Exploring the Potentials of Interdisciplinary Studios in the University of Washington College of Built Environments

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Abstract

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Interdisciplinary collaboration has become a key strategy in the fields of the built environment to understand and address complex environmental and societal issues. The College of Built Environments at the University of Washington has applied the idea of interdisciplinarity to education, offering a series of college-wide interdisciplinary studios since 2009. This study conducts a qualitative review of the interdisciplinary studios at the College of Built Environments from 2009-2019. Through fifteen in-depth interviews with previous studio instructors, this study explores how studio instructors understand the idea of interdisciplinarity, how their understandings are reflected in the studio pedagogy, and what are the future potentials for the interdisciplinary studio in the University of Washington College of Built Environments.

INTERDISCIPLINARIT?

I am deeply grateful to all the brilliant minds who generously shared their insights and gave shape to this study. Thank you also to my advisors, parents, friends who supported and accompanied me through this journey.

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PREFACE

The seed of this study grows from a design assignment I had as an undergraduate student in Landscape Architecture. This assignment was an urban design of a superblock surrounded by nationally famous universities in Beijing, China. On the site, there is a historic rail line running through; old residential buildings about to relocate, restaurants, a shopping mall, and a cinema serving all students around the world and a busy metro station right across the street. It was a very exciting location with great dynamics. I found the design proposals of that project very inspiring. Some designs used a pedestrian bridge to ease the traffic, celebrating the commercial vibe, creating a cultural hub for international students, and highlighting the historic value of the old rail line. I was fascinated by these ideas and curious about how they could happen.

When I attended graduate school, I began to take different classes across departments in the College of Built Environments, trying to understand what are the different perspectives to see the urban space. In my second year, I happened to have an opportunity to teach an urban design class with a friend, teaching young teenagers about urban design. Helping prepare the course syllabus gave me a chance to connect pieces I learned and break it down for young students. Then I started wondering, is it possible to have a more comprehensive curriculum for built environment education? This idea has been lingering in my mind, but I understand I cannot achieve that.

On the one hand, there are always more perspectives that can be added to any "comprehensive framework." On the other hand, I see both being able to understand the complicated urban conditions and focusing on a specific area valuable. I value the course discussing the large societal issue as much as the course spending months crafting woods in a rural village. These are all meaningful experiences that would make me a better designer. I feel it is unnecessary to position one over the other, and I seek to understand their relations without judgment. At that point, I found the intersection—the interdisciplinary studio. I wondered why teachers would be interested in "interdisciplinarity" and how they teach it? And then, I began this study.

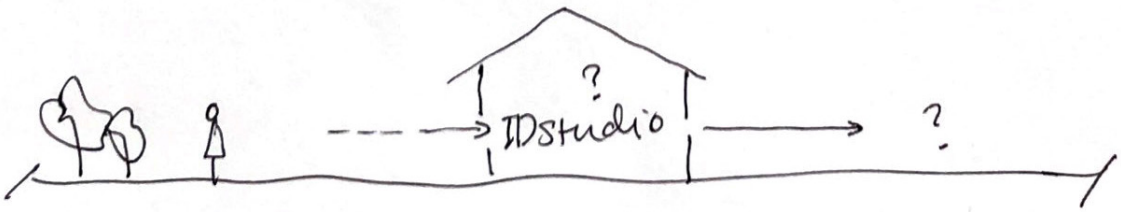


Figure 1. Thinking about Interdisciplinary Studio

1. INTRODUCTION

Recently, the term interdisciplinarity has been frequently brought up in almost every field. One reason behind this is because human knowledge of the world has been divided into too many branches and subbranches, to the degree that one single discipline is unable to see the whole picture of an issue (Ramadier 2004). One the other hand, in the context of globalization, the revolution of internet technology, and the increasingly serious environmental problems, human beings together are facing grand challenges such as climate change, social injustice, and sustainability. Under such a context, people began to seek innovative solutions through the unity of knowledge and collaboration with other disciplines.

Addressing environmental and societal issues through design and planning has long been the focus of built environment practice and education. Today, themes like climate change, equity, resiliency, and sustainability have been the primary discussions in the built environment field. "Every school of architecture is engaged in one or more of these large-scale societal issues [...] the importance of collaborative skills is becoming clearer", said Renée Cheng, the Dean of UW College of Built Environments (Cheng, Renée. Interview with Antonio Pacheco, 2019).

Interdisciplinary education is seen as a "hallmark strategy" to prepare students' knowledge and skills to understand and address the growing complex urban issues (Yocom et al. 2012). There is an increasing body of literature in environmental education discuss the rationales for interdisciplinarity as well as the challenges and methods to bridge the disciplinary divide (Hawkins et al. 1975, Braddock, Fien, and Rickson 1994, Petts, Owens, and Bulkeley 2008, Chapman 2009, Wallace 2017). However, limited literature studies interdisciplinary teaching and learning experience through personal reflection and narrative. To understand how to cultivate an interdisciplinarian requires not only theoretical support but also a return to the "complex actuality of doing interdisciplinary work" and studying individual narratives of doing it (Klein 1990, 184).

The College of Built Environments at the University of Washington has applied the concept of interdisciplinarity to the studio model, offering year-round college-wide interdisciplinary studios since 2009. Grounded in this context, for this study conducted a series of interviews with interdisciplinary studio instructors from 2009-2019, exploring: how they interpret the concept of interdisciplinarity in the context of built environment education; how their understanding reflects in the studio pedagogy; and what are the potentials they see for the future CBE interdisciplinary studio. My intention for this study is neither to generate an interdisciplinary studio model nor to define the concept of interdisciplinarity better. Rather, I sought an in-depth understanding of the interdisciplinary studio teaching objectives in CBE and possible implications for interdisciplinary teaching and learning.

In this study, Chapter 2 discusses the calling of interdisciplinary collaboration and education in the built environment, provides reference terminology of interdisciplinarity, and discusses the characteristics of interdisciplinary education and studio teaching in architectural school. Chapter 3 introduces the background for interdisciplinary studios in CBE and overviews the studio topics from 2009-2019. Chapter 4 discusses my research methods and my role as a researcher. Chapter 5 summarizes and interprets my findings, including how CBE studio instructors characterized interdisciplinarity, the cognitive process in interdisciplinary studio learning, and pedagogy to facilitate the process. Chapter 6 discusses the implications of this study and summarizes faculty members' visions for the future CBE interdisciplinary studio. Chapter 7 concludes and reflects on the lessons learned and makes suggestions for future research.

2. LITERATURE REVIEW

2.1 Urban Design Amid Interdisciplinarity in the Built Environment

The term "built environment" refers to human-made surroundings, including buildings, the spaces in between, infrastructural systems, farmland, among others, that support our day-to-day activity. Environmental and societal issues inherently require the collaboration of people from multiple disciplines to address, but the more vibrant understanding of the built environment today and the growing specialization in the professions give interdisciplinary collaboration and education new meaning.

Today, the asset of a well-built environment goes beyond the physical design to its larger societal and environmental impact. Evolving urban theories indicate various crucial aspects to understand urban phenomena and evaluate urban design. For example, Kevin Lynch's *The Image of the City* (1960) reveals the visual cognition of cities by studying how individuals experience physical space (Moudon 1992). Jane Jacobs (1961) explains how to maintain urban "vitality" by making spaces for human interaction. Norberg-Schulz (1979) discusses how architectural design can affirm the local identity and further give place special meaning (Sternberg 2000). Everyday Urbanism theories seek meanings of urban life from every day and focus on aspects overlooked by a professional urban designer (Kelbaugh 2008). Landscape Urbanism theories understand places as ever in-changing and evaluate the adaptivity and sustainability of urban spaces from a more extended time-frame (Waldheim 2006).

Along with the evolution of information technology, the material basis of society was reshaped and understood. Booher and Innes (2002) offered explanations about the "power" of the network created by individuals and agencies on urban space-making. More urbanists began to analyze cities based on the energies and materials flows (Jarzombek 2008). These multi-faceted understandings of the city enrich the dimensions and evaluation criteria of a well-designed environment today.

On the other hand, the built environment professionals have become more specialized and have been subdivided into various groups after industrialization. The professionalization in working and thinking also accelerates the disciplinary division in academia (Wortham 2007). Architects, for example, were considered as the "master builders." Before, the seventeenth-century engineering for the building was based on architects' empirical knowledge, and there was no clear separation between the two disciplines (Seaburg and Brown 1999). However, after industrialization, machines and prefabrication replaced craftsmanship. Engineers and scientists began to take over building development, and architecture design and production were thus separated (Gropius 1955). In the mid-eighteenth century, with the establishment of engineering schools, architectural engineering separated from architecture and became a formal discipline (Parasonis and Jodko 2013).

Urban Planning in the United States grew from courses of "comprehensive civic design" offered in Landscape Architecture in 1909 and then matured into full degree programs. The first graduate degree in City Planning was established at Harvard University in 1924. In the beginning, planning education in the United States was focused on physical urban design. After the 1950s, influenced by the New Deal and social movements, the focus shifted to land use regulation and social science and included environmental planning after the first Earth Day in 1970 (Alonso 1986; Guttenberg and Wetmore 1987; Dalton 2001).

Due to the disciplinary division to a multitude of autonomous units, a city pertains to various realities to different disciplines. Designers focus on physical characteristics, sociologists look at the personal experience, and psychologists pay attention to individual behaviors in space (Ramadier 2004). Each discipline has developed its own cultures in terms of framing issues and what evidence and methods are considered legitimate (Petts, Owens, and Bulkeley 2008).

Originating from the Weimar Bauhaus School, founded in 1919, "designing for the full human being" and "serving for the betterment of society" has been the highest pursuit of the built environment professions (Anker 2019). In recent years, "livable," "sustainable," and "equitable," have come to be regarded as important environmental qualities (Chapman and Larkham 1999; Petts, Owens, and Bulkeley 2008). Chapman and Larkham (1999) use London as an example and further unpack the 'environmental qualities' into eight elements, ranging from human activities, physical design, to urban management. Both the early ideal of Bauhaus and the recent pursuit of these environmental qualities imply a good environmental design, and urban life is multifaceted and seek integration of multiple considerations in a design (Chapman and Larkham 1999; Sternberg 2000).

In the endeavor to create an integrated society, Walter Gropius, the founder of Weimar Bauhaus School, expressed his concern about vocational training in built environment education. He says, "the fact that the man of today is, from the outset, left too much to traditional specialized training which merely imparts to him a specialized knowledge, but does not make clear to him the meaning and purport of his work, nor the relationship in which he stands to the world at large." He urged the next generation to have an "unprejudiced state of mind," learn and collaborate with other disciplines, and believe in "togetherness" (Gropius 1955, 23).

Thus, preparing students for professional practice as well as instilling a more comprehensive mindset requires an updated educational approach. Sterling (2003) suggests that environmental education shall change from suiting modern industrial age to postmodern information age "knowing more wholly." They foresee that future learning will move from decontextualized abstract knowledge to applied and local knowledge, from institutional isolation towards social and community engagement, from formal education to life-long learning, from single and separate discipline towards more inter- and transdisciplinary.

Summarizing above, today, with the growing specialization in the built environment professions and the multi-angle understandings of the places, to accomplished a thoughtful project requires a much broader interdisciplinary collaboration. Moreover, interdisciplinary education seems increasingly important under such context.

2.2 Interdisciplinarity

Historic Context & Terminology

The literal meaning of "inter-disciplinary" is "between disciplines." The emergence of the concept closely tied to the long history of Western science development and the reductive approach to examining a subject apart from the whole (Karlqvist 1999). Scientific knowledge came from deductive reasoning as universally true and context-independent (Flyvbjerg 2001). The reductive approach has profoundly influenced how people perceive the world and organize knowledge. It is reflected in segmented academic departments, specialized research, and practice domains. (Karlqvist 1999). Discipline, in this sense, "is a specific body of teachable knowledge with its background of education, training, procedures, methods and content area" (OECD 1972).

Contrary to the postmodern worldviews, such as systematic thinking, complexity and change theory, and ecological thought in recent decades (Sterling 2003), the linearity of disciplinary

thinking is lacking in the perception of holistic and incapable of explaining the complexity of contemporary cities (Ramadier 2004). Concepts like cross-disciplinary, multidisciplinary, interdisciplinary, and transdisciplinary emerged in recent decades. These concepts are all related, indicating different approaches to incorporating or addressing how the multiple disciplines can "work together." However, there is no common definition of these terms. Klein (1990, 55) summarized the four major ways how "interdisciplinary" is defined: by the form it assumes, by the motivation, by the principle of interaction, and by the level of integrations.

The following definitions are used in this thesis.

> ***Interdisciplinary*** is an adjective describing the interaction among two or more different disciplines. This interaction may range from simple communication of ideas to the mutual integration of organizing concepts, methodology, procedures, epistemology, terminology, data, and organization of research and education in a fairly large field (OECD 1972). Interdisciplinary studies draw on disciplinary perspectives, and integrate their insights, intending to construct a more comprehensive perspective (Newell and Klein 1996).
>
> ***Multidisciplinary*** is a range of disciplines working in a self-contained manner with low levels of collaboration or synergy in the outcomes (Bruce et al. 2004).
>
> ***Transdisciplinary*** focuses on the issue and its context, and the organization and articulation of knowledge instead of the predetermined disciplinary bias (Bruce et al. 2004; Ramadier 2004).

Interdisciplinary Education

The concept of interdisciplinary education grew from the idea of integrated instruction in schools that emerged in the mid-nineteenth century, attempting to create an instructional method to understand a subject about others and the whole (Klein 2006). The application of interdisciplinary education ranges from a single course to a degree program. It was adapted to various levels of education, including graduate, post-graduate, Ph.D. program (Graybill et al. 2006), and adult education (Dinmore 1997). There are also different kinds of formats branded as interdisciplinary programs. Some are jointly offered by different academic departments; others are hosted in one department and supplement with several cross-department courses (Braddock, Fien, and Rickson 1994).

Interdisciplinary theories pay attention to the integration of epistemologies and methods, but effective interdisciplinary education relies on continual day-to-day interaction among individuals.

In interdisciplinary education, disciplines are assembled, but integration is left for the participants to make. Effective interpersonal communication and sustained formal and informal interaction are seen as the key to achieving interdisciplinarity (Braddock, Fien, and Rickson 1994; Franks et al. 2007; Yocom et al. 2012).

Interdisciplinary Teaching & Learning

The interdisciplinary learning outcome is a cognitive product. Marlene Schommer (1994) defines how individuals "believe about the source, certainty, and organization of knowledge" as "personal epistemology belief." Synthesizing epistemological belief literature, she found that young students tend to believe in absolute knowledge being handed down by authority, encountering different views would stimulate them to refine their previous epistemology belief. Bringing this idea to interdisciplinary education, Ivanitskaya et al. (2002) provide a more theoretical description of the learning outcome of interdisciplinary education. They characterized the intellectual advancement through interdisciplinary experience as a "higher-order cognition" or "metacognition"—seeing the relations of different knowledge, internalized, and reorganized the knowledge. They suggest interdisciplinary programs could promote individuals' "metacognitive skills"—knowing when and how to apply different strategies in different contexts, and better-preparing students with complex thinking skills.

Moreover, thus, through interdisciplinary learning, students could "contend with complex knowledge domains that lack structure." To obtain a higher-order of cognition requires individuals to reflect on, seek meaning in, internalize, and restructure the knowledge learned (Ivanitskaya et al. 2002). It needs "an understanding of the discipline themselves, as well as an understanding of how to connect disciplinary knowledge" (Karlqvist 1999).

