Built Environments Laboratory: Pedagogical Reflections on Inter-Disciplinary Studio Teaching

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Current practice in the allied design and planning professions requires interdisciplinary collaborations to address the increasing complexity and rising issues surrounding environmental quality, social equity, and economy in our contemporary built environments. Accordingly, professional practice is becoming increasingly characterized by team based and research-oriented environments that embrace new technologies and develop strategies to address contemporary architectural and planning challenges.

Reflecting these operational evolutions in practice, academic colleges and departments are responding; developing educational programs that transcend the boundaries of traditional disciplinary training. In the studio classroom this requires a pedagogical approach that pushes the students to move beyond the focus of furthering their own 'personal creativity' through idiosyncratic and proprietary approaches to architectural design.[1] These educational venues must promote new collaborative forms of architectural education that accommodate the emerging practice of the professional community, the incorporation and integration of design technologies and the expanding scope of architectural and environmental challenges that face our contemporary built environments. To prepare students, design studio classes must support and enable rigorous forms of experimentation, collective understanding, and interdisciplinary collaboration.

Above all, architecture schools need to focus on developing critical thinkers. Students, the future of our profession, need to have the opportunity to develop the necessary tools to realize, comprehend, and question their assumptions about design and its application to be an active participant in the transformation of our profession.[2] The ability to look beyond the structures of one's chosen discipline is an important ingredient for generating such an aptitude. Interdisciplinary expertise does not only facilitate the collaboration with other disciplines, but it further expands the understanding of one's own. Therefore creating opportunities for interdisciplinary collaborations within the academic professional curricula in architecture, landscape architecture, and urban planning, is becoming increasingly important.

BUILT ENVIRONMENTS LABORATORIES

Building on this paradigm shift, the College of Built Environments, at the University of Washington, recently introduced a new interdisciplinary series of courses called Built Environments Laboratories - BE Labs. These labs form a unique, special-topic micro-curriculum within the college to provide students and faculty with opportunities for transdisciplinary, highly integrative, and experimental coursework.[3] The series promotes new forms of interdisciplinary collaborations across the college's four diverse departments, Architecture, Construction Management, Landscape Architecture, Urban Planning, and beyond. In changing constellations of departments

and faculties, BE Labs expressly engage grand challenges, test novel methods, and promote rigorous frameworks for research, instruction, and design inquiry.[4] BE Labs are typically developed as short course sequences with an interdisciplinary special option studio as the core component. These core studios are either introduced by preparatory seminars, connected to already existing courses and travelling programs or continued by follow-up studios offered by individual departments. The creation of these thematic sequences helps better integrate the labs into the larger curriculum offered by programs within the college. In general, the BE Labs enable a large number of student and faculty to gain interdisciplinary experience first hand. They also contribute an important asset in the college's curriculum by initiating engagement of the entire college population in current interdisciplinary debates.

To unfold the potential opportunities and challenges in developing an interdisciplinary curriculum in the BE Lab series, this article describes the structure, process, outcomes, and most importantly, lessons learned, from developing and teaching the BE Lab "Vertical Farming and Sustainable Site Design." This lab was conducted in the winter term of 2010 with three faculty and eighteen students with backgrounds in Architecture, Landscape Architecture, Urban Planning, Anthropology, Biology, and History. The pedagogical strategies integrated into the course structure focused on revealing disciplinary distinctions, building upon common concepts, and bridging educational and professional practices to develop a hybrid studio approach. These strategies were observed, tracked, and recorded by the faculty during the term with several primary phenomena emerging. These include the different perspectives of the disciplines on the built environment, their divergent methods to research, the integration of these methods in the (design) studio and distinctive approaches to teamwork and peer learning.

