Designing for the Most Vulnerable: Cultivating More Genuine Empathy through Transdisciplinary Research

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What would cities look like if they were designed for the most vulnerable? This question proved fertile ground for a research-based pedagogy focused on one specifically vulnerable group—young children—disproportionately impacted by current social unrest, ecological degradation, and extreme urbanization; and yet seldomly the subject of architectural research or education except in limited typologies, e.g. schools and playgrounds—where they are segregated into. The two-semester research studio asked, what if instead of more or better spaces dedicated to children, the entire city was redesigned for them? Students examined the child's experience in the contemporary city and the way design turns children's vulnerability into a liability, especially in the context of urbanization and climate change. During the first of two semesters, students collaborated in transdisciplinary research resulting in a jointly-authored framework of evidence-based design principles: playfulness, safety, health, sustainability, and inclusivity; arguing how designing for children would make a better city for everyone. Drawing on ample evidence of how open and frequent access to immersive experiences in natural landscapes positively influence children's cognitive, physical and emotional development; the course challenged whether these "natural experiences" are at odds with dense and compact urban development. This polemic generated a challenge for design research during the second semester: how to design "natural experiences" into everyday spaces of dense cities, beyond the centralized park? This was a point of departure for ten individual design investigations, that together illustrate the potential for a new constructed urban landscape. Projects focused in the city of Boston, including planning for inclusive housing, transportation, and coastal resilience; and hybrids of socio-ecological infrastructure and learning environments. This pedagogical analysis reveals how transdisciplinary research expands the definition of vulnerability, cultivates genuine empathy, and builds confidence in designers' social agency; but also uncovers unique challenges and opportunities for architectural education and practice.

INTRODUCTION: CULTIVATING EMPATHY

This work is focused on two fundamental questions for Architectural Research and Teaching: "How does designing for vulnerability transform practice and outcomes?" and "Can we teach skills that cultivate more genuine empathy to produce better design for everyone"? While researchers suggest a lack of consensus on what vulnerability is, it is generally associated with being exposed, and with human beings' ability to feel—their "general openness to the other," not just to people, but to communities and the world—in ways that need to be continuously supported and repaired; thus connected to ordinary, everyday design.[1] The relational nature of vulnerability can be enabling, but also disabling by opening people to harm. In the context of design, this raises important questions: what about the built environment are people vulnerable to; and what are the enabling or disabling aspects of that vulnerability? The Social Vulnerability Index, for example, connects negative effects (human suffering and economic loss) in the face of external natural or human-caused stresses on human health, with demographic characteristics—defining communities that may "need support before, during, or after disasters."[2] How then does understanding vulnerability transform design to provide that support? Researchers believe vulnerability enables dialogue between people, and that designers can be enablers by creating the conditions for these relations to emerge: mediating, facilitating, fostering or stimulating collaboration, expression, communication, and story-telling.[3] It is also important for designers to acknowledge that design itself can cause or amplify vulnerability, causing direct harm to humans and the world, or indirectly limiting humans ability to thrive, care for and be supported in a changing environment. This is what researchers referred to as "arrangements of carelessness."[4] The argument for inclusive design—that design must not abstract people as an average user, but understands people relate to the world in different ways—integrates differential affects and effects that design could impose on people, fostering productive interactions of users and designers, and later users with design after professionals complete their work.

User-centered design has often relied on the idea of empathy—the act of understanding or vicariously feeling the feelings, thoughts or experiences of another without having those explicitly communicated.[5] Even though designers generally see empathy as a positive, the lack of acknowledgement

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of the limits of empathy is said to suggest an ideology rather than a set of principles, an end rather than a means.[6] These critics emphasized two missing approaches in discussions of empathy in design: the ethical one when choosing methods, and perspectival one that shifts focus from mental states to embodiment. This paper examines how research-based design can cultivate more genuine empathy, expanding the affective and relational aspects of human empathy with more objective knowledge of body-environment interactions to overcome designers' self-referentiality and bias. Specifically, transdisciplinary methods of design research bring diverse perspectives: expert evidence of physical and mental health impacts of the built environment, and non-expert knowledge of people's situations, to define vulnerability more broadly.