Scholars point out that students need to be intentionally taught to think in an interdisciplinary way (Huber, Hutchings, and Gale 2005). The teacher plays a crucial role in constructing interdisciplinary experience and mediating the internal process. Lenoir (1997) summarizes interdisciplinary teaching on three levels: curricular, didactic, and pedagogical, meaning the structure, the pre-active or proactive anticipation, and the actualization. Meanwhile, the dimension of diversity among students also potentially impacts the learning experience and how learning is perceived. The variable among individuals includes prior academic experiences, personal characteristics, personal commitments, and vocational experiences (McEwen et al. 2009).

2.3 Interdisciplinary Studio

Studio Teaching in Architectural School: History, Theories, Characteristics

The studio as a pedagogical tool is commonly used in built environment education, especially in design disciplines like architecture and landscape architecture. Because the traditional studio is largely physical-design-focused and emphasis on the techniques used in the architectural professions, it is less central in urban planning education, especially when the program is situated within social sciences and human geography (Vella et al. 2014).

The French atelier system at *École des Beaux-Arts* first adapted studio into architectural education in 1819, to improve students' "artistic" and analytical thinking skills." In the *École des Beaux-Arts* model, the studio serves as an applicational course that came after the theoretical session. In 1918, the Weimar Bauhaus School established and placed the studio at the center of architectural education. Distinguished from the two-fold *École des Beaux-Arts* atelier model, Bauhaus integrated theories and practical skills learning within an interdisciplinary studio environment (Pasin 2017). These two studio models primarily influenced architectural design education around the world between 1930 and 1960 (Pasin 2017).

The Bauhaus studio, integrating theory and application, is a hands-on approach to learning. In other words, an experiential learning model. John Dewey depicted how individuals extracted knowledge and constructed meanings through their experiences as "learning by doing." Dewey believed learning not only came from reading textbooks, but also from physical actions–*doing*. His experiential learning theory concerned how the environment affected students' experience and how students reflect upon the experience (Berman 2013).

Donald Schön echoed on the idea of experiential learning in his book, *Educating the Reflective Practitioner*, which is one of the most widely discussed literature on studio pedagogy. In the book, Schön characterizes studio education as a "reflective practicum," representing essential features of professional practice. In the studio, disciplinary knowledge is developed through "reflection-in-action." The architecture studio experience allows students to "think of the problem architecturally." However, the most "essential meanings" cannot be taught but must be "discovered and appropriated" by the students themselves through the experience (Schön 1987, 92-93). Schön sees studio instructors' function as a coach rather than a teacher, who demonstrate, question, perform, and guide the students through the experience. In verbal instruction and nonverbal performance, students see and name the world in a particular professional way, and later practice based on such understanding (Figure 2). Schön explains the process of learning to

see and think like one's profession: "through countless acts of attention and inattention, naming, sensemaking, boundary setting, and control, they make and maintain the world match to their professional knowledge and know-how [...] they have, in short, a particular professional way of seeing their world and maintaining the world as they see it" (Schön 1987, 36).

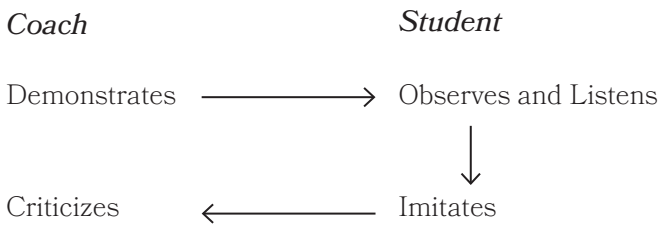


Figure 2. Map of Intervention and Responses
Source: Schön 1984, p114

Furthering Schön, Vella et al. (2014) and Hostetler (2014) summarize critical characteristics of a studio in built environment education, including project-based learning, synthesizing and applying knowledge and skills, simulating complexity in real-world practice, professional rehearsal, collaborative work, and social learning from peers. Besides instructors and students, often, practicing professionals, project clients, and community members would engage in the studio process and final reviews, sharing their thoughts. Through doing the project, students learn to apply knowledge gained from other classes to specific contexts, experience the professional procedure, and engender a sense of professional persona (Vella et al. 2014; Thompson 2016).

The specific course content in the studio accommodates the different demands in the built environment professions. For example, architecture studios usually focus on plot-scale physical-design and cultivate creativity. In contrast, planning studios aim to equip students with leadership and collaboration skills, project management, and the ability to work with diverse stakeholders (Higgins, Aitken-Rose, and Dixon 2009; Hostetler 2014). In addition, different types of studio-like experiential classes have emerged in recent years, such as design/build studio, policy-oriented workshop, community-based studio, and research-based studio (Abramson 2005).

Interdisciplinarity + Studio

The movement from modern industrial thinking to systematic postmodern thinking has slowly been reflected in the changing approach to design (Milburn and Brown 2003) and the discussion of the studio. Scholars began to see the studio model as more than a tool for professional training but also an opportunity to explore interdisciplinarity, prepare students for complex work-life, and broaden the definition of research. Chapman (2009) outlines a model

linking different spatial scales and timescales focus of the built environment professions and the instruments they use, from planning policy and project implementation. He suggests that in interdisciplinary built environment education, the "shared appraisal of places" contributes to integration between disciplines. Yocom et al. (2012) suggest that interdisciplinary experience should be intentionally structured and provide a pedagogical framework to foster the "collective understanding" among students across disciplines. Building upon Yocom et al., Hostetler (2014) emphasizes interdisciplinary studio instructor should facilitate the forming of metacognition, the "awareness of how one learns," and proposes a Process-Based Learning (PBL) studio model. With the components of "discovery" and "interdisciplinary collaboration," Hostetler adds two more activities to help students understand how they learn—an introduction of the studio at the beginning and a reflection on how they learned at the end of the studio. Heikkinen (2018) explores how studio-based higher education cultivates "T-shaped" knowledge workers--who "possess deep disciplinary knowledge and a keen ability to communicate across." Wortham (2007) argues that teaching studio and the inquiry process of the architectural studio can be a new way to do research. He claims the open discussion in the class, engagement with people, being in the place is different from the traditional "deep and narrow" scientific research, the hegemony of the independent researcher, but about an ideology of transdisciplinary knowledge production.

As revealed above, an interdisciplinary studio in professional education serves multiple purposes. The studio as a teaching approach mirrors professional practice, and it attempts to prepare a student for future work. Meanwhile, it opens up a new opportunity to do research. Lenoir (1997, 79-83) categorizes four primary aims of interdisciplinary practice.

1. Scientific Interdisciplinary — to link, or create, or restructure scientific/theoretical knowledge,
2. Practical Interdisciplinary — to practically respond problems arise in everyday life based on individual's experiential knowledge,
3. Professional Interdisciplinary — attempting to train a professional as much as the practice itself, which requires integrating theoretical knowledge and experiential knowledge to bring about a professional action,
4. Interdisciplinary in School — to spread scientific knowledge in teaching and training context.

In this sense, an interdisciplinary studio is where the above four aims intertwine. The studio as part of the professional training, spreading and integrating theoretical knowledge, experiential knowledge, and professional knowledge in a specific project. By teaching and learning with people from other disciplines, basing on a particular project, teachers and students may potentially link and restructure their knowledge to understand the issue.

The relationship between discipline, profession, and the social-political world is reflected in the studio. Schön (1987, 306-309) discusses the inherent "dual-orientation of professional school"—the dilemma between the discipline-oriented academic research and the practice-oriented vocational training. He sees the "reflective practicum" (studio) as a bridge between disciplinary research and professional practice. While Schön seeks the coherent relationship between the world of university and practice can be achieved in the studio, other researchers find it rather difficult. Dutton (1987) claims that the knowledge taught in architectural school is not a neutral entity free from political-economic trends, and the "asymmetrical relations of power" are reproduced in the studio. Higgins, Aitken-Rose, and Dixon (2009) find the tension between academic and the larger world fostered through studio engagement, requiring "input from experienced practitioners rather than ivory-tower scholars."

2.4 Challenges in Moving Toward Interdisciplinary Education

The calling for built environment education is growing popular, yet it is not as easy to transform disciplinary education to interdisciplinary. Scholars recognize two significant challenges facing interdisciplinary education: the discipline-profession dichotomy, and the traditional institutional structure. Braddock, Fien, and Rickson (1994) find the professions and the demand from the job market substantially influence what is taught and how it is taught in the university, while they may "have little understanding of interdisciplinarity and push for disciplines." Klein (2006) further discloses the underlying process of disciplining knowledge, revealing a complicated relationship between knowledge, discipline, school, and professional practice (Table 1). Many scholars call for widening the definition of what counts for tenure and promotion to encourage interdisciplinary teaching and research (Wortham 2007; Wallace 2017; Klein and Falk-Krzesinski 2017).

In sum, as suggest by Braddock, Fien, and Rickson (1994, 39), an interdisciplinary education model has to solve the challenges of: "1) structural or formal integration of disciplines; 2) interpersonal or informational integration; and 3) external pressure by professional associations, employers, schools, and government agencies."

Feature 1. Functional Differentiation
• a subject matter and objects isolated for study • a body of evidence, canon, content, laws, formalisms • exempla, models, paradigms, and law • concepts and theories • methods, procedures, techniques, and skills • explanatory modes, language and argument styles • ontologies and epistemologies.
Feature 2. System of Power
• departmental units of teaching and research • institutional structures of a profession • criteria of validity and legitimated practices • a behavioral culture that shapes self and collective identities • patterns of education and training, publication, and funding • accounts of disciplinary history • employment and labor markets • allocations of resources, privileges, and prestige • economies of value with social, political, and intellectual capital.

Table 1. The Underlying Process of "Disciplining" Knowledge.
Source: Klein 2006

In sum, studio as a pedagogical approach in built environment education has been used to prepare students to think and act like their profession, bridging theories and practice. The relationship between discipline and profession is reflected a studio's focus and teaching methods. Interdisciplinary studio adapts the concept of interdisciplinarity to studio teaching and learning, attempting to prepare students for the complex real-world issue and seeking an innovative answer to challenging problems. However, the idea of an interdisciplinary studio is still experimental, and there is no common template on what to do and how to do it. This study used the interdisciplinary studio in the University of Washington College of Built Environments as an example, exploring the actuality of interdisciplinary studio teaching and learning.

3. RESEARCH CONTEXT

3.1 Background

Today, the College of Built Environments (CBE) at the University of Washington (UW) is made up of five departments: Architecture, Construction Management, Landscape Architecture, Real Estate, and Urban Design & Planning. CBE dates back to 1914 when the Department of Architecture was established in the College of Arts and Sciences. In the early years, the program followed the *École des Beaux-Arts* tradition (Johnston 1991). In 1957, the architecture department broke out from the old college, joined by the Department of Urban Planning, and became the College of Architecture and Urban Planning (CAUP). The College later added the programs of Landscape Architecture and Building Technology and Administration, embracing the thinking in "more versatile terms, not just of architectural design but of environmental design and the breadth of outlook that this implied" (Johnston 1991, 52). In the meantime, some curricular changes and new seminars were introduced "to bring to the student every pertinent technical development, [...], develop students the highest professional integrity, [but not] over-emphasis on these technical and specialized aspects of professional education" (CAUP Annual Report 1957-58, cited by Johnston 1991, 75).

In 2009, the College of Architecture and Urban Planning was renamed as the College of Built Environments. The rebranding reflects an interdisciplinary vision of the College, seeking greater synergy and collaboration among its departments and continuing efforts to capitalize on the College's diverse range of worldviews and areas of expertise (Thompson 2016). "College of Built Environments' better reflects our core responsibility to 21st-century challenges — urbanization, climate change, and livable communities," said Daniel Friedman, the dean of CBE at that time. "Environmental integrity demands an increasingly interdisciplinary approach to design, planning, and construction" ("University of Washington Architecture and Urban Planning Renamed the College of Built Environments | UW News" n.d.).

Built Environments Studio & McKinley Futures Studio

In 2009, the newly designated College of Built Environments began to offer a series of interdisciplinary, multi-departmental studios known as Built Environments Laboratories (BE Labs), now called BE Studio. By requirement, they are taught by at least two faculty from different CBE disciplines and are generally offered in Fall and Winter quarters. In BE Studio, students from all five BE departments come together. They are tasked with producing projects that generate research-based hypothetical design scenarios and are challenged to consider larger problems facing society–health, the environment, the economy, science, and technology.

In 2014, thanks to an endowment from David and Jan McKinley, CBE began to offer another series of interdisciplinary studios for the design of the future built environment. Different from the BE Studio, topics of the McKinley Futures Studio are visionary and future-oriented.

In BE Studio and McKinley Futures Studio, students consult with and are critiqued by experts outside of the design field, such as lawyers, environmental experts, healthcare providers, business leaders, among others. The students use the perspectives and feedback to develop potential solutions and present their findings and proposals at the end of year critique.

To initiate a BE studio or McKinley Futures studio, faculty members from different departments who are interested in teaching an interdisciplinary studio collaborate to devise a studio proposal. The Dean's Office reviews the proposals and selects the annual offerings. The BE Studio and McKinley Futures Studio are optional advanced studios. Both graduate and undergraduate students from all departments are eligible to apply based on their interests. Given that they are advanced studios, student participants usually have prior entry-level studio experiences in their home department or previous degree.

3.2 Overview of BE studios and McKinley Futures Studio 2009-2019

From 2009 to 2019, the College offered sixteen BE studios and McKinley Futures studios (Table 2). Approximately twenty-four faculty members from four departments (Architecture, Landscape Architecture, Real Estate, Urban Design & Planning) engaged in the teaching, and some taught multiple times. Among all disciplines, Architecture and Landscape Architecture are the most active, while Construction Management has never been involved in instruction.

YEAR	STUDIO TYPE	STUDIO TOPIC	INSTRUCTORS (DEPT.)					PROJECT SITE		
			ARCH	CM	LA	RE	UDP	SEA.	U.S	INT.
2009 Aut.	BE Lab	Community-Based Earthquake Recovery in Taoping, China			●		●			●
2010 Aut.	BE Lab	Vertical Farming and Sustainable Site Design	●		●		●	●		
2011 Aut.	BE Lab	Designing For Urgent Change on The Pacific Rim (Seattle+Japan)	●		●			●		●
2014 Spr.	Mckinley	Cities on Water	●						●	●
2015 Spr.	Mckinley	Cities within Cities	●		●			●	●	
2015 Aut.	BE Lab	Gravity and Water (Rome, Italy)	●		●					●
2016 Spr.	Mckinley	Smart Cities and Urban Productivity	●		●			●	●	●
2017 Spr.	Mckinley	Restructuring for the Future City	●		●			●		
2017 Aut.	BE Lab	Transit Oriented Development at Ken/DesMoines	●			●	●	●		
2018 Win.	BE Lab	Staying in Place: Designing for Community Resilience			●		●	●		
2018 Spr.	Mckinley	Mexico City-Towards a Resilient City	●		●					●
2018 Aut.	BE Lab	Mid-century to Modern High Performance–Designing the 21st Century Neighborhood	●				●	●		
2019 Win.	BE Lab	The Right to the City: Jackson Street Social Justice Transect Studio	●		●			●		
2019 Spr.	Mckinley	Transformational Design: Developing Alternative Urban Futures in an Era of Change	●		●	●	●	●	●	
2019 Aut.	BE Lab	The Future of Seattle Industrial Lands	●				●	●		
2019 Aut.	Mckinley	Nehemiah Initiative: Exploring Asset Based Community Development on Three Sites	●			●	●	●		

Table2. BE Studio and McKinley Futures Studio Inventory 2009-2019
Source: created by the author

Topics of McKinley studios are usually speculative, seeking innovative solutions for large-scale and long-term environmental and societal issues, such as global warming and sea-level rise. For example, the "Cities on Water" McKinley studio in 2014 imagined future offshored urban development alternatives based on technology transfer, natural formations, and pure invention. "Cities within Cities" in 2015 engaged a selection of urban district typologies in Seattle and Los Angeles and proposed design interventions to facilitate the equitable influx of a diverse population and strengthened local resilience, transforming the threat of climate change into an opportunity for social and ecological urban regeneration. In 2017, the "Restructuring for the Future City" studio re-envisioned a highly dynamic and multi-functional public space system in Seattle, through reconfiguring spatial and programmatic jurisdictions and exploring new policies and governance models. The Autumn McKinley studio in 2019 looked at gentrification and displacement issues of the African American population in Seattle's Central District. The studio explored more affordable alternative development scenarios to respond to community needs through real-estate

assessment and redevelopment of historically-Black churches. It represented an important pivot to think broadly about social rather than specifically environmental futures.