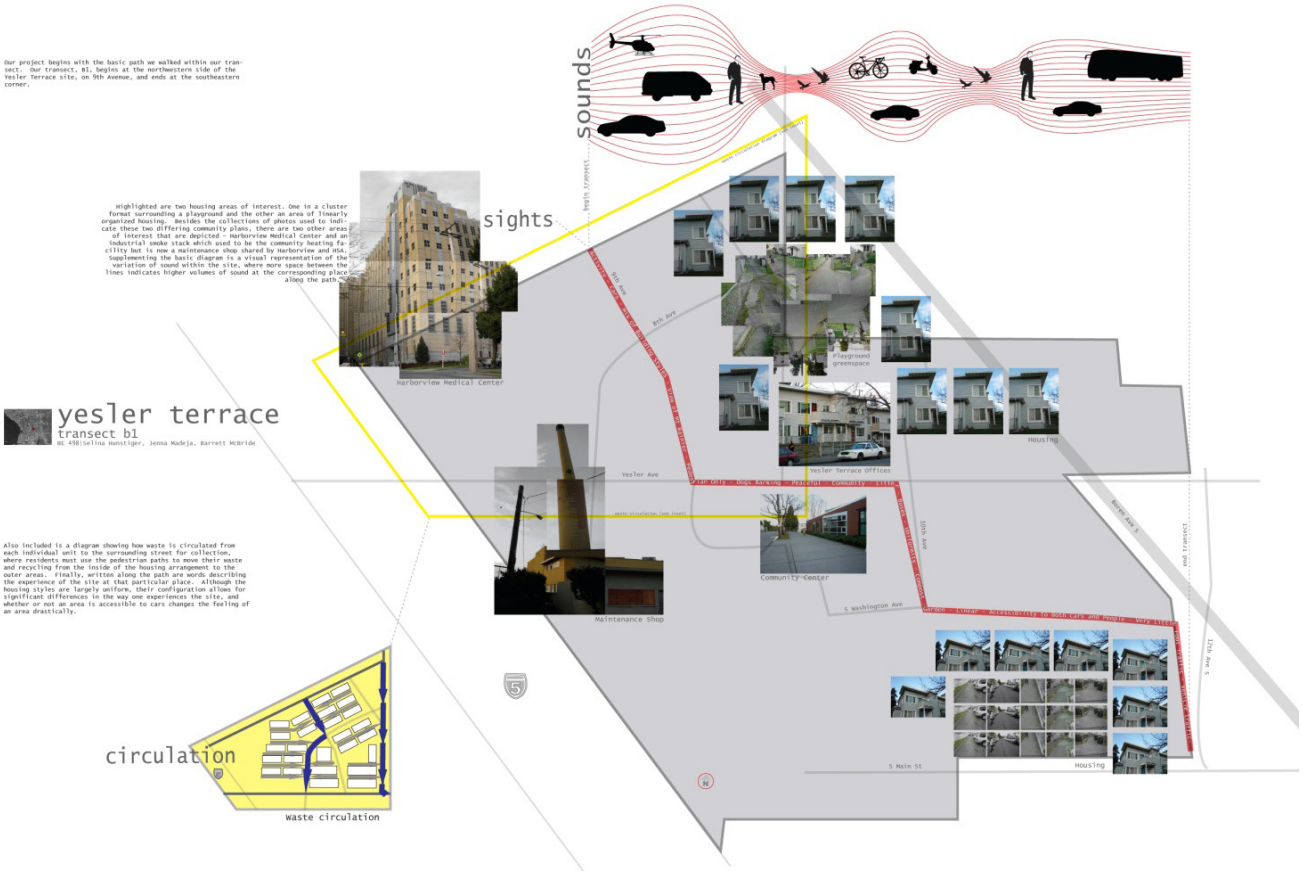

Figure 1: Transect - Interdisciplinary Site Analysis

LABORATORIES IN ARCHITECTURAL EDUCATION

Laboratories as a place for experimental and research-oriented work in architectural education are not new concepts. Their history and development reflects a wide spectrum of different foci from scientific research and innovation to collaboration and peer learning, always in conjunction with a specific relationship to professional practice.

