ABSTRACT

KOO, TAE SEO. Integrating Design Disciplines: Understanding the Potential for and Factors Affecting the Success of Interdisciplinary Design Education for Architecture and Landscape Architecture. (Under the direction of Art Rice).

Interdisciplinary design education is becoming more important as design disciplines need various perspectives and solutions. However, only a limited amount of research has been done in regard to interdisciplinary design education. The goal of this study is to begin to answer the question about how designers and researchers develop and improve interdisciplinary design educational skills and methods.

This study investigates the current interdisciplinary efforts and structures of design curriculum in the American higher educational system and will focus on two disciplines, architecture and landscape architecture. Both disciplines deal with design issues affecting the physical environment and frequently collaborate in professional settings. This study does not deal directly with other environmental design majors, such as urban design, planning, architectural engineering, and historic preservation. However, some of the results and findings may also benefit these environmental educational programs.

The centerpiece of design education is the design studio (Glasser 250). In the studio, students integrate their knowledge of theory and technology in the pursuit of design solutions. In addition, the design studio could be the major place for collaborative learning. Therefore, the focus of this study is to document and understand the presence or absence of interdisciplinary learning in architecture and landscape architecture studios and to identify and evaluate the factors that promote and/or prevent interdisciplinary learning in this academic setting.

This study proposes to address these questions through
• the review of literature on interdisciplinary concepts, programs, approaches, and applications.
• the exploration of current interdisciplinary programs in the United States of architecture and landscape architecture.
• the investigation of existing interdisciplinary programs in the United States, through a preliminary and a primary questionnaire for design faculty.
Integrating Design Disciplines: Understanding the Potential for and Factors Affecting the Success of Interdisciplinary Design Education for Architecture and Landscape Architecture

by
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A dissertation submitted to the Graduate Faculty of North Carolina State University in partial fulfillment of the requirements for the degree of Doctor of Philosophy

Design

Raleigh, North Carolina

2012

APPROVED BY:

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Professor Eric Wiebe
DEDICATION

To

Young Eun Meghan Koo
my daughter

Kwan Hoi Ian Koo
my son

Wonjung Yeom
my wife

Hyun Seo Koo, Na Young Koo and Youn A Kim
my brother's family

Kyung Woong Koo and So Ja Kim
my parents

And to
my entire family
BIOGRAPHY

Tae Seo Koo was born in Seoul, Korea and developed an interest in environmental design questions including architecture and landscape architecture issues. This interest led him to gain an academic background in both architecture and landscape architecture disciplines. His environmental study began with perspectives in landscape architecture.

After receiving his professional degree, a Bachelor of Landscape Architecture in 1996 at Kyung Hee University, Seoul, Korea, he decided to expand his environmental design scope to larger scale design issues. He received his first Master of Engineering in Environmental Design ranging from architecture, landscape architecture, and urban planning to transportation systems in 1998 at Han Yang University, Seoul, Korea.

His research compelled him to continue his education studying architecture for his second Master's degree at Syracuse University, New York, in the United States. While earning his Master of Architecture, he worked as a teaching assistant for Architecture Structure 1, 2, 3, and Masonry Structure. He also participated in the summer study abroad program in Florence, Italy with a university scholarship and spent two months expanding his architectural vision and education.

After receiving his second Master's degree in architecture in 2002, he decided to attend the North Carolina State University to pursue his doctoral degree in design, concentrating on understanding environmental design problems by integrating architecture and landscape architecture disciplines. At North Carolina State University, Tae Seo worked as a research assistant and conducted his research focusing on interdisciplinary design education under the
supervision of Art Rice, Professor of Landscape Architecture. His research interest mainly focuses on integration specifically between architecture and landscape architecture. Interdisciplinary design education is a way of realizing collaboration between the two disciplines in the academic environment.

His research entitled "The State of, and Barriers to, Interdisciplinary Design Education in Landscape Architecture and Architecture" was presented at the 2012 Conference of the Council of Educators in Landscape Architecture (CELA) at the University of Illinois, Urbana-Champaign. Tae Seo received his doctoral degree in design at North Carolina State University in 2012.
ACKNOWLEDGMENTS

It was quite a long journey from the beginning to the end. However, this end does not mean the ending of this research. It leads to other questions and interests, and I plan to be deeply involved in the future development of this subject with all my passion and effort. Through this long journey, I experienced huge developments not only in academic achievement but also in personal success. During this journey at North Carolina State University, I learned how to conduct research and explore the research process and methods for accomplishing successful outcomes. My learning and growth were not limited to the academic aspect, but expanded to my entire life as a scholar and a person.

I am indebted to my dissertation committee: Professors Art Rice, Paul Tesar, Robert Kochersberger, and Eric Wiebe. Their knowledge and intellectual advice made it possible for me to make this journey successfully and with confidence. As a mentor, academic advisor, and dissertation committee chair, Professor Art Rice was the first person whom I met while studying at Syracuse University to interview me and give me an opportunity to pursue my Ph.D. at North Carolina State University. I will never forget and will always be grateful that I had the chance to meet such a wonderful person, for he was the person who gave me direction whenever I was faced with problems not only academically but also personally. Professor Rice was more than a mentor, advisor, and committee chair. He always encouraged me and supported me with his warm heart to stay on track when I lost my way or got off track on occasion for several different reasons. I thank him for working together with me to make my long journey enjoyable and leave a great impression on my life.
I express my deep gratitude to Professor Paul Tesar, School of Architecture, who enlightened me to the architectural perspectives and the application of my research interest to a more practical adaptation. His academic support inspired me to integrate my research subject with diverse perspectives from architecture education.

I want to thank Professor Robert Kochersberger from the Department of English for his continuous advising and for corrections of my dissertation with more professional journalistic perspectives. I was impressed by his interdisciplinary interest and guidance to make my long journey possible. I was first introduced to him as part of my committee, and our regular meetings soon extended to share and learn together what we found and studied.

I also want to thank Professor Eric Wiebe from the College of Education. His interest in design education inspired me to broaden my knowledge so it was not limited only to design disciplines. His questions always led me to think about various perspectives from the educator’s point of view. My academic journey would not have been possible without all of these men’s intellectual insights, professional advice, education with passion, and guidance with a warm heart.

I further wish to express my warm appreciation to my academic advisor Professor Jung Man Lee, at Han Yang University in Seoul, Korea, who introduced me to architectural inspiration and design learning. My introduction to architecture by him then came to fruition by my academic advisor Professor Arthur McDonald at Syracuse University who guided my academic career and taught me a broader scope of design problems while I pursued my Master of Architecture. These mentors' long-term relationship with me has kept me interested in design issues and developed my design career.
I wish to express my gratitude to my wife Wonjung who supports me with endless hope and wisdom for this long journey and for our life together with my lovely daughter Meghan and my brave son Ian who always wanted to have more and more time to play with me. Also my brother has always supported me with all his advice including computer technical support and a long term life plan while encouraging my research and design philosophy. Laura helped our entire family in a variety of ways, praying for our happiness, editing and reading my dissertation, and providing a chance to meet various people in the United States. I owe to each of them what I am and a piece of my success in this academic journey.

Finally, I also want to express my deepest, endless appreciation to my parents who have always trusted me and supported me in all ways possible, not only for this journey but also for my entire life. Without their assurance and concern for me, this journey would not have been successfully completed. Whenever I was faced with any kind of problem, my parents were always there for me and gave me a positive perspective, with confidence that I would soon be on the right track again, and I have felt what parents' love is.
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CHAPTER 1

1. INTRODUCTION

1.1 Premise

"Design activities are becoming more complex, creating new requirements for designers to work in interdisciplinary environments" (Spence, Macmillan and Kirby).

“Interdisciplinary is a way of seeming to be just a little bit adventurous and even transgressive, but not too much. It has been around long enough now to seem like a regular professional option, if it is not a discipline, in the structure of academic knowledge” (Mitchell).

As the above scholars’ statements indicate, design needs various perspectives and knowledge to effectively deal with complicated design problems. Both the academic and professional settings require a broader, deeper scope of vision to understand design issues and achieve successful design works. In professional design fields, compared to academic fields, most design projects are built through a process of interdisciplinary work and insights by sharing specific information and knowledge to accomplish design goals. In the Interior Design Handbook of Professional Practice, Coleman indicates the need for designers to have interdisciplinary perspectives in professional settings. “As the scale and variety in a global economy increases, clients are moving away from multiple-source providers and are seeking-out single-source providers. This is true in the design-arts related fields such as architecture, landscape architecture, graphic design, industrial design, and interior design” (Coleman). Fisher, Dean of the College of Architecture and Landscape Architecture at the University of Minnesota, mentions the academic design studio as the place for students to work in teams, learning through solving problems and making design products. Fisher states, “Students’ learning in such a setting is interdisciplinary, integrative, and concrete. Therefore, design disciplines should be understood more broadly than only dealing with specific aspect of the design” (5).
In academic settings, researchers and scholars from design disciplines have become interested in interdisciplinary design due to the need to combine different environmental perspectives in order to improve design solutions. By combining these various disciplinary perspectives, researchers and scholars have been able to expand and connect boundaries of related disciplines. Students also express interest in exploring design careers that cross disciplinary boundaries. To understand the differences and similarities among design disciplines and respond to design activities becoming more complex, an interdisciplinary approach to design is crucial for academic as well as professional environments. However, limited research has been done specifically focusing on interdisciplinary design education. Therefore, the goal of this study is to gain a better understanding of the design disciplinary gap and how to overcome this gap to develop a more successful model of interdisciplinary collaboration in the academic setting. It is hoped that more interdisciplinary design education could better prepare students to address complex design problems that need various perspectives.

1.2 Importance of research

1.2.1 Importance of interdisciplinarity in design research, education, and practice

Interdisciplinarity has been discussed and advocated in both the arts and sciences. William J. Thomas Mitchell, professor of English and art history at the University of Chicago, emphasizes interdisciplinarity in the Art bulletin when he says; “There is no question that ‘being interdisciplinary’ is a ‘good thing’ in contemporary academic parlance. If it is good to have a discipline or to be disciplined, it must be even better to have mastered more than one discipline, to be interdisciplinary” (540). Seipel, Professor of Agricultural Science at Truman State University, approaches interdisciplinarity from a scientific perspective. He proposes that “Interdisciplinary analysis in a more formal setting involves drawing on the specialized knowledge, concepts, or tools of academic disciplines and integrating these pieces to create new knowledge or deeper understanding” (2).
Just as in the arts and sciences, designers live and work in a complex world. They constantly draw on and integrate diverse information from education and experiences to make decisions, interpret phenomena, and generally understand the world. These informal and formal processes need an interdisciplinary approach.

A survey of North American design schools in the August/September 2004 issue of *The Metropolis* magazine reveals the significance of interdisciplinary collaboration among different design disciplines. It is suggested that interdisciplinary collaboration is an essential skill when dealing with complex design problems in a global market (Szenasy). Design educators need to embrace design through meaningful collaboration to develop pedagogy that encourages individual disciplines to learn together and move forward through productive collaboration.

In the article "The Multiple Tasks of Design Research," Margolin, a professor of art and design history at the University of Illinois at Chicago, mentions the importance of interdisciplinary approaches in design fields: “Designers need to know more about disciplines other than their own. They have to be familiar with literature in related fields such as the social sciences, engineering, and management theory” (43). His emphasis on interdisciplinary insights focuses on disciplines other than design but it is appropriate for the design disciplines and begins to identify interdisciplinary design educational issues.

Interdisciplinarity is also a polymorphous phenomenon as Lyon, a professor of English at Temple University, indicates in the *journal of College English* in 1992. She argues that “the nineteenth-century divisions of the university are no longer an adequate grid for intellectual activity, and in response, many disciplines appear more open to external discourses. One discipline's discourse is turning up in the texts of another, and often the inquiry focuses on broader issues and aims than have been traditional in the discipline” (681). Interdisciplinarity is moving to a larger frame of interpretation not limited to a specific discipline. The incorporation of different ideas from different disciplines is not limited to academic environments. In the book *Outside the Lines: Issues in Interdisciplinary Research*, Salter and Hearn argue that research in general is interdisciplinary in many ways because many research problems like design problems cannot easily be addressed from within the boundaries of particular disciplines, instead requiring the combined efforts of many people, each reflecting a different perspective. Interdisciplinary research plays a critical role in the research community and its significance is well established (Salter and Hearn).
In the journal *Design Issues* in 2004, Bayazit reviewed the past forty years of design research. During the 1990s, design research grew significantly in many fields of design. Bayazit states:

New professional demands on design research and the new educational confrontations for restructuring knowledge changed the context of design. Many academic environments around the world are developing models of higher education in design. The relationship between practice and research in design disciplines has become an important subject among the academic settings as well as the professional communities (27).

As Bayazit mentions, design research has been related strongly to design practice and design education. However, compared to the growing number of educational connections among these elements, not many of the institutional models have developed interdisciplinary design education.

Cross, a professor of design studies at Open University in U.K., also points out the importance of design research in *Design Issues* in 1999. He says, “Design research is becoming significant in various design disciplines. Design research has the possibility of creating paradigms and developing design research culture” (5). Cross also discusses the growing awareness of the strengths and appropriateness of design thinking in the field of design research in the last decade. Cross goes on to point out that “It is the challenge for design research to construct and develop both interdisciplinary and disciplined at the same time. Designers are still building the appropriate paradigm for design research. To build such a paradigm will be helpful to design practice and design education” (8).
Figure 1.1: Relationship among design research, practice, education, and interdisciplinarity

The above diagram shows the importance of interdisciplinarity in design disciplines. Interdisciplinarity can be a way of connecting various design aspects and also can be interpreted as an opportunity to expand the design education, collaboration, and interaction to the larger scale environmental problems caused by less interdisciplinary approaches and efforts in academic conditions. This diagram focuses on three major elements of design disciplines. All of the elements in design disciplines strongly influence each other. However, relevant literature indicates that the relationship among design practice, research, and education is not efficiently connected and well-established. Design education needs design research and design practice because of the relationship between design ideas and realizing the ideas in the physical environment. By introducing interdisciplinarity to design disciplines, the relationship among these elements will be more clearly understood. Interdisciplinary design education embraces the knowledge and interactions among different design disciplines and makes it possible to communicate with different ideas and thoughts by using interdisciplinary design skills. Therefore, this research can provide methods of overcoming the gap among these elements in design disciplines. However, this research will
only focus on interdisciplinary design education dealing with architecture and landscape architecture.

1.2.2 Purpose of this study

The purpose of this research is to explore interdisciplinary design and its application in environmental design education. The objective is to improve the development of our physical environment through theoretical and practical knowledge based on interdisciplinary integrations within environmental design fields.

This study investigates a variety of current situations related to interdisciplinary design education and is intended to provide beneficial guidelines for introducing and expanding interdisciplinary design education in professional design disciplines. Architecture, landscape architecture, interior design, graphic design, fine arts, and arts-related disciplines have many collaborative connections that provide innovative possibilities for interdisciplinary learning and teaching. This study will examine the potential interdisciplinary relations between architecture and landscape architecture education. The intent is to begin developing a structure for building interdisciplinary bridges between these related theoretical cultures in academic settings.