Topics of the BE studios were more community-based, responding to local needs and the urban development trends in the Puget Sound area. In the BE studio, faculty will often incorporate their research into the studio or partnered with a 'real client' to form the studio topic. For example, the 2009 BE studio partnered with Sichuan University in Chengdu China and explored how the Taoping region may recover from the devastating earthquake in 2008. The studio aimed to enhance the resilience in Taoping by empowering local communities, giving voice to local knowledge, respecting the regional natural and cultural characteristics, and building trust between different stakeholders. The 2010 BE studio focused on a low-income housing complex redevelopment in downtown Seattle, seeking design solutions to support agricultural integration and increase housing densities. In Autumn 2017 BE studio, students imagined the light rail expansion in the Seattle area would become a catalyst for suburban transformation. Students proposed designs with mixed-use development and connected ped-bike systems around the light-rail station area, transforming the auto-oriented suburb into a vibrant, livable urban space. The 2019 Winter BE studio studied how socio-economic inequity and precarity, housing scarcity, identity and heritage, and political resistance are experienced through people's everyday life. In the context of Seattle Jackson Street Corridor, the studio explored how design can support a particular social structure and experience.

The project sites for these studios were varied. Most BE studio projects are based in the United State, while some McKinley studios have looked at overseas countries in Asia, Europe, and South America. The international projects sometimes include a study abroad trip for students to have experience in foreign cities in person.

The history of CBE shows that the College has gradually embraced an interdisciplinary focus in the overall organization and pedagogy. The topics in the BE Studio and McKinley Studio reflect faculty members' and students' interests in the College, as well as trends in the built environment. The different characteristics between the futuristic McKinley Studio and the present-focused BE Studio enrich the studio options. It also entails a slightly different purpose of being interdisciplinary.

4. RESEARCH METHODS

4.1 Research Questions

This study explores interdisciplinary education under the specific context of the College of Built Environments (CBE) at the University of Washington. Through a series of one-on-one in-person interviews with the previous CBE interdisciplinary studio instructors, this study seeks to answer how instructors' understandings of "interdisciplinarity" are reflected in their studio pedagogy. Explicitly, this study explores how each instructor describes the concept of interdisciplinarity, whether they designed the class to achieve interdisciplinarity and how they designed it, what they learned from the experience, and lastly, how they envision the future for interdisciplinary studio education in CBE.

4.2 Characteristics of Participants

I used the CBE interdisciplinary studio inventory presented in the last chapter (Table 2) as a reference for recruitment. Considering face-to-face interviews would provide more in-depth communication, I reached out to twenty potential participants who are currently based in Seattle, out of the twenty-four on the full list. Four faculty members were excluded because they have left the College or were unable to conduct face-to-face interviews. Through an email invitation, all the potential participants were informed of the research background, interview protocol, and confidentiality.

Fifteen faculty members replied and volunteered to share their thoughts and experiences of interdisciplinary studio teaching—six from the Architecture Department, five from the Urban Design & Planning Department, three from the Landscape Architecture Department, and one from the Real Estate Department. Among all, eleven of them are full-time faculty, and four are

affiliate faculty. Meanwhile, five participants had served an administrative role in the College, who provided insights into CBE interdisciplinary studio from an institutional administration perspective. Interestingly, all participants either have a cross-discipline educational background or were educated in one discipline while working in another adjacent field. The diversity of participants gives a rich description and holistic vision of CBE interdisciplinary studio education.

4.3 Interview Procedure

Under a constructivist worldview, this study hopes to understand each studio instructor's perspective in their particular circumstances, allow and collect a complexity of views spoken from different standpoints rather than narrowing thoughts to a few categories, and see the CBE interdisciplinary studio education more comprehensively (Creswell 2014). Hence, the interviews followed a semi-structured protocol (Table 3). As the researcher, I rarely controlled the direction of the dialogue. I allowed my interviewees to express their flow of thoughts. I played the role of a listener. I asked questions, but I tried not to give my opinion or engage in the discussion of a topic. Each interview took about 30-75 mins, and the interviewees shared their: 1) understanding of "interdisciplinarity," 2) teaching methods applied and lessons learned, and 3) vision for future CBE interdisciplinary studios.

Interview Protocol
1. How does your educational and work experiences make you interested in "interdisciplinary"?
2. What does "interdisciplinary" mean to you? How do you understand and describe it? How does it look like when "interdisciplinarity" was achieved?
3. What is your personal motivation to teach this studio?
4. Why this topic for an interdisciplinary studio?
5. How did you design the course's framework and the assignment?
6. What do you hope the students will take from the class in regards to values/knowledge/skill?
7. How do the process and outcome look to you? Did they meet your expectations?
8. What works well, and what does not? Where are the challenges coming from?
9. What are the future potentials for CBE interdisciplinary studio?

Table 3. Interview Protocol
Source: created by the author

To have an in-depth understanding of how faculty understand the idea of "interdisciplinarity," the interview started by asking how their previous life experience led their interest to this concept.

And then it moved on to ask what motivates them to teach the interdisciplinary studio and how they would describe the idea of interdisciplinary. I intentionally use the term "describe," instead of "define," considering asking for a rigid definition might limit the richness of the answers. Sometimes, I rephrased the question as "what does 'interdisciplinary' mean to you" or "how it might look like when interdisciplinarity was achieved in the studio project," hoping the interviewees would give more elaboration on their understandings.

The interviewees were then asked to describe their pedagogy to achieve interdisciplinarity. The next question further broke down the course objectives to value, knowledge, and skill (Frank 2006), asking each faculty what they hoped to convey in the interdisciplinary studio in regards to the three components. And then, I asked the interviewees to reflect on the students' performance, whether the process and outcome meet their expectations, and lessons learned from the teaching experience.

I ended each interview with a future-visioning question, asking each participant, "what potential they see for the future CBE interdisciplinary studio." I kept the question of "potentials" open-ended, trying not to limit ideas to particular perspectives and allowing visions from different considerations.

With the permission of the participants, the interviews were audio-recorded in order to document the information accurately. The audio records were later transcribed. All participants received a digital copy of the transcripts, and they were welcome to offer additional thoughts in written form. I also asked the interviewees for a copy of their studio syllabus at the end of the interview, if they are willing to share.

4.4 My Role as Researcher

When writing this thesis, I continuously reflected on my role as a researcher, and both my stated and preselected motivations for doing this study. It is important to recognize my dual role in when doing this research, as a researcher as well as a student, and my educational experience in different cultures and different disciplines. All these instruments hold potential shaping the direction and the interpretation of the result. My cross-discipline study experience makes me interested in the concept of 'interdisciplinarity.' Nevertheless, as a student, I am not clear about the meaning of interdisciplinary education, which stimulated my curiosity about teachers' perspectives.

The three years I spent in the CBE studying Landscape Architecture and Urban Design and Planning, and my personal experience of one BE studio and one McKinley Futures studio give me a better understanding of the CBE context and different standpoints of the interviews. Benefiting from the role of being a student researcher, my interviewees, the teachers, tend to be more willing to explain the "mystery of interdisciplinary teaching" to me. However, my perceptions and interpretations of interdisciplinary studio education are also shaped by limited experience as a student.

I see the result of this study as co-constructed by both the researcher and the participants. There are two types of self-interpretation in giving meaning to this study — self-interpretation of participant and self-interpretation of researcher. The interdisciplinary studio teaching experience and the meaning of doing interdisciplinary studio only come into being as the interviewees reflect, describe, and name them (Van Manen 2016, 35). Through the interview, the interviewees verbalize their interdisciplinary understandings, self-interpret their studio teaching method, and give meaning to the interdisciplinary studio. They are both the meaning giver and the subject of this study (Flyvbjerg 2001, 36). As the researcher, I collect the individual reflections, piece them together to a bigger picture, and seek a comprehensive understanding of the CBE interdisciplinary studio, and then reinterpret the story. My self-understanding as a researcher and background do not "exist in a vacuum," which should be understood with the context (Flyvbjerg 2001, 33). The result, the interpretation and the vision of the CBE interdisciplinary studio is a joint product of the research and the participant. As said by Mishler, it is "what the interviewee and the interviewer talked about and how they talked about it" (Mishler 1986, vii).

4.5 Interpretation & Documentation

Once each interview was completed, I transcribed the recordings with the assist of otter-ai software. It usually takes a half-day to transcribe a 45 minutes interview, and I would re-listen to the audio multiple times. The transcribing process allows me to re-immersed in, digest, and memorize the conversations. In the meantime, I used my own educational experiences and intuition to understand the dialogues and coded the transcripts by manually highlighting emerging themes in a different color.

To make sense out of the fifteen narratives, I went through a first inductive and then deductive path. I first sought an understanding of each participant's self-interpretation in their particular circumstances, and I wrote memos to document my thoughts along the way. In the process, I

was sometimes doodling on my sketchbook to think about obscure words and seek relationships between concepts. I later found that these impromptu doodles could help me quickly grasp some fleeting thoughts and avoid finding precise words to describe an idea at the moment.

When all interviews finished, I reviewed the printed transcripts and the different themes I highlighted, using the course syllabi as supplement to understand the pedagogical approaches mentioned by the interviewees. I saw two keywords, "differences" and "understanding," repeated in every conversation. I went back to each dialogue to understand why and how "differences" and "understanding" were described. By going back and forth between individual descriptions and the collective narrative, I found three shared features of how each individual characterized interdisciplinarity and an experiential structure of interdisciplinary studio. While using this structure as a rough framework to retell the story logically, I do not hope to reduce or generalize descriptions into a "model" or match any definition of "interdisciplinarity." I believe all the perspectives, together, give a richer and multidimensional portrait of the CBE interdisciplinary studio pedagogy. Thinking of the lived life is always more complex than any explication of meaning can reveal and the "ineffability of pedagogy" can never be summarized in a simple model. In the following sections, I tend to present my findings with its "textuality" in the "dialogic text," hoping readers can grasp the full meaning by being in the dialogue (Van Manen 1990, 38).

5. FINDINGS & INTERPRETATION

5.1 Featuring Interdisciplinarity

What does interdisciplinary mean to you?

There has to be a discipline--an expertise domain. Disciplines come together around a shared goal, establishing what those goals and objectives are, and a community agreement about what we are trying to achieve, and mutual respect that all disciplines can collaborate and add something.

How do faculty members understand the concept of interdisciplinarity? Here is one example that covers many other ideas and outlines the process of doing interdisciplinary work. Bringing all the other perspectives together, I summarized three keys that faculty described as interdisciplinarity:
1) having the differences as the foundation,
2) finding shared value and approach,
3) and the interdisciplinary reflected in the meaningful, integrated, and unpredictable result.

Differences as Foundation

Speaking of interdisciplinarity, almost all interviewed instructors first mentioned the differences between disciplines in the built environment field. "You know, we have very different focus. Even really close allied disciplines like Architecture and Landscape Architecture. They use different language, have different thinking, and slightly different approach. It is an opportunity for student to see what they are doing." Another interviewee summarized the differences between disciplines in ordinary language: "in the realm of CBE, we are all dealing with built environment stuffs here. But we are doing different things. We have different values driving the work. And we have different method and vocabulary. If those are the disciplines, interdisciplinary is bringing in."

The different expertise and perspectives brought by separate disciplines is the foundation of being interdisciplinary, as expressed by many instructors. The beauty of interdisciplinarity sits in the differences. One said, interdisciplinarity is "bringing to bear more than one disciplinary perspective in a synthetic manner, together to help illuminate a problem, or explain something."

For an interdisciplinary outcome, there have to be differences in knowledge to understand a situation from various angles, and solving a problem relies on different skills. "I do believe that you need to have the discipline to be interdisciplinary. You have to be based on something that you can't just do everything," said one faculty. "You have to have domain expertise," another echoed. The idea that interdisciplinarity is based on disciplinary differences is directly brought up by three interviewees. Other interviewees expressed that they enjoyed interdisciplinary work because it allows them to think about an issue from various perspectives.

Meanwhile, in the interviews, the concept of "discipline" has various definitions. For most interviewees, discipline roughly equates to the academic discipline and its professional practice. While three instructors described inter-discipline a bit more broadly, speaking of marrying professional knowledge and the "knowledge of the place." They see the place – "the locality," "the indigenous knowledge rooted in experience and oral history"— is a kind of "discipline" to which one could engage. To them, interdisciplinarity in a built environment project is a "careful spatial response" resonated with both the professional knowledge and the "non-specialized" knowledge from "people in place" and their everyday life. They explained:

> *I saw the cultural difference and the environmental difference as being a kind of discipline. I feel that cultural literacy, including historical literacy and geographic literacy, for working with people in places, and making places, and respecting the uniqueness of places, which is the key to the environmental design and planning fields. All of those involved a kind of transdisciplinary capacity.*

> *How I see interdisciplinary teaming and education is—"what is the question" and "what area of knowledge do I need". I want the best knowledge at the table. And that knowledge might come from residents because they are actually in the place, not specialized knowledge. Or you could frame the non-specialized knowledge as "the knowledge of the place."*

While seeing disciplinary differences as the foundation of interdisciplinarity, the differentiation is also a challenge that must be resolved in the interdisciplinary studio. In CBE's context, architects, landscape architects, planners, real estate developers, and engineers usually focus on different scales of the built environments, engage at different times in the work process, and stay for different lengths of time. Planners generally engage earlier in the process, laying out the city zoning requirements and the neighborhood guidelines. Architects and landscape architects will come in later to design a specific site. Then, engineers join in to develop technical solutions for implementation, and real estate developers come to examine the financial feasibility. Given the nature of their work, each discipline develops its distinct approach, process, and value system, and a body of professional terms to explain the methods and values.