In the postwar era, laboratories like The Architectural Research Laboratory at the University of Michigan, strived to expand knowledge in building construction and performance to advance the profession of architecture, in particular through scientific research that individual practitioners were not able to conduct by themselves.[5] In the 1970s, with Robert Venturi and Scott Brown's Learning from Las Vegas project, an explicit focus on research began to be integrated in design studios. The studio was driven by "structured research, conducted in teams with a teaching aim, but also strived for research and artistic discovery."[6] This type of architectural research inspired works like Delirious New York by Rem Koolhaas and more recently Koolhaas's studio series at Harvard the Project on the City, exploring the Pearl River Delta, Shopping, Lagos, and Rome. The goal of all these projects was the generation of new perspectives on existing cities and processes and to assist in developing fundamentally new urban visions.[7] The Design Research Laboratory at the University of Pennsylvania taught by Stephan Kieran and James Timberlake, on the other hand, conducts research on building technologies in conjunction with research carried out in their professional office, emphasizing a strong connection to professional practice. In the Design Research Lab D[R]L, offered by the Architectural Association in London, students work in self organized groups on a single project for sixteen months to promote peer to

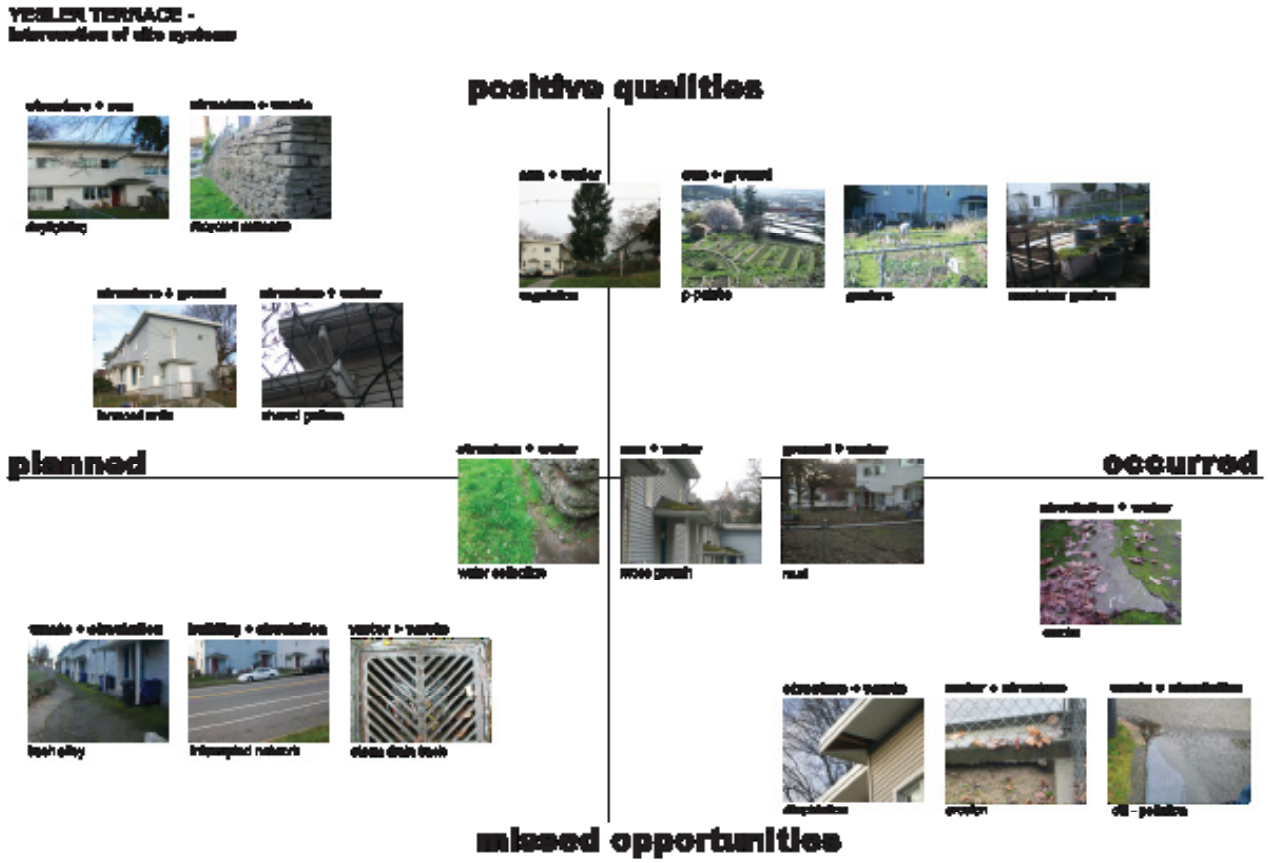

Figure 2: Matrix - Intersection of Site Systems

peer learning. This graduate design program is collaborations in professional practice; it promotes work processes with shared project data in an open source, non-proprietary approach to design. BE Labs at the University of Washington, focus on inter- and trans-disciplinary collaborations between departments, individuals and the larger professional community that address the emerging issues of our contemporary urban environments.

