ARCHITECTURE IN THE ANTHROPOCENE: TOWARD AN ECOLOGICAL PEDAGOGY OF PARTS AND RELATIONSHIPS

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ABSTRACT

The impact of human activity on the global climate has started to cause physical repercussions that form, transform, and inform the natural and built environment. These repercussions have been materializing in a variety of ways, from sea level rise to wildfires, from health-threatening pollution to contamination of air, soil, and water. Architectural education in the age of climate crisis must tackle ecological challenges and respond to the impacts of global environmental change.

This paper uses three curricular components as a case study to demonstrate how architectural education may be able to address global challenges through the lens of ecology, showcasing (1) Design Studios, (2) Seminar Courses, and (3) International Initiatives. This methodological approach is strongly connected to a pedagogy based on flat hierarchies, personal engagement, and collective awareness of the individuals within a course environment. The content-based pedagogy around ecology becomes a guide for both architecture and architectural pedagogy. The aim is to provide students with an understanding of how the formal relationship between the (geometric) parts of space becomes an integral part of the emerging systems within the changing environment.

This paper also highlights the importance of travel components in contemporary architectural curricula, promoting a global-campus concept that is based on international academic and professional partnerships. Concrete examples of interdisciplinary and inter-university collaborations are provided to connect teaching components to research projects.

The paper concludes by relating teaching and research endeavors to the current transition of traditional architecture programs to STEM-affiliated disciplines.

Keywords: Ecological Design, Climate Crisis, Systems Thinking, Architectural Education, Global Campus

1. ECOLOGY AS A CONCEPT FOR DESIGN AND PEDAGOGY

In the age of climate crisis, the paradigm of ecological design in architecture and architectural education needs to be expanded from microscale approaches on the architectural object to a holistic understanding of the object as an interconnected part of the global ecosystem on the macro scale. While the generic properties of architecture are tempting designers in the digital age to apply similar solutions around the world, often disregarding the specifics of vernacular contexts, this paper stresses the importance of the phenomenon of place as the basis for ecological design. Place approached as *"context of our existence"* provides all the parameters to ground architecture in a specific field,

including the impacts of global and local phenomena like climate and weather, changing seasons, fauna, flora, light, materiality, and cultural habits (Norberg-Schulz 1979). Place and its formal morphology blur the boundary between natural and built context, as the face of the "given context" may be understood as natural or built, as an organism or assembled object growing on a surface. If natural and built context form a hybrid environment of manufactured interventions within the natural environment, one may perceive the impact of architecture through an ecological lens, focusing on the relationships between the built object, the living organisms that inhabit it, and their surrounding context.

Ecology, defined as "a single web of life" that focuses on the relationships between parts and the relationships between the parts and their surroundings (Hester 2006), is an excellent approach to both architecture and architectural education. The climate crisis is the single biggest challenge for humanity in the twenty-first century, demanding to overcome the boundary between design, technology, and biology. Within this complex (eco)system, architecture programs need to find a new identity reconnecting them to the properties of place and understanding architecture as an integral process rather than a static object.

1.1 The Changing Landscape of Architectural Education

Over the past one hundred years, the role of the architecture program has been in constant change: from Walter Gropius founding the Bauhaus in 1919; to the Royal Institute of British Architects (RIBA) conference on architectural education in Oxford in 1958; to the Boyer Report connecting architectural education, design, and research in the United States in 1996; to the Bologna Process in Europe of the late 1990s, declaring architecture to be a research discipline (European Association for Architectural Education 2019).

The role of the contemporary architecture program has once again been challenged, as many programs across the United States became STEM (Science, Technology, Engineering, Mathematics) fields in 2018. On the constant quest for architecture's place within colleges and universities, STEM affiliation clearly demands a science- and research-based focus, expanding the discipline beyond its traditional creative focus aligned with the fine arts (Walsh 2019). Nevertheless, the role of a university asks any discipline to contribute to developing new knowledge aimed at finding solutions to current and future problems. The pedagogical landscape for (now) STEM-affiliated programs in the United States certainly restricts the artistic freedom of faculty and students. Especially as the requirements to fulfill accreditation and STEM criteria bring even more institutional pressure to a discipline that has been creative rather than scientific for most of its history.