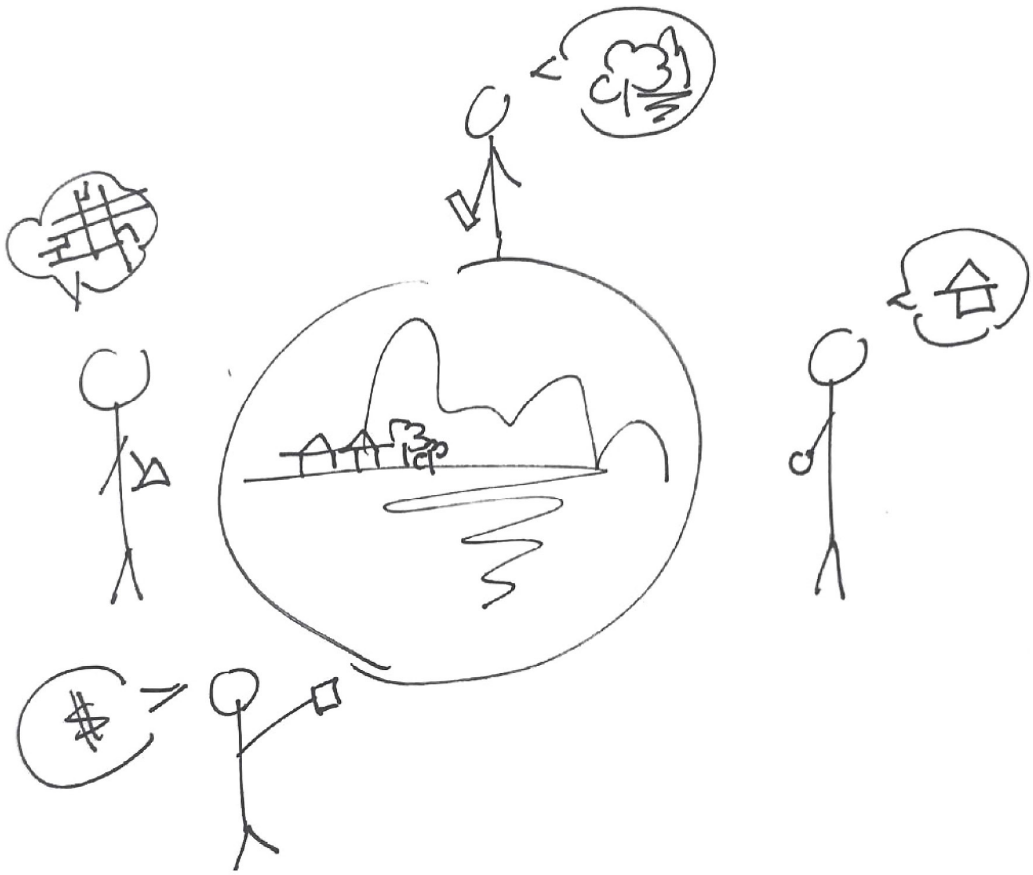


Figure 3. Differences as Foundation
Source: created by the author

The differences in disciplinary thinking are reflected in the departmental culture in school, and the culture cultivates individuals' persona. These multi-level differences all need to be reconciled in the studio to achieve interdisciplinarity. One interviewee describes, "you have all these different values and different cultures in each department—it reflected in faculty, it reflected in how things are taught, and it reflected in student. So, you have to spend some time in the interdisciplinary studio [to create] commonality."

Shared Value & Approach

Building upon the different perspectives and expertise, establishing a "shared goal" is the second recurrent theme. The term is phrased in different ways, such as "share value," "common good," "end goal," "collective understanding," among others. However, in general, faculty members' expression of a shared value reflected the values and considerations of each discipline and systematically connected them. One said, "like a system understanding from landscape architecture, influencing a district-level urban design plan, and it connects well to existing urban planning policy. You know, that seems pretty delightful."

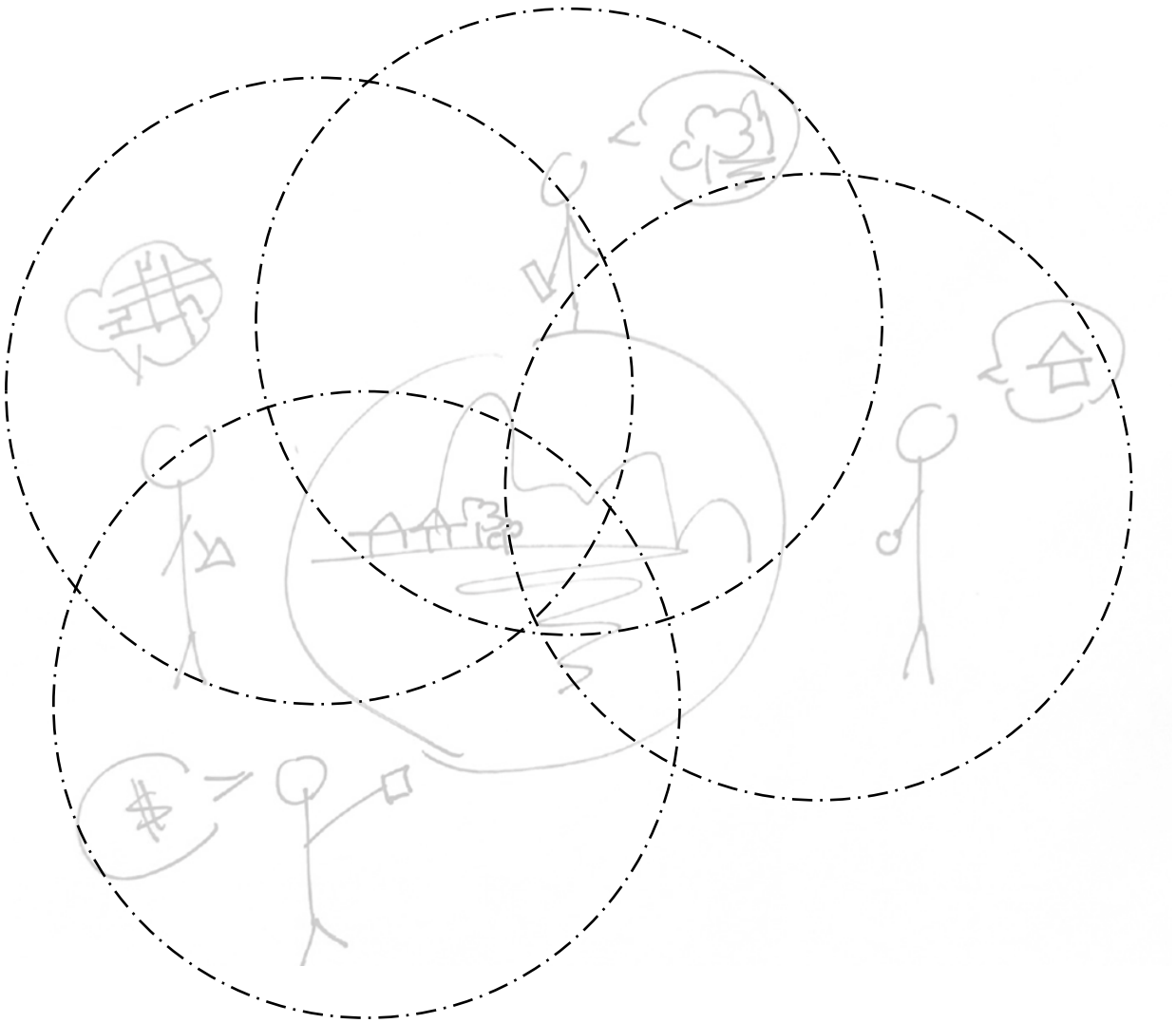


Figure 4. Establish Shared Value and Approach
Source: created by the author

The "shared value" is not simply adding pieces together. It should be transformative. The shared value comes with, first, an understanding, and then, an advancement of the mind in every individual in the interdisciplinary team. All interviewees emphasized the idea of "understanding" that each team member has to have a common understanding of others' ideas and approaches. With such understanding, several instructors mentioned an essential stage when building the shared value–mind shifting. "I think it is not being interdisciplinary if the work and the thinking behind the project is still siloed," explained by one interviewed. "It is about the thinking of one affects the thinking of the other, and it is 'better' than everyone used to think," reflected another instructor. "I would say when 'real' interdisciplinarity happened, the coming together transforms the way everybody thinks to a new set of frameworks or a new set of understanding," added a third interviewee. Without a transformation in individual thinking, it is not "true interdisciplinarity." They claimed whether the shared value or collective understanding, in other words, was formed, is a fundamental distinction between the concept of interdisciplinarity and multidisciplinarity.

With the establishment of shared values and thinking transformation, the interdisciplinary team would potentially create a new set of methodologies to approach the problem. Guided by the new shared framework, individuals apply specialties and skills toward the shared goal. In this latter process, the differences in expertise come into play. One instructor explained, "certainly, in the end [of the studio], they broke off. And whoever was more skilled in representation went that way, and whoever was more skilled in large scale development have to refine that. There is a 'skill' there, but the overall framework, narrative, became interdisciplinary."

Meaningful, Integrated, Unforeseen Product

In the built environment professions, the third feature of interdisciplinarity is reflected in the product—the spatial product or a solution.

How does it look like when interdisciplinarity is achieved? I asked the interviewees. They said:

> *It has a richness of meaning because it is meaningful to a greater diversity of people with different knowledge and experience.*
>
> *It happens from an integrated place that has meaning and resonates on a meaningful level. And I think it takes interdisciplinary approaches and relationships to build meaning. You will see [that] the most meaningful results come from diversity.*

The words "meaningful" and "rich" are brought up by three subjects. They expressed an interdisciplinary result shall reflect and speak to the "shared value" of all the contributors and

resonate with the local context. The interdisciplinarity solution shall be diverse and not "singular." One interviewee explained via Henri Lefebvre's *The Production of Space*. Taking the idea of "dialectical relationship" to an interdisciplinary lens, they said, "the meaningful results mean that you can't take one of those [voices] away. The production of space, the dialectical relationship, is both-and. It is not either-or. Thus, the best result is integrating to the point where one voice, if removed, is the whole thing that doesn't work."

The above answer also implies the second feature of the interdisciplinary product—integrated. "It is not a smorgasbord," one instructor provided a vivid metaphor, meaning the result is not simply placing separated works together. The interdisciplinary process is not "working in parallel," and an interdisciplinary result "merged" all components coherently and systematically. Perhaps, in another analogy, a true interdisciplinary outcome is more like a curry.

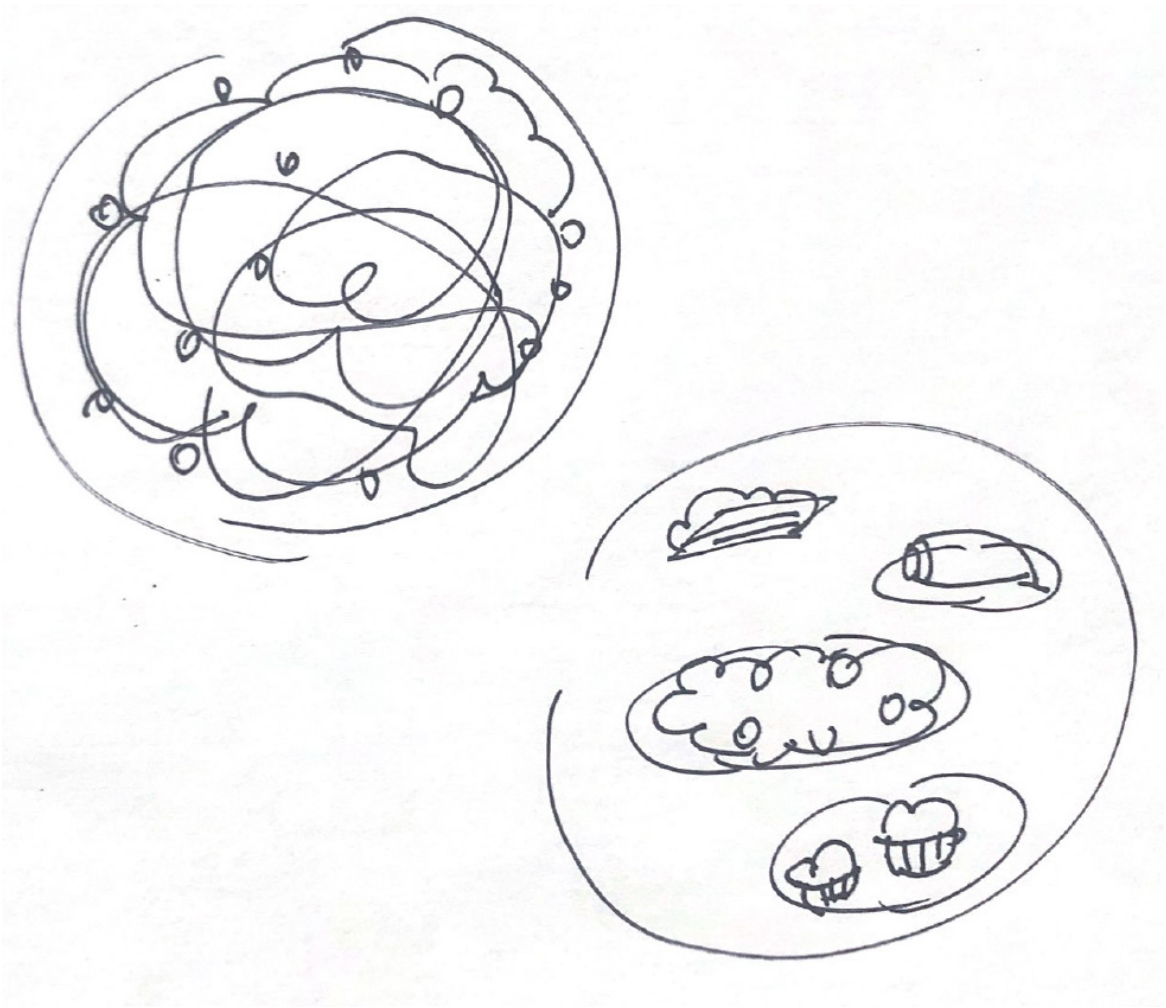


Figure 5. Curry vs. Smorgasbord
Source: created by the author

"It should be collaborative," they further explained,

> *We can expose the students to these different disciplines. That is fundamentally different from collaborating. Collaborating means that it is a genuinely integrated creative process. And a really successful collaborative process is impossible and irrelevant to know where ideas came from, whose ideas are whose, it doesn't matter.*

Lastly, because the shared idea is different from what each team member used to think, it is impossible for the individuals who were disciplinarily trained to predict the outcome at the front end. One instructor said:

> *I might not be able to project what we would come up. I was not trained in it. I've come to it. [...] The exciting elements are the unintended, unforeseen consequences, the potential. The solution that neither one of the disciplines necessarily would come up with, I guess I might call it "an emergent property."*

Thus, based on different perspectives and expertise, the established shared values and approaches, and the interdisciplinarity are reflected in the integrated, meaningful, and unforeseeable product (Figure 6). These are three key features of interdisciplinarity collectively described by the interviewees.

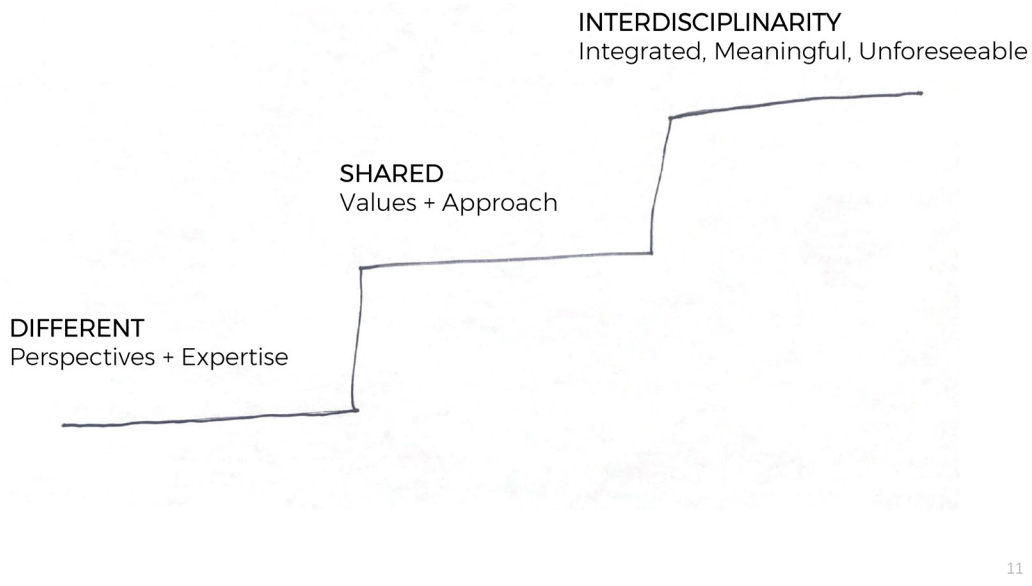


Figure 6. Steps to Interdisciplinarity
Source: created by the author

5.2 What to "Teach" in an Interdisciplinary Studio?

What do you (interdisciplinary studio instructors) hope to covey in the interdisciplinary studio, and what do you hope your students to take away? I asked in my second set of questions. The answers to what value, knowledge, skills instructors hope to communicate in the interdisciplinary studio are always two-fold. On the one hand, there is a set of values, knowledge, and skills tied to the specific studio topic, and its solution. For example, in a community design project, students may see the value of community engagement and empowerment. Through working with community members, students may identify water pollution as an issue. They then obtain the knowledge and skills of wastewater treatment with green infrastructure to solve the problem.

