the end, each university cohort provided a vision for resilience actions. Some cohorts focused on particular challenges, such as much-needed housing alternatives, others concentrated on particular neighborhoods—mainly along Nantucket’s waterfront, another group paid close attention to natural defense systems, and the UM team proposed a resilience tool kit, tying it to a masterplan proposal, thereby providing a holistic understanding of priorities in each neighborhood over time and how to link building and infrastructure adaptations to policy actions within the sensitive historic context of Nantucket. All the approaches were valid and thought-provoking, thereby permitting students to appreciate the differing vantage points and possible responses. The semester concluded with a joint online final review composed of local and national resilience experts, as well as representatives and political and government agency leaders from the community, and all the participating students and faculty. Shortly thereafter, student representatives and faculty from each university participated in a two-day, in-person event in Nantucket, made possible thanks to event organizers and donors. The in-situ convening allowed for greater interaction amongst program participants as well as with community members and leaders; further allowing students to hone their presentation and community engagement skills. Kiosks were set



Figure 4. Rendering of the proposed intervention to convert one of Nantucket's streets into a linear park (source: University of Miami Nantucket Challenge team).

up around a communal space and students presented their work to the community, and discussed their proposals, all while adhering to Covid-related safety protocols. The local non-profits, Envision Resilience in coordination with ReMain Nantucket, curated an exhibition showcasing a sampling of the resulting student work from each participating university cohort. The two local non-profits have since provided online and in person program updates, while continuing to organize events meant to expand related conversations and potential actions.

6. DISCUSSION: BRIDGING THE PEDAGOGICAL GAP

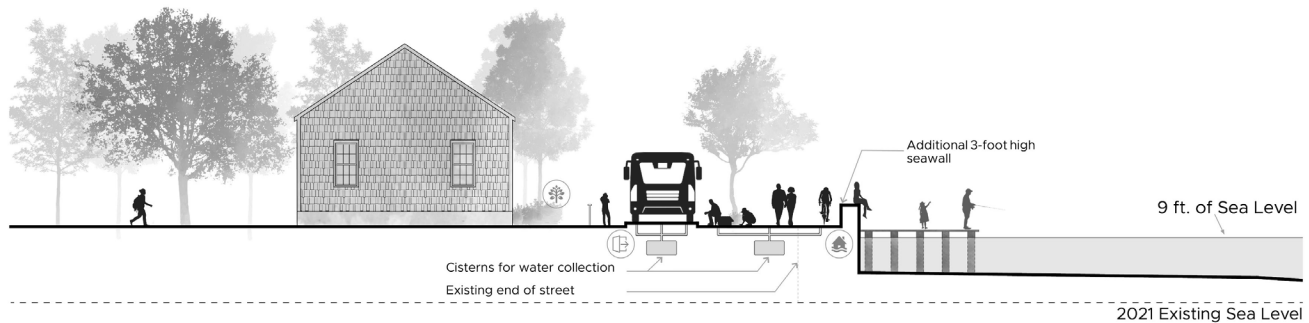
The invitations to academic institutions and their participating faculty to collaborate on the co-creation of conjoined courses and the subsequent events organized by Envision Resilience and ReMain Nantucket demonstrate how transdisciplinary and multi-institutional collaborations, closely tied to place-based and community engaged processes, engender enriched pedagogical experiences, which in turn, better prepare students for professional practice. Such hyper-connected modalities were in great measure made possible thanks to the coordination between the local non-profits and the Florida Climate Institute with the participating faculty (Meeves, 2021), and they mirror the emerging evolution of professional practice. Indeed, professionals, in particular those located in communities already facing mounting climate challenges, are breaking down their siloed practices and are increasingly engaging multiple specialists from the very initial stages of conceptualization, thereby more seamlessly integrating expertise and collaborating more efficiently as

well; leading teams of experts to cross-pollinate and more effectively tackle the complex intersection of overlapping climate adaptation issues. Such interactions are capable of resulting in granular and place-specific responses. Post-disaster charrettes or competitions of the last few decades have illustrated, (i.e. the 'New South Dade Planning Charrette for South Dade' following Hurricane Andrew or more recent 'Rebuild by Design' following Hurricane Sandy), just how effective a cross-disciplinary, multi-institutional model can be at arriving at concrete, innovative, and implementable design solutions. Academia has not pervasively evolved in like manner but the example of the Envision Resilience Nantucket Challenge can serve as a useful precedent.