1.3 Focus of research

1.3.1 Problem area of study

The important and overarching motivation for engaging in interdisciplinary design education is to give students practice doing design projects that they will need to execute in their professional careers and personal design experiences. The professional may be called on to prepare a report that requires designers to draw on existing knowledge from several fields without becoming an expert in all of those fields; the individual may have to evaluate "expert claims" being made by competing interest groups. In either case, the practice of interdisciplinary design would be helpful in assembling and evaluating the necessary information.
Fisher argues that design schools in the future need to be based more on the perspectives of interdisciplinary design. He says, “One of the important transitions to be made by design schools over the next decade is to recast themselves as places where students learn to think critically as designers, while keeping the potential applications of that thinking as broad as possible” (5). This is the similar transition made in law schools earlier in this century, when students, formerly trained mainly in trial law, began to be encouraged to think like lawyers and to apply that thought process to the larger-scale law problems (Fisher 5). Before one can discuss the nature of interdisciplinary design education between architecture and landscape architecture, it is important to understand how each discipline is defined and how they are linked and differ.

Roth, Professor of Architectural History at the University of Oregon at Eugene, defines architecture as “the unavoidable art. Every moment, we are in buildings, around buildings, in spaces defined by buildings, or in landscapes shapes by human artifice. Architecture constantly touches us, shapes our behavior, and conditions our psychological mood. Architecture is the science and the art of building” (6). As his definition indicates, architecture can be thought of as an art that deals with human beings at all social levels and at different places and times. Architecture can also be thought of as a science of designing spaces for serving the diverse activities of human beings and their physical needs. It is a discipline that requires the major fields of human endeavor such as the humanities, science, art, and technology.

Architecture is also defined in the dictionary of architecture as concerned with the creation of order out of chaos, a respect for organization, the manipulation of geometry, and the creation of a work in which aesthetics plays a far greater role than anything likely to be found in a humdrum building. Architecture might be described as the art and science of designing a building having qualities of beauty, geometry, emotional and spiritual power, intellectual content and complexity, soundness of construction, convenient planning, many virtues of different kinds, durable and pleasing materials, agreeable coloring and decorations, serenity and dynamism, good proportions and acceptable scale, and many mnemonic associations drawing on a great range of precedents (Curl and Sambbrook).
In *Modern Architecture and Other Essays*, Scully, Professor of the History of Art in Architecture at Yale University, interprets architecture as follows:

The human act of architecture is the construction of the whole human environment and that the entire constructed environment is architecture. Therefore, the first element of architecture is the natural world, and the second element is everything manmade. In that relationship between the manmade and the natural, the metaphysical wholeness of architecture is always seen. Architecture builds an environment which normally takes shape and changes across time, and everything plays a part in it: buildings with interior functions and exterior responsibilities, streets, sidewalks, lights, signs, and automobiles. Hence all of the constructed environment is architecture (Scully and Levine).

His definition of architecture deals with larger scale environmental issues which need collaboration among environmental design disciplines.

Landscape architecture deals with the analysis, planning, design, management, preservation and rehabilitation of land and also determines the environmental impact. It integrates the elements of architecture, urban design and civil engineering for meaningful and practical solutions. Landscape architecture covers a wide spectrum of professional expertise, ranging from landscape planning at the regional and city scale on the one end to the small and medium scale of public and private landscape at the other. It involves dealing with plazas, squares, highways, parks, housing developments, and institutional campuses. Architecture and landscape architecture are the two major design disciplines related to constructing the environment. The American Society of Landscape Architects defines landscape architecture as:

the analysis, planning, design, management, and stewardship of the natural and built environments. Types of projects include: residential; parks and recreation; monuments; urban design; streetscapes and public spaces; transportation corridors and facilities; gardens and arboreta; security design; hospitality and resorts; institutional; academic campuses; therapeutic gardens; historic preservation and restoration; reclamation; conservation; corporate and commercial; landscape art and earth sculpture; interior landscapes; and more. Landscape architects have advanced education and professional training and are licensed in 47 states ("What Is Landscape Architecture?").
Laurie, Professor of Landscape Architecture at the University of California at Berkeley, quotes Garrett Eckbo’s definition of landscape architecture in the 1986 book *An Introduction to Landscape Architecture*. Garrett Eckbo defines landscape architecture as, “the establishment of relations between building, surfacing, and other outdoor construction, earth, rock forms, bodies of water, plants and open space, and the general form and character of the landscape; but with primary emphasis on the human content, the relationship between people and landscape, between human beings and three-dimensional outdoor space quantitatively and qualitatively” (Eckbo qtd. in Laurie 10).

A dictionary of landscape architecture states:

landscape architecture is one of three broadly based professions (the others being engineering and architecture) that deals with the arrangement of animate and inanimate objects on land and the ties people have with those objects. Landscape architecture as a science deals with the technical manipulation of objects and people in outdoor places. As an art, it expresses applied intelligence and human emotion, from anger to love, from compassion to aloofness, from frustration to nostalgia, in a compelling mixture of new and old ways, at its best linking people and landscape in a timeless, chromatic flow (Morrow).

As the above definitions indicate, architecture and landscape architecture are the two major environmental design disciplines. They both deal with environmental design problems, and they frequently educate students within the same college or school in the university. This research focuses on the future development of successful interdisciplinary design education between these two disciplines.

### 1.3.2 Focus of design disciplines

Interdisciplinary design education can be approached from a variety of perspectives. There are numerous disciplines including architecture, landscape architecture, urban planning, graphic design, and industrial design, and all have the potential to engage in interdisciplinary design education settings. However, for this study all of these potential interconnections cannot be explored. This study focuses on two selected design disciplines, architecture and landscape architecture. These two design disciplines have significant potential for providing and benefiting from interdisciplinary design education. Architecture
mainly deals with interior space and landscape architecture with exterior space. Interior and exterior space are connected and benefit from a more collaborative approach to design. Interdisciplinary design education should not be limited to these two disciplines. Thus, this study is intended to be a beginning, leading toward a better understanding of the broader issues facing interdisciplinary design education. Despite the narrow focus of this study, it is hoped that the methods and observations of this study can be applied to other design disciplines in different academic and professional settings. This study attempts to find ways of integration and collaboration between the two design disciplines by investigating the barriers to, opportunities for, and both the successes and failures of interdisciplinary collaboration between these two related design disciplines.

1.4 Research structure

In this section, the research process and structure are introduced. The structure of this research is developed through the process of identifying the issues of each stage.

The first phase of the research involves understanding the importance of interdisciplinarity to the growth of design education and the future of design disciplines. This exploration includes a thorough review of existing literature related to interdisciplinarity, design disciplines, collaboration in design, and interdisciplinary design education.

Phase two involves the investigation of the current status of interdisciplinary design education. In this stage, the research was limited to higher educational systems in the United States that have architecture and landscape architecture programs in the same college or school. The process for this phase includes a web-based survey to find out the current status of interdisciplinary design education in these institutions. The entire university system, curriculum structure, course requirement, and mission statement are examined to identify the status of interdisciplinary design education at each institution and how it is currently administered and expressed in the curriculum.

Phase three consists of a survey of the faculty’s perspective on interdisciplinary design education to identify its current status, problems, advantages, and disadvantages from a faculty perspective.
Phase four focuses on identifying faculty activity related to interdisciplinary design education to identify barriers, successes, and faculty interpretations of interdisciplinary design education. It investigates problems and solutions related to reducing obstacles in interdisciplinary design educational programs in academic settings.

The final phase is to analyze the results from the previous phases in order to identify and develop observations relating to the goals of this study and, it is hoped, to develop recommendations regarding the future direction of interdisciplinary education in design. Different methods are used in each phase, and the results of each phase will be compared to define common issues and observations that can be the underpinning for a set of findings that will contribute to our understanding of interdisciplinary design education.
Figure 1.2: Structure of this research

The above diagram shows the overall process and structure of this research.
CHAPTER 2

2. LITERATURE REVIEW

This section will focus on the relevant literature of interdisciplinarity. It will begin with interdisciplinarity in general including non-design disciplines, define similar terms related to interdisciplinarity, and ultimately will discuss writings related to interdisciplinary design, research, practice, and education.

2.1 Introduction

Interdisciplinarity has been interpreted by many scholars, researchers, and practitioners in different academic disciplines. Seipel addresses the concept of interdisciplinarity and the role of interdisciplinary studies in liberal arts and sciences. He says that for more than fifty years, higher education has relied on academic disciplines to generate new knowledge and provide a process by which it becomes accepted:

This discipline-based structure has become dominant in most universities, controlling the resources that go into teaching, research, and outreach activities. This structure capitalizes on the benefits of specialization—allowing specialists within a discipline to refine theories, methods, and technologies and push outward the bounds of knowledge within that field. Interdisciplinary analysis builds on, rather than supplants, the strengths of the disciplinary model. The interdisciplinary scholar draws on appropriate disciplinary insights and reconfigures them in novel ways to address the question. However, simply drawing on the concepts or methodologies of multiple disciplines does not automatically constitute interdisciplinary analysis (2).

The following diagram presents a structure for the exploration of interdisciplinary approaches, specifically related to design disciplines. It shows the whole process of the literature review and the relationship between design disciplines and interdisciplinary design education.
Figure 2.1: Overall structure of literature review
2.2 What is a discipline?

Nissani, a professor of Interdisciplinary Studies at Wayne State University, defines interdisciplinarity as follows:

The word “interdisciplinarity” is made up of two words: *inter* and *disciplinarity*. *Inter* means between, in the midst of, and connecting. *Disciplinarity* refers to a specific field of academic study. Each discipline has its own specialists, typically taught by one or another department within a university with its own distinct subjects. As the disciplinary boundaries are extended to address complex academic problems that are hard to solve by disciplinary territory, it is necessary to bring different disciplines together. Thus, interdisciplinarity may be defined as combining in some fashion components of two or more disciplines (Nissani).

As the word “interdisciplinarity” represents, it is closely related to disciplines. Therefore, the first step is to clarify the meaning of discipline.

Lattuca, a professor of education at Penn State University, focuses her research on the intersections of curriculum, teaching, student learning, and faculty work in higher education. She points out that disciplines are complex phenomena. She emphasizes that disciplines can be defined as sets of problems, methods, and research practices or as bodies of knowledge that are unified by any of these. In addition, she discusses disciplines as social networks of individuals interested in related problems or ideas. The first definition stresses the infrastructure of the disciplines, the second their social, cultural, and historical dimensions (Lattuca).

Another scholar, Finkenthal, a professor of the Department of Physics and Astronomy at Johns Hopkins University, indicates in *Interdisciplinarity: Toward the Definition of a Metadiscipline*? that a “discipline is more than a field of intellectual endeavor defined by the object of its research. Discipline implies the ability to transfer knowledge in an 'objective' way, that is, in such a way that anybody in possession of certain tools can understand it, anywhere and at any time” (5). In addition, Finkenthal points out that "the definition of a discipline requires a logic which enables a consistent handling of its concepts. If this logic is
applicable to another set of concepts, an interdisciplinarian relation can be established between the two domains" (5). This logic is also applicable to design disciplines because of the design issues requiring more than one design discipline to find design solutions.

Disciplines also provide the foundation for the departmental structure of American colleges and universities and strongly influence faculty appointment, teaching assignments, and even accounting practices. Bauer, a professor of chemistry and science studies at Virginia Polytechnic Institute and State University, also emphasizes the point that the various academic disciplines represent different cultures. “By seeing disciplines as cultures, one recognizes that a field or subject-- its knowledge, methods, and theoretical approaches--cannot be separated from its practitioners. Outsiders cannot properly practice an intellectual discipline, just as foreigners find it difficult to assimilate into a national culture. Single elements of a culture cannot be separated from it and then merged with elements from other cultures” (Bauer 111). Communication across academic disciplines is impeded by a host of differences that are largely implicit. He suggests that communication and cooperation could be facilitated by making explicit what the differences actually are and how they stem from an initial concern with different subjects. Disciplines differ not simply through being knowledge about different subjects, nor just because they happen to use different methods for getting knowledge. Bauer identifies how disciplines differ in epistemology, in what is viewed as knowledge, and in opinion over what sort of knowledge is possible. Therefore they differ over what is interesting and what is valuable. The attempt to communicate across the cultures is as listening to a foreign language of which one only knows a few words. The disciplines evolved and flourished as their individual quests for knowledge prospered, just as languages grew and evolved differently. Bauer also points out that “division of the intellectual realm into disciplines is analogous to the division of humanity into different language groups. Just as languages are distinguished more by grammar and syntax than by vocabulary, so disciplines are distinguished more by theoretical and methodological points of view than by the 'facts' they contain” (112).

Another definition of discipline is also presented by scholars in the field of musicology in their interactions with other music disciplines. On their web site, http://www.uni-graz.at/~parncutt/cim07/definitions.htm, they show a conscientious effort to define terms of discipline to lay the ground work for collaboration. An academic discipline generally has a common research object and common ways of describing and investigating it. These
include terminology, methods, approaches to and techniques of analysis, and ways of thinking and perceiving.

According to Ross and Parncutt,
The word 'discipline' corresponds not only to this generally accepted meaning but also to the original Latin *disciplina*, which means teaching, instruction, training, or education in the broadest sense. *Disciplina* can also refer to the content or results of teaching, which can itself be divided into two aspects. The first involves (self-) discipline or an ordered way of life, and associated habits, customs, and culture. The second involves learning in general: bodies of knowledge in fields as diverse as science, art, morals, politics, and rhetorical or philosophical schools, systems, and doctrines. This final meaning corresponds to the academic meaning of the word 'discipline' in different modern languages. In its original sense, *disciplina* may be applied to different levels of academic disciplinary hierarchies. The only condition is that different disciplines involve significantly different kinds of training. At the highest or broadest level the domains of knowledge to the humanities, the sciences, and design may also be regarded as 'disciplines,' just as subdivisions of these groupings such as history, physics, or industrial design may be regarded as disciplines. Even smaller further subdivisions may also be regarded as disciplines, provided that experts in these areas have significantly different training from experts in neighboring areas ("Definitions").

A discipline can vary in size consistent with the original meaning. However, the word is more often applied to intermediate levels in the hierarchy of academic knowledge. Ross and Parncutt state, "If the use of the word is confined to that level, then the term 'interdisciplinary design' is self-contradictory: interactions within design are by definition not inter- but intra-disciplinary. The problem with this objection is that the subdivisions of design are more closely related in their methods, training, and ways of thinking to the corresponding 'mother disciplines' than to each other" ("Interdisciplinary Collaboration"). For example, interaction between architecture and landscape architecture is also an interaction between design disciplines, because it involves an interaction between the methods, training, and ways of thinking of design discipline. Thus, an interaction between architecture and landscape architecture can be regarded as interdisciplinary, even though architecture and landscape architecture are also part of a single discipline called design cultures.
2.3 What is a design discipline?

Design requires an understanding of a variety of sub design disciplines, including design technology, history, theory, and criticism. Design disciplines have their own terms, within their own rigorous culture like other non-design disciplines.