On the other hand, regarding teaching interdisciplinarity, the words "understand" and "an understanding" are recurrent in every dialogue. Many interviewed instructors spoke of a similar idea -- "the whole idea here is getting students from different disciplines together and have a greater understanding of what each other do" and obtain "a better understanding of how other fields see the same work than they are looking at." Here, interviewees pointed out that a "better understanding" is not merely seeing and recognizing the differences. A greater understanding means "knowing why"—knowing the values of other disciplines, why they use certain approaches, what are the benefits and disadvantages.

The "greater understanding" is evoked when one sees their knowledge and skills interfacing with the others'. Thus, in terms of knowledge and skills, in the hope of taking part in the interdisciplinary studio, all instructors expressed they expected students to have a certain level of disciplinary training before enrolling in the interdisciplinary studio and building off the capacity they gained from their discipline. They said,

> *We expected them to understand where they were in their knowledge and take a step forward. Where are you? What do you know? What can you contribute to this group project by bringing your skills and expertise?*
>
> *I hope it (the studio) helps build a better ability to work in teams, more knowledge of self, about how they function in a team. Better translate between different disciplinary norms.*

Furthering above, other messages instructors hope to convey in the studio included the recognition of one's professional expertise, ability to collaborate with people who have different modes of thinking and working style, understanding roles and responsibilities, and knowing how to go together for a shared target. One interviewee talked about a balance between understanding

other disciplines and maintaining one's professional beliefs. "I hope they would be able to talk across disciplines and understand what that difference means, and be able to articulate what they believe to people who don't speak the same language and not to lose their value or goal," they explained.

Overall, soft skills—interpersonal communicative skills (verbally, literally, graphically), critical thinking, and collaboration skills—are the keys instructors hope students can gain in an interdisciplinary studio, which would assist them in getting to that "greater understanding" of other disciplines and themselves.

Lastly, many instructors talked about a sense of belief that is the value they hope to impart. "We hope students have a positive experience so that they believe interdisciplinary is the best way to design the environment," one said. "I am hoping that most of them come away with a belief in the importance or the value of working together, and then it yields something," echoed by another instructor.

The above answers implies, interdisciplinarity, or the intellectual virtue of interdisciplinarity, may not be directly teachable. "Is interdisciplinary studio modeling interdisciplinary? Or do we need to teach some specific skills that might not be achieved in an actual model of interdisciplinary practice? It's hard to know what's the right thing to teach?" said an interviewee. Another added, "That's why it's so important for our students to do it. Unless you go into the situation, you don't experience it". They use "modeling interdisciplinarity" and "experience" instead of "teaching."

In addition, one interviewee spoke of the evaluation of interdisciplinary learning outcomes. "It is very difficult to assess," they said.

> *The evaluation usually takes place right after the class and before the students get their final grade. It is hard to know whether they are assessing what they got from the class [...] unless you could go back and survey people five or ten years later, how that helps them when they entered practice to be more collaborative. Did it? Or did they just get experienced with how messy it was, and they still had to learn about it in practice?*

This answer implies that the internalization of the interdisciplinary studio experience needs time and continuous reflection. The interdisciplinary studio stimulates interdisciplinary thinking. To become an interdisciplinarian, it also requires the accumulation of interdisciplinary experiences.

In sum, as described by interviewed instructors, the interdisciplinary studio is to help students to see the value of togetherness and to experience how to work toward an interdisciplinary collective judgment. The intellectual virtue of interdisciplinarity may not be something directly teachable but must be gained through experiences. Intensive communication and self-reflection are the keys to obtain understanding beyond one's discipline. Teachers' role is to create a framework for the interdisciplinary experience to happen and assist students in gaining that understanding.

5.3 Cognitive Processing

As Ivanitskaya et al. (2002) stated, the interdisciplinary learning outcome is a cognitive product. Connecting the above three features of interdisciplinarity and instructors' description of teaching goals, I found hidden the cognitive processing of interdisciplinary studio learning experience. Here, I summarized the process as 1) seeing and hearing, 2) recognizing differences, 3) understanding differences, 4) repositioning oneself in the shared picture, and 5) contributing toward the shared goal. Although presented linearly, I think the cognitive process happens cyclically in learning, as the disciplinary differences disclosed gradually (Figure 7). "I don't experience it quite that cut and dry. It's all become jumbled in my mind," one interviewee said.

As expressed by many instructors, the interdisciplinary product relies on the contribution of each member's knowledge and expertise. An unspoken precondition here is one knows what they know. However, often, students don't know the specialized knowledge they bring to the table. "I am not that special," a student might say. "It is when a planning student works with a landscape student, then realizes that the landscape student thinks differently and proceeds differently. And then it becomes clear 'oh, I do understand something,'" explained an interviewee. One needs to aware and understand the differences in expertise before they know where to contribute.

In the interdisciplinary studio, disciplinary differences occur gradually and continually as one talks to and works with the others. By seeing and hearing what an engineering student brings to the table and what they say, an architecture student would recognize how other disciplines see the same project differently, and then they further find the differences in their values, approaches, and tools. They might start to wonder and later ask their teammates, "why you said that word and why you use that approach."

With a greater understanding of the engineering and real estate implications of architectural design, architecture students would then see a city in a different way than they had seen it

before. Realizing the insufficient visual cues, their perception of architectural space could shift. A similar mind-shift would also happen to the engineering students. “Some of the most delightful ones are when most engineering type people can explain the architectural vision and why it is important. And the people that are really driven by aesthetics can also explain how they solve some technical problems,” one interviewee said. This shift allows an architecture student and an engineering student to come together with a collective professional judgment on the issue. Then, they both reevaluate their expertise and think about how those skills might intersect others. By repositioning themselves in the shared picture, they then find where and how they can contribute to the interdisciplinary shared goal.

The cognitive process is a self-discovery — one interviewee described it as getting the “knowledge of self,” and I called it “seeing oneself in others.” It is through interacting with other people who are trained in different manners that they see “differences,” change their minds, and understand where they are in a bigger picture. In this sense, interdisciplinarity is not only reflected in the combined approach and the integrated product but also the advanced mind. If disciplinary training is to frame issues in particular perspectives, the interdisciplinary studio experience is to “open” the shaped disciplinary mind.

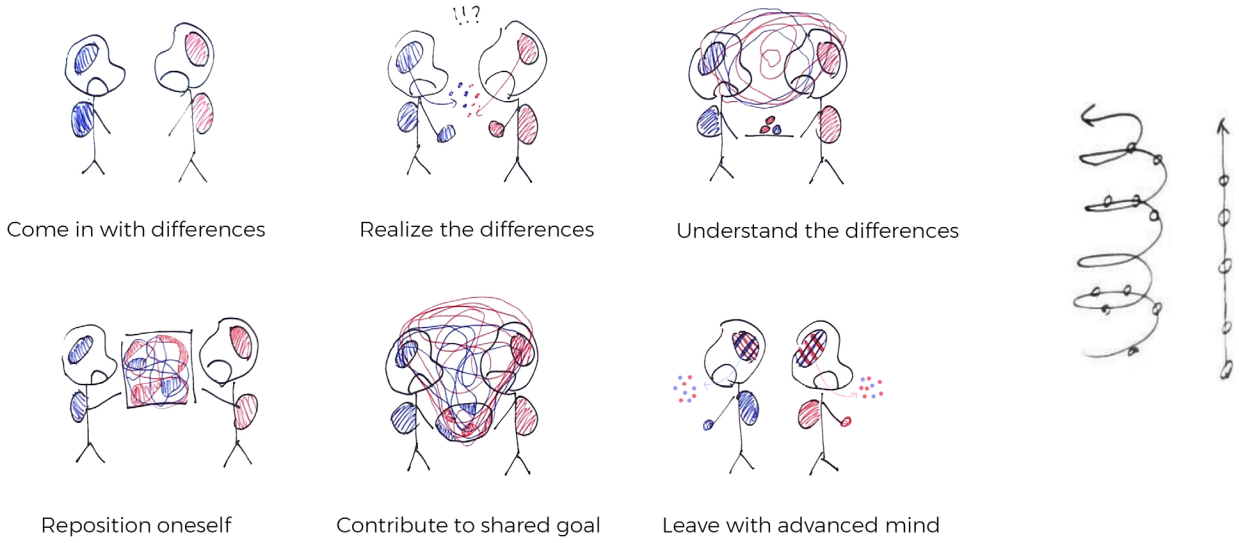


Figure 7. Cognitive Processing in Interdisciplinary Studio
Source: created by the author

5.4 Interdisciplinary Studio Pedagogy + Experiential Essences

What could instructors do to structure and facilitate the interdisciplinary studio experience? This section summarizes the pedagogical approaches used and experiential essences suggested by the interviewed studio instructors. It is important to emphasize that this is not proposing a universal model for interdisciplinary studios but to share reflections from CBE's experience. Methods and approaches need to be contextualized in specific circumstances.

A Hybrid Studio Framework

The studio, as an experiential teaching tool, was used in different disciplines for different purposes. Thus, there is a different cultural consensus on how each department sees the studio and expectations of what and how to teach in it. Seven interviewees talked about how studio teaching differs between the departments in CBE. Their points are summarized in the following paragraphs.

In CBE, the studio is the core curriculum for the design disciplines, like Architecture and Landscape Architecture. The class meets three times a week, and students are expected to bring finished drawings to the course for the instructor's critique. The specific design focus within the studio topic is directed by the students' interest and moves forward through desk critic and iterations of drawings. Often, whether the design solution is implementable is less critical compared with design thinking, creativity, and storytelling. The design studio would generate a variety of proposals.

On the other hand, in the non-design discipline, like Real Estate and Urban Planning, the studio course aims to cultivate analytical thinking, collaboration skills, and leadership. Working with real clients and generating a rational and feasible written report to inform clients is the goal of the studio. The non-design discipline works within the rigors of planning regulations and budget, and thus, the studio product, in general, varies little. Often, it was presented as a professionally-oriented report. Rather than being driven by iteration of drawings, the non-design studio may be directed by a series of readings, analytical exercises, and discussions.

The process of how the design discipline and the non-discipline to get to their result is radically different. An instructor reflected the different processes: "planning thinking starts broadly. It is kind of like a big funnel. You've got all these possible alternatives, and planners try to find the problems and what precedent exists. And then it filters down and gets narrower. The project comes out at the end. Designers start with a question. It broadens up first, like a creative

generation, and narrow down later." They found that when teaching an interdisciplinary studio, instructors from different departments would agree on the end goal quickly, but have relatively different procedures in terms of "how to get there."

Hence, for interdisciplinary studios, it is essential for studio instructors to reconcile the above difference, come up with an agreement of what to teach and how to prepare the topic, and collaboratively create a "hybrid" studio framework. A hybrid syllabus shall reflect and adapt the teaching objectives, procedures, and assignments of all the participating disciplines. Admittedly, given that the studio is the central course at design disciplines, the teaching style of the interdisciplinary studio can be easily slanted toward the design studio model.

In the CBE context, five interviewees mentioned the negotiation between the creativity of the design and rationality of real estate and planning. For example, interviewed instructors from non-design disciplines tend to expect a practical result. Therefore, they may give the opposite guidance to the teacher from the design disciplines. One interviewee reflected on a disagreement on whether they should allow students to challenge the conditions given by clients. "You have to accept what is given, and there is no way to change it. It doesn't matter what anybody comes up with. To me, that makes the whole thing less valuable. It is not like having a different opinion, when you are fundamentally don't agree on what we are doing" They suggested studio instructors from different disciplines should establish a common goal on the project and teaching objectives.

Another interviewee further explained that a "true" interdisciplinary studio model is not a "design studio with a little nuance of the non-design elements, and a truly interdisciplinary urban design concept should meet both the physical and the economic, financial goals and objectives." They questioned, "some of the projects (student works) were on the same parcels yielding a billion of dollars of development. And some of the concepts were yielding six billion worth of development. There is something fundamentally flawed when these goals and objectives are one-sixth of the other. It is not [only] about the typology of the buildings. [...] there wasn't enough economic analysis done to create the goals and objectives clearly." They suggested with the considerations of zoning and financial feasibility should be embedded in the interdisciplinary studio teaching objectives, as well as the guidance instructors gave every day. An interdisciplinary studio model –– is not simply adding a financial analysis exercise to a design studio syllabus.

To create a "hybrid framework," instructors from different disciplines have to go through the above-mentioned cognitive process together with the class preparation. As explained by one interviewee:

> *The professors need to be on the same page. There is no magic other than spending more time up-front, making sure we are having the same kind of values about what we are going to accomplish—a common understanding of the project. We met three or four times a month. One professor is kind of a leader, and we each have a thing to work on. We reviewed and respected each other's work, and developed a syllabus with clearly-spell-out learning objectives and a fair amount of details about what the assignments would be. We would go through the assignment two or three times before presenting it to the students so that we can answer all the questions that would likely come up.*

"Leadership" and "clear and strong roles" are the two keys in integrating instruction, mentioned by five interviewees. They suggested one faculty to initiate the studio framework, and then other partners modified upon it. "There has to be a 'song' first. And then everybody comes in and brings their knowledge and talent to the 'song' and makes it better," one said.

Ensuring Equal Numbers of Enrollment

Having equal numbers of students from different disciplines enrolled in the studio is essential, ensuring the knowledge exchange and the expertise to produce a deliverable. One interviewee spoke of the uneven enrollment impacting the learning experience. This interviewee said, " Who students got to learn the different knowledge from, when 95% of the students are coming from the same background? How integrated is it? Not very. It is a problem when you have six students who are great at SketchUp and InDesign (design software), and zero students who can do the financial analysis."

However, equal enrollment is hard to meet when the studio is not in the core curriculum in disciplines like Real Estate and Construction Management. Three instructors mentioned that students from these departments need to make special coordination to overcome conflicting schedules and credit loads to participate in the studio. For example, reducing credits or participating as an independent study. To ensure students from all departments have the option to join the interdisciplinary studio, they suggest all departments align their class schedules and credit loads better.

Informing Students of the Expectations

Another key to the interdisciplinary studio is informing students that the course expectations and the learning style of the interdisciplinary studio are different from those of the studio in their home discipline, of which students may not be aware. One faculty explained, "I guess one of the reasons why architecture students have been frustrated in my studio is because I don't operate the

interdisciplinary studio like an architecture studio. They are really looking forward to having an 'architecture studio.' That is a good example of the cultural challenge of bringing these different students and different learning styles together."

Without being informed, students may be frustrated when they experience a different studio learning style than their home discipline. "I think the professor has to make it clear to the students what the learning objectives are, what they would get out of it, and why it is important," the interviewee further explained, "if the students know what you want to teach, it is easier for them to learn."