REVEALING DISCIPLINARY DISTINCTIONS

A studio is a place for hands-on learning where students take an active role engaging with and incorporating distinct components of the curriculum into a comprehensive project. Beyond this shared understanding, studios have very different meanings, positions and goals within the pedagogies of Architecture, Landscape Architecture and Urban Planning. The BE Lab "Vertical Farming and Sustainable Site Design" strived to benefit from these disciplinary distinctions by synthesizing diverse approaches and reinforcing the strength of each discipline's studio experience into a new hybrid studio model. Several core objectives of the monodisciplinary studios became the focus of inquiry into the nature of this new, interdisciplinary conceptualization of the design studio as a venue for collaboration.

The typical Architecture studios create an environment in which students can develop and test their design process with ample space for imagination, speculation and creativity. Architecture students are asked to reflect on their design process while bringing together various aspects and scales, from conceptual, theoretical ideas to physical concerns of structure, materiality and construction methods. In contrast, studios in landscape architecture are often structured in a manner that grounds the student in a topic or place through extensive research of pertinent site and systems structures and processes. This research thus forms the foundation for conceptual and design development later in the term. Urban planning studios primarily structure studio courses around actual projects with paying clients and an expectation of generated information that is pertinent and applicable. These planning projects typically identify project goal and objectives, generate constraints, define the scope of potential interventions, and propose a course of action.

Encompassing these diverse pedagogical perspectives and approaches, the structure of the BE Lab was flexible and inclusive of a broad spectrum of potential questions and opportunities to allow students and faculty to simultaneously engage across different topics and scales to benefit from and maximize the distinct sensibilities offered by integrating the disciplines. The primary goal was to develop a design studio course that was deliberately interdisciplinary in its conceptual approach and applica-

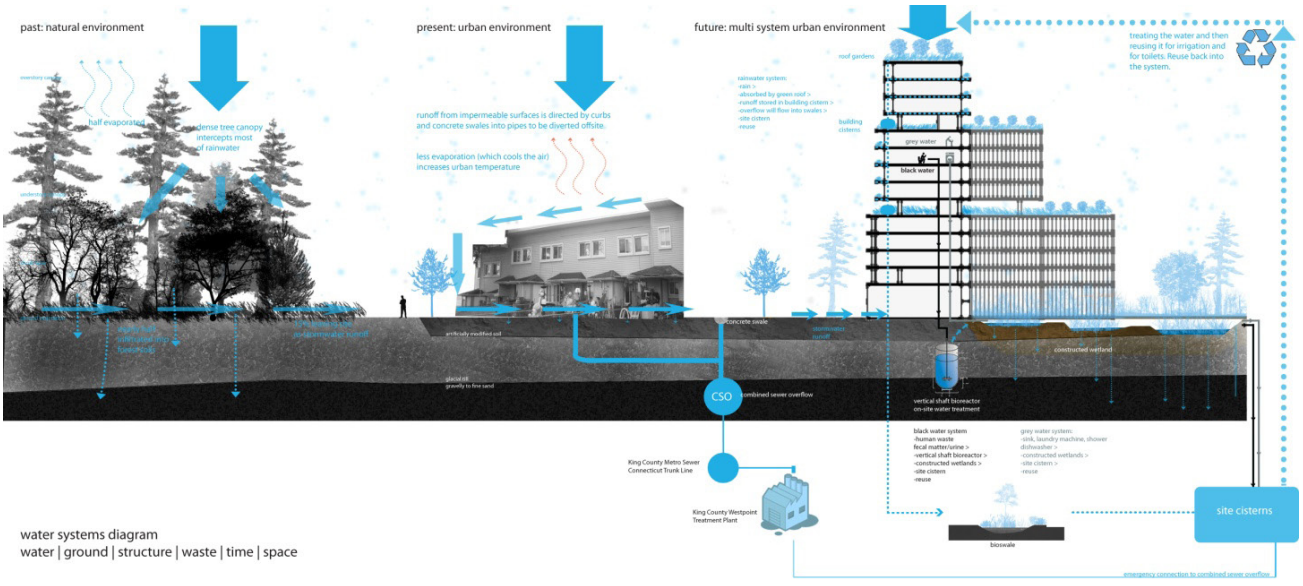

Figure 3a: 'Thick Section' Water Systems

tion, not merely a disciplinary mix of participating students and faculty.