In the book *The Idea of Design*, Margolin and Buchanan mention the design disciplines and design thinking. They claim that design thinking in the contemporary world must be based on knowledge gained from many fields and disciplines and not limited to design disciplines, stating “The core of design thinking remains the ability to conceive, plan, and present ideas about products and places which do not as yet exist. Knowledge may be a source of inspiration, practical constraint, or criteria for evaluation, but knowledge is useless unless it is transformed in the designer’s imagination into ideas and images, visions of the world that may be effectively communicated to others” (X\Y). Even within a design field, there are many design disciplines; some are more closely related than others. For this study, architecture and landscape architecture are the two design disciplines that have a close relationship because these design disciplines have similar design processes, products, and concentrations. However, in academic settings, these design disciplines are separated by structure, administration, and departmental boundary. Therefore, the concept of interdisciplinary design provides the ability to understand and communicate with various design disciplines to accumulate design ideas, knowledge, and thinking. The concept of interdisciplinary design also can be applied to architecture and landscape architecture for developing integration and collaboration between these disciplines.

A proposal for a school of design in the University of California at Irvine indicates that design disciplines now encompass more than the issues, technologies, and the agents involved in creating and using artifacts, processes, and built spaces. The expanded role of design has imposed new demands on designers. In addition, the proposal points out that designers are required to have a global perspective on their work and to investigate and articulate the principles and methodology behind the designs through systematic research, experimentation, intellectual inquiry, theoretical speculation, and interdisciplinary insights (*Proposal for a School of Design at the University of California, Irvine*). Design disciplines
are also expected to communicate their findings and contribute to a body of knowledge constitutes the basis for academic disciplines and the integration of disciplines. The proposal suggests that this integration is one of the most important aspects of interdisciplinary design settings.

In the book *The Sciences of the Artificial*, Simon proposes that “the science of design" could form a fundamental, common ground of intellectual endeavor and communication across the arts, sciences and technology. He suggests that the study of design could be an interdisciplinary study accessible to all those involved in the creative activity of making the artificial world. For example, “Few engineers and designers can carry on a mutually rewarding conversation about the content of each other’s professional work. They can carry on such a conversation about design, can begin to perceive the common creative activity in which they are both engaged, can begin to share their experiences of the creative, professional design process” (Simon 137). His suggestion deals with design disciplines and includes non-design disciplines to expand design thinking and ideas. This research focuses only on design disciplines, specifically architecture and landscape architecture.

2.4 What is interdisciplinarity?

Since the beginning of the use of the term “interdisciplinarity,” many scholars have shaped interdisciplinary work. Interdisciplinarity has been defined in many different ways by various disciplines and scholars. Depending on one’s definition of discipline, one may nevertheless argue that "true" interdisciplinarity can be achieved through collaboration.

Lattuca defines interdisciplinary as 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. An interdisciplinary group consists of persons trained in different fields of knowledge (disciplines) with different concepts, methods, data and terms organized into a common effort on a common problem with continuous intercommunication among the participants.
from the different disciplines. As Lattuca correctly notes, this definition is broader than teamwork or collaboration, is discipline-based, and may be reformulated in terms of a continuum of interactions (18).

Similar to Lattuca’s definition of interdisciplinarity, Ross and Parncutt define it as an interaction between or among academic disciplines. There are many different levels of interaction between disciplines, ranging from superficial reference to relevant work done by another discipline without incorporating its findings to the fundamental assumptions and methods of one discipline. Another problem is the fuzziness of the boundaries of disciplines. The Latin etymology suggests that interdisciplinarity is an interaction between different kinds of academic training; not only different bodies of knowledge, but also different ways of approaching and thinking about academic questions or methods ("Definitions").

Interdisciplinary work is defined as integrating concepts across different disciplines. New disciplines have arisen as a result of such syntheses. Interdisciplinary work is usually common in complex environments and conducted by a team of people with training in different fields. A few traditional disciplines could be considered as more interdisciplinary than others: philosophy, anthropology, mathematics, business, education, ecology, and history among others. However all disciplines have important connections with other disciplines ("Dictionary by Labor Law Talk").

Klein, a professor of humanities in interdisciplinary studies program at Wayne State University, is among the leading theorists of interdisciplinarity. She compares interdisciplinary relationships among the humanistic and social sciences as well as in the sciences. She investigates the claims, activities, and institutional structures that define interdisciplinary practices. Her study is a synthesis of existing scholarship on interdisciplinary research, education, and health care. She provides the comprehensive study of the modern concept of interdisciplinarity. Her definition of interdisciplinary study is "a process of answering a question, solving a problem, or addressing a topic that is too broad or complex to be dealt with adequately by a single discipline or profession" (3). As Klein's definition of interdisciplinarity indicates, design disciplines, specifically architecture and landscape architecture, also need interdisciplinary approaches because of the complex and broad design problems that cannot be solved by a single design discipline.
Interdisciplinary approaches to design expand knowledge, processes, and solutions in design problems by collaborating with other design disciplines.

Klein argues that any interdisciplinary activity embodies a complex network of historical, social, psychological, political, economic, philosophical, and intellectual factors. Whether the context is a short-ranged instrumentality or a long-range reconceptualization of the way we know and learn, the concept of interdisciplinarity is an important means of solving problems and answering questions that cannot be satisfactorily addressed using singular methods or approaches. As Klein notes, interdisciplinarity is a concept of wide appeal, but it is also one of wide confusion. She identifies three major reasons for this confusion: the first one is general uncertainty about the meaning of the term; the second one is widespread unfamiliarity with interdisciplinary scholarship; and the third one is the lack of a unified body of discourse. She states,

While all three contribute to the background context for any proposed definition of interdisciplinarity, it is the last confusion, the dispersion of discourse on interdisciplinarity, which is most fundamental. Accordingly, it is necessary to propose a provisional, working definition of the concept that is sufficiently structural or formal, specifically, one that is broad enough to accommodate within its semantic scope the diverse, and even competing, types of interdisciplinary interaction. As such, it will function as a preliminary interpretive orientation to interdisciplinarity as a complex, vast, and diverse phenomenon (Klein).

At the university level, Dolan’s Master’s thesis Designers’ Perceptions of Interdisciplinary Design Education investigates the benefits of an interdisciplinary approach to design education and defines interdisciplinary design as "a design program in which two or more of the disciplines of design are taught jointly in some curriculum of their respective program" (10). Compared to Klein’s approach to interdisciplinarity including various disciplines, he focuses on the design disciplines. He emphasizes the meaning and value of interdisciplinary approach in design.

Ross and Parncutt explain why interdisciplinary work can benefit various disciplines. Disciplines are carried forward by individual researchers; one might define a discipline as a coherent field of research whose size is limited by that constraint. This idea can explain why, when a field of research becomes too big for one person to deal with, the field tends to split into smaller fields. If the concept of discipline is defined in this way, it
becomes clear that one person cannot be an expert in two disciplines at once. Therefore, interdisciplinarity can benefit from collaboration with one of those experts ("Definitions").

There are many definitions of interdisciplinarity. In academic settings, students and faculty working in an interdisciplinary fashion will each develop his or her own view as to what constitutes interdisciplinarity.

The following perspective from Fairbairn and Fulton is offered to focus attention and prompt thinking of interdisciplinarity:

Our hypothesis is that interdisciplinarity can be defined as a problem-based approach - or what we might also call an object-based approach - in which knowledge and methods are brought to bear as needed to solve a complex problem or to address an object of study. The problem or the object is defined externally to the disciplines involved; it is not a simple intellectual construct or abstraction. Such an approach is distinct from disciplinary research, in which problems are conceived within the knowledge and methods of the discipline (4).

This view stresses the need for identifying problems, for the crossing of boundaries, and for embracing different perspectives and methodologies (Fairbairn and Fulton 5). Similar to their perspectives, design disciplines including architecture and landscape architecture frequently use an object-based approach to find design solutions. Design fields also tend to use the problem-based approach to solve complex design problems by using design knowledge, methods, and skills. Therefore, design disciplines specifically for architecture and landscape architecture have the potential to be more interdisciplinary for identifying design problems, collaborating across the disciplinary boundaries, and implementing design methodologies. In design education, the concept of interdisciplinarity is not so much engaged to the extent one would think given that design itself needs various perspectives from different disciplines. Interdisciplinarity in design education is a way of understanding and applying the fragmented knowledge into meaningful interpretation for solving complex design problems.

Mitchell distinguishes three kinds of interdisciplinarity: (1) "top-down": a comparative, structural formation that aims to know the overarching system or conceptual totality within which all disciplines are related; (2) "bottom-up": a compulsive and compulsory interdisciplinarity that is dictated by a specific problem or event; (3) "inside-out": the undisciplined or anarchist moment (541). The top-down model incorporates organization of
knowledge production that can regulate flows of information from one part of the structure to another. The bottom-up model emerges on the floor in response to emergencies and opportunities.

2.4.1 Definitions of interdisciplinary related terms

In addition to the concept of interdisciplinarity, there are several other similar terms such as multidisciplinary, intradisciplinary, crossdisciplinary, and transdisciplinary. These terms and concepts are frequently used together without defining the differences and similarities among the terms. Misunderstandings happen when these terms are used to collaborate and communicate with other disciplines and practices. Therefore, the terms related to interdisciplinarity should be clearly defined and used correctly.

Marilyn Stember contrasts the terms interdisciplinary, crossdisciplinary, multidisciplinary, intradisciplinary, and transdisciplinary. By Stember's definition, "interdisciplinary analysis requires integration of knowledge from the disciplines being brought to bear on an issue. Disciplinary knowledge, concepts, tools, and rules of investigation are considered, contrasted, and combined in such a way that the resulting understanding is greater than simply the sum of its disciplinary parts" (341). However, the focus on integration should not imply that the outcome of interdisciplinary analysis will always be a neat, tidy solution in which all contradictions between the alternative disciplines are resolved. Interdisciplinary study may indeed be "messy." However, contradictory conclusions and accompanying tensions between disciplines may not only provide a fuller understanding, but could be seen as a healthy symptom of interdisciplinarity. Analysis which works through these tensions and contradictions between disciplinary systems of knowledge with the goal of synthesis—the creation of new knowledge—often characterizes the richest interdisciplinary work.

Stember goes on to define crossdisciplinary activity as one discipline from the perspective of another, such as when principles of physics are used to understand acoustics of music and multidisciplinary analysis as drawing on the knowledge of several disciplines, each of which provides a different perspective on a problem or issue. Stember cites Women's Studies and African-American Studies programs as often based on a
multidisciplinary model. For example, a Women's Studies Minor allows students to choose classes from a number of disciplines, including English, History, Sociology, Art, Theatre, Communications, and Philosophy and Religion. In multidisciplinary analysis, each discipline makes a contribution to the overall understanding of the issue, but in a primarily additive fashion. Students make the connections between the various disciplinary contributions. Nicolescu defined multidisciplinarity as the study of a subject belonging to one given discipline, by means belonging to several other disciplines.

Interdisciplinary analysis, which involves integration and synthesis, builds on the intradisciplinary, crossdisciplinary, and multidisciplinary analyses. Intradisciplinary analysis involves work within a single discipline, such as the biologist investigating cell structure of a particular organism.

Transdisciplinary analysis, in Stember's words, is "concerned with the unity of intellectual frameworks beyond the disciplinary perspectives" (341). It may deal with philosophical questions about the nature of reality and the nature of knowledge systems that transcend disciplines. It is also defined by Romanian quantum physicist Basarab Nicolescu. Finkenthal quoted Basarab Nicolescu's definition of "transdisciplinarity as concerns that which are at once between the disciplines, across the different disciplines, and beyond all discipline," and its aim is the unity of knowledge together with the unity of our being. Its goal is the understanding of the present world, of which one of the imperatives is the unity of knowledge. Transdisciplinarity is a new way of knowing, a new epistemology which in turn requires a new ontology (Nicolescu qtd. in Finkenthal 86).

Finkenthal, a physicist with interests in other fields, defines the conceptual similarities and differences between interdisciplinarity, transdisciplinarity, multidisciplinarity, intradisciplinarity, and metadisciplinarity. He quotes the definitions from Basarab Nicolescu’s book Transdisciplinarity published in France: “Interdisciplinarity is a mere transfer of methods from one discipline into another. There are three degrees of interdisciplinarity. One is that of the ‘transfer,’ when methods of a discipline transferred to another discipline offer a new way of knowledge. The second is the ‘epistemological’ degree, which represents a transfer of a ‘tool.’ The third is the creation of new disciplines” (Nicolescu qtd. in Finkenthal 86).

Nicolescu’s definition of multidisciplinarity is that, “It represents the study of a subject belonging to one given discipline, by means belonging to several other disciplines.” By his
definitions, both interdisciplinarity and multidisciplinarity are relevant only inside a given discipline. However, transdisciplinarity must address that which is at the same time between the disciplines, across the disciplines, and beyond the disciplines. It requires a unity of knowledge and a new way of knowing” (Finkenthal 80).

2.5 Why is interdisciplinarity important?

In the book *Facilitating Interdisciplinary Research*, the National Academies Committee approaches interdisciplinarity in a variety of disciplines and fields. They indicate

Interdisciplinarity in various fields, including the design disciplines, can be one of the most productive and inspiring of human pursuits. It can be the basis of communications and connections that lead to new knowledge. Interdisciplinarity has resulted in many accomplishments in different fields. It has long been accepted in many industrial and government laboratories and other nonacademic settings; such settings traditionally emphasize teams and problem-driven research, and they permit researchers and scholars to move easily between laboratories, to share and learn their skills (National Academies 16).

In the academic environment, such collaboration is often impeded by administration, funding, and cultural barriers between departments. However, successful interdisciplinarity in the design fields may reduce existing gaps that can cause less than desirable environmental outcomes.

Nadler, professor of industrial and systems engineering at the University of Southern California, claims that:

if college education emphasized integration and use of knowledge, then necessary skills and the principles behind them would be learned by a broader cross-section of the workforce and in ways that would promote more effective use. Rather than educating students for just one life-long career, it is hoped to educate them to be instrumental in contributing and managing technological change. This requires balanced experience in several areas: analysis and synthesis, science-based and process-based knowledge, communication, and human and societal issues (Nadler).
The goal is for students to develop a deeper understanding of their own discipline, an appreciation of what several related disciplines bring to their problems and strong collaboration skills. Therefore, interdisciplinarity is significant to make an effective and strong bridge connecting design disciplines.

2.6 Evolution of interdisciplinarity in the academic community

"In the realm of the intellect and its variety of cultures, we are still at the primitive level of tribalism, complete with xenophobia, much more likely to wage war on other tribes than to regard them as equals worthy of meaningful collaboration" (Bauer 111). As Bauer says, interdisciplinary approaches in various disciplines are still struggling with issues related to the methods, territories, and applications of interdisciplinarity.

As the concept of interdisciplinarity has been developed through history, many scholars have asked questions about interdisciplinarity in various disciplines. Specialization within the borders of well-defined disciplines is a reality of intellectual endeavor in all areas of contemporary academic research.