Revealing Differences

Helping students to see and hear the disciplinary differences is mentioned by almost every interviewee, and seven of them would begin the interdisciplinary studio with interactive games. Many teachers realized the different usage of terms between disciplines, and they tried to make vocabulary difference a game. One activity is to come up with some key vocabulary involved in the studio topic; for instance, "resilient" and "community." Then they ask students to have some casual conversations on their personal and disciplinary understandings of the terms. Similarly, one instructor mentioned talking about "the processes as a discipline" in the very first class. Starting from the instructors themselves, the class would discuss 'who am I, as a planner/architect/ landscape architect." Another instructor had students watch a comedy about the open-mode production of artists and closed mode production of engineers, and talked about the trade-off between the two modes in the first class. In addition, having students present their individual site experience to each other is one popular assignment. "To develop your own tour guide is my favorite activity," said one instructor, "we can all be in the same place, but we all see it differently. And we come back together and communicate however you want to do. That's a great way to start. Because there is no one tour guide." Meanwhile, teachers not only intentionally reveal the difference at the beginning, one faculty member also mentioned keeping the process works pinned up on the wall so that students and instructors can refer to cross-disciplinary examples during the class.

Balancing Individual Interests

When asked "what works well to bridge disciplines together in the studio," many interviewees spoke of the idea of "willingness," meaning students need to be opened to different ideas and commit to "dive into the messy interdisciplinary process." Supporting the willingness requires instructors to balance individual interests as well as ensure the knowledge exchange between disciplines when assigning the interdisciplinary team.

Grouping students is an art in an interdisciplinary studio. "Forcing teams never work," said one instructor. Often, students would be asked to fill out a survey or write a short statement of their interest at the beginning of the class. This assignment aims to help students to think about their hope to pursue in the class and gives teachers a reference when making an interdisciplinary team. Three interviewees observed that students from different disciplines with similar interests could come up with shared value more quickly. Allowing them in the same group can provoke them to "continuously opt into doing the extra work that's needed for interdisciplinarity."

Besides the survey, two instructors set several individual exercises before giving the team assignment, hoping students can "give a full expression of their [own] field" before joining in the interdisciplinary team. Another interviewee spoke of teaming students in different configurations in the first several assignments so that students would know each other more and figure out "who they might work best with."

Facilitating the Interaction and Understanding

Instructors use various approaches to facilitate the interdisciplinary team members to understand each other. Some emphasized the overall class structure design, while others focused on oral instructions every day.

In terms of the overall framework, one believes that the interdisciplinary interaction needs to be set intentionally by forcing students to think together for "long enough time" and squeeze the time for production so that they will not "fall back on their disciplinary thinking." For example, if there are ten assignments, they would use the first eight tasks to force the students to form an interdisciplinary strategy and the last two assignments for production. "Students do not necessarily like that. Because they want to get to a certain level of the product. But my point is, I care less about what they get, but how they get there and how they reflect upon that," they explained. Another faculty added that they would break down the class into "a series of small prompts" that then, in the entirety, led to the final project. Both of the interviewees designed their course syllabi into multiple stages with relatively detailed written expectations for each step, using the series of assignments to foster interdisciplinary understanding.

Compared with the above two teaching approaches, which are more structured and controlled, another two interviews mentioned giving the studio structure "less rigidity" and assignments "less specific instructions." These two faculty members gave students more agency to define and explore the issue and more allowance for creativity. One interviewee explained the objective, saying, "I really want them to develop their professional judgment. It is one of the real things

I think they are put into positions all the time, where they have to use their own judgment. [...] So, I want to pushing that early, get them to struggle with the questions and end up using their judgment to answer." While they also reflected that the interdisciplinary studio experience might be "more confusing and challenging" when it is less structured, and it is probably beneficial to have more structure in a ten-week-studio when students do not know each other.

The "structured" schedule and the "loose" instructions are two strategies to teach interdisciplinarity – the former wants to shape the experience for the students, while the latter hopes the students to find the path themselves. Both approaches have their merits, and both require students to continually reflect on the experience to find the meaning of interdisciplinarity.

In addition to the "series of tasks" method, other interviewees used "a trick" to encourage interdisciplinary collaboration. For example, in regards to establishing a shared procedure, two interviewees talked about having the interdisciplinary teams to set up a "work contract" or an "agreement" about how to resolve differences of opinion and responsibility. Another mentioned using "peer evaluation" at the end of a class, so students see themselves more as a team.

On the other hand, some interviewees expressed helping students to understand each other in daily instruction, with the language they use and the actions they take. One instructor talked about getting both sides to learn a little of the other in the desk critiques. Such as asking the design students to justify their design with some data and pushing the planning students to "loosen up and be a little more adventurous." Two faculty members spoke about modeling the interdisciplinary collaboration for the students by bringing the discussion among the interdisciplinary instruction team back to the classroom, telling students how teachers themselves reconcile on the different perspectives, or having open conversations in front of the students. They explained:

> *Because they saw us communicating with one another, and with them. They saw us working things out from a disciplinary point of view and resolving things going forward. So, we were modeling for them what we were asking them to do.*

Another faculty spoke of attitude and sense of humor when seeing the disciplinary differences. Instead of being frustrated, they encouraged students to use a positive and open manner to deal with the differences. They said:

> *One of the things that we tried to do right away says, when you run into that problem, instead of getting frustrated, what we want you to do is laugh about it, and write it down. And then come back to class and say, "okay, what are the crazy interpretations that you ran into that were problems this week."*

Having "Real Experience"

When asked what might help dissolve the disciplinary thinking boundary, three instructors mentioned bringing in "span-discipline" guest speakers. Two interviewees talked about taking a walking tour to the project site, or having an opportunity to talk to the "real clients" or "people in place." I think they meant back to the issue or physical places not yet filtered by disciplinary perspectives and languages:

> *If we have an opportunity to interact with the community and listen to first-hand information, it gives them a more real experience. You feel more grounded. There are some sorts of nuances that got communicated in a way that we, as instructors, do not have the capacity to do. We tend to speak jargon, with a disciplinary focus. It takes a real community or a real client for the students to come away with a much deeper understanding of the issue. Almost always, there is something magical there. And I think that translates into dissolving the disciplinary boundary.*

Meanwhile, the above answer also implies that knowledge in the interdisciplinary studio included disciplinary knowledge as well as experiential knowledge from everyday life. Knowledge not only from academic disciplines, but also from "the place" and "people in the place."

Not Just Inter-discipline

Finally, it is crucial to recognize that the interdisciplinary studio is not only about disciplinary interaction but also interaction with the "whole person." "There are a lot of different levels of work and life experience," said one interviewee. "We had experienced a four-way integration—experience disparity (graduate and undergraduate) and then disciplinary disparity," explained another. Both of them pointed out that the integration might be more comfortable and more focused if the students are at the "same level" of professional experiences in a ten-week-studio.

The familiarity between students also influences the level of integration. Several instructors expressed that if students can have the opportunity to know each other better, personally and disciplinarily, before they enter the interdisciplinary studio, such as another college-wide course, they could then "leverage" that familiarity. "But students don't know much about other departments," several instructors said. Thus, it takes a longer time in interdisciplinary studios to have the students become familiar with each other. In this case, letting students know each other as friends allows better collaboration. "I probably would do it a little differently next time, to break down the difference into non-disciplinary. Just like doing an exercise like everyone who likes chocolate ice cream comes over here, so that students can see there are different ways of valuing who they are like and not like," said one instructor.

5.5 Summarizing in a Story

At the end of this chapter, I would like to give a textual example of how the keys mentioned above—language, knowledge, skill, differences, understanding, and togetherness—interplayed in the collaboration, using a story shared by one interviewee. The example is from an interdisciplinary studio in which students who speak different languages participated. Because the language barrier is more tangible in this example, it provides a refreshing lens to understand what communication means.

> *In this studio, there are three different interdisciplinary teams with very different dynamics. Team A had a bilingual student who served as the translator for all team members; he gathered all information from both sides and controlled the flow of information. The result was a little bit lacking in richness because it all depended on one person, in the end, to synthesize what different groups were saying.*
>
> *Team B also had a bilingual student who translated everything and made sure everyone knew what was being said. The translator wouldn't make decisions and insist that everybody had input on a decision. Team B didn't get very far because it was moving slowly with everything getting translated.*
>
> *Team C had nobody truly fluent in speaking both languages. Everyone spent minimal time talking, and they decided to divide the work earlier. Each member brought back separate layers of work, merging them, overlaying them, and seeing what the output could be. It was sort of an emergent process. Together, the members generated a lot more layers, and they were able to see how each of their outputs could be related. They don't talk about it so much, but they ended up producing a rich product.*

I think the above is a fascinating example of "common language" in the interdisciplinary studio. Communication and having a common language are essential for integration—as mentioned by all interviewees. Language is the bridge to help people from different disciplines to "understand" each other's thinking. Still, communication is not the only key to achieve interdisciplinarity. In this story, when the language barrier can be tangibly seen, one may better understand the role of language and communication. It pictures a balance between and a more subtle relationship of doing, sharing, and saying in interdisciplinary collaboration. "It means that any interdisciplinary work communication is not constant. It requires coming together, but it also requires going away and producing something with your own perspective that is still understandable and shareable, but it is clearly driven by your perspective," said the instructor who shared the story.

In sum, interviewees expressed that the purpose of CBE Interdisciplinary studio is to bring people trained in different disciplines together to generate a better judgment and solution on a specific issue. It relies on disciplinary expertise and requires a greater understanding of one's home discipline in a bigger picture, and the ability to collaborate and contribute. In the cognitive level, it is a process of self-recognition and repositioning. The intellectual virtue of interdisciplinarity is unlikely to be taught but to learn from the experience. Studio, in this sense, is an experiential tool to "teach interdisciplinarity." Studio instructors are the ones to structure and facilitate the interdisciplinary experience. However, it is the students themselves who must discover the value of interdisciplinarity and make the integration. Communication and collaboration skills are seen as the most important keys to help achieve interdisciplinarity in the studio.

At the most basic level, the interdisciplinary experiences allow seeing and recognizing other disciplines. The CBE interdisciplinary studio provides an opportunity for students from different disciplines to come together, seeing and knowing what the others are doing. It gives students an awareness that there are different kinds of thinking and approaches to look at the same issue they are working on, being open-minded, unbiased, and conscious about their roles. "One may speak like an architect, but they are conscious of that, and they would ask for opinions," said one interviewee of self-consciousness. Besides, the studio potentially broadens a student's social network, said one faculty, "if they have a question in planning, they know who they can talk to."

Beyond seeing and knowing others, interdisciplinary experience may further stimulate one to critically look at their home discipline and refine their disciplinary perspectives by adapting ideas from other disciplines. One said, "thinking differently than their home discipline and being 'better' than their discipline."

6. DISCUSSION

This chapter seeks a deeper understanding of CBE interdisciplinary studio--why do it? It then summarizes interdisciplinary studio instructors' future visions, discusses the implications for built environment education, and sketched out a rough diagram to better understand where these visions locate in a shared picture—giving hints to the inquiry at the beginning "what are the future potentials," while keeping the answer to the "future potentials" opened.

6.1 Implications

Near the end of my analysis, I began to wonder: why is interdisciplinary important to the Built Environment Education. It was a question I did not directly ask in the interview. Once again, I dived into the transcripts. I found the answers to the question of how does it look like when interdisciplinarity is achieved — "it has a richness of meaning. Because it is meaningful to a greater diversity of people with different knowledge and experience." Then, my question of why interdisciplinary education is important in the Built Environment becomes, in other words, what is considered as a "good" built environment and what kind of people can produce a "good" built environment, how to educate students to become that kind of people? The words "rich" and "meaningful" come back to me. "It has a richness of meaning because it is meaningful to a greater diversity of people with different knowledge and experience," the answer describing how a place may look like when interdisciplinarity is achieved. It implies a built environment project is considered "better" when rich in meaning and integrates different considerations coherently.

"The best solutions come from a network. The best solutions don't come from an individual voice or singular voice," one interviewee said. As simple as it may sound, this answer points out the value of being interdisciplinary—the multitude, the multivalent—and responding to two multiple considerations in one solution.

Today, the richness and integrity in built environments can no longer be reached by individuals, but be brought from a unified and integrated system of disciplines, or even broader, "diversity of people with different knowledge and experiences." The growing specialization in urban development divided the work of "master builders" to architect, engineer, landscape architect, urban planner, among others. Today, no one is capable of mastering everything. Moreover, the development of computer technology is transforming the way people live and experience the city. Evolving urban theories explain urbanism and evaluate urban design from multiple perspectives.

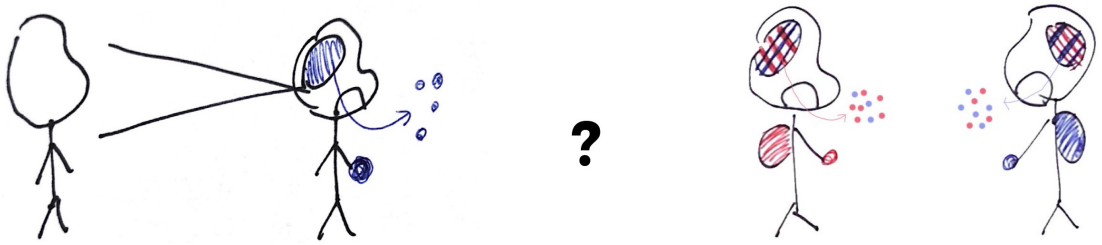


Figure 8. Cultivating an Interdisciplinarian
Source: created by the author

From a student's perspective, however, I see the highest ideal inherent from the Bauhaus, "designing for the full human being," and "for the betterment of society" is still the pursuit of environmental education. With the growing specialization in the built environment professions and the multi-angle understandings of the places, interdisciplinarity seems increasingly essential in pursuing environmental integrity. "It should be our highest aim to produce this type of man who can visualize an entity rather than let themselves get absorbed too early into the narrow channels of specialization. Our century has produced the expert type in millions; let us make way now for the men of vision," said Walter Gropius (1955, 18). He argues the highest goal for built environment education is to produce "men of vision," who possess specialized knowledge, clear to the meanings and purpose of his works, as well as "the relationship he stands to the world (Gropius 1955)."

Translating Gropius' pedagogical goal to the findings of this study, I think a "man of vision" is an interdisciplinarian—who is open to ideas, speaks across disciplines, grounded in expertise, and knows where to contribute. Cultivating an interdisciplinarian requires a balance between educating for specialized skills and stimulating a broader mindset. Through the collective description of the instructors, I see such an objective is embedded in the BE Studio and McKinley Futures Studio.

6.2 Future Visions

Looking into the future, almost all the interviewed faculty members expressed that environmental and societal issues are becoming more complicated. The professional practice in this field has been and is increasingly interdisciplinary. They hope to "simulate the interdisciplinary professional practice" and better prepare the students for their future jobs. Further beyond, they expect students to think broadly, creatively, and critically.

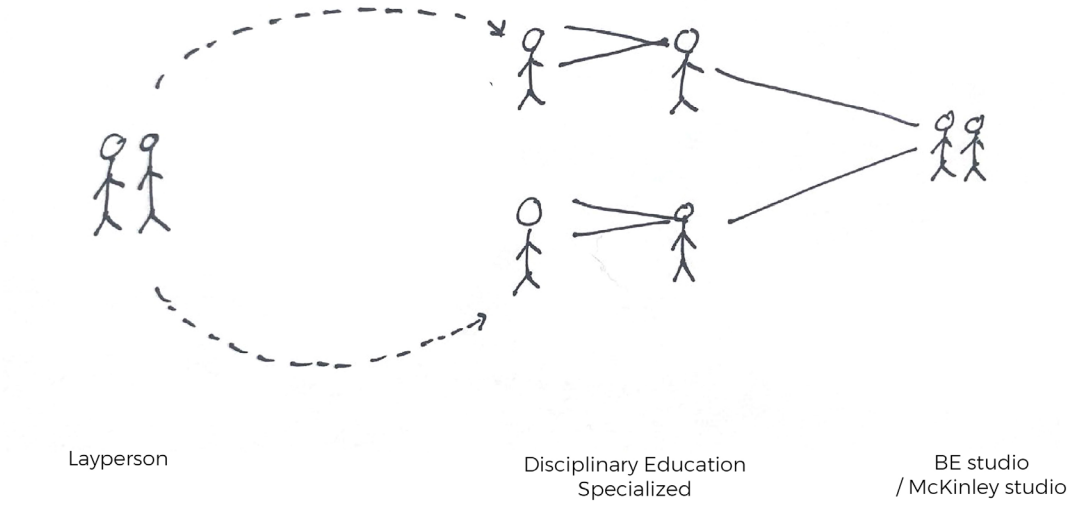
Visions mentioned for the future CBE interdisciplinary studio can be summarized into two categories: level of collaboration (college-wide, across the university, and beyond academia) and when to do it (Figure 9). Five interviewees spoke of bringing the currently optional interdisciplinary studio to the next level, "being more fully institutionally embedded in the college." Four instructors suggested a partnership with the practicing professionals in the classroom, who have "more experiences in interdisciplinary collaboration." While another four interviewees talked about finding new relevant knowledge and a broader collaboration across the university. Such as with disciplines like oceanography, anthropology, digital art, human-centered design, among others.