SITUATING VULNERABILITY: CHILDREN IN THE CONTEXT OF A GLOBAL CRISIS

These questions were examined in the context of a research-based pedagogy by specifically focusing on children in cities. Children are one of the most vulnerable demographics. Their openness to exploring the world, lower inhibitions, and intense curiosity make them more cognitively and emotionally engaged with the environment but also more likely to suffer harm from those interactions, requiring more continuous care and support. Focusing on the lives of the most vulnerable in the shared space of the city was a prompt to examine how deep knowledge of a social situation can inspire designers to turn vulnerabilities into creative opportunities to design a better environment for everyone. The method relied less on developing students' intuitive understanding of the whole of the child's lived experience (the metaphorical *"being in their shoes"*), but more on finding ways that design can positively support the child's full development, and how design's shortcomings and blind spots limit their potential. The ultimate goal was to define design's agency within socio-political systems to make more continuously just, supportive, and caring environments.

The subject was situated within larger challenges facing designers globally: climate change and unprecedented urbanization. Related cultural and environmental changes are shifting the situation of children, not only as a vulnerable population but as future stewards of the environment. Economic changes challenge industrial educational models and demand new models of creative learning.[7] Decreased mobility and health impacts demand new programmatic, policy or infrastructural approaches to promote physical activity.[8] Participatory models challenge planning protocols to engage "invisible" populations in realizing human rights, including children's rights.[9] These challenges intersect with the built environment, focusing designers on the situation children find themselves in, rather than only their experience. The situational focus overcomes the limitation of empathy based on a projected image of self, moving from being self-oriented to being other-oriented.[10] It may also demand more diverse perspectives, identifying ways

in which people are affected by the physical environment before and especially if they do not yet realize it.

Including user/experts in the design process is an important natural resource,[11] but too small a cohort or inadequate methods of engagement can present limitations. Younger children are not expert users, and in many cases are not aware of their rights or what they mean in their communities.[12] Without education or the right tools or process, they may be less able to articulate needs, wants, or concerns about the built environment. Caretakers know the child but often have very different priorities and experiences they project onto them. Expert researchers have found ways to understand the perspectives and bodily experiences of children through sophisticated methods of observation, measurement, and analysis that are centered on the child. Architects should be inclusive of children in the design process, but these experts may be better at facilitating the use of appropriate tools and forms of communication to include children's perspectives. Transdisciplinary collaboration can bring expert and non-expert knowledge to design practices, and in turn, designers can contribute expert analysis of the role of the physical environment in the observation of outcomes.[13] This represents an often-unwelcome complexity in research and education,[14] where hybridization of methods without appropriate theoretical and technical expertise may risk inappropriate implementation, and fear of violating institutional human subjects' protocols. Genuine participatory efforts take significant time and access to literature, institutions and people, but as will be shown, with more curricular time and advanced planning, new pedagogies can engage knowledge from ongoing research and institutional efforts, including appropriate proxies for diverse, vulnerable groups in the design process.

RESEARCH PEDAGOGY: FRAMING QUESTIONS FOR DESIGN

This pedagogy happened in the context of a two-semester, research-based studio course sequence. The two master-level courses consist of a research-focused, seminar-format course in the Fall semester followed by a design studio course in the Spring semester where design is informed by that research. Ten graduate students worked on transdisciplinary research leading to a joint book, then developed ten individual design proposals in sites of their choosing.