Further, while the virtual components of this project emerged out of necessity during the COVID-19 pandemic, the remote experience brought about lessons and opportunities that would not have been possible during a normal, in-person semester. For example, the digital space allowed for the inclusion of many individuals, groups, and institutions to interact and collaborate from various localities with the removal of financial barriers, scheduling difficulties, and carbon emissions that would arise from creating similar spaces in-person. While challenges also were presented through the remote experience, such as presenting more friction for full collaboration and meaningful interactions that happen more readily face-to-face, in general, the opportunities presented by virtual collaboration are many, and it is anticipated that others can learn from this hybrid in-person and remote experience and improve upon it.

Union Street Becomes Coastal Promenade

Long Term: 2100+
(+9 ft. Sea Level Rise)



Transforming existing infrastructure to act as a resilient edge:

- Existing homes begin the relocation process as sea level increases
- Raise Union Street up to meet 12 feet above sea level elevation
- Extension of Union Street to become a coastal promenade
- Construction of 3-foot seawall

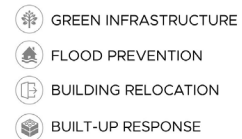


Figure 5. Section of one of Nantucket street's conversion into a coastal promenade after 9 feet of sea level rise (source: University of Miami Nantucket Challenge team).

7. CONCLUSION: A PEDAGOGICAL PRECEDENT CENTERED ON CLIMATE ADAPTATION, COMMUNITY ENGAGEMENT, AND CROSS-POLLINATION

There is a growing necessity for higher education institutions to offer students robust learning opportunities which holistically address complex climate-related challenges, allowing for a greater comprehension of adaptation needs, as well as the contributing role of human settlement patterns in the acceleration of global warming - such as is the case of 'climate deaf' architecture and urbanism, which have resulted in greater carbon emissions and the destruction of natural habitats. "Such training requires a careful mix of conventional methods and innovative solutions, a task not always easy to accomplish. Traditional lecture formats are not sufficient to fully engage students in these [environmental] issues." (Ban, 2015) Experiential learning, with real-world applications and community engagement components as well as exposure to different disciplines and vantage points, promises greater pedagogical results (Kabisch, 2016).

Furthermore, according to Spellman et al., "an emerging body of theoretical and empirical work has explored the role that education plays in enhancing the resilience and adaptability of social-ecological systems." (Spellman, 2015). One can infer that such intersections and methods were evidenced throughout the Envision Resilience Nantucket experience as students, faculty, and the community learned and envisioned solutions together. The online modality, rather than a hinderance, proved to be a productive opportunity for learning, interaction, and

engagement between students, faculty, professionals, community leaders and experts, facilitating vigorous conversations, while drawing attention to the often under-acknowledged correlations between the health and vulnerabilities of human settlements, environmental systems, nature-based solutions, and the role of "bio-politics" (Arvanitis, 1985). Bringing together cross-disciplinary perspectives in architecture, urban design, environmental sciences, geology, social justice, building sciences, engineering, and policymaking, can engender multiple perspectives of research, designs, and spatial strategies, which test modalities to build local resilience in preparation for major societal challenges, and defining the position of architecture in urban resilience discourses (Troglal et al, 2019).

Human-induced climate change and the resulting stressors and shocks, represent a mounting worldwide challenge necessitating a wide-ranging shift in pedagogy and practice. The complicated and inter-mingled topics revolving around climate challenges signal a need to broaden our partnerships, expand engagement, and to do so with clarity of purpose and a sensibility towards, the needs of all members of society. To address such needs, educators should consider integrating theoretical and practical frameworks centered upon climate adaptation, including social, environmental, and physical considerations into core curricula, while expanding community engagement skill sets and conversations focused on environmental justice. The next generation of architects, urban designers, and planners will have little choice but to tackle increasing climate-related challenges,

and the sooner academia embraces the need for a pedagogical re-alignment and related capacity-building, to better prepare students for an evolving professional landscape, the more likely positive real-world climate adaptation outcomes can result. This paper has briefly presented a theoretical and practical framework for the integration of multi-institutional interdisciplinary and transdisciplinary pedagogy and collaboration, which the successful example of the Envision Resilience Nantucket Challenge experience serves to evidence; not only as possible but rather, as the way forward, if future professionals are to partake and or lead in the creation of climate savvy place-making and building design solutions for the benefit of generations to come.

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