In terms of how to structure a more interdisciplinary education, three instructors suggested creating a college-wide introductory course, borrowing the interdisciplinary studio model, to instill students an "a foundation of design thinking within the context of the built environment before they broke off and specialized." Disciplines then become "a medium," a tool to deal with an issue, but the "thinking" is shared. One pointed out that this suggestion may work better in an undergraduate-level course when students do not yet have a disciplinary bias. Meanwhile, another two interviewees talked about a required college-wide capstone studio so that all students have an opportunity to learn from other academic disciplines before they graduate.

However, transforming a disciplinary-based education into interdisciplinary education is not as simple as changing a curriculum or adding courses. At the basic level, it requires departments to align schedules and credit loads better to make room for the interdisciplinary courses, and teachers to the right topic for collaboration and coming up with a hybrid teaching model. In a professional school like CBE, programs accredited by professional associations need to meet training standards, and thus their curricula are less flexible. Meanwhile, three interviewees pointed out that the standing academic structure of tenure-promotion does not encourage interdisciplinary teaching. "The autonomy of the individual is what is rewarded and given tenure. And the willingness to integrate into a shared vision and collaborate towards execution is not," one interviewee said. They suggested the College should create an institutional culture to encourage interdisciplinary

atmosphere, acknowledge and encourage interdisciplinary teaching and learning through incentives. Moving toward a more interdisciplinary education would affect all components in the educational system. “From philosophy, organizational structure, management style, institutional culture, licensure, teacher education and training, and professional development” (Klein 2006).

Overall, I see visions from studio instructors sketched out in figure 9 below as related rather than conflicting. They are visions of different scales with slightly different purposes. For example, faculty members who spoke of partnering with professional practitioners see the interdisciplinary studio as stimulation of interdisciplinary work in firms, and they hope the studio can better rehearse students for their future job. At the same time, instructors who envision a broader collaboration with disciplines beyond the environmental disciplines seek intellectual inspirations and less about practical purposes. These visions reflect the dual-orientation of professional school. I arranged them sequentially in time. I think before we choose the future path, we shall, once again, ask what the purpose of doing interdisciplinary education is. And then choose the path strategically.



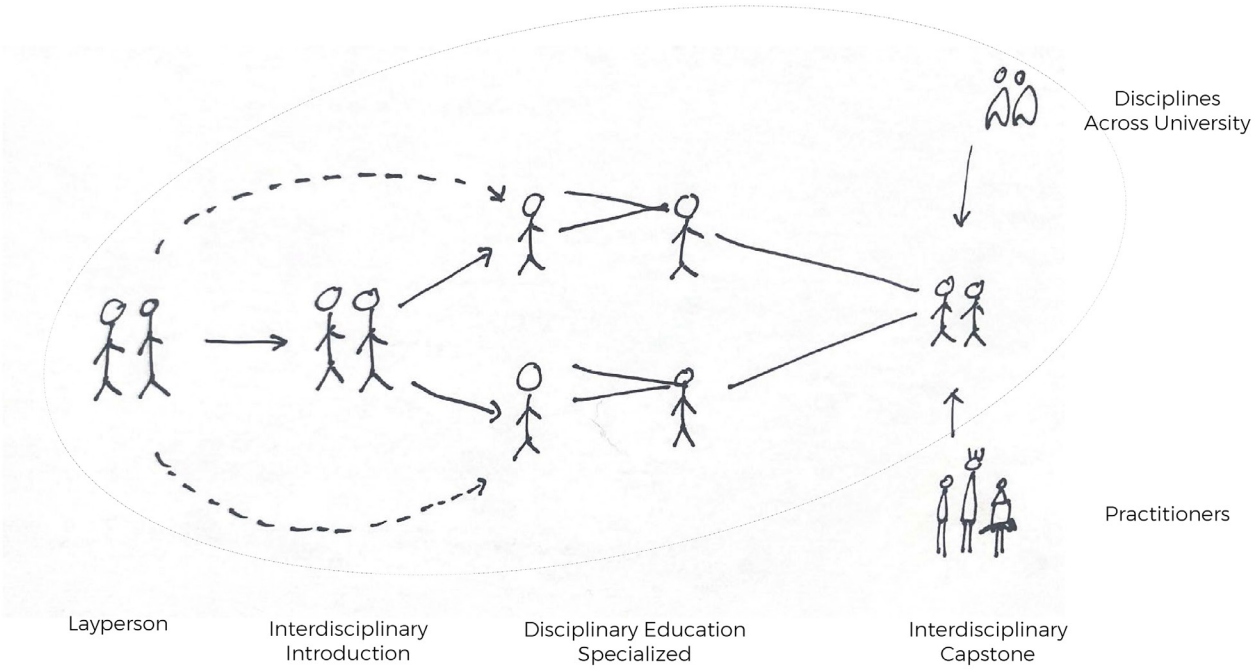


Figure 9. Current Structure vs. Potentials for Future CBE Interdisciplinary Education
Source: created by the author

7. CONCLUSION & REFLECTION

This study explores interdisciplinarity, and interdisciplinary pedagogy in the context of the College of Built Environments at the University of Washington, through fifteen in-depth interviews with the interdisciplinary studio instructors. Four pairs of relationships unfolded in this exploration: discipline and interdisciplinary, oneself and others, discipline and profession, and differences and understanding. The idea of interdisciplinarity in CBE studios is unpacked in two levels: the concept and the features of interdisciplinarity, and interdisciplinary teaching and learning experience.

Interdisciplinarity, as a concept, attempts to integrate different concepts, methodologies, procedures, epistemology, terminology to produce a more holistic outcome. In this study, Interviewees echoed this idea. They expressed that the idea of interdisciplinarity would not stand without disciplines, and the concept is compelling because it integrates the disciplinary differences. Pursuing interdisciplinarity does not mean to abandon the component of disciplinary training.

Interdisciplinarity in the Built Environment fields. The CBE interdisciplinary studio instructors describe the scope of interdisciplinarity rather broadly, integrating disciplinary knowledge, indigenous knowledge, history literacy, and geography. Although such description is defined as "transdisciplinary" by scholars, like Ramadier (2004), it entails the unique elements of interdisciplinarity in the built environment field. It reflects our pursuit to provide a thoughtful response to the diverse users, geography, and the history of the place. Interdisciplinarity in the built environment profession is profoundly different from the interdisciplinarity between, for example, Math and Dance.

The findings imply interdisciplinarity in built environments is highly context-dependent. In this sense, I think it is less important to argue about the definition of interdisciplinarity in Built Environment. However, it is more important is to understand the meaning in the descriptions and the pedagogical intentions behind—why we are valuing interdisciplinarity and what we are hoping to achieve in environmental education. Collectively, the CBE studio instructors give a thicker description of their purposes embedded in the BE studio and McKinley Futures studio, and the special meaning of doing interdisciplinary work in placemaking. "Interdisciplinary" is an adjective describing the teaching approach. However, being interdisciplinary is not the purpose.

Interdisciplinarity at a personal level. Interdisciplinary teaching and learning are based on interpersonal interaction. Interdisciplinarity at the personal level is about cognitive processing. In a simple term, it is open-minded. To do that, it requires a sense of willingness, meaning willing to "let go" and "throwaway" some of the disciplinary processes, willing to listen and embrace different ideas. The interdisciplinary experience stimulates a greater understanding of others as well as oneself, disciplinarily, and personally. Knowing what we know, what we can do, our expertise, and personality. Interdisciplinary interaction is between people with different disciplinary educational backgrounds. Individuals who had disciplinary training represent their disciplines. However, the individual, as a person, also bears other life experiences and identities. Individuals join the interdisciplinary team as a whole person (Figure 10). They not only bring in their disciplinary knowledge and skills to the studio, but also other resources from their common life.

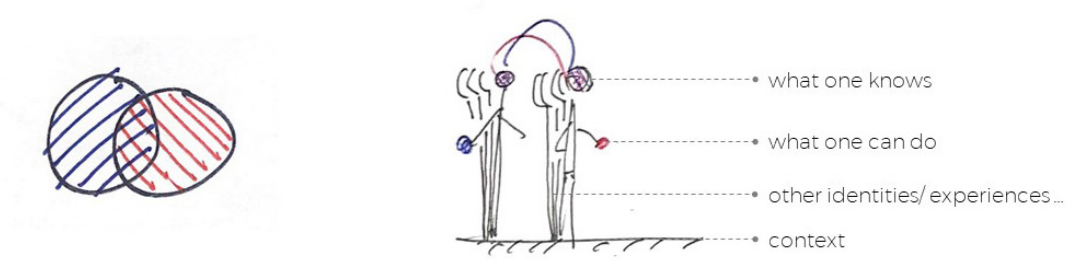


Figure 10. Interdisciplinary in Concept vs. Doing Interdisciplinary Work
Knowledge and disciplines are not physical objects that cannot interact. A human being is the carrier of knowledge.
Source: created by author

It is impossible to distill one's disciplinary experience and discuss interdisciplinary studio experience without recognizing the different experiences they had and other identities they processed. Interpersonal dynamics shall be acknowledged in the discussion of the interdisciplinary teaching and learning. An interdisciplinary result only comes into being because these people come together and think about the issue creatively. The result will be different when the group of people changes, even in the same disciplinary formation. There is no "magic formula" for instructing interdisciplinary studio.

Interdisciplinary studio. An interdisciplinary studio is one kind of format to instill students the value of interdisciplinarity through experience. As advanced-level interdisciplinary studios, the current BE and McKinley Futures studios emphasize the application of knowledge and skills. They require students to have a fair amount of disciplinary training before they enroll in either studio. Through interfacing with different thinking and approaches, students learn how to collaborate, appreciate others, and increase knowledge of self. Pedagogical methods mentioned by interviewees ranged from syllabus design, activity, and everyday oral instruction. The language difference between discipline and the importance of communication is well-aware by all instructors.

From the administrative point of view, bringing students and faculty from different departments to a studio can be resource-intensive. It takes significant institutional effort to organize and faculty members' commitment and time to succeed.

On the other hand, if we see the studio as a format, the value of interdisciplinarity can also be embedded in different experiences. For example, the experience could be sharing workspaces and allowing interdisciplinary understanding to happen in informal daily conversations and observation.

Future potentials. I asked the question, "what are the future potentials of the interdisciplinary studio at CBE," and I would like to keep the answer open-ended. This study summarizes some visions provided by previous studio instructors. Meanwhile, the findings in this study entails a complex relationship between discipline, profession, institutional structure, and individual actors in the studio (Figure 11). The next step from an interdisciplinary studio to interdisciplinary education needs to be taken very strategically, thinking about when and where to insert an interdisciplinary class and how to be effective.

Overall, this study intends to understand, rather than define, the interdisciplinarity in CBE's interdisciplinary studio. The study is based on self-reflections and self-interpretations of the studio instructors. Examining from Lenoir's (1997) curricular—didactic—pedagogical interdisciplinary teaching model, one limitation of this study is the absence of the observation of pedagogical interdisciplinarity—the instructors' immediate reaction to particular situations. For future researches, I think the following points are worth exploring: 1) to observe how interdisciplinarity is achieved in day-to-day studio operation, what instructors say and how they act; 2) to conduct a longitude study on how individuals reflect on the interdisciplinary learning experience; and 3) to explore how the professional and employers understand the interdisciplinarity and what their expectations are for professional education.

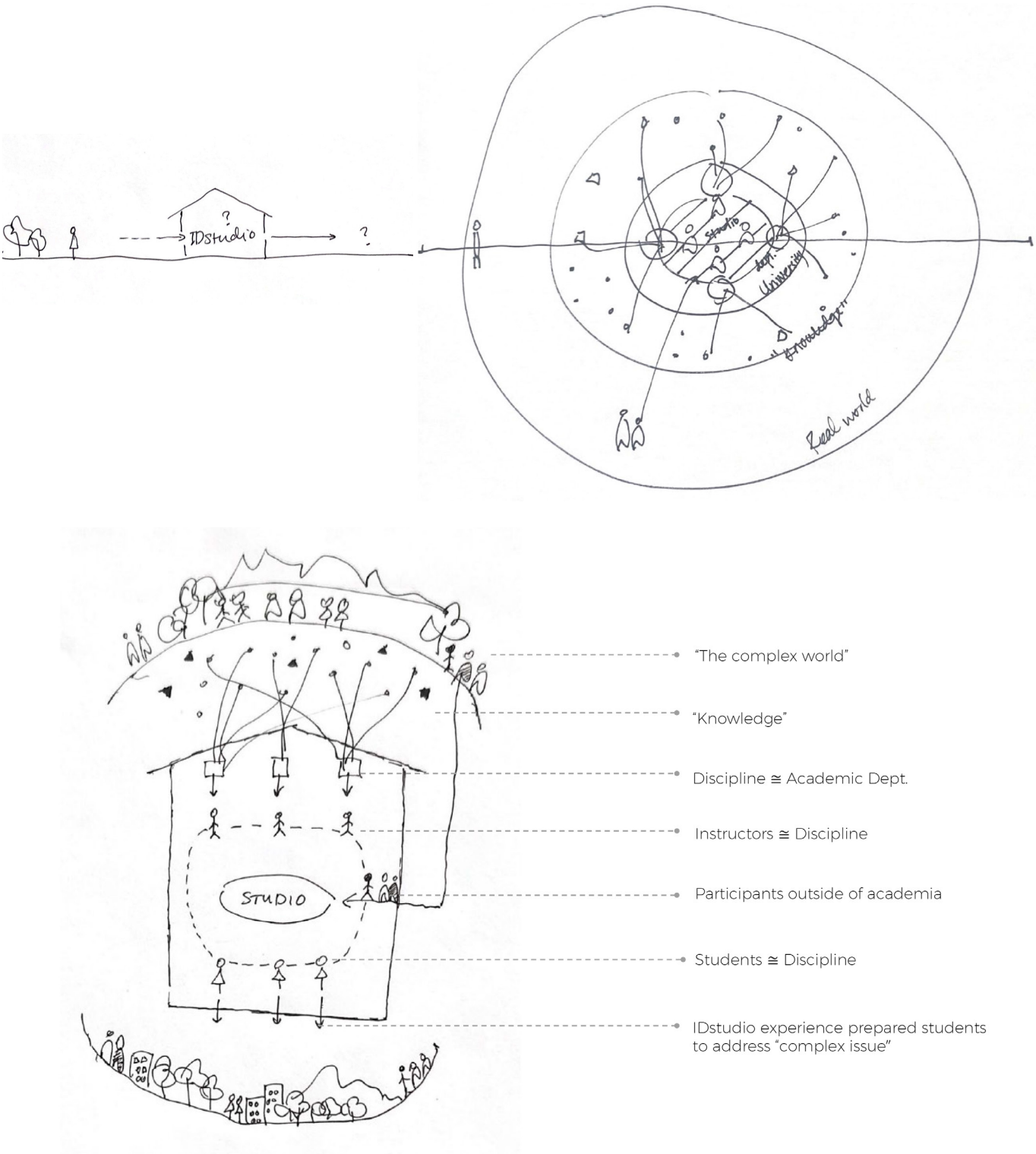


Figure 11. Interdisciplinary Studio in a Bigger Map

A sketch that is trying to picture the nesting relationship of individual actors in interdisciplinary studios, the institutional structure of the discipline, and knowledge production. Knowledge is generated from the reduction of the "real world," through scientific inquiry, life experiences, and professional practice, among others. A body of knowledge is assembled as a "discipline." In the institutional structure, an academic department roughly represents its discipline. The interdisciplinary studio at the core of the diagram is where faculty members and students trained in different disciplines come together to explore an issue. This exploration is often joined by professionals, clients, and community members outside of academia.