Within this framework of interconnected parts, this paper proposes a content-based approach to discussing how architecture and architectural education need to be transformed as an academic discipline over the next decade. The question of how an architectural intervention on any scale relates to its environment may be as crucial as traditional object-based questions on building form, type, performance, or materiality. Similarly, architectural curricula should be further developed, focusing on the relationship and integration between courses and modules rather than course objectives only.

1.2 Chasing the Black Swan

The complex problem of climate change needs to be understood as a global crisis. Almost every discipline needs to contribute to finding solutions. Certainly, architecture and the built

environment must be part of the climate solution, as architecture forms and informs the physical background of everyday life.

While many architecture curricula have historically increased the complexity of student projects linearly from first year to graduation, this approach may not apply to major global challenges. The climate crisis needs to be approached holistically: from global to local, from large scale to small scale, from generic to specific, and vice versa.

Nassim Taleb describes a Black Swan as a "highly improbable event with three principal characteristics: it is unpredictable; it carries a massive impact; and, after the fact, we concoct an explanation that makes it appear less random and more predictable than it was" (2010, 4–11). Chasing Black Swans as a metaphor may be an appropriate theory for architecture programs when addressing the sometimes unpredictable environmental events that form the basis of built interventions of tomorrow on various scales. The role of design education in the realm of environmental impacts may be one to identify potential future impacts and cascading events, regardless of their probability. As architecture as an artistic discipline is allowed to keep developing micronarratives and progressive future scenarios, this artistic freedom allows experimental design to identify Black Swans. While artistic freedom often lacks traditional scientific research, architecture can be flexible and quick in responding to change. STEM affiliation, accreditation, expectations of the American Institute of Architects, and departmental requirements may make it more difficult to chase the Black Swans, yet approaching design challenges and pedagogy more methodologically and more scientifically may also lead to a new seriousness in design. Especially when considering global challenges like the climate crisis, interdisciplinary collaboration and a data-driven approach are necessary for architecture to succeed as a relevant academic discipline. In an age also driven by digitalization, the integration of quantitative methods for data collection that informs design is crucial as architecture defines its role aligned with STEM fields and collaborations in social and urban sciences.

The following paragraphs outline three curricular areas aiming to provide education on ecological design: (1) Design Studios, (2) Seminar Courses, and (3) International Initiatives.

2. CURRICULAR IMPLEMENTATION

The courses summarized under the title "Ecological Design Module" have been implemented at the University of Texas at Arlington College of Architecture, Planning, and Public Affairs in collaboration with the University of Innsbruck, Austria, Faculty of Architecture (Fakultät für Architektur), aiming to start a global campus concept.

The Ecological Design Module introduces concepts in architectural design and theory, tying natural, cultural, and built environments together. Ecology is approached as a complex system focusing on the interrelations between architectural components. The aim is to provide students with a comprehensive course sequence focusing on climate adaptation strategies on the (1) territorial, (2) urban, and (3) architectural scale. These courses may be taken in any sequence yet are constrained by year levels in the curriculum.

2.1 Foundation Studios as Design Incubators

Developing a strategy for a consistent architecture and design curriculum at the foundation level is a research task: it is based on disciplinary content, methods, and pedagogy. Foundation studios should be approached as design incubators to establish a timely response to (global) challenges within and beyond the discipline of architecture. A design

incubator is a space to critically address cultural and ecological issues through design and especially design principles. By nature, a studio or incubator is a collective experience built on the synergies of bringing a group of individual talents together in a creative work environment.

A contemporary design studio must tackle ecological topics in academia and practice as architecture materializes itself within the rapidly changing natural environment. Especially in basic design education, architectural principles should be investigated over time. Therefore, the education of an architect must not be seen as theoretical or unrelated to reality but as a product of cultural activity shaped by global trends and regional phenomena. Architecture always takes place within the real as long as progressive projects address contemporary problems through visionary concepts and designs. Design studios, even on the foundation level, should serve as a platform for both students and faculty to further develop their skills, tools, and research foci through the lens of basic design principles.