The research semester started with reading and discussions of two seminal texts. The first, the *Last Child in the Woods* was a thematic provocation, defining the situation the child lives in today in an increasingly urbanized, risk-averse, and ecologically-degrading world.[15] For the students this brought into focus two important issues for their research: the child's loss of freedom and of everyday connection to nature. The second text, *Architectural Research Methods*, foregrounded the relationship between research and design.[16] Discussions were focused on (a) framing research questions and literature
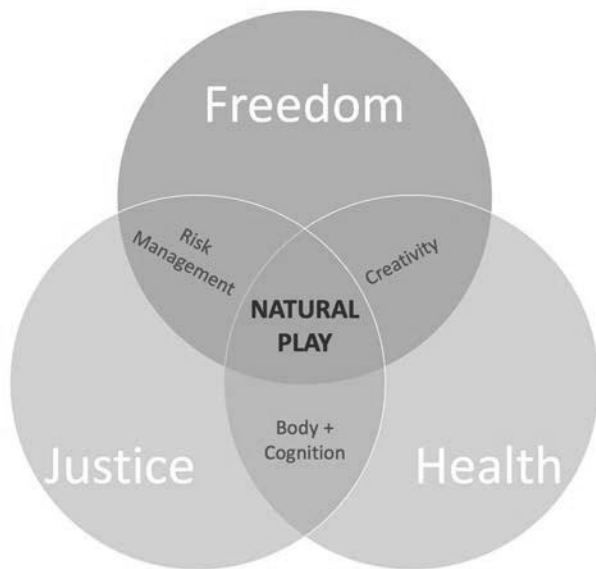
Figure 1. Relationship of transdisciplinary research topics shows how a design question (creating spaces for Natural Play in cities) emerges at the intersection of different perspectives on children's vulnerability. Image by Michelle Laboy.

review, (b) theory building and research design, (c) qualitative research, (d) case studies and combined methods, and (e) design applications.

After four weeks of engaging with the provocation and methods, the class was divided into three groups to dive into specific topics through transdisciplinary research (Figure 1): literature review within and beyond design fields, engaging a combination of academics, professionals and non-experts in interviews and discussion; and through field work, including site visits, e.g. Brooklyn Bridge Park and Battery Park housing with Michael Van Valkenburgh Landscape Architects; playgrounds with a Central Park historian, Rooftop Urban Farms with founding parents in Manhattan public schools, Brooklyn Botanical Gardens with educational staff, and of course, observations of children in all these urban spaces.

The research of the first group examined whether and how play-based pedagogies are emerging as an effective response to the crisis of creativity in education; and interrogated the relationship to natural-play: its suitability to creative play and freedom, and the development of environmental behaviors. The work of this team included review of scholarship, films, and professional post-occupancy evaluations; interviews with experts in early childhood pedagogy at Boston Public Schools (BPS), visits to natural play spaces in dense urban developments in Brooklyn and lower Manhattan, and field observations of users.

The second group examined whether regulatory frameworks that govern the design of the built environment perpetuate a culture of risk aversion; and interrogated the role of natural settings and loose-play design strategies in developing better risk management skills; identifying new paradigms, initiatives, and movements emerging in the cultural discourse to realize children's rights in cities. This was especially informed by literature on risk and films on children-designed Adventure Playgrounds,[17] discussions with Roger Hart, children's rights expert at City University of New York, site visits to innovative early learning environments led by and in conversation with designers and school directors,[18] and tours of playgrounds designed in different eras to observe changing approaches to safety and observe children in each of those contexts.[19]

The third group focused on the relationship between children's health and the built environment, examining evidence from psychology, medicine, and cognitive science about socio-ecological factors or environmental determinants of health, including the role of building site design and natural systems in reducing stress, promoting physical activity and improving cognition of children. This work was especially informed by lectures and in-depth interviews with a renowned expert in neuroscience and physical activity;[20] visits to school yards and urban gardens, and conversations with parents and teachers.

TRANSITION: FROM RESEARCH TO DESIGN FRAMEWORK
The research phase concluded with discussion sessions between all three groups. The emerging consensus was to reject the notion that the child only learns at home or school, debating: *if learning happens everywhere, what planning principles and design strategies could guide the design of everyday spaces for mobility, dwelling, working, and leisure?* Students brainstormed, argued and connected evidence. They examined how pedagogical concepts and metaphors for play and environment-based learning, e.g. the garden or forest school, connect with evidence-based principles stemming from psychology, medicine and neuroscience about nature, environment and cognition. They identified children's biggest vulnerabilities to the built environment today, and transformed them into a framework of Urban Design principles for a city that is more playful, healthy, safe, inclusive, and green—arguing how this approach had benefits of everyone. Each of these principles became in-depth chapters in a book titled *Landscapes of Learning: New Paradigms for Children Spaces*[21] (Figure 2), an unintentional but appropriate nod to an educational philosophy book by a similar name.[22] The publication was presented to leadership in Boston's planning agency, Boston's Public Schools, and national advocacy groups.