Finkenthal believes that interdisciplinarity as understood and practiced today is not a miraculous solution to all the difficulties to understand the complex world, but rather that interdisciplinarity poorly understood and badly practiced leads to nonsensical intellectual constructs which deepen the disciplinarian divide. At all times when we talk about interdisciplinarity, nobody is an expert. The apple has its origin in the roots of the apple tree; that is a perfectly true statement, it is at the same time a perfectly useless one when we want to characterize an apple and compare it with an orange (17).

As he emphasizes, doing interdisciplinary work successfully requires an approach to the problems with the right methods, techniques, and directions.
2.7 Historical development of interdisciplinary efforts

Roberta Frank identifies that “the concept of interdisciplinarity was probably born in New York City in the mid-1920s at the corner of Forty-Second Street and Madison Avenue. The offices of the Social Science Research Council (SSRC) were at Forty-Second and Madison. During the 1930s the term was used in the SSRC as a kind of ‘bureaucratic shorthand’ for research involving two or more of the several professional societies of the Council” (139).

In addition, Lattuca points out that “the historical development of interdisciplinarity in the American academic community began in the 1930s but reached a peak during the 1970s and 1980s. The realities of today's academic organizations oblige observers of higher education to study interdisciplinarity and disciplinarity in point and counterpoint. Most scholars define the locus of interdisciplinarity as the integration of disciplinary perspectives” (23).

In 1979, the first Interdisciplinary Research Management Conference showed that such research was of growing importance but many barriers to its introduction and efficient use were being encountered. Most of them were a matter of getting people coming from diverse disciplinary backgrounds to overcome institutional obstacles and personal inhibitions (Epton, Payne and Pearson 1).

In the late 1980s, a number of reports announced the relatively disruptive nature of the construction industry in the UK compared with Japan, USA and other European countries (Collier, Bacon and Burns). There was the need for greater collaboration among professionals and attempts to encourage an interdisciplinary approach in many disciplines including design (Andrews and Derbyshire).

Salter and Hearn point out that interdisciplinarity has been at times associated with intellectual fads and fashions. This view, that interdisciplinary research lacks both substance and good scholarship, is frequently heard in university chambers. But there is a contrasting view. In recent years some universities in Canada, in the United States, and elsewhere have come to value interdisciplinarity. It is seen to represent the best efforts of researchers not only to focus on societal issues but to explore the social and practical applications of their expertise (3).
Mitchell also indicates that “every up-to-date university in the United States has its commitment to interdisciplinary research and training. Institutes, councils, consortia, collaborative groups, and workshops are set up to encourage conversations across disciplines” (540).

Despite increases in interdisciplinary activity in postsecondary education, disciplinary frameworks still organize most faculty members’ understanding and interpretations of information and experience (Lattuca). The disciplines may still be adequate for coordinating teaching activities within a university, but they are misleading simplifications of research areas and the intellectual domains that sustain them (Becher).

2.8 Benefits, obstacles, barriers, and challenges of interdisciplinarity

Despite the apparent benefits of interdisciplinarity in design research and education, researchers, educators, and designers interested in pursuing it often face obstacles and disincentives in higher educational systems. Some of the disincentives take the form of personal communication or cultural barriers; others are related to the traditional form in academic institutions of organizing and teaching activities by discipline-based departments.

Salter and Hearn suggest that there are three ways to become interdisciplinary:

1. The combination of two or more disciplinary traditions.
2. The creation of new fields of study.
3. The incorporation of the interdisciplinary critique within the perspectives, methods, or topics of the established disciplines.

However, there is another quite different kind of challenge posed by interdisciplinarity. This second type of challenge takes at least three different forms.

1. A general critique of the organization of knowledge into specific disciplines.
2. A critique of the “voices” represented in and through research.
3. A critique of the relevance, social commitments, practicality, and audiences for research.

These challenges cannot be resolved simply, but neither are they easily ignored (Salter and Hearn). Two sorts of interdisciplinary effort seem to have been successful: specific,
delimited problems have been solved by teams in what is actually multidisciplinary rather than interdisciplinary work, and new disciplines have sprung up at the intersections of existing ones (Bauer).

Palmer indicates the difficulties of being interdisciplinary: “Interdisciplinary accumulation is complicated by the need to bring together knowledge from multiple domains. Structural and cultural boundaries get in the way. To successfully promote interdisciplinary inquiry, all aspects of the accumulation process need to be recognized and supported, especially the work at the boundaries between disciplinary communities” (123). His analysis has concentrated on the boundary-crossing practices and strategies of the researchers, the major influences in the work setting, and how the interdisciplinary research process is currently accommodated by formal and informal bridge-building structures.

Collier et al. identify the following objective for future developments: “to encourage the view that students of related disciplines benefit from working and learning together and that collaborative working is a positive and important component in an education program” (35). Andrews and Derbyshire also conclude that there is considerable scope for greater commonality in the education, training and continuing professional development of the construction professions (Andrews and Derbyshire). However, changes in programs of study require careful consideration if they are to be effective.

**2.8.1 Successful interdisciplinary practice**

In academic settings, a discipline is held together by a shared epistemology. Epistemology is based on assumptions about the nature of knowledge and acceptable ways of generating or accumulating knowledge. That is, practitioners within a discipline share basic assumptions about the nature of the world, beliefs about what constitutes an interesting question for study, methods for generating and analyzing information. Disciplines are often clustered into three categories: the natural sciences (e.g. biology, chemistry, physics), the social sciences (e.g. anthropology, economics, sociology), and the humanities (e.g. literature, music, visual arts). Professional programs (for example, design, education, business, nursing, and health science) generally operate on a multidisciplinary model, drawing on ways of knowing from the sciences, social sciences, and humanities. This is true for design disciplines, which frequently have many characteristics from natural sciences, social
sciences, and even the humanities. Therefore, the interdisciplinary approach to the design field is crucial for developing desirable environmental design solutions.

The interdisciplinary scholar may draw from two or more disciplines that share similar epistemologies or from disciplines whose epistemologies differ markedly. Faculty members have often given highest praise for interdisciplinary thinking that combines disciplines that are more disparate or different from one another to achieve new insight.

However, the key feature of successful interdisciplinary practice is not the disparity of the chosen disciplines. What demonstrates real interdisciplinary thinking is the use of each discipline as a valid source of knowledge in its own right and a valuable contribution to the discussion at hand. According to Seipel,

Novice interdisciplinary thinkers might simply tag on content or terminology from a disparate discipline to an analysis carried out in a primarily intradisciplinary fashion. Successful interdisciplinary thinkers not only generate new knowledge through integration and synthesis as they explore the issue or topic at hand. They also acquire a fuller appreciation for the epistemological similarities and distinctions between and among the disciplines (5).

As he emphasizes, successful interdisciplinary design also needs to generate new knowledge from diverse design disciplines by integrating and accepting design ideas and thoughts.

2.8.2 Barriers against interdisciplinarity and to change

The first Interdisciplinary Research Management Conference in 1979 showed not only the growing importance of interdisciplinarity but also that many barriers to its introduction and efficient use were being encountered. Epton, Payne and Pearson state,

Most of them were a matter of getting people coming from diverse disciplinary backgrounds to overcome institutional obstacles and personal inhibitions which prevented them from working together in a mutually supportive manner. The difficulties were intensifying because more and more projects required not only collaboration between practitioners of different disciplines but also collaboration over the cognitively
greater distances such as separate these as a group from economists, behavioral
scientists, and politicians (1).

The Reinvention Center is a national center focusing on undergraduate education at
research universities. On their web site, they deal with achieving an interdisciplinary general
education. The barriers to interdisciplinary education are presented below. This view is not
limited to design disciplines; however, designers can reinterpret these barriers and
overcome them in developing successful interdisciplinary design education. Before
implementing an interdisciplinary education based on collaborative learning, there are
several major barriers, reflecting both cultural and institutional patterns that act as
disincentives to change. However, it is possible to overcome such barriers by developing
strategies to enable implementation.

Faculty mindset: Faculty members are frequently reluctant to teach general education
courses, perceiving them merely as a necessary service load for their department. They also
seem particularly reluctant to teach formal interdisciplinary general education courses. This
reluctance stems partly from a lack of time to develop new courses, especially those
requiring new thinking about how to teach. It may also stem from a lack of understanding of
the structure of an interdisciplinary course sequence and a sense that they do not know how
to design such a course.

Student expectations: Students can potentially play a large role in institutional reform.
While student demonstrations against "spoon-fed knowledge" classes have yet to materialize,
a growing number of students really want to be exposed to material in new and different
ways. However, many students persist in the mentality that they will acquire knowledge by
memorizing the lectures and the text, and will manifest this knowledge by performance on
individual assessment tools.

Physical infrastructure: Most university classrooms are box-like structures with students
limited to fixed seating in a crowded room with a professor at the front. If we are interested in
using collaborative learning as a framework for launching interdisciplinary general education
classes, we need classroom space that has a better layout. While the renovation of campus
space can be expensive and controversial, we can no longer afford to underestimate the
effect of the box-like lecture hall in demoralizing student learning. The creation of more
flexible learning spaces and the use of technology to increase the potential for collaborative
work can have a significant impact on student learning.
2.9 Interdisciplinary aspects of design research, education, and practice

Nadler points out the importance of design experiences and reflections. He says that there has been little emphasis in post-secondary education in helping students learn the ins and outs of doing design successfully. Freshman design experiences tend to emphasize the design experience itself, often without helping students reflect on and understand what the experience is teaching them. Even when both components are in place, there is little connectivity between these early and late experiences (Nadler).

In addition to Nadler’s view from an engineering perspective, interdisciplinarity in the design field is also an important factor in understanding diverse experiences and knowledge related to design disciplines.

Cross, a professor of design studies at Open University in UK, indicates that within “design research in recent years there has been a growing awareness of the intrinsic strengths and appropriateness of design thinking within its own context and culture. There has been a growing acceptance of design on its own terms, a growing acknowledgement and articulation of design as a discipline. It is recognized that design has its own distinct intellectual culture” (Cross, Designerly Ways 126).

Over the past two decades, many of the design programs at research universities have substantially increased the amount of formal instruction and systematic training required of students. They have significantly extended their scope to establish interdisciplinary connections with a wide range of academic disciplines. As stated in one design school proposal,

Over the next decade, design and a new academic discipline will emerge from the diverse professional practices and programs. Design has expanded to encompass environmental issues, the rapid evolution of materials, and a shifting scale of problems. This broader scope for design has forged new connections among disciplines that previously developed in isolation, created new languages that cross disciplinary boundaries and transform the infrastructure of design, and realized an array of objects and fields of study (Proposal for a School of Design at the University of California, Irvine).
2.9.1 Design education

Design education promotes design thinking through a range of various activities and events, including academic exhibitions, workshops, seminars, and conferences led by designers and design educators. Designers have influenced the environment both positively and negatively. One reason for negative effects in the environment is the lack of understanding of interdisciplinary design ideas and importance. Designers have potential power to create and make our physical environment meaningful. In this sense, design education is so important that we must understand and suggest ideas for better communication among design disciplines, especially for architecture and landscape architecture.

For many years in the United States, design education and its forms of pedagogy have treated the various design disciplines as unique and segmented, ignoring the obvious relationships inherent in the design processes and the overall philosophy of design. Currently there is a shift, at least by design schools, faculties, and students, away from the traditional segmented approach to instruction and a renewed interest in a unified, cohesive methodology to interdisciplinary design education (Dolan 9).

Rothstein compares design education in the United States with other countries:
Globalization has created an unprecedented challenge for US design education. In countries such as China, India, Singapore and Korea, traditional core competencies are being taught to ever-increasing numbers of highly competitive students. These countries are forming strategic partnerships among design education, government and the private sector. In the United States, the relationship between design education and design practice is immature with a lack of funding and outdated expectations (23).

He claims that many of the university design programs are isolated and starved for funding. They become easy targets when budgets need to be reduced and academic programs eliminated.
2.9.2 Architecture education

Before the American Civil War, there was no certain path to follow to become an architect. None of the university programs existed to educate and train design professionals. Instead of university education, individuals pursued a number of different paths: university training in art and engineering, professional apprenticeships, and/or study in the esteemed design schools of France and Germany. A various mix of skilled designers and builders served for the growth of American cities and industry.

After the Civil War, Americans began to address the need for a means to create truly American architects. In 1868 the first university-based school of architecture opened its doors at the Massachusetts Institute of Technology (MIT) under the guidance of William R. Ware. Since the beginning of architecture education at MIT, many programs began to establish professional architecture schools within universities and institutes: MIT (1868); the University of Illinois at Urbana-Champaign (1870); Cornell University, Ithaca, New York (1871); Syracuse University, Syracuse, New York (1873); Columbia University, New York City (1881); Pratt Institute, Brooklyn (1888); the University of Pennsylvania, Philadelphia (1890); the Armour Institute, Chicago (1893); Harvard University, Boston, Massachusetts (1894).

For most nineteenth-century American schools of architecture, the Ecole des Beaux-Arts provided the principal model for architectural education. From the beginning of architectural education, the teaching of architecture, fine art, and the history of art and architecture was a highly collaborative effort. The faculties of the Department of Fine Arts and Architecture cooperated in teaching drawing and modeling, forming a single, integrated enterprise that recognized no division between the practice and study of art and architecture.

In the book *Educating Architects*, Pearce and Toy indicate that “Architectural education has always been in tension with architectural practice. That is how it should be; practice sometimes gets complacent and education is there as a kind of conscience, trying to correct what seems to be going wrong. From time immemorial the architect has been subject to learning in two quite different ways; theory in a classroom of some kind and practice on the job or in the office” (39).
The relationship between architectural education and architectural practice has been separated during the past thirty years. The discussion has become significant since the mid-1990s. Schools, professional organizations, and publications have all devoted great attention to analyzing and commenting on the disjunction between education and practice. Students are confused because of this disconnection. What architecture schools expect from students and expect to offer students is not clear. Students in school are asked to work on projects they will never be asked to do as architects, and they can be misled by this. Two factors cause this problem:

First is the dynamic state of the profession. Architectural practices, after emerging from a devastating recession in the early 1990s, have been undergoing significant changes. Many practitioners are experimenting with new types of practice, partnerships, and methods of delivering services and projects. Second, the state of professional schools is in change. The relationship between professional schools and the university is based increasingly on common values and procedures; professional schools are now accommodating themselves to standards and processes that have long dominated the traditional disciplines like the natural sciences, mathematics, and humanities (Piotrowski and Robinson 260).

Education and practice have their own particular limitations and allowances: however, architectural education should not limit its scope to only educational perspectives. In this way, interdisciplinary design education extends the design educational boundaries and promotes the relationship between architectural education and practice.

2.9.3 Landscape architecture education

The profession of landscape architecture had its scientific roots in horticulture (Zube, "The Advance"). In the book Design on the Land, Newton investigates the development of landscape architecture through its long history. He states:

The ancient art became a new profession officially, when in 1863 the title Landscape Architect was first used by the state-appointed Board of Central Park Commissioners in New York City. It had been employed unofficially by Fredrick Law Olmsted and Calvert Vaux beginning in 1858. They professed themselves 'Landscape architects,' inventing the name to convey their intent to bear toward the total landscape
the same relation that an architect bears toward a building, with essential emphasis on design (XXi).