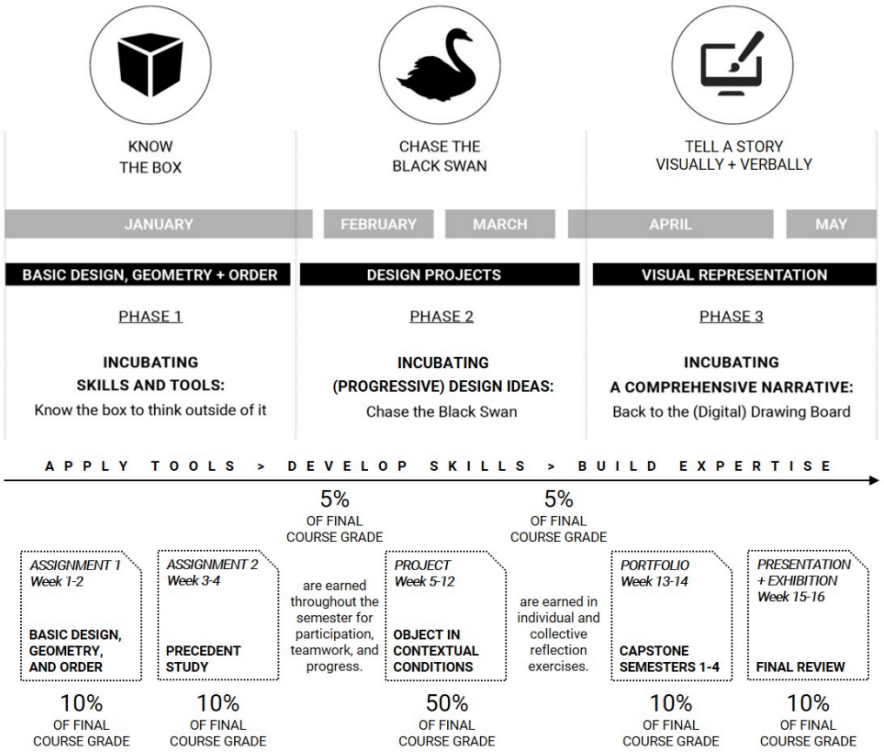

Figure 1: Syllabus overview of Architectural Foundation Studio (Oswald Jenewein)

The semester is divided into three comprehensive phases: (1) incubating (digital) skills and tools: exploring basic design, geometry, and order, (2) incubating progressive (design) ideas: chasing the Black Swan, (3) incubating a (comprehensive) narrative: telling a visual story (Figure 1).

First, students explore the geometric properties of an architectural object within Cartesian space to ultimately relate several objects to one another and to a datum. This abstract relationship between a geometric volume and the notion of surface prepares the main semester project when volumes become habitable spaces and the surface condition becomes a landscape. A precedent study introduces houses in different environmental conditions in this first phase, from coastal to urban to alpine contexts. The main objective is to understand the architectural object, or building, in response to

its immediate surroundings. This phase also defines architectural drawing principles, from applying line types, weight, and color, to generating floorplans, sections, elevations, and 3D models to scale.

Figure 2: A story of mutants, parasites, and hybrids
(Dianna Hozda, Karina Mendez, Alfredo Gallegos, Oswald Jenewein)

Most of the semester is spent chasing Black Swans, as described earlier. The aim is to introduce contemporary challenges while reducing the complexity of a challenge to a foundation studio project. Students work in teams of three to develop a comprehensive story of a fictional character who fights against a major global challenge, like an environmentalist, a scientist, or a journalist. The projects are placed in three distinct contextual conditions: (1) coastal wetlands, (2) urban plains, and (3) alpine forests. In addition, three distinct design methods are introduced, so each student starts the project applying a different approach: (1) addition, (2) growth, and (3) subtraction. The projects also start with an uncommon typological assignment. Students do not follow a conventional program but rather explore spatial relationships within the object and between the object and the ground. The typologies include (1) a mutant, a spatial structure based on five cubic volumes that are transformed into one object; (2) a parasite, a spatial structure attached to, but clearly different from, its host; and (3) a hybrid, a spatial structure in which ground and the object merge into one figure. Figure 2 shows a final semester project highlighting three projects in three different conditions as part of a continuously changing landscape. The one-point-perspective section as a representational tool makes interior spaces visible while the environmental conditions move to the background.