The theory book revisits the very idea of childhood, and the parallel relationship between early childhood pedagogy and design—all recent products of 20th century. It highlights the relationship of building and landscape, from forest schools to
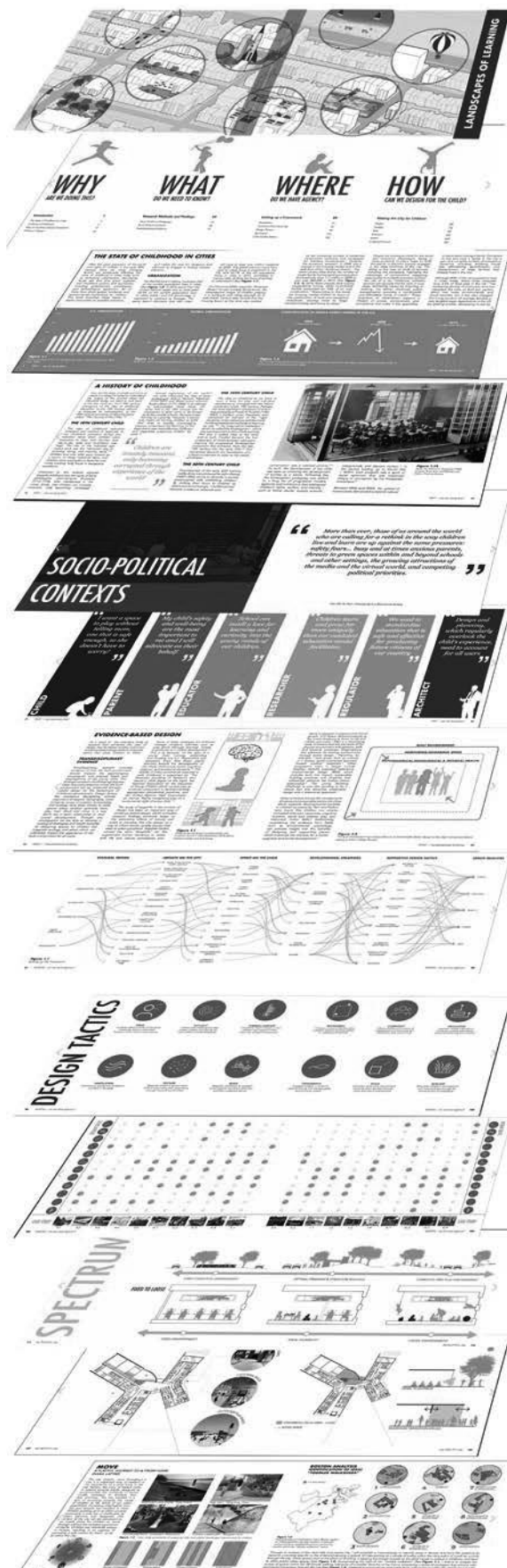
kinder-*gardens*; and from Le Corbusier's proposal for the play landscape on the roof of the *Unité* in France to the open-air schools that embraced modernism's opening of the building to the natural landscape to improve health. Contemporary case studies highlight how interiors and exteriors can leverage some of the benefits of natural experiences through materiality, performance and form. It debated history, theory, scientific evidence and case studies, to make the case for an emerging challenge of the 21st century: the construction of immersive landscape experiences and their performance in dense urban environments. Drawing on ample evidence of how natural landscapes positively influence children's cognitive, physical and emotional development; the framework and case studies challenged the notion that this experience may be at odds with dense and compact urban development. This polemic presented a design-research question: how to integrate "natural" experiences in the everyday life of dense cities beyond the centralized park? The liberating paradox about "the natural" is that its most significant and historically consequential urban manifestations are completely constructed. Therefore, why not invent a entirely new urban landscape for the child?