In the academic environment,
Landscape gardening courses were offered in Horticultural Departments of College of Agriculture in 1863 at Michigan State University and 1868 at the Universities of Illinois and Massachusetts. The first professional degree program was initiated in 1900 in the Lawrence Scientific School at Harvard University by Frederick Law Olmsted, Jr. The March 1900 announcement of the new program at Harvard listed three courses in landscape design and a substantial number of courses in other disciplines, including architecture, botany, horticulture, fine arts, geology, geography, and engineering (Zube, "Landscape Planning" 370).

From the beginning, as Zube points out, landscape architecture has been related to other disciplines very closely in professional and academic settings.

Landscape architecture mainly deals with complex human and physical relationships between built and natural environments. It is an interdisciplinary profession only a little over a century old that creates healthy, enjoyable and secure places. It embraces various aspects of science, design, and art. This broad coverage needs a wide range of design skills, techniques, and knowledge. For that reason, the focus of landscape architectural education emphasizes the interpretation, synthesis, and application of knowledge and skills from a variety of environmental academic disciplines to cover the complex design problems.

Gazvoda, a professor in the Department of Landscape Architecture at the University of Ljubljana, Slovenia, argues that the core of landscape architecture must remain the same and special knowledge can be added on top of it through the proper structuring of landscape architectural education. He suggests that

Landscape architectural education programs must be flexible enough to combine the creative character of the profession as well as natural sciences. The main problem remains how to follow the development of our profession which leads toward very specialized branches, and a general landscape architectural education? Once schools start to develop specialization in a profession, the programs narrow down to that discipline and the core of landscape architecture is lost (132).

As he indicates, landscape architectural education should be flexible to solve complex design problems. An interdisciplinary design approach to landscape architecture is a way of
improving and developing effective design educational methods for the discipline of landscape architecture.

2.10 Interdisciplinarity in design research and education

Interdisciplinary research includes a wide range of fields of study for the purpose of connecting various disciplines in order to understand the relationships among those disciplines. Interdisciplinary design education focuses on the interdisciplinarity which integrates design disciplines to promote design solutions by approaching from diverse design perspectives. Interdisciplinary design allows designers to communicate and solve territorial design problems between professional and academic environments by integrating the relationship and learning from each environment. Interdisciplinary design also breaks down perceived barriers prohibiting integration and collaboration among design disciplines. Therefore, the importance of interdisciplinary design education should be emphasized in professional as well as academic environments.

The literature of interdisciplinary education in its general sense is extensive and inclusive but limited in its relevance to the teaching of fully integrated subject matter. The majority of it refers to multidisciplinary collaborations at the secondary level e.g. using art, literature, and/or geography to teach history. Most studies focus on the successes and failures of specific programs. Accounts of secondary and undergraduate pedagogy may present interdisciplinarity as an administratively imposed task that requires team teaching (Meister and Nolan; Frank and Schüler; Bartell).

In the journal *Current Issues in Education*, Epstein approaches interdisciplinarity from the post-secondary level. She indicates that “The notion of interdisciplinarity as a concept inherent to some fields of study is rarely given emphasis. Even fields of study that began in the 1960s and 70s as interdisciplines, e.g. Communications and Women’s Studies, developed in the 1990s to include discipline-specific canons of literature and methodology. Thus, the question of ‘what is an interdisciplinary subject?’ imposes itself on the process of course design” (Epstein). A distinction between multidisciplinary and interdisciplinary approaches is drawn by Squires, who cites "integrative degrees" such as medical sociology
as examples of fully realized interdisciplinarity motivated by new categories of employment (Squires). Lombardo discusses problems of definition inherent in the founding of new disciplines, since traditional disciplines may change with time to encompass aspects of others (Lombardo). Newell argues that undergraduate education in a specific discipline need not precede interdisciplinary approaches, since the holistic perspective of interdisciplinarity allows disciplinary literature to be read as representative of a perspective, rather than definitive in itself (Newell). Epstein asserts, “The integration of knowledge and methods from widely differing disciplines into a seamless unity requires respect, imagination and lateral thinking. For disciplines based in the methods of science, the task of integration with non-scientific fields is particularly problematic, since it may involve accepting the validity of alternative methods of proof” (Epstein).

Design professions are characterized by complicated, interdisciplinary problems requiring cooperation of various professionals. The distinctive features of individual locations, regulatory requirements, and owner preferences require interdisciplinary approaches to cooperate throughout the design process to ensure that all design requirements are satisfied. In contrast to this professional environment, design educational environments are characterized by strict disciplinary boundaries. Minimal interaction occurs within the educational framework of the design curriculum. Chinowsky and Robinson address the challenges and issues facing the design and engineering education community in the process of integrating interdisciplinary educational experiences into a traditional segregated educational curriculum.

In the history of design education, case studies have traditionally been used to teach and illustrate design concepts. A case study approach to design education provides students with a greater understanding of the complex relationships that pervade project solutions. However this case based education has weaknesses for capturing and using interdisciplinary case studies to bridge the gap between design and other disciplines (Chinowsky and Robinson).

Current approaches to design education tend to emphasize individual work, learning facts, and the analysis of artifacts. Not many of the programs emphasize integrative activities as a fundamental part of the design curriculum. Based on the pilot study, approximately 25 percent of the sample show the word ‘interdisciplinary’ in their mission statements; however, they do not actually provide an interdisciplinary program in their real
curriculum. Therefore, many of the students graduate knowing a lot of disconnected facts and concepts without understanding how or when to use those facts in responding to complex problems. Students are not ready for the workplace when they graduate nor are they prepared to collaborate well, transfer their skills from one domain to another, to learn and consider concepts beyond those learned in academic settings.

### 2.10.1 Bauhaus as an early example of interdisciplinary design education

During 1919 in Germany, a new art school formed whose basic concept was the integration of art and technology. The Bauhaus combined the role of artisan and craftsman and applied this to everything from architecture to theater, including typography. It was the most famous and respected school of architecture in the 20th century. The Bauhaus was founded by Walter Gropius at Weimar in 1919, on the fundamental premise that all of the creative arts should be unified under the leadership of architecture. It was Gropius' belief that a mastery of both material and technique was essential to all creative design. The early intention was for the Bauhaus to be a combined architecture school, crafts school, and academy of the arts. Although the first intention of the Bauhaus was to connect various design disciplines, interdisciplinary design concept was embedded and articulated even at that time. After the Bauhaus was introduced to many countries, interdisciplinary design efforts began by combining different types of design.

The school had three aims that stayed basically the same throughout the life of the Bauhaus even though the direction of the school changed significantly and repeatedly:

- The first aim of the school was to ‘rescue all of the arts from the isolation in which each then found itself,’ to encourage the individual artisans and craftsmen to work cooperatively and combine all of their skills. Secondly, the school set out to elevate the status of crafts, chairs, lamps, teapots, etc., to the same level enjoyed by fine arts, painting, sculpting, etc. The third aim was to maintain contact with the leaders of industry and craft in an attempt to eventually gain independence from government support by selling designs to industry (Whitford 11).

With these goals at its basis, the Bauhaus began and has influenced our lives enormously. The effects and influences of the Bauhaus are widespread and varied and can easily be
seen in homes and offices across the United States. Besides the Bauhaus' work with lamps and chairs and other such manufactured items, its influence spread into other design fields.

2.11 Collaborative learning in design education

In architecture education, interdisciplinary technique can demonstrate its most important strengths because of its significant qualities such as professional work in teams, practical skills and creativity. Thomas Kuhn described knowledge as "intrinsically the common property of a group or else nothing at all," explaining the discoveries of sciences or the products of arts to be recognized shared among the members of a certain community (210). The debate over interdisciplinary teamwork approaches in colleges and universities has not delivered a clear solution yet.

Collaborative learning is used to describe new procedures in education that are intended to help students learn by working together (Bruffee). Architecture education is intended to develop students' major skills, which are supposed to allow them to engage in a professional field. Many of the architecture programs in universities provide professional experiences to make the connection between academic and professional settings. The School of Architecture and Planning of the University of Buffalo intends to prepare students for two major goals:

1. to place the practice of architecture in relation to social and cultural frameworks
2. to develop critical thinking toward current practice

From this specific approach to architecture education it can be established how the virtues of the "collaborative learning" method match the architect's major skills, which have been stated as the ability to join multidisciplinary teams, creativity and capacity to engage in practical and continuously changing problems.

The following examples show the benefits of collaborative learning in design education.

- Developing social skills: Professionals have stated the importance and benefit of developing interdisciplinary work in practice. Virginia Polytechnic Institute defines architecture studies as an interdisciplinary degree, which opens students' minds to a wide universe of study fields. This demonstrates the necessity of architecture studies to develop
social skills in students in order to enable them to interact with other specialists whom they will need to accomplish their main professional purposes. Therefore the "collaborative learning" method appears as an appropriate instrument to achieve this goal.

- Stimulating individual capacities: The School of Architecture of MIT emphasizes the fact that architecture education should "open diverse paths" to students in a varied number of fields, from design to teaching, planning, real estate, arts or communications. This is basically the same position held by other Schools of Architecture, like Syracuse University which highlights the importance of allowing students the discovery of a "personal expression" through which they will be able to realize their personalities and offer better work to society.

- Arousing critical thinking: Architecture design has been characterized by the Department of Architecture of Harvard University as the capacity to synthesize a broad body of knowledge to be followed by the "skillful manipulation of the form" in order to solve design challenges. It emphasizes as well the importance of a creative and always renewing approach which must promote among students the capacity to engage and enjoy lifelong learning.

Besides, architects are expected in the new coming "global village", to be able to "deal with clients and projects virtually in every corner of the globe" as MIT declares in its mission statement. These qualities are closely related to the encouragement of critical thinking that "collaborative learning" intends to promote.

2.12 Differences between architecture and landscape architecture in an academic setting

2.12.1 Collaborative curriculum

From the origins of architecture and landscape architecture education, Harvard University employed collaborative curriculum between these two disciplines. By the beginning of the twentieth century, two separate programs, in architecture and landscape architecture, existed at Harvard, but they shared a single curriculum, faculty, and resources,
with specialized courses required of each field. Both programs prepared practitioners with preliminary and technical training in architecture, to be supplemented by practical experience in an architect's office during summer vacations; both programs maintained the same pre-professional objectives of providing knowledge and training that formed the basis for professional practice (Alofsin 23).

2.12.2 Design studio and interdisciplinary approach

In design studio, students learn design as a creative model for interpreting a project with complex, interdisciplinary challenges in our environment. There is a demand for students to understand the same environmental problems from multiple perspectives and to integrate these perspectives into creatively designed solutions. To achieve these goals, design education (and increasingly, all disciplines) should provide concrete experience in integrating closely related interdisciplinary majors such as architecture and landscape architecture. This interdisciplinary approach to design education demands that the relevant knowledge base be expanded to include the facility and expertise not currently being required of students in architecture, landscape architecture and other design disciplines. Interdisciplinary understanding has the power to potentially provide diverse views for the same design problems, not previously emphasized in architecture, landscape architecture, and other design fields. An interdisciplinary approach in design studio may provide more power to see our environmental issues with different lenses, and it is essential for our understandings to focus not only on architectural but also landscape architectural concepts.

Based on this assumption that the design studio should be collaborative between architecture and landscape architecture, this study investigates real academic departments or schools in the United States interested in conducting an intensive interdisciplinary design workshop or program to learn studio models for architecture and landscape architecture that effectively integrate design disciplines.
2.12.3 Accreditation

Although an interdisciplinary design approach offers various opportunities to the students, the real academic situation is different because of the separate educational systems between these two disciplines. Architecture is accredited by the National Architectural Accrediting Board (NAAB) and landscape architecture by the Landscape Architectural Accreditation Board (LAAB). Recognition as a school of architecture is to be accredited as a professional school of architecture. In many countries, schools hold this status by a license from the state; in the United States, schools are accredited by an organization, the National Architectural Accrediting Board, which is partially controlled by the national professional organization, the American Institute of Architects. Recognition as a professional school implies an important responsibility to society by preparing people to enter the practice of architecture (Piotrowski and Robinson 292).

The NAAB is the sole agency authorized to accredit US professional degree programs in architecture. Since most state registration boards in the United States require any applicant for licensure to have graduated from a NAAB-accredited program, obtaining such a degree is an essential part of preparing for the professional practice of architecture. While graduation from a NAAB-accredited program does not assure registration, the accrediting process is intended to verify that each accredited program substantially meets those standards that, as a whole, make up an appropriate education for an architect.

The curriculum of a NAAB-accredited program includes general studies, professional studies, and electives, which together compose a liberal education in architecture. The curriculum ensures that graduates will be technically competent, critical thinkers who are capable of defining multiple career paths within a changing societal context ("About the Naab").

LAAB accreditation is a non-governmental, voluntary system of self-regulation. Its core is the concept of self-evaluation. The LAAB accreditation process evaluates each program on the basis of its stated objectives and compliance to externally mandated minimum standards. The program conducts a self-study to evaluate how well it is meeting its educational goals.
LAAB then provides an independent assessment, which determines if a program meets accreditation requirements. Programs leading to first professional degrees at the bachelor's or master's level in the United States are eligible to apply for accreditation from LAAB.

The Board of Trustees of the American Society of Landscape Architects (ASLA) recognizes the quality of educational programs leading to first professional degrees in landscape architecture at the bachelor's and master's level accredited by the Canadian Society of Landscape Architects Accreditation Council. It regards the criteria for accreditation and many of the individual program guidelines to be comparable to those employed by the Landscape Architectural Accreditation Board of ASLA ("Accredited Programs in Landscape Architecture").
CHAPTER 3

3. RESEARCH QUESTIONS AND THEIR DEVELOPMENT

Research questions reflect the problem that the researchers try to investigate. Research questions are interrogative statements that represent "an extension of the statement of the purpose of the study in that it specifies exactly the question that the researcher will attempt to answer" (Johnson and Christensen 78). Research questions can be formulated based on theories, past research, previous experience, or the practical need to make data-driven decisions in a work environment.

Research questions have several roles. They provide a framework for conducting the study, helping the researcher to organize the research and give it relevance, direction, and coherence, helping to keep the researcher focused during the course of the investigation. Research questions also delimit the study, revealing its boundaries and give rise to the type of data that are collected (Onwuegbuzie and Leech 478).

Mixed methods research can be conceptualized as comprising the following 13 distinct steps as asserted by Collins, Onwuegbuzie, and Jiao (63).
Determining the research question(s) is an extremely important step in both the quantitative research process and the qualitative research process because these questions narrow the research objective and research purpose to specific questions that researchers
attempt to address in their studies. However, research questions are even more important in mixed methods research because mixed methods researchers make use of the pragmatic method and system of philosophy. As such, in mixed methods studies, research questions drive the methods used. Moreover, research questions in mixed methods studies are so important because they, in large part, dictate the type of research design used, the sample size and sampling scheme employed, and the type of instrument administered as well as the data analysis techniques used. Forming research questions is much more difficult in mixed methods studies than in monomethod such as quantitative or qualitative investigations because it involves the formation of both quantitative and qualitative research questions within the same inquiry (Onwuegbuzie and Leech).