CROSS-DISCIPLINARY COMMON GROUND

Given the different expectations of the individual disciplines when entering the BE Lab, the studio capitalized on an inherently inter-disciplinary topic to establish a shared interest and strong common ground. Building upon the complex and often contentious redevelopment process of an approximately 30-acre public housing project in downtown Seattle, the course developed a program for collaborative design research between students, faculty, and practitioners actively engaged in the project, while simultaneously supporting inter-disciplinary objectives that promoted the exploration and evaluation of approaches to community based design and strategies for productive agricultural integration.

From an interdisciplinary perspective in the allied design and planning disciplines, urban agriculture provided a central topic for the project because it integrates components of site structure, ecological processes, community engagement, and policy. From a teaching perspective this topic would have represented a distinct challenge when approached by a single discipline, but prospered under the evaluation conducted by an interdisciplinary group.

A large number of students applied to participate in the BE Lab based on their interest and expertise in urban agriculture. This shared interest between the students of the various disciplines that participated provided the studio with an early focus, which remained the common element through out the term as disciplinary requirements took hold of the project. Vertical farming required thinking in the present and future; it motivated each person to develop new strategies and allowed everybody to be part of an exciting innovative movement.

Given the strong interest of the professional community in the subject of urban agriculture, the BE Lab was able to attract practitioners and professionals from across the allied design and planning professions to collaborate in presentations, desk critiques and reviews. Hence the BE LAB was not only successful in its collaboration across the disciplines, but also in crossing the boundaries between academia and professional practice.

MODES OF COMMUNICATION AND STUDIO PROCESS

Studios in all design and planning disciplines are a process-oriented form of instruction, usually initiated through a series of introductory projects. In the BE Lab these initial investigations were above all an important tool to begin interdisciplinary com-