Students agreed on the importance of children's input in defining design challenges and goals. They also identified methodical problems: access, genuine engagement during the compressed timeline of a studio course, disruption in children's programs; risking problematic practices of extractive research. A solution was provided by the BPS leadership. Kindergarten children had recently created proposals as part of a program called *Our Boston: Voices from Kindergarten,* which later was featured in an exhibition at the BSA Space of the Boston Society of Architects.[23] The projects were a response to a letter from the mayor of Boston asking the children: *"what ideas do you have about construction that would make Boston a fairer and more interesting place for children?"* The children worked together in classrooms across the city to build models for thirty-four proposals. The example in Figure 3 is a proposal for an *Interesting Train Station*, which the kids from a predominantly black neighborhood of Boston explained as *"fair for kids and adults."* Instead of demanding a full process of continuous and sustained engagement with children for each individual project, each architecture student identified and analyzed a visionary project by BPS children as a powerful imaginary that could propel the next phase of design research.

Figure 2. (Left) Sample spreads from research publication *Landscapes of Learning*, jointly authored and illustrated by graduate students, and edited by the faculty member. The composition shows: (1) cover, (2) table of contents, (3) sample text and illustrations of data, (4) history, and (5) global context; transdisciplinary perspectives from (6) stakeholders and (7) scientific evidence of children development; (8) the connections of research findings that resulted in the development of a framework, (9) illustration of design tactics, (10) case study documentation, and (11) and student framing of a specific design problem and application of the framework. Image selection and composition by Michelle Laboy, content from ARCH 7130, Northeastern University.

Figure 3. One of Boston's children vision for a fairer and more interesting place in the city, from the curricular project "Our Boston: Voices from Kindergarten". Image courtesy of Boston Public Schools.

DESIGN PEDAGOGY: TRANSLATING THEORY INTO DESIGN PROPOSALS

The relationship between theory and design is usually compromised or sporadic as a result of the intervention of clients[24] or the contamination or distorting role of reality.[25] Unlike typical studios, the design semester had no predefined project brief, no mandated program, and no specific client; certainly not predetermined by the faculty. Instead, each student identified how design created a problem and potentially offered solutions—arguing design's agency, if any, in addressing a social vulnerability. Students had to define specific applications for their theoretical design framework: the contextual challenges and/or situations that design was to address. This required a second research phase: defining the condition of children in a specific context through demographic analysis, mappings and field observations. Their book provided an intellectual context and justification for urban design priorities, richly illustrated case studies that served as precedents, and culminated with ten distinct visions as defined by the voices of BPS children, amplified by data, framing a challenge for children in the city of Boston to be addressed through design. The second semester

started with ten individual theses— proposed statements of potential to be proved through design research, including the identification and justification of sites of intervention, the definition of project goals, the proposed design research methods, and criteria.

The proposals included new sites and prototypes for classrooms, children library pavilions in parks, transformation of the top of parking garages into richly landscaped school grounds, shared interior and exterior landscapes in dense multi-family housing, and a few projects featured in this paper with a common thread: mobility—stemming from that vision of children for an *interesting train station*. As a starting point, this vision challenged students to consider: *how do children move through a city predominantly designed for adults, and how would it change for everyone if children's unique needs and perspectives were prioritized?* During the research semester, students documented the ever-shrinking territory of the urban child across generations driven by urbanization, motor vehicle dependence, and risk aversion; and the increase in sedentary lifestyles, pollution and the impacts of climate events;

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Figure 4. Rendering of redesigned flood entry point, from the student's produced film of a journey through the entire coast of Boston. Image by student Aaron Fowle, Northeastern University.

connecting it to the evidence from medicine and neuroscience about the importance of physical activity in children's physical and cognitive development, and their increased susceptivity to chronic disease when their young bodies are exposed to toxins earlier in life.