As can be seen from the above diagram, research questions occupy a place in the mixed methods research process that is central, interactive, emergent, and evolving. Not only does the development of research questions occur at the fourth step of the process, but these questions are re-evaluated during the data analysis (step 9), data legitimation (step 10), and/or data interpretation (step 11) steps. Any of these steps might lead to the research questions being modified and/or to additional research questions being addressed. Once the research report has been written (step 12), the role of the research question does not end. This step leads to the research question(s) being reformulated (step 13), which might lead to a reformulation of the research goal (step 1), research objective (step 2), research/mixing rationale (step 3), and/or research/mixing purpose (step 4). Alternatively, the research goal, research objective, research/mixing rationale, and research/mixing purpose may stay intact, in which case the reformulation of the research question directly leads to a reformulation of the mixed methods sampling design (step 6) and mixed methods research design (step 7).

An examination of interdisciplinarity in the professions and design education along with an understanding of the existing state of interdisciplinary education in architecture and landscape architecture developed through preliminary data collection and an extensive literature review has identified a set of research questions.

The focus of the research questions relates to detailed methodologies for developing more effective interdisciplinary design curriculums and programs in higher education. The scope of this research effort is shaped by the observations presented below. These observations were developed through a comprehensive preliminary review of literature.
related to design research, education, practice, and a preliminary pilot study focused on the disciplines of architecture and landscape architecture.

3.1 Observations

- Design activities need interdisciplinary thinking, ideas, and approaches. The most complex design problems lie at the intersection of various disciplines such as science, engineering, and design.

- In modern society, interdisciplinary design is one of the most important factors for designers and researchers to understand, and this understanding will have a positive impact on the designed physical environment.

- Architecture and landscape architecture are two design disciplines that deal with highly interrelated environmental design problems and frequently collaborate in professional settings.

- The professions of architecture and landscape architecture are characterized by comprehensive, interdisciplinary problems requiring integrated teams.

- Unique attributes of individual locations, regulatory requirements, and owner preferences require interdisciplinary professional teams to cooperate throughout the design and building process to ensure that all requirements are satisfied. In contrast, design education environments are frequently characterized by strict disciplinary boundaries and a lack of interdisciplinary discourse.

- An increasing number of higher educational systems have been trying to develop interdisciplinary design programs to overcome the existing strict border lines among the design disciplines.
3.2 Research issues

What is the goal of this research?

This research is intended to define the current conditions of interdisciplinary design education in the environmental design fields of architecture and landscape architecture. The goal of this research is to develop a level of understanding that can be a foundation for promoting more diverse and interdisciplinary interactions between these design disciplines in the educational process. From this starting point, this research will attempt to reveal the reasons behind the current situation and propose a roadmap for progress.

It is hoped that these findings will have the potential to apply to other design disciplines and can serve to support research related to design education in other disciplines.

What is the focus of this research?

This research investigates existing courses and structures of interdisciplinary design education in universities. The focus is to define the problems and develop solutions that apply to design education in the university environment. This research will also address the challenges and issues facing design education with regard to integrating interdisciplinary educational experiences into traditionally segregated educational curriculums.

This research focuses on the universities in the United States that have architecture and landscape architecture programs at the graduate level within the same college or school. The following research questions will therefore drive this study.

3.3 Research questions

1. What is the current situation with regard to the extent of interdisciplinary design education and how is the current situation changing?
2. What are the advantages and disadvantages to learning the disciplines of architecture and landscape architecture in an interdisciplinary setting that focuses on understanding complex environmental design problems?

3. What are the existing barriers to interdisciplinary architectural and landscape architectural design education?

4. How can design educators achieve a more interdisciplinary architecture and landscape architecture design education?

To address these research questions, a variety of research methods will be employed.
4.1 Research structure

In the design professions, interactions among design-related disciplines are crucial in developing design ideas and incorporating them into the built environment. Like design professions, design education also needs interdisciplinary understanding to communicate, learn, cooperate, and interact among design disciplines.

This study explores the current situations of interdisciplinary design education in academic settings specifically at the university level. The study includes a literature review, web-based data collection, a preliminary questionnaire, and a primary questionnaire. The study focuses on two significant environmental design disciplines; architecture and landscape architecture. The interactions and relationships between these two disciplines are explained and described in the previous chapters.

For this study, mixed methods research combining quantitative and qualitative research methods is used as the major component in both the preliminary and primary questionnaires. The following diagram shows the overall structure of the research approach used in this study. The approach employs a variety of research methods including aspects of quantitative and qualitative research. Each part of the diagram represents a different research method used for exploring the research issues. In addition, the diagram is explained in the following section starting with quantitative and qualitative research methods. As the diagram indicates, the importance and role of interdisciplinarity in design disciplines are investigated through the literature review. Web-based data collection is used to understand the current status of interdisciplinary design education. The preliminary questionnaire is the first step in examining the sample faculty group’s approach to interdisciplinary design education. Through this preliminary questionnaire, a primary questionnaire is developed with a precise scope of research focus. Ultimately, this study deals with numerous aspects of interdisciplinary design education to recognize and advance
the current situation of interdisciplinarity in design education for architecture and landscape architecture.

The following sections describe the basic characteristics and structure of the study and its use of both qualitative and quantitative research approaches.
4.1.1 Qualitative research

In the book *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*, Creswell points out that qualitative research demonstrates a different approach to scholarly inquiry from methods of quantitative research. Qualitative inquiry employs different philosophical assumptions; strategies of inquiry; and methods of data collection, analysis, and interpretation. Although the processes are similar, qualitative procedures rely on text and image data, have unique steps in data analysis, and draw on diverse strategies of inquiry (173).

In addition, in qualitative research, the role of the researcher as the primary data collection instrument necessitates the identification of personal values, assumptions and biases at the outset of the study. In that way the investigator's contribution to the research setting can be useful and positive rather than detrimental (Creswell 196).

The following diagram as developed by Lincoln and Guba shows the characteristics of qualitative research as described by Maykut and Morehouse (43).
4.1.2 Quantitative research

Quantitative research has been characterized by various scholars and writers. Numerous researchers point out that quantitative research design is a valuable approach to scientific research because it offers precise measurement and data. In quantitative research, researchers will count and classify, and build statistical models to explain what is observed. This research approach deals with data collection in the form of numbers and statistics.

Figure 4.2: Characteristics of qualitative research
The following statements indicate some definitions and interpretations of the quantitative research method.

In the book *Qualitative-Quantitative Research Methodology: Exploring the Interactive Continuum*, Newman and Benz indicate that the quantitative approach is used when one begins with a theory or hypothesis and tests for confirmation or disconfirmation of that hypothesis (3).

Bryman indicates that "Quantitative research is an approach to the conduct of social research which applies a natural science approach to social phenomena" (77). Quantitative research deals with the relationship between an independent variable and a dependent variable in a population. It is about quantifying relationships between these variables. Quantitative research designs are either descriptive (subjects are usually measured once), or experimental (with subjects measured before and after a treatment). Descriptive research establishes associations between the variables and experiment research establishes causality.

### 4.1.3 Mixed methods research

Qualitative and quantitative research approaches are woven into the research process. Mixed methods research describes the two different research approaches and how they are combined to make an effective and efficient research method.

Brannen indicates that "The claims that qualitative research uses words while quantitative research uses numbers is overly simplistic. A further claim that qualitative studies focus on meanings while quantitative research is concerned with behavior is also not fully supported since both may be concerned with people's views and actions" (175).

Brannen also suggests that mixed methods research may enter into one or more phases of the research process: the research design; data collection; and interpretation and contextualization of data (181).

In order to mix research in an effective manner, researchers need to consider all of the relevant characteristics of quantitative and qualitative research. The major characteristics of traditional quantitative research are a focus on deduction, confirmation, theory testing,
explanation, prediction, standardized data collection, and statistical analysis (Johnson and Onwuegbuzie 18).

The use of mixed methods has the potential to reduce some of the problems associated with singular research approaches. By using quantitative and qualitative research techniques within the same framework, mixed methods research can incorporate the strengths of both methodologies.

The major strength of mixed methods research is that it allows for research to develop as comprehensively and completely as possible. Tashakkori and Teddlie state the strength of mixed methods research: "When compared with a single method, the domain of inquiry is less likely to be constrained by the method itself. Because the supplementary data are often not completely saturated or as in-depth as they would be if they were a study in their own right, certainty is attained by verifying supplemental data with data strategies used within the core study" (195).

In this study, mixed methods research was used to explore diverse aspects of interdisciplinary design education both quantitatively and qualitatively. Quantitative research deals with aspects of the current situations and environment of interdisciplinary design education such as the amount of interdisciplinary courses, the credit hours of interdisciplinary courses, and the elective course hours including non-design disciplines. Qualitative research deals with the perceptions and experiences such as faculty's perception of interdisciplinary aspects of the programs, perceived advantages and disadvantages of the interdisciplinary design education, perceived barriers to interdisciplinary design education, and the nature of the relationship between architecture and landscape architecture. In general, quantitative research is used to approach the questions of what the current situation of interdisciplinary design education is and qualitative research deals with the questions of why and how related to interdisciplinary design education in current education systems.
This diagram indicates mono method and mixed methods research. Number 1 and number 8 show the mono method of qualitative research and quantitative research. Numbers 2 through 7 show the mixed methods research processes that were used in this study for the procedure of data collection and analysis.

The following section describes each phase of this study. It presents the research issues and the approaches used to clarify research questions and approach solutions.
4.2 Research design

The research was designed to approach questions from a variety of research perspectives employing mixed methods research defined as the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study (Johnson and Onwuegbuzie).

In preparation for this study effort, issues related to research reliability and validity have been explored to produce focused and reliable results. In addition, issues related to postal and internet questionnaire development, implementation, and analysis were also examined.

4.2.1 Reliability

Joppe defines reliability as "the extent to which results are consistent over time and an accurate representation of the total population under study is referred to as reliability, and if the results of a study can be reproduced under a similar methodology, then the research instrument is considered to be reliable" (1). In other words, reliability is the extent to which an experiment, test, or any measuring procedure yields the same result on repeated trials.

Without the agreement of independent observers able to replicate research procedures, or the ability to use research tools and procedures that yield consistent measurements, researchers would be unable to satisfactorily draw conclusions, formulate theories, or make claims about the generalization of their research. Reliability is such an important concept that it has been defined in terms of its application to a wide range of activities.

Reliability is concerned with the question of the extent to which one's findings will be found again. The more times a study's findings can be replicated, the more reliable the phenomenon is thought to be.

In the social sciences, the whole notion of reliability is problematic because studying people and human behavior is not the same as studying inanimate matter whereas the scientific notion of reliability assumes that repeated measures of a phenomenon with the same results establishes the truth of the results. Design disciplines including architecture and landscape architecture have characteristics of social science as well as natural science. In this study, interdisciplinary design education is mainly approached from the viewpoint of
social science because it deals with people and their experiences, thoughts, and preferences.

Qualitative researchers are not seeking to establish "laws" in which reliability of observation and measurement are essential. Rather, qualitative researchers seek to understand the world from the perspectives of those in it. Since there are many perspectives, and many possible interpretations, there is no benchmark by which one can take repeated measures and establish reliability in the traditional sense. Replication of a qualitative investigation will not yield the same results as it might in quantitative research. Rather, both sets of results stand as two interpretations of the phenomenon.

Instead of reliability, Lincoln and Guba suggest "dependability" or "consistency" (292). The real question for qualitative researchers is not whether the results of one study are the same as the results of a second or third study, but whether the results of a study are consistent with the data collected.

4.2.2 Validity

The exact nature of validity is a highly debated topic in both educational and social research since there exists no single or common definition of the term. Therefore, it is essential to review a selection of the range of definitions by leading authors. Validity can be thought of as the degree to which our test or other measuring device is truly measuring what we intended it to measure. Five types of concepts related to validity are explored through this section.

Joppe provides the following explanation of what validity is in quantitative research: "Validity determines whether the research truly measures that which it was intended to measure or how truthful the research results are. In other words, does the research instrument allow you to hit 'the bull's eye' of your research object? Researchers generally determine validity by asking a series of questions, and will often look for the answers in the research of others" (1). Another way of stating this is that validity refers to the degree to which a study accurately reflects or assesses the specific concept that the researcher is attempting to measure. While reliability is concerned with the accuracy of the actual
measuring instrument or procedure, validity is concerned with the study's success at measuring what the researchers set out to measure.

There are two types of validity that researchers should be concerned with: internal and external validity. Internal validity refers to (1) the rigor with which the study is conducted (e.g., the study's design, the care taken to conduct measurements, and decisions concerning what is and is not measured) and (2) the extent to which the designers of a study have taken into account alternative explanations for any causal relationships they explore. External validity refers to the extent to which the results of a study are generalizable or transferable.

The concept of validity is described by a wide range of terms in qualitative studies. This concept is not a single, fixed or universal concept, but rather a contingent construct, inescapably grounded in the processes and intentions of particular research methodologies and projects. Although some qualitative researchers have argued that the term "validity" is not applicable to qualitative research, at the same time they have realized the need for some kind of qualifying check or measure for their research. Creswell suggest that the validity is affected by the researcher's perception of validity in the study and choice of paradigm assumption. As a result, many researchers have developed their own concepts of validity and have often generated or adopted what they consider to be more appropriate terms, such as, quality, rigor and trustworthiness (Creswell).

For some researchers, mainly qualitative, validity is not a singular test that can be applied to the research process as a whole. The validity measure can be applied differently depending upon the researcher's beliefs as to what stage of the research process is in need of validation. Such an approach may perceive validity as referring only to measurement, observers, scores, instruments, relationships between scores or observable variations, rather than to the whole research process.

Maxwell identifies five typologies of validity as they relate to various stages of the research (285).

- Descriptive Validity: Concerned with the initial stage of research, usually involving data gathering the central issue is factual accuracy in the informational statements that describe what was observed and experienced. The choice of language and selection of relevant data are the greatest threat to validity. Maxwell identifies many possible areas of error within this
process concerning data selection and initial interpretative biases (287-88). The section concludes with the following statement: "If different observers or methods produce descriptively different data or accounts of the same events or situations, this puts into question the descriptive validity (and other types of validity as well) of the accounts" (287).

• Interpretative Validity: Within the qualitative paradigm, interpretation is typically viewed as an unavoidable element of data collection. Maxwell's segregation of description and interpretation is not only a false distinction, but effectively impossible. Interpretation is essentially couched within the rhetoric that the researcher uses to describe a situation and is mutually constructed between researchers and subjects. Quantitative researchers do much to disassociate themselves from such interpretations, yet these too are inevitable in their categorizations and selection of data. That any reasonable constructed interpretation could ever be proven to be invalid is almost unimaginable. Yet, in Maxwell's realist approach to validity he ultimately upholds that a valid account must respect the perspectives of the actors in that situation (290). Maxwell asserts that an account is only valid if the actors are able to confirm or recognize the findings of the research, in particular, he notes, where there is a chance that they may be disadvantaged by the results.