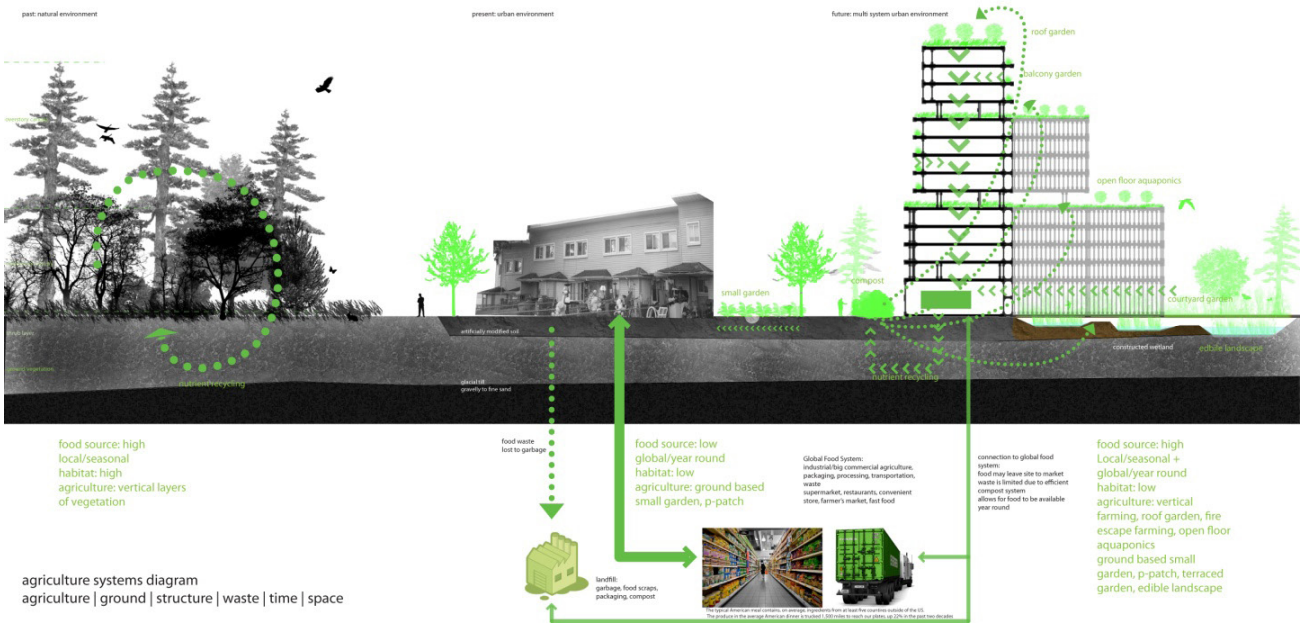

Figure 3b: 'Thick Section' Agriculture Systems

munications and collaborations. Further-more, presentations from professionals working on similar projects in the region introduced students to the site and relevant case studies, and most importantly, to one of the largest challenges in the entire design process, the different disciplinary perspectives, vocabularies and modes of communication. Johnson and Hill identify shared modes of representation and communication as essential for a successful interdisciplinary collaboration. Each discipline should become familiar with the other's methods and expand their repertoire of skills to include new ways of representing and communicating ideas.[8] To allow for this exchange and reduce the challenges through disciplinary language differences in order to support the final goal of physical design interventions on the site, the BE Lab required the students to include graphic representations in their communication and documentation of research from the beginning of the process. In doing so the communication in the BE Lab was far more diverse and interdisciplinary than in any traditional studio type.

[A1] transect, the first introductory assignment, asked interdisciplinary pairs of students to create a 'transect' through the site, which is generally defined as the operation of cutting across or dissecting transversely. 'Transect' also indicates a methodology developed in the field of ecological science to evaluate environmental conditions along a linear quadrant and is often used to evaluate site conditions such as plant distribution, and animal populations.

The disciplinary use of the term, however, reflects the different perspectives and biases of the three disciplines on the built environment. Urban Planning uses the term and associated research method as an urban sampling technique[9] in which data is systematically recorded along a line to investigate a gradient in the development of a site. For example, the term urban-to-rural transect describes a method to analyze the gradient of density and massing from a metropolitan area's edge to the core, providing a strategy for analyzing urban form. In Landscape Architecture, 'transect' is often used at a smaller scale to determine the physical conditions and qualities of a site. In Architecture, the term 'transect' is rarely used as part of the disciplinary jargon per se. Translated into architectural terms, the act of cutting a slice across the site would most closely resemble the generation of a site section. This orthographic projection of the site, seen as if cut by an intersecting plane, investigates and documents topographical spatial and conceptual relationships. Much like in landscape architecture, the understanding of these site conditions becomes a prerequisite for the manipulation and creation of physical space on the site.

Offering this reflection of the primary focus and attitude to a site of the three disciplines, the term 'transect' was an ideal starting point for this interdisciplinary studio. Understanding different perspectives early in the studio process and having an open discussion about expectations and goals was important for successful collaborations in the teams. The results of this assignment (Figure 1) showed that students collected data on the topo-graphical, environmental, (infra)structural, and perceptional qualities of the site simultaneously in one composite site representation to detect potential synergies.

In a second step, **[A2] matrix,** multi-disciplinary teams were asked to define an organizing framework through which transects and the intersection of different systems could be integrated to express the entire site. This assignment intensified the conscious use of different forms of communication. By translating a matrix, a form of representation usually used in science, into an analytical design drawing, the students were challenged to use graphic communication inventively. They went beyond the standard representation methods to explore innovative hybrid forms of presentation. One example (Figure 2) describes the site by identifying typical condition for how two site systems intersect. Instead of simply locating their occurrence on the site, they are ordered in a matrix that estimates their environmental value and origin.