This led one student to map health and climate vulnerabilities against where children live in Boston, and to identify opportunities for coastal resilience, usually driven by property protection, to solve other health problems as well. His project ultimately focused on protection of flood entry points as opportunities for new forms of public space that are not only friendly to children, but that create an entire network of open spaces that promote fun and diverse forms of physical activity for people of all ages. Inspired by the field work during the research phase, he filmed a bike ride thorough the entire coast of Boston and juxtaposed rendered simulations of its spatial transformation into accelerated time lapse film (Figure 4).

Another student started from the much smaller "Toddler Walksheds," focusing on areas that serve high densities of children services, documenting paths in an app, redesigning street networks to provide richer, active and safer urban experience for the child that accommodated a wider range of modes and speeds of movement (bottom of Figure 2). A similar project by another student developed a new addendum for the City of Boston's Complete Streets Guidelines,[26] expanding its ambitions to consider the perspective and needs of the

child. Her book showed the original adult-focused guidelines and graphics side-by-side with revised guidelines illustrating spaces more inclusive of children, and how they improved the space for everyone. This included for example, translating the front porch that makes residential streets more successful, into models for dense urban neighborhoods that redistribute the right-of-way for many more forms of movement.

A different proposal transformed the street framework with biophilic design guidelines for redevelopment that maximizes exposure to natural experiences in everyday urban spaces for urban housing and schools. The goal was overcoming what the student's data mapping identified as the psychological distress and mental health issues that are more common in predominantly-minority Boston neighborhoods that lack open space and urban canopy (Figure 5).

Lastly, a student looked at how traditional park design in Boston prioritizes patterns of use by dominant cultures, and argued for the importance of public spaces for socialization and representation of a more diverse population. She identified one corridor that connected most of the immigrant populations in Boston. Her design research made a logical and compelling argument for why Boston's history of secondary green corridors provided more opportunities for diversity than traditional centralized parks, due to their connectivity across neighborhoods, their more democratic frontage or longer perimeter, more access points, that connect pockets of
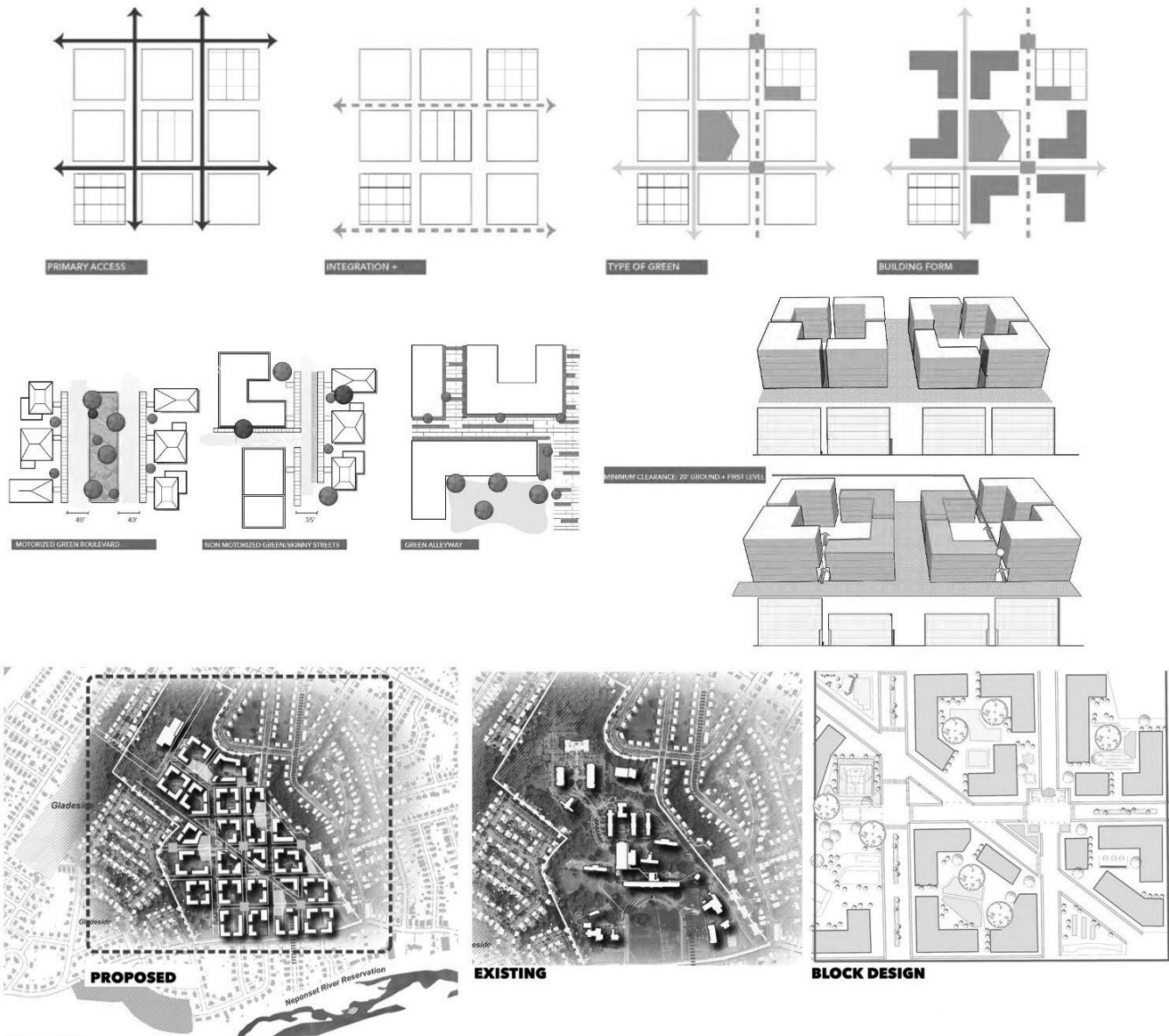
Figure 5. Biophilic Design Guidelines, with applicaiton in a Boston neighborhood. Image by student Daniela Acevedo, Northeastern University.