• Theoretical Validity: Maxwell comments that the previous two accounts of validity depend on a consensus on the application of terms and that disagreements refer only to accuracy and not meaning. Maxwell continues to say theoretical validity is a more abstract analysis than the descriptive and interpretive validities concerning the immediate physical and mental phenomena studied (291). Maxwell claims that theoretical validity goes beyond the concrete and descriptive and concerns itself with the constructions that researchers apply or develop during the research. This of course is a misleading notion, as we have already established that a researcher's theoretical framework and constructions, whether grounded theory or meta-theoretical, intrinsically define both the recording and interpretation of the data at the initial stage of research. What is interesting about this typology is that this form of validity applies not only to the research itself, but to the mental and emotional constructs of the researcher.
• Generalizability: Maxwell observes that the degree to which an account is believed to be generalizable is a factor that clearly distinguishes qualitative and quantitative research approaches (293-5). The ability to generalize findings to wider groups and circumstances is one of the most common tests of validity for quantitative research and yet is considered to be of little, or even no, importance for many qualitative researchers. Maxwell also notes that sampling, a vital consideration in establishing the validity of a statistical test, is usually purposeful in qualitative research as opposed to random. Qualitative research almost exclusively limits itself to internal generalizations, if indeed it seeks to claim any form of generalizability at all. Quantitative research, on the other hand, attempts to deal with both internal and external generalizations, referring to these as internal validity and external validity respectively (Maxwell 294). One possible explanation for this difference in the scope of the claims made by researchers is tied to the types of situations and phenomena that qualitative and quantitative researchers investigate. In a very general sense, qualitative research concerns itself with the meanings and experiences of the whole person or localized culture. On the other hand, quantitative research attempts to fragment and delimit phenomena into measurable or common categories that can be applied to all of the subjects or wider and similar situations.

• Evaluative Validity: This form of validity that Maxwell proposes refers to the application of an evaluative framework. Maxwell asserts that evaluative frameworks are similar in both qualitative and quantitative research and that many researchers make no claim to apply any evaluation to their research whatsoever (295). However, evaluation is not some conclusive statement that may or may not be tagged onto the end of a research report, thus determining the nature, outcome or reality of that research. Similar to the issues raised in response to Maxwell's categorization of interpretive validity, evaluation is an almost inescapable, and often unconscious, consequence of the research process itself. Recognizing that evaluation of some sort is an inescapable inevitability within research enables the control of that evaluation and offers a measurement of the research in terms of its overall validity.

Issues related to quantitative, qualitative, and mixed methods research and overall reliability and validity for this study are addressed. In the following part, each research
method deals with the aspect of quantitative, qualitative or mixed methods research. Each part also approaches the issues of reliability and validity for the specific research method.

4.3 Literature review

Relevant literature to understand prior research is a significant feature of this research as with any other academic project. Literature review gives an overview of what has been investigated, who the major authors are, what the prevailing theories and hypotheses are, what questions are being asked, and what methods and methodologies are appropriate and useful for this specific interdisciplinary design education research. Based on other investigations, the purpose of literature review is to inform the reader and researcher of what knowledge and ideas have been established and developed on this subject, and what their strengths and weaknesses are. Literature review creates a solid basis for investigating knowledge and facilitating theory development when further research is needed based on the previous research done by numerous scholars and researchers. Besides enhancing the knowledge about this research, literature review achieves and demonstrates skills of information seeking which is the ability to scan the literature efficiently using manual or computerized methods and to identify a set of useful articles, books, and magazines. Literature review also demonstrates skills of critical assessment which is the ability to apply principles of analysis to identify valid research. In addition, literature review also should be organized around and related to the research question and synthesize results into a summary of what is and is not known and identify areas of argument in the literature. Finally, literature review should formulate research questions that need further research.

For this study, the previous chapter deals with literature ranging from issues of what interdisciplinarity is, why it is important, what the current condition of interdisciplinary design is, what the problems and challenges are, to why interdisciplinary design education does not actually occur often in the current academic environment, what obstacles exist, and how researchers promote interdisciplinary design education in the United States.

Within that issue, the literature review investigates specifically the definition, importance, historical development, current conditions, and collaborations of interdisciplinarity in general
including within the design field. Through this relevant literature review, it is revealed that interdisciplinarity is described as relevant to a particular environmental design field. The stated purpose of this literature review is to find a way to promote interdisciplinary design education by investigating current literature that conceptualizes interdisciplinary design education research areas and research questions. It also provides essential subjects and directions for future research that expand the limitation of this research.

4.3.1 Structuring the literature review

A literature review is not an author-centric approach so that the summary of relevant sources unsuccessfully synthesized, but rather a concept-centric approach so that concept determines the organizing framework of a review. This research approaches a concept matrix as each source accumulates to formulate the development of the concepts.

Table 4.1: Concept-centric approach

<table>
<thead>
<tr>
<th>Approaches to Literature Reviews</th>
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<tbody>
<tr>
<td>Concept-centric</td>
<td>Author-centric</td>
</tr>
<tr>
<td>Concept X ... [author A, author B, ...]</td>
<td>Author A ... concept X, concept Y, ...</td>
</tr>
<tr>
<td>Concept Y ... [author A, author C, ...]</td>
<td>Author B ... concept X, concept W, ...</td>
</tr>
</tbody>
</table>

4.3.2 Quantitative aspect of literature review

According to Creswell, "A quantitative research approach is best if the research problem requires the identification of factors that influence an outcome, the utility of an intervention, or understanding the best of outcomes. It is also the best approach to use to test a theory or explanation" (18). The analysis of data is an objective process with numerical terms since the data collection uses formal instruments of measure.
The data collection techniques for a quantitative research approach depend on factors relevant to the research. Researchers primarily use survey or trend studies as their data collection instruments. In this study, quantitative research methods are used for relevant literature review, web-based data collection, and the preliminary questionnaire. In addition, this study deals with qualitative research such as a primary questionnaire based on the findings and measurements of a preliminary questionnaire.

4.4 Web-based data collection

In the article "To Mix or Not to Mix Data Collection Modes in Surveys," De Leeuw indicates that one of the most important challenges to researchers is to decide which data collection method or mix of methods is optimal in the current situation to get the greatest result from the research. Times and methodologies are limited and data collection technology is also changing (De Leeuw).

4.4.1 Introducing web-based data collection

Since the introduction of computers to the research field, there has been an evolution of improvements in data collection methods corresponding to advances in technology. Academic researchers are increasingly using internet tools such as email and web-based data collection as a research method instrument since the number of computer and internet users in the world increases yearly. In addition, there have been remarkable advances in the development of web-based data collection instruments. Duffy mentions that web-based data collection, through email and web-based surveys, is becoming an increasingly popular research methodology to collect data because access to the internet is fast becoming the communication method of choice for many researchers in a variety of fields (Duffy). Menon also indicates the evolution of internet research has been developing rapidly and many writings deal with internet research as a fascinating tool to get information using the World Wide Web. The internet is intriguing for its lack of geographical boundaries. Researchers
have found the internet to be an important research tool in the areas of social sciences, natural sciences, engineering, and design disciplines (Menon).

4.4.2 Evolution of survey methodology

According to Dillman, the most significant advances in survey methodology during the twentieth century were the introduction of random sampling in the 1940s and telephone interviewing in the 1970s. However, researchers today are witnessing similar significant advances in the field of survey methodology, with the introduction of technology-based surveys such as the internet, voice recognition systems, and electronic fax surveys. Today, mail and telephone surveys have reached maturity as research instruments. However, not much research focuses on technology-based survey methodologies, simply because they have been introduced only in the last decade. The analysis of past research on the use of the internet as a survey methodology has shown that there is a wide variation in response rates and speeds for internet-based surveys. Despite this increased use of the internet for data collection, there is little published research on the process of data collection online. That is, discipline-specific studies publish the results of their web-based surveys in discipline-specific journals, but little information is available on the specifics of how internet-based data collection can be accomplished. Thus, it is difficult for a researcher wishing to use this data collection method to find resources to use as guides. Numerous researchers are hesitant to consider the use of the internet for collecting research data. Much of the hesitation in adopting internet research is based on concerns about how valid the internet is as a means of data collection in comparison to traditional data collection methods (Dillman).

4.4.3 Benefits of web-based data collection

Researchers from many disciplines are starting to see the benefits of collecting data using the internet, and increasingly journals are publishing data that have been collected online. Dillman and Couper indicate that internet or web surveys are very cost and time efficient, and this together with the novelty value have made them very popular in a short time (Dillman and Couper).
Using the internet for data collection offers several benefits. First, online research methods are able to yield results much faster and at a lower cost compared to offline studies. Second, web surveys do not suffer from interviewer bias and also can be completed at the respondent's convenience, which makes the online research medium much less intrusive than traditional offline methods such as telephone or personal interviews. Third, the quality and accuracy of web data is increased due to fewer errors in data entry and larger sample size. Fourth, in addition to the potential for larger, yet affordable sample size, the internet makes it easier to stay in touch with respondents for research design that requires multiple measurements over time. Finally, web surveys facilitate building in intelligence, such as personalization, question branching, skipping patterns, forced answer prompts and audio-visual material.

The power of web surveys is that they make survey data collection available to the masses. Not only can researchers get access to numbers of respondents at dramatically lower cost than traditional methods, but members of the general population too can put survey questions on dedicated sites offering free services and collect data from potentially thousands of people. The ability to conduct large-scale data collection is no longer restricted to organizations at the center of power in society, such as governments and large corporations. The relatively low cost of conducting web surveys essentially puts the tool in the hands of almost every person with access to the internet, potentially fully democratizing the survey-taking process. Web surveys make feasible the delivery of multimedia survey content to respondents in a standardized way using self-administered methods. This opens up a whole new realm of survey possibilities that were heretofore impossible or extremely difficult to implement using more traditional methods (Couper).

4.4.4 Challenges of web-based data collection

Online data collection provides researchers with numerous possibilities and significant challenges. The benefits in reduced cost, ease of data entry, format flexibility, and ability to access different populations make this type of data collection extremely appealing. Nevertheless, as with any survey method, measurement errors, low response rates, and possible nonrepresentativeness of the sample must all be addressed before meaningful
data can be obtained. The benefits of accuracy, low cost, speed, and data entry become meaningless if the limitations are not adequately addressed.

As Schmidt indicates in the article "World-wide Web Survey Research: Benefits, Potential Problems, and Solutions," web demographics are likely to be skewed; one must be cautious in generalizing survey results based on a general web sample that are intended to apply to the population at large. Nonetheless, by collecting demographic data along with other survey items, one can work towards checking that the population that is being considered is appropriate for the conclusions that are drawn. As more and more people get on-line, this potential problem will diminish; however, until that time, one must give careful consideration to the population sampled. Web-based survey research is best suited for a targeted population who are more likely to be representative of their limited class than of the population as a whole that has narrowly defined interests (Schmidt).

4.4.5 Quantitative aspect of web-based data collection

Taylor states that
The major purpose of quantitative research is to make valid and objective descriptions on phenomena. The researcher is attempting to show how phenomena can be controlled by manipulating the variables and to discover principles and laws which can be generated to the larger population. The researcher attempts to achieve objectivity by not letting his personal biases influence the analysis and interpretation of the data. Researchers seek to understand phenomena by isolating and examining the interrelationship among and between variables in a controlled setting (91).

In addition, quantitative research mainly uses numbers and statistical methods. It tends to be based on numerical measurements of specific aspects of phenomena and it abstracts from particular instances to find general descriptions or to test causal hypotheses. Additionally, quantitative research also tries to find measurements and analyses that are easily replicable by other researchers.

In this study, as Taylor states, a quantitative approach is used to make valid and objective descriptions of phenomena about interdisciplinary design education of selected
samples of institutions in the United States. Based on the manipulation of controlled variables, the intent is for a selected sample of institutions to present principles that can be generalized to the larger population. The goal is to understand broader perspectives of interdisciplinary design education in the larger context.

4.4.6 Validity of web-based data collection

The validity of web-based survey research is likely to be strongest for research domains that target specific populations. Because one of the main attractions of internet connectivity for the average users is accessibility to information pertaining to quite specific topic materials, it is possible for researchers to access a large number of individuals with an interest in very narrow topic domains. Regardless of whether the researcher intends to survey the unrestricted population or to restrict survey respondents geographically by using conventional methods of subject selection, web-based data collection offers a means to survey a large number of individuals. It is especially appropriate for accessing groups of individuals interested in very narrow topic domains, and provides a means for accessing such individuals based on the content of their interests (Schmidt).

4.4.7 Interdisciplinary design education of web-based data collection

The purpose of web-based data collection in this research is to summarize a systematic web-based approach to evaluate the current conditions of interdisciplinary design education and to describe the results of interdisciplinary efforts in design education settings.

To address this issue in the review of materials on the web-based source, twenty-six universities that have graduate architecture and landscape architecture programs within the same college or school are used. Based on these samples, the university’s design programs are divided by their department name, what other disciplines are in the program, what types of courses they have, how the curriculum is structured, length of study, their design mission statements, and their design interests.
The web-based data collection explores five associated components of interdisciplinary
design education between architecture and landscape architecture programs in the university.
The first component focuses on the mission statement that represents the core design ideas
of each university. The second component is the investigation of the program's name. The
third component focuses on courses of each program. Within this component, courses are
divided into three sections that deal with a range of interdisciplinary trials in the form of
courses. The fourth component considers the credit hours, and the fifth component focuses
on the name of the department.

A large number of universities in this era typically announce their educational purpose,
background information, admission procedure, educational philosophy, and much other
information in the form of their websites. Therefore, web-based data collection is one of the
most appropriate methods to find the most up-to-date information about these universities.

Using web-based data collection, twenty-six universities in the United States are found
to have both architecture and landscape architecture on the master level in which to
investigate the current status of university structure of interdisciplinary design efforts.

As indicated previously, five components are used to understand the whole configuration
of interdisciplinary design education in all of the selected universities.

**Component 1; Mission statement**

The mission statement is the primary message showing their educational trial and duty
on the first expression of educational goal. For this study, the mission statements specifically
mentioning the term "interdisciplinary" are counted and documented to understand what they
are trying to accomplish through interdisciplinary attempts.

**Component 2; Name of program**

The second component explores the name of the graduate program which indicates their
focus of study, length of study, and degree options. It also explains the connection among
other disciplines and how intensely they are coordinated with related disciplines.

**Component 3; Course requirement**
The third component deals with actual provided courses forming the curricular structure of the architecture and landscape architecture disciplines. Within this component, there are three sections dealing with interdisciplinary aspects of the courses.

**Section 1; Interdisciplinary course**

The first section investigates any required courses handling interdisciplinary subjects with a variety of perspectives not only limited to architecture or landscape architecture. This section indicates the broader interdisciplinary approach related to design disciplines.