In a third introductory step, **[A3] case study,** each student was asked to research and present a relevant precedent project. The information was accumulated and shared as collective research within the laboratory to create a database of specialized knowledge applicable to the studio topic. Through the selection and presentation of a case study, each student was able to demonstrate his/her specific interest in the studio project; highlighting their disciplinary perspective. These presentations initiated discussions, in which the teams started to outline the skills and strengths of each member and discipline. The expression and iden-

tification of disciplinary biases early on facilitated and eased the teamwork and collaboration.

The work on the actual studio project, the redevelopment of 30-acre public housing project with a focus on the integration of urban agriculture, was structured into three phases each leading to an critical presentation.

[A4] strategy asked the students to develop approaches to a sustainable site design and building prototypes based on their previous site analysis. In this phase, one group developed 'thick section' diagrams (Figure 3) that discussed the integration of their site and building strategy in the temporal context of (pre-contact) past, present, and future. In the phase **[A5] concept**, students developed the conceptual design of the entire project and in **[A6] development** they continued the design research collaboration on their projects for the final presentation. Through the contribution of up to six students with diverse backgrounds in each group, the range of scales and content included in each project exceeded the scope of any disciplinary studio. The final project presentation included urban development strategies, site design, building prototypes, sustainability plans, system design, community design, growing methods, metrics and planting schedules.

For the faculty it was rewarding to see that the disciplinary strengths in different modes of communication of the diverse participating disciplines eventually coalesced during the final presentation (Figure 5). While the designers took a larger share creating excellent graphic representation of the complex studio projects, the non-designers seemed to be at ease with elaborating complex interrelations between the different disciplinary parts in the verbal presentations.

DESIGN RESEARCH VERSUS RESEARCH DESIGN

The work on the actual studio project was defined as design and research collaboration. Therefore the

Figure 4: Building Prototype and Community Garden

understanding of the approach of the three disciplines to the definition, importance, and integration of research in a studio project was crucial for the development of the studio pedagogy and process.

Over the past decades, planning education has largely moved away from the architecture studio-type approach of learning and embraced more knowledge-based activities supporting rational planning models, advocacy and activist planning. In many programs studios have been adapted and renamed into 'workshops'. These project oriented courses are often used to teach practical skills such as communication and presentation skills, and team work[10], in an otherwise theoretical, research-oriented, and scientifically rigorous planning curriculum.[11]

The urban planners participating in the BE Lab estimated that most of their studios are research driven, mainly by secondary research of precedents through literature review and case studies to optimize the own approach in a similar situation. Supporting this rational and knowledge-based approach, social science methods[12] provide a systematic introduction to research methods and have become a steadfast element of the planning curriculum.

Urban planners[13] are not directly concerned with design of physical space. Their input is the design of processes and policies that allows for certain developments and change to take place. The landscape architecture students claim a balance of research and design in their studios. A typical studio project starts with a thorough site analysis. This research constitutes the base for the initial design idea and its development. In this process research and design are viewed as one and the same. Research provides focus and understanding which frames creative development and direction. This understanding, infused with the student's creativity generates new questions for further research, establishes an iterative mode for design that builds upon and is informed by both site specific and topically related research in addition to the creative expression of the students.

The definition of design research or design as research is a wide ranging debate in architectural education and the profession in general. Architectural design is, on one hand, identified as mode of research, scholarship and inquiry[14] that is special to architecture -- and one that is not adequately described in terms of "the scientific method."[15] This type of architectural research aspires not just to represent the world, but also to help the profession to look at the world in a fundamentally new way. On the other hand, with the growing complexity of the built environment, scientific research in architecture is increasingly necessary and often based on research methods originally developed in engi-

Figure 5: Final Presentation

neering, psychology, sociology, and other fields.[16] Design studios in Architecture attempt to integrate research on multiple levels, but few studios have a rigorous methodology. Typical studios start with conducting research like site analysis and case studies, but spend less than one third of the studio time on instructed research before moving to the individual, often idiosyncratic, design process. With the growing complexity of design problems, building systems, building performance and tools for their investigation, students continue their research while they are designing. The largest challenge for architects and studio pedagogy remains; no matter which type of research is conducted, there must be the creative integration of research in the design process for the project to be successful.