The third and last phase focuses on visual and verbal (re)presentation of the project. The teams now visualize the comprehensive narrative developed throughout the

semester and develop (1) poster boards and (2) a digital presentation alongside (3) a physical model. They also put their work up on display in (4) a student work exhibition and individually summarize their work in (5) a student portfolio.

2.2 Seminar Courses on Ecological Design

Nondesign courses in architectural theory are an integral part of both undergraduate and graduate curricula. The Ecological Design Module described in this paper includes three elective seminar courses that approach architecture through the lens of ecology: (1) Territorial Strategies (Territoriale Strategien), (2) Productive City Landscapes (Produktive Stadtlandschaften), and (3) Adaptive Typologies (Adaptive Typologien). These courses investigate ecological design on the scale of (1) a territory, (2) a city, and (3) an architectural object or building.

The premise for these seminar courses is the basic understanding of architecture as an integral process within the natural environment, not as a static object. Therefore, architecture is approached as a system of interrelated parts connected to and informed by contextual conditions. The conceptual framework of all courses includes a broad understanding of (building) life cycles, from resource extraction to construction, maintenance, and disassembly, related to environmental design, sustainability, and resilience.

In Territorial Strategies, students apply geospatial analysis tools to grasp the notion of landscape on the territorial scale. Charles Waldheim's *Landscape as Urbanism* book serves as a key reading assignment for this course. Students investigate specific territories to identify assets and challenges and synthesize them into strategies for proposing solutions on the micro and macro scale. This course focuses on global connections and is taught in collaboration with the University of Innsbruck in Austria.

In Productive City Landscapes, students utilize a participatory mixed-methods approach to identify selected ecological challenges of the urban scale. Randolph Hester's book *Design for Ecological Democracy* is a crucial reading component for the course. Students work with communities, private and public stakeholders, and other organizations in the field. A major method introduced is Participatory Action Research, which describes "(1) a commitment to investigate an issue or problem, (2) a desire to engage in self- and collective reflection . . ., (3) a joint decision to engage in individual and/or collective action that leads to a useful solution . . ., (4) the building of alliances between researchers and participants in the planning, implementation, and dissemination of the research process" (McIntyre 2007, 15–22).

In Adaptive Typologies, students draw, model, and generate diagrams and concepts to develop generic prototypes that apply ecological design strategies on the architectural object scale. A variety of readings, including Branko Kolarevic's *Architecture in the Digital Age* and several texts by Rafael Moneo, Jean-Nicolas-Louis Durand, and Quatremère de Quincy provide the theoretical background for this course. Through a series of typological investigations, students adapt existing (building) types to the environmental challenges in the age of anthropogenic climate change.

These three courses branch out into several interdisciplinary collaborations to provide a solid scientific foundation informing students about critical knowledge helpful for future design decisions. These collaborations include geo- and atmospherical sciences, civil and environmental engineering, and social sciences. In response to redefining architecture programs as STEM fields, cross-disciplinary work is a crucial

asset to both faculty and students in transitioning from artistic practice to scholarly discipline.

2.3 Global Campus: International Academic Initiatives

Travel components have historically been an important part of architectural education, yet the interaction between students and the sites visited abroad were often tourist-like experiences. Beyond visiting and experiencing built environments abroad, travel components should connect people, institutions, practitioners, and places in a collaborative way. Student involvement within (academic) communities and local institutions abroad enhances the opportunities to perceive a place by participating in creative activities and events. Students can immerse themselves in a different place for a short time and become a temporary part of it rather than being observers only.

To take international initiatives to the next level, faculty, students, and scholars need to be active members in academic exchange to generate a global campus. International academic partnerships are an opportunity for enhanced collaboration on all three levels. This paper builds its global campus initiative on the academic partnership between the University of Texas at Arlington and the University of Innsbruck. Started as a faculty exchange in 1989, the program opened to exchange students in 1996 and ultimately to scholars in 2018. Both institutions have been sending and hosting exchange students, faculty members, and visiting scholars.