Source: created by the author

REFERENCES

Abramson, Daniel Benjamin. 2005. "The 'Studio Abroad' as a Mode of Transcultural Engagement in Urban Planning Education: A Reflection on Ten Years Of Sino-Canadian Collaboration." *Journal of Planning Education and Research*. https://doi.org/10.1177/0739456X04271475.

Alonso, William. 1986. "The Unplanned Paths of Planning Schools." *The Public Interest* 82: 58-. https://doi.org/10.1080/07293682.2009.9995289.

Berman, Larry A. 2013. "John Dewey's Experiential Theories and Leadership Preparatio in High Education." Saint Louis University. https://search.proquest.com/docview/1501462797?accountid=14784.

Booher, David E, and Judith E Innes. 2002. "Network Power in Collaborative Planning." *Journal of Planning Education and Research*. Vol. 21. https://doi.org/10.1177/0739456X0202100301.

Braddock, R D, J Fien, and R Rickson. 1994. "Environmental Studies: Managing the Disciplinary Divide." *Environmentalist* 14: 35–46. https://doi-org.offcampus.lib.washington.edu/10.1007/BF01902658.

Bruce, Ann, Catherine Lyall, Joyce Tait, and Robin Williams. 2004. "Interdiscilinary Integration in Europe: The Case of the Fifth Framework Programme." *Futures* 36 (4): 457–70. https://doi.org/10.1016/j.geoforum.2006.08.013.

Chapman, D. W., and P. J. Larkham. 1999. "Urban Design, Urban Quality and the Quality of Life: Reviewing the Department of the Environment's Urban Design Campaign." *Journal of Urban Design* 4 (2): 211–32. https://doi.org/10.1080/13574809908724447.

Chapman, David W. 2009. "Knowing Our Places? Contexts and Edges in Integrating Disciplines in Built Environment Education." *Journal for Education in the Built Environment* 4 (2): 9–28. https://doi.org/10.11120/jebe.2009.04020009.

Cheng, Renée, and Antonio Pacheco. 2019. "Deans List: UW's Renée Cheng on How Comprehensive Design Can Engender Inclusivity | Features | Archinect." Archinect. 2019. https://archinect.com/features/article/150145488/deans-list-uw-s-ren-e-cheng-on-how-comprehensive-design-can-engender-inclusivity.

Creswell, John W. 2014. *Research Design: Qualitative, Quantitative,and Mixed Methods Approaches*. 4th ed. Thousand Oaks, California : SAGE Publications.

Dalton, Linda C. 2001. "Weaving the Fabric of Planning as Education." *Journal of Planning Education and Research* 20 (4): 423–36. https://doi.org/10.1177/0739456X0102000404.

Dinmore, Ian. 1997. "Interdisciplinarity and Integrative Learning: An Imperative for Adult Education." *Education* 117 (3). https://go-gale-com.offcampus.lib.washington.edu/ps/i.

do?id=GALE%7CA19471176&v=2.1&u=wash_main&it=r&p=PROF&sw=w.

Dutton, Thomas A. 1987. "Design and Studio Pedagogy." *Journal of Architectural Education* 41 (1): 16–25. https://doi.org/10.1080/10464883.1987.10758461.

Flyvbjerg, Bent. 2001. *Making Social Science Matter : Why Social Inquiry Fails and How It Can Succeed Again*. Oxford, UK ; New York : Cambridge University Press.

Frank, Andrea I. 2006. "Three Decades of Thought on Planning Education." *Journal of Planning Literature* 21 (1): 15–67. https://doi.org/10.1177/0885412206288904.

Franks, Daniel, Patricia Dale, Richard Hindmarsh, Christine Fellows, Margaret Buckridge, and Patti Cybinski. 2007. "Interdisciplinary Foundations: Reflecting on Interdisciplinarity and Three Decades of Teaching and Research at Griffith University, Australia." *Studies in Higher Education* 32 (2): 167–85. https://doi.org/10.1080/03075070701267228.

Graybill, Jessica K, Sarah Dooling, Vivek Shandas, John Withey, Adrienne Greve, and Gregory L Simon. 2006. "A Rough Guide to Interdisciplinarity: Graduate Student Perspectives" 56 (9): 757–63. https://doi.org/10.1641/0006-3568(2006)56[757:argtig]2.0.co;2.

Gropius, Walter. 1955. *Scope of Total Architecture*. 1st ed. New York, Harper. https://www.academia.edu/9251905/Wk10-walter-gropius-scope-of-total-architecture?auto=download.

Guttenberg, Albert, and Louis Wetmore. 1987. "What's in a Name Change? City Planning and Landscape Architecture at the University of Illinois." *Journal of Planning Education and Research*, no. 7: 29–34. https://doi.org/10.1177/0739456X8700700104.

Hawkins, Mary E, Beverly Jeanne Davis, Daniel Roselle, Theodor Benfey, Clifford E Swartz, Joan G Creager, Colleen Stamm, and Eugenia Keller. 1975. "A Declaration on Interdisciplinary Environmental Education." *The American Biology Teacher* 37 (2): 81–82. https://www-jstor-org.offcampus.lib.washington.edu/stable/4445084.

Heikkinen, Kari-Pekka. 2018. "Exploring Studio-Based Higher Education for T-Shaped Knowledge Workers, Case Lab Studio Model Acta." University of Oulu.

Higgins, Marilyn, Elizabeth Aitken-Rose, and Jennifer Dixon. 2009. "The Pedagogy of the Planning Studio: A View from Down Under." *Journal for Education in the Built Environment* 4 (1): 8–30. https://doi.org/10.11120/jebe.2009.04010008.

Hostetler, Kelly Rose. 2014. "Process Based Learning in Planning Studio Pedagogy: A Theoretical Model for Planning Education." University of Washington.

Huber, Mary Taylor, Pat Hutchings, and Richard Gale. 2005. "Integrative Learning for Liberal Education." *Peer Review* 7 (3/4): Association of American Colleges and Universities: https://www.aacu.org/publications-research/periodicals/integrative-learning-liberal-education.

Ivanitskaya, Lana, Deborah Clark, George Montgomery, and Ronald Primeau. 2002.

"Interdisciplinary Learning: Process and Outcomes." *Innovative Higher Education* 27 (2).

Jarzombek, Mark. 2008. "A Green Masterplan Is Still a Masterplan." In *Urban Transformation*, edited by Ilka and Andreas Ruby, 22–29. Berlin: Ruby Press.

Johnston, Norman J. 1991. *The College of Architecture and Urban Planning, Seventy Five Years at the University of Washington : A Personal View - University of Washington*. Seattle : The Author.

Karlqvist, Anders. 1999. "The Theory and Practice of Interdisciplinary Work." *Policy Sciences* 32 (4): 379–83. https://www.jstor.org/stable/4532477.

Kelbaugh, Douglas S. 2008. "Three Urbanisms: New, Everyday and Post." In *New Urbanism and beyond : Designing Cities for the Future*, edited by Tigran Haas, 349. New York : Rizzoli.

Klein, Julie Thompson. 1990. *Interdisciplinarity : History, Theory, and Practice*. Wayne State University Press.

Klein, Julie Thompson. 2006. "A Platform for a Shared Discourse of Interdisciplinary Education." JSSE - *Journal of Social Science Education* 5 (April): 10–18. https://doi.org/10.2390/jsse-v5-i4-1026.

Klein, Julie Thompson, and Holly J. Falk-Krzesinski. 2017. "Interdisciplinary and Collaborative Work: Framing Promotion and Tenure Practices and Policies." *Research Policy* 46 (6): 1055–61. https://doi.org/10.1016/j.respol.2017.03.001.

Lenoir, Yves. 1997. "Some Interdisciplinary Instructional Models Used in the Primary Grades in Quebec." *Issues in Integrative Studies*, no. 15: 77–112. http://hdl.handle.net/10323/4168.

McEwen, Lindsey, Ros Jennings, Rob Duck, and Hazel Roberts. 2009. *Students' Experiences of Interdisciplinary Masters' Courses* | Lindsey McEwen - Academia.Edu. Edited by John Canning. Teaching & Learning. The Interdisciplinary Teaching and Learning Group, Subject Centre for Languages, Linguistics and Area Studies, School of Humanities, University of Southampton, Southampton. https://www.academia.edu/2111225/Students_experiences_of_interdisciplinary_Masters_courses?email_work_card=title.

Milburn, Lee Anne S., and Robert D. Brown. 2003. "The Relationship between Research and Design in Landscape Architecture." *Landscape and Urban Planning*. https://doi.org/10.1016/S0169-2046(02)00200-1.

Mishler, Elliot George. 1986. *Research Interviewing : Context and Narrative*. Harvard University Press.

Moudon, Anne Vernez. 1992. "A Catholic Approach to Organizing What Urban Designers Should Know." *Journal of Planning Literature* 6 (4): 331–49. https://doi.org/10.1177/088541229200600401.

Newell, William H, and Julie Thompson Klein. 1996. "Interdisciplinary Studies into the 21st Century." *The Journal of General Education* 45 (2): 152–69. http://www.jstor.org/stable/27797297.

OECD. 1972. "Interdisciplinarity: Problems of Teaching and Research in Universities." Paris: OECD Publications Center, Suite 1207, 1750 Pennsylvania Avenue, N. W., Washington, D. C. 20006

Parasonis, Josifas, and Andrej Jodko. 2013. "Architectural Engineering as a Profession: Report on Research Leading to a Curriculum Revision." *Journal of Civil Engineering and Management* 19 (5): 738–48. https://doi.org/10.3846/13923730.2013.812980.

Pasin, Burkay. 2017. "Rethinking the Design Studio-Centered Architectural Education. A Case Study at Schools of Architecture in Turkey." *The Design Journal* 20 (sup1): S1270–84. https://doi.org/10.1080/14606925.2017.1352656.

Petts, Judith, Susan Owens, and Harriet Bulkeley. 2008. "Crossing Boundaries: Interdisciplinarity in the Context of Urban Environments." *Geoforum* 39 (2): 593–601. https://doi.org/10.1016/j.geoforum.2006.02.008.

Ramadier, Thierry. 2004. "Transdisciplinarity and Its Challenges: The Case of Urban Studies." *Futures* 36: 423–39. https://doi.org/10.1016/j.futures.2003.10.009.

Schommer, Marlene. 1994. "Synthesizing Epistemological Belief Research: Tentative Understandings and Provocative." *Educational Psychology Review* 6 (4): 293–319.

Schön, Donald A. 1987. *Educating the Reflective Practitioner: Toward a New Design for Teaching and Learning in the Professions*. 1st ed. San Francisco : Jossey-Bass.

Seaburg, Pual, and Patricia S. Brown. 1999. "The Architectural Engineering Institute A Professional Society For Architectural Engineers." In *Association for Engineering Education - Engineering Library Division Papers*, 5. Atlanta: American Society for Engineering Education-ASEE. http://search.proquest.com/docview/2317720828/.

Sterling, Stephen. 2003. "Whole Systems Thinking as a Basis for Paradigm Change in Education: Explorations in the Context of Sustainability." University of Bath. https://doi.org/10.11120/jebe.2014.00011.

Sternberg, Ernest. 2000. "An Integrative Theory of Urban Design." *Journal of the American Planning Association* 66 (3): 265–78. https://doi.org/10.1080/01944360008976106.

Thompson, James. 2016. "Becoming an Architect: Narratives of Architectural Education." University of Washington. https://search.proquest.com/docview/1862183626?accountid=27233%0Ahttp://technion-primo.hosted.exlibrisgroup.com/openurl/972TEC/972TEC_SP?

"University of Washington Architecture and Urban Planning Renamed the College of Built Environments | UW News." n.d. Accessed April 27, 2020. https://www.washington.edu/news/2008/09/22/university-of-washington-architecture-and-urban-planning-renamed-the-college-of-built-environments/.

Van Manen, Max. 1990. *Researching Lived Experience : Human Science for an Action Sensitive Pedagogy*. State University of New York Press.

Van Manen, Max. 2016. *Phenomenology of Practice*. *Phenomenology of Practice*. Routledge. https://doi.org/10.4324/9781315422657.

Vella, Karen, Natalie Osborne, Severine Mayere, and Douglas C Baker. 2014. "Studio Teaching in Australian Planning Curriculum." *In Planning, Politics and People: Proceedings of the Australia and New Zealand Association of Planning Schools Conference*. http://anzaps.net/admin/wp-content/uploads/2014/01/2014.

Waldheim, Charles. 2006. The Landscape Urbanism Reader. Edited by Charles Waldheim. New York: Princeton Architectural Press.

Wallace, Richard L. 2017. "Barriers to Interdisciplinarity in Environmental Studies: A Case of Alarming Trends in Faculty and Programmatic Wellbeing." *Issues in Interdisciplinary Studies*, no. 35: 221–47.

Wortham, B. D. 2007. "The Way We Think about the Way We Think: Architecture Is a Paradigm for Reconsidering Research." *Journal of Architectural Education* 61 (1): 44–53. https://doi.org/10.1111/j.1531-314X.2007.00127.x.

Yocom, Ken, Gundula Proksch, Branden Born, and Shannon K. Tyman. 2012. "The Built Environments Laboratory: An Interdisciplinary Framework for Studio Education in the Planning and Design Disciplines." *Journal for Education in the Built Environment* 7 (2): 8–25. https://doi.org/10.11120/jebe.2012.07020008.

APPENDIX | CONSENT FORM

Investigator: Yuansi Cai
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Purpose of the Interview

As part of my thesis research, this interview seeks to understand how faculty translate the idea of interdisciplinary to their studio pedagogy and discuss the future potentials for the future interdisciplinary studio in the College of Built Environments. You are invited to this research because of your teaching experience in BE studio or McKinley Futures Studio.

Study Procedures

If you are willing to be in this study, I would like to have a 30-60 minutes interview with you. The interview will ask questions about your interest and interpretation of interdisciplinarity, how you applied it into the studio teaching, your takeaways from the experience, and your insights on the future interdisciplinary studio operation.

Confidentiality of Research information

With your permission, I would like to audio-record our interview in order to record our conversation accurately. The audio-record will be later transcribed. You will receive a digital copy of the transcripts, and you are welcome to offer additional thoughts in written form.

All the interview recordings and notes will be kept confidential. I will assign you a pseudonym and the link between your name and the pseudonym will be kept securely and separately. I will not use your name or any other identifying information if the results of this study are published or presented. The study records will not be used to put you at legal risk of harm.

You may refuse to answer any question in the interview and free to withdraw from this study at any time. If you have any questions about the research later, feel free to contact me anytime.

Printed name of study staff obtaining consent	Signature	Date
Printed name of subject	Signature	Date