Capitalizing on these different approaches to site analysis and design, research was integrated on two levels in the BE Lab. A structured site analysis established an important base for the project, in terms of site specific knowledge and interdisciplinary workflow. In addition, the individual teams accomplished a great deal of research on project specific systems that were not part of their disciplinary expertise. The BE Lab facilitated the gathering and exchange of data between the teams through introduction of methodologies, frequent group discussions, presentations and panels on specific topics and provided easy access to infrastructure to share project data. In addition, the students learned from one another how to conduct research on subjects outside of their field. Through this collaboration, architecture students were introduced more systematic, scientific approaches to research by urban planners and landscape architects, while they contributed a more speculative, innovational approach to design research.

Most importantly, the BE Lab allows all students to experience the need for inter-disciplinary research. Stretching research in the built environment across separate disciplines does not address the particular need for this knowledge and practice to be integrative across epistemological boundaries. The built environment functions in a number of independent but interactive ways. Its structural, environmental, social, cultural and economic components can be analyzed separately as well as holistically. Research into the built environment thus has to be conscious of these interactions across traditional separate intellectual fields.[17]

TEAMWORK AND PEER-LEARNING

Students brought amplified motivation, a priori connections with the subject and a wide range of interdisciplinary experiences. Beside this specialist knowledge and expertise, the studio process showed the need for developing interpersonal skills and social competence to succeed in the interdisciplinary setting. Communication and mediation skills, team building and management, leadership, patients, flexibility, adaptability, open-mindedness and the ability to leave inflexible, disciplinary expectations and patterns became the most valuable assets for a successful interdisciplinary collaboration.

Regardless of a considerable pool of these 'soft' skills in the studio, the teamwork remained a challenge. A difficult task in itself, additional conflicts could be traced to different studio cultures from the home departments. All three disciplines promote peer learning as an important component of the studio process, but they interpret it very differently. Urban planning studios are entirely based on teamwork. Groups of students work on different assignments, therefore all participants experience a studio differently and learn directly from working with their peers. By concentrating on different project tasks and generating individual deliverables, all students contribute to a single collaborative studio project. In landscape architecture and architecture studios, the collaborative work phase is often relatively short; almost from the beginning, students work on their individual design projects. The peer-learning experience emerges here out of the studio culture, which means that students learn from each other while working in the same studio space side by side. In this studio model the individual authorship is important and the success of the studio is measured by the process and product of the individual projects. Regular landscape architecture studios combine both peer-learning strategies to a greater degree. Students collaborate for approximately the first half of the studio in teams on shared analysis and research, before they start working on individual projects.

Given these different educational cultures provided in the students' primary disciplines, the students entered the BE Lab with very different expectations. The lab mediated those through focused discussions about everyone's interdisciplinary goals at the beginning of the teamwork. Above all, the core

prerequisite for a successful collaboration was the willingness of all team members to push beyond their individual, disciplinary comfort zone.

CONCLUSION

The traditional division of disciplines is no longer an adequate model for studio teaching for the built environments. After the development of a disciplinary skill set, students should be exposed to interdisciplinary opportunities and collaborations in order to be better prepared for professional endeavors. Interdisciplinary studios and course work expose students to work and research methods, especially through an extended collaboration with practitioners in this process, which are standard practices in the professional world. Most importantly, through this experience students develop interpersonal communication and collaboration skills that are sought after by the professional community, but otherwise difficult to acquire in an academic setting.

Interdisciplinary collaborations open the doors to opportunities for students, faculty and professionals for developing hybrid approaches necessary for addressing the issues that face our contemporary and future built environment. Integrating an interdisciplinary pedagogy into the curricula of design and planning disciplines presents challenges, because interdisciplinary work has marginal space in the academic structures of departments and accreditation requirements. When interdisciplinary interaction occurs, it usually happens against the grain of the university.[18] Whereas, especially in time of limited resources, the thoughtful synthesis of courses offered in one college or university into an interdisciplinary curriculum is often an overlooked opportunity. Additionally a more careful integration between studios and special laboratories and existing specialized, research based courses in technology, ecology, or history would help to address pressing interdisciplinary challenges more successfully. Colleges and schools must find ways to transcend obsolete educational structures, and foster the further development of inter-disciplinary programs.

ENDNOTES

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