Following a global campus concept, the course Territorial Strategies was first offered in 2019–20 in both architecture programs. To best showcase the potential synergies of working with partners abroad, a four-week summer program conducted in 2018 is described below.

A group of students from UT Arlington spent four weeks traveling through Europe during a summer study abroad program. Besides traveling to several cities from Amsterdam to Venice and Vienna to Brussels, most of the program was spent at a partner institution in Innsbruck. Students were challenged to design and build a seating landscape for a local youth center in Innsbruck in one week. Methodologically, the group followed a Design Thinking Process, aiming to (1) emphasize, (2) define, (3) ideate, (4) prototype, (5) test, and (6) implement a concept from design ideas to built outcome.

Bouncing ideas around within and beyond the group helped students to collaboratively design several iterations of possible outcomes before additional feedback led to the design of the final prototype. A similar sequence of idea finding was necessary to determine ways of setting up a movable workshop to work on-site. Choosing smart materials and construction methods was essential to stay on time and budget. The successfully built project was tested at an inauguration event with locals and visitors, users and designers who became a part of the group. The seating landscape has been successfully evaluated in everyday use.

Figure 3: Engaging with places and communities abroad: Innsbruck, Austria (Oswald Jenewein)

3. CONCLUSION

For architecture programs transitioning to a STEM discipline, the traditional role of a teaching institution preparing students to practice needs to evolve into a more research-based academic institution contributing to a global architectural discourse. Suppose STEM-affiliated fields are becoming guides for how architecture schools will look in the future. In that case, architecture faculty members will ultimately teach less, research more, and approach their topics through measurable scientific methods rather than artistically. The transition in architectural education should be informed by content: as the climate crisis and emerging technologies blur the lines between organic and synthetic objects, as science and nature set the premise for informed design decisions, architecture as a STEM field may rise to a new level. With a lack of doctoral students and traditional research labs, architecture programs must push their research down to other year levels, at least to a certain extent. This is an opportunity to rethink architectural curricula and to develop a contemporary hybrid curriculum linking teaching and research.

In summary, this paper argues that (1) ecological design should be part of architectural education from first year to graduation; (2) architecture needs to develop a research-based identity if approved as a STEM field; (3) international initiatives should be seen as project-based partnerships to engage with local communities and collaborate with different organizations.

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REFERENCES

Boylston, Scott. 2019. *Designing with Society: A Capabilities Approach to Design, Systems Thinking and Social Innovation*. 1st ed. New York: Routledge.

Durand, Jean-Nicolas-Louis. 2000. *Précis of the Lectures on Architecture: With Graphic Portion of the Lectures on Architecture*. Translated by David Britt. Los Angeles, CA: Getty Research Institute.

European Association for Architectural Education (EAAE). 2019. *The Practice of Teaching/The Teaching of Practice: The Teacher's Hunch*. Accessed February 2, 2020. http://www.eaae.be/event/practice-teaching-teaching-practice-teachers-hunch/.

Hester, Randolph T. 2006. *Design for Ecological Democracy*. Cambridge, MA: MIT Press.

Kolarevic, Branko, ed. 2003. *Architecture in the Digital Age: Design and Manufacturing*. New York: Spon Press.

McIntyre, Alice. 2007. *Participatory Action Research*. Los Angeles, CA: Sage Publications.

Norberg-Schulz, Christian. 1979. *Genius Loci: Towards a Phenomenology of Architecture*. New York: Rizzoli.

Taleb, Nassim Nicholas. 2010. *The Black Swan: The Impact of the Highly Improbable*. 2nd ed. New York: Random House Trade Paperbacks.

Waldheim, Charles. *Landscape as Urbanism: A General Theory*. Princeton, NJ: Princeton University Press, 2016.

Walsh, Niall Patrick. 2019. "Architecture Becomes a STEM Subject in the United States." *ArchDaily,* January 2. Accessed February 25, 2020. https://www.archdaily.com/908830/architecture-becomes-a-stem-subject-in-the-united-states.