diversity and multiple uses of open space. Her project showed the contrast between a current transportation proposal for a mobility-focused greenway with a more inclusive place-making proposal of "Play along the Way" landscapes that represent and celebrate cultural diversity.

RESULTS: PEDAGOGICAL EVALUATION
Earlier sections of the paper addressed the challenges of time, access, and risk of extractive practices; and creative approaches to overcome those. Beyond the design work's novelty, the pedagogical evaluation of learning outcomes relied on the faculty's observations of student discussions and growth over a year; as well as student's midyear and year-end evaluations, and a follow-up retrospective survey two years

later, focused on longer-term impacts. Coding these forms of evidence identified broad themes—a set of interrelated strengths and limitations created by the topic and the structure of the course. The strengths are significantly powerful for a generation of students that are increasingly concerned about and motivated by social justice. Next to each strength, Table 1 explains a challenge or limitation. While the limitations can seem significant, none were insurmountable. Awareness of these risks allows educators to recognize the situation and be prepared to intervene. When students are facing these forms of difficulty, educators in a studio context can help students individually to access additional resources or experts on the subject matter, provide assurance, help prioritize, refocus and redirect efforts to overcome the sense of being "stuck."

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TABLE 1: OBSERVATIONS ABOUT PEDAGOGY	
STRENGTHS	**LIMITATIONS**
MORE CRITICAL UNDERSTANDING OF VULNERABILITY. Research uncovers correlates and evidence to identify design's blind spots, impacts on specific groups, and opportunities for more inclusive design-based solutions	**SLOWED BY INERTIA OF RESEARCH COMPLEXITY.** Students internalized research as preceding design, rather than part of iterative process. The "rabbit warren" of research felt like an endless search that delayed design.
MORE GENUINE EMPATHY. Multiple research perspectives challenge designers' perceived relatedness with a group; e.g. "we have all been children." This experience raised awareness of how self-based personal perspectives can be generalizing and misleading, highlighting the importance of understanding situational perspectives.	**PARALYZED BY INTERSECTING CHALLENGES.** Open-ended collaborative research can create great breadth and depth, which can make down-scaling or scoping of a design problem overwhelming for a student, especially when dealing with intersecting global challenges affecting large and diverse groups of people in different contexts.
MORE CONFIDENCE IN DESIGN'S POWER. Focusing on design's impacts on future generations, as stewards of the cultural and ecological environment, is a hope-filled motivator and powerful reminder that designers can make a difference and work to enable meaningful change.	**DEMORALIZED BY LIMITS OF DESIGN'S AGENCY.** The flip side of hopefulness was a feeling that "design alone cannot fix this"; and in some cases, students expressed frustration that design seemed like a superficial way to address systemic social, economic and political problems.

This course sequence happened in the last two semesters for graduate students. Two years later, the now working professionals reflected on how realizations about the power and limitations of design informed career decisions. One of the students decided to pursue work in landscape architecture instead of buildings, believing it to be more aligned with the magnitude of the problems and the scale of necessary design solutions. For another, this was a call to activism, engaging with community organizations, competitions and installations for children spaces. Another was motivated to accelerate her path to licensure so she could search for different job opportunities with firms she perceived as more community-engaged than the office she was employed part-time job during school. For an international student, this experience led her to pursue teaching in her home country, believing she could bring the lessons from research-based pedagogies to the local architecture culture, and that this in turn would make her a better and more mature designer. More removed from the learning experience, these former students reflected on specific long-term lessons, and how they compared with previous learning experiences:

- Ethics: Not having a physical problem right away empowers students to formulate social problems and make choices about if and where design should have agency

- Empathy: The focus on human impacts of design prioritizes the end-user's experience over the designer's. Students felt that for the first time, a design studio was not about them, and that their voice was not the only one that matter. They considered this a threshold to maturity.

- Methods: Focus on social situations helps students differentiate the idea of place-making from the physical contextualism governing purely physical problems in design

- Practice: Transdisciplinary research significantly expands "typical research" in architecture studio, but the complexity of collaboration and the positive results highlighted why making space and time for that knowledge to drive design is beneficial

CONCLUSION: FROM EDUCATION TO PRACTICE

This pedagogical development and analysis illustrate how open-ended transdisciplinary research can support a more holistic view of vulnerability, expanding the designer's awareness of a group's whole situation, and reducing the risk of misinterpreting or oversimplifying user perspectives and needs based on a limited number of interactions or the limited scope of a project. While research-based design solutions showed novelty and promise, the most valuable aspect of this work was the definition of both design problems and opportunities for agency. This represents a paradigm shift from designer as problem-solver, to an expert interpreter of complex socio-ecological situations.

Vulnerability opens designers to build human relations over objects, engaging in more inclusive and creative approaches to advocacy, social and political action. For example, the focus on children revealed how the deepest human vulnerabilities situate design at the intersection of physical and mental health, environmental sustainability, and social justice. The optimism of the students' framework suggests that the innocence societies generally attribute to children can be a political tool, i.e. leveraging the enabling and disabling aspects of vulnerability to build consensus around proposals or initiatives. That is, it can overcome a significant limit of empathy, e.g. what happens when people's own subjectivity assign fault to a person

for their situation, or the personal bias from designers liking/disliking a particular person or group.[27]

Dedicating sufficient time and scope for transdisciplinary research before a problem is defined may seem the privilege of an academic setting. But research-based practices choose to intentionally invest overhead and research time into developing technical expertise without necessarily having an immediate application in a specific project. Building social expertise is no different, i.e. identifying and building knowledge about communities and the vulnerabilities of groups that they do not yet serve but could. Transdisciplinary research can connect multiple perspectives and forms of knowledge, from non-experts, e.g. people's lived experience and unique situational perspectives; and from experts, e.g. evidence about human bodies interacting with the environment; to expand the definition of vulnerability and cultivate more genuine empathy.

ACKNOWLEDGEMENTS

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