**Section 2; Architecture or landscape architecture course**

The second section searches for required courses specifically focused on architecture or landscape architecture. Through this section, actual interdisciplinary courses correlated between the two selected design disciplines for this research are covered.

**Section 3; Elective course**

The last section investigates elective courses which may or may not have interdisciplinary themes or subjects. These elective courses have more flexible curricular configurations than the two previous interdisciplinary courses. The purpose of this section is to consider the curricular flexibility and variety in learning interdisciplinary design with various elective courses.

**Component 4; Credit hours**

The fourth component calculates the total credit hours of each graduate program. Through this component, how the total credit hours affect the structuring of interdisciplinary courses is explored and questions are asked about the connection between the total credit hours and the real interdisciplinary courses including broader and more specific aspects.

**Component 5; Department name**

The last component considers the name of department in which disciplines are included and connected to articulate the whole department or college. The department name is demonstrated to include each discipline with representing ideas in an efficient manner. The
department name is also offered to express the overall design educational directions and goals.

Through these five components, the current status of interdisciplinary design education in the United States is investigated and systematized in a variety of subjects and issues. Based on these selected university examples, further investigation and exploration is done to develop methodological techniques and data collections.
4.5 Questionnaire

Questionnaires are printed lists of questions used to find out what people think or feel about an issue, product or service. The term "questionnaire" has been used in different ways.
Some practitioners would reserve the term exclusively for self-administered and postal questionnaires, while others would include interview schedules (administered face-to-face or by telephone) under the general rubric of questionnaires. They can be filled out away from the researcher in the form of a self-administered, group-administered or postal questionnaire. The term "questionnaire" is also often used to describe a set of questions administered face-to-face or by telephone in the form of a structured interview. The function of a questionnaire is measurement. What a questionnaire measures depends on the issues under investigation, the aims of the study, and the research design (Oppenheim).

### 4.5.1 Question types

Questionnaires can provide quantitative data using closed (or fixed-response) questions, where the respondent is presented with a number of alternative responses to a question and asked to mark the one that they think is most appropriate (Oppenheim). Qualitative data can be gathered using open (or free-response) questions to which respondents are asked to write their own answer (Jordan). Closed questions have been criticized for forcing people to choose their answer from the alternatives provided rather than answering in their own words (Converse and Presser). However, closed questions are more specific than open ones, they communicate the same frame of reference to all respondents, and well-designed response categories can more accurately detect differences among respondents (Converse and Presser). One argument against closed questions is that they may fail to provide an appropriate set of responses that are meaningful in substance or wording to respondents. However, questionnaire design should begin with open questions in pilot or pre-test work (Schuman and Presser). These pre-test results can then be used to create appropriate sets of responses for closed questions. Using open follow-up questions as probes of key closed questions can combine the advantages of both open and closed questions (Converse and Presser). Based on the questionnaire results, the reliability and validity of the collected data should be considered for developing this research.
4.5.2 Strengths and weaknesses of postal questionnaires

Postal questionnaires can be a cheap and effective method for gathering data from a large number of widely dispersed people (Oppenheim). Another strength is that, because the researcher is not present while the respondents state their answers, data collected using questionnaires is free of any investigator effects (Jordan). That is, the respondents cannot be influenced by the researcher and will not, consciously or unconsciously, try to answer in the way that they think the researcher wants them to.

The weaknesses of postal questionnaires are related to the fact that they may be filled in away from the researcher. This means that the respondents do not have the chance to ask the researcher about anything that is unclear, as they do in interviews or focus groups (Jordan). Hence, careful design of the questions is needed, incorporating the gathering of preliminary information from a sample of the target population (for example, using focus groups and pilot testing the questionnaire). In addition, the researcher has no control over how the questionnaire is answered: the respondent may answer the questions in the wrong order; answer questions incompletely; skip questions or whole sections; or pass the questionnaire on to others (Oppenheim).

Although a large number of questionnaires can be sent out by post, because they are filled in away from the researcher, only a small proportion tend to be completed and returned. Jordan quotes a return rate of around 25%. This is a weakness of questionnaire based research because the people who actually take the time and effort to complete the questionnaire and return it may not be representative of the population in whom the researcher is interested. Return rates are likely to be lower the more time and effort it takes to complete a questionnaire. Therefore, there is an advantage to keeping questionnaires as short and concise as possible (Jordan).

4.5.3 Internet and email questionnaire

During the twentieth century, there were two significant advances in survey methodology: the introduction of random sampling in the 1940s and interviewing by telephone in the 1970s. Both of these innovations have transformed how most major surveys are done. We are now
witnessing another development in survey methodology the collection of survey data through self-administered electronic surveys by email; the World Wide Web; and Interactive Voice Response.

The electronic survey methods have potential for bringing efficiencies of comparable importance to the design and administration of self-administered questionnaires. These efficiencies include the nearly complete elimination of paper, postage, mail out, and data entry costs. Some of these electronic survey methods also provide a potential for overcoming international boundaries as significant barriers to conducting surveys. Most importantly, the introduction of electronic survey methodologies offers the potential for dramatically reducing the close correspondence between sample size and survey costs.

Electronic surveying also requires the surveyor to take a somewhat different look at the social exchange elements of responding to a survey. Whereas it can be assumed that most people have previous experience with paper and pencil questionnaires, familiarity cannot be assumed for people who are asked to respond to electronic surveys (Dillman).

Computers and internet access are becoming basic work requirements in many professions, and it is anticipated that electronic survey methods will become increasingly popular. Email surveys are both very economical and fast. More people have email than have full internet access making email a better choice than a Web page survey for some populations. On the other hand, email surveys are limited to simple questionnaires, whereas Web page surveys can include complex logic.

4.5.4 Advantages and disadvantages of email surveys

Advantages

• Speed- An email questionnaire can gather several thousand responses within a day or two.
• Cost- There is practically no cost involved once the set-up has been completed.
• Media- Pictures and sound files can be attached.
• Novelty- An email survey often stimulates higher response levels than ordinary mail surveys.
Disadvantages

- A list of email addresses must be purchased or possessed.
- Some people will respond several times or pass questionnaires along to friends to answer.
- Many people dislike unsolicited email even more than unsolicited regular mail. You may want to send email questionnaires only to people who expect to get email from you.
- Email surveys cannot be used to generalize findings to the whole population. People who have email are different from those who do not, even when matched on demographic characteristics, such as age and gender.
- Email surveys cannot automatically skip questions, randomize questions or answer choice order, or use other automatic techniques that can enhance surveys the way Web page surveys can.

4.6 Preliminary questionnaire

The next step in the research was to conduct a preliminary questionnaire that was sent to the twenty-six universities that were the subject of the web-based data collection and had both architecture and landscape architecture at a master level in the same college. The goal of this part of the project is to investigate general understandings, thoughts, and attitudes on the range of issues and explore the general perception of the role of interdisciplinary design education in architecture and landscape architecture. The preliminary questionnaire was conducted through an internet email survey of all the architecture and landscape architecture faculty members of the twenty-six universities.

The understanding of interdisciplinary design education may vary with different groups of respondents such as faculty, students, and administrators. For this research, only faculty were considered for the pilot questionnaire. Compared to students and administrators, a faculty group is considered more significant for realizing interdisciplinary design education with experienced and professionalized design knowledge and philosophy. A major role of the faculty members is to deal with teaching students and preparing educational programs,
to develop curriculum and deliver design education. In addition, faculty members work as
communicators between students and administrators to make university structure more
flexible and to enable change for future educational requirements. Faculty members are
also mediators to organize educational systems and programs when the university is faced
with financial, educational, and political problems and challenges. Therefore, faculty
members are the focus point for this research. As indicated before, the preliminary
questionnaire was limited to the faculty of twenty-six universities.

The preliminary questionnaire was distributed in July 2005 and collected over a one
month period from August 1, 2005 to August 31, 2005.

The preliminary questionnaire asked questions about design education, design
methods, and design courses. After the questionnaire was collected, responses were
organized and stored in a manner to protect personal confidentiality. Along this line all
individual email responses were deleted after being recorded.

For the selected universities, the preliminary questionnaire was designed to investigate
the interaction between architecture and landscape architecture disciplines. The preliminary
questionnaire focused on the faculty's perception of the interdisciplinary aspects of their
colleges' architecture and landscape architecture programs. Four major categories studied
included:

1. The structure of interdisciplinary design education in their college;
2. Perceived advantages and disadvantages of the interdisciplinary design education;
3. Perceived barriers to interdisciplinary design education;
4. The nature of the relationship between architecture and landscape architecture at
   their institution.

In addition, respondents were asked about their faculty rank to understand the
correlation between their status and contribution to interdisciplinary design education; the
nature of their teaching assignments (studio, lecture, seminar, and/or lab); the mixture of
disciplines in their classes and whether their classes were required or optional.

The next part of the preliminary questionnaire asked participants to rate their preference
on a scale from 1 to 5 for having students who are majors in other disciplines within their
college or school; based on their perception of the benefits to students of working with
students in other disciplines in the same college or school; the importance of learning from
other design disciplines and the interactions among design related disciplines both academic
and professional; and the benefits of interdisciplinary design education and willingness to participate in teaching interdisciplinary design.

The preliminary questionnaire also dealt with their opinions with regard to the difficulties of interacting with other disciplines in the academic setting. And finally, the last part of the preliminary questionnaire asked the respondents’ opinions dealing with which disciplines would be considered to work together within the same college or school; the advantages and disadvantages of teaching students with different majors; and the comments or concerns regarding current design education and curriculum.

As mentioned before, the main goal of this preliminary questionnaire was to understand the general perception of interdisciplinary design education among all of the faculty at the selected institutions. The next step in the research focused on selected faculty identified as experts in interdisciplinary design education in architecture and landscape architecture.

4.6.1 Qualitative aspect of preliminary questionnaire

In the *Handbook of Qualitative Research*, Denzin and Lincoln acknowledge that qualitative research means different things to different people. They offer what they call a generic definition. Qualitative research is multimethod in focus, involving an interpretive, naturalistic approach to its subject matter. This means that qualitative researchers study things in their natural settings, attempting to make sense of, or interpret, phenomena in terms of the meanings people bring to them. Qualitative research involves the studied use and collection of a variety of empirical materials - case study, personal experience, introspection, life story, interview, observation, history, interactions, and visual texts - the described routine and problematic moments and meanings in individuals' lives (Denzin and Lincoln).

Consistent with Denzin and Lincoln's observations, the preliminary questionnaire and primary questionnaire of this study deal with personal experience, introspection, and meanings. Faculty members are asked to interpret reality and develop observations related to interdisciplinary design education from their own experiences, thoughts, and opinions.
4.6.2 Quantitative aspect of preliminary questionnaire

Glesne and Peshkin emphasize that quantitative researchers are aimed to find explanations and predictions that will generalize to other persons and places. Careful sampling strategies and experimental designs are aspects of quantitative methods to generalize results. In quantitative research, the major role of researcher is to observe and measure, and care is taken to keep the researchers from contaminating the data through personal involvement with the research subjects (6).

In the process of selecting the preliminary questionnaire sample of this study, the sampling strategy of using the whole sample is used for both the architecture and landscape architecture program. Sampling of the selected group of faculty members is applied to the primary questionnaire.

4.6.3 Reliability of preliminary questionnaire

Reliability is considered in this study; for example, the preliminary questionnaire used all of the faculty members from the samples both have architecture and landscape architecture disciplines. Faculty members are not the fixed group. They are a changing group of people in every institution: however, faculty members are a specialized group of people in teaching, researching, and studying. Their opinions and experiences are reliable especially for their field of specialization. In this manner, this study has reliable and consistent questionnaire data. Based on the results of the preliminary questionnaire, the primary questionnaire has been developed to explore the specific and detailed ideas of faculty members who have been identified as experts in interdisciplinary design education. They were selected by the department chair or head who was asked to select those faculty members. For the process of selecting the specialization group, the faculty member who knows all of the faculty's interests and specialization better than anyone else is the department chair or head. This is why the chair or head was asked to select the expert group of faculty of every institution. If the department chair or head is new to the program, he is not the best person to select the expert; yet, his position and responsibility indicate that
he is reliable for selecting the expert group of faculty. For both the preliminary and primary questionnaire, faculty members are used consistently.

4.6.4 Validity of preliminary questionnaire

When designing fixed-response questionnaires, it is important to be aware of the issues of reliability and validity. Reliability is broadly concerned with the repeatability of what the questionnaire measures and validity refers to whether a questionnaire measures what it is intended to. The validity of a questionnaire can be improved by basing it on the qualitative data gathered using focus groups on the topics of research interest (Jordan). For this study, one aspect of reliability appropriate in the questionnaire context is an estimate of the consistency of the scales. If the scales identified through the analyses are valid measures of various dimensions of the faculty member's experiences, thoughts, and opinions, they should be able to explain a high proportion of variance of the faculty member's overall evaluation of interdisciplinary design education. The validity of the questionnaire is also improved by using the qualitative data composed of the faculty group which have specialized knowledge in their specific research ground. Faculty members are a group of people who have been qualified as experts and this specialization adds to the value of the questionnaire data.
Web-based data collection

Preliminary questionnaire

Quantitative & qualitative research method: Investigating general understanding, thoughts, attitudes & exploring general perceptions of interdisciplinary design

University settings

Students

Faculty

Administrators

Quantitative approach

Number of teaching classes, distribution & status of classes

Qualitative approach

Faculty's perception

Interdisciplinary design education

4 major categories

Figure 4.5: Structure of preliminary questionnaire

Number of 26 universities: Master level of Arch & LA in the same college
4.7 Primary questionnaire

The next step in the research process was the development of a primary questionnaire based on the results of the preliminary questionnaire. The preliminary questionnaire was limited to the institutions on a masters level having both an architecture and landscape architecture discipline, however, the primary questionnaire expanded the range from masters level to undergraduate level covering a large number of universities and programs in the United States that have either an architecture or landscape architecture discipline.

Through the preliminary questionnaire, overall perception and understanding of interdisciplinary design education as experienced by all of the faculty members of the twenty-six universities was examined. The preliminary questionnaire was designed and distributed to observe general perception and understanding of interdisciplinary design education of faculty members at a master's level in architecture and landscape architecture of universities in the United States. The reason for only focusing on the master's level was based on the idea that the interdisciplinary activity needs to be based on a each disciplinary knowledge usually studied at the undergraduate level and expand that disciplinary knowledge to accomplish overall interdisciplinary design education.

The primary questionnaire was focused on specific questions related to barriers, advantages, disadvantages, examples, and experiences of interdisciplinary design education in American academic settings including the undergraduate and graduate level. For the primary questionnaire, a different methodology was used for selecting the sample. Whereas the preliminary questionnaire covered all of the faculty members in the institution, the primary questionnaire was distributed only to the faculty who were identified as having expertise in interdisciplinary design education.

The department chair or director, it was felt, would be the most familiar with all faculty members and their specialized field of study in their institutions. This expertise was determined by input from department chairs or directors from both architecture and landscape architecture disciplines. They identified faculty members who they felt have expertise in interdisciplinary design education.

The primary questionnaire was also conducted through an internet email survey, as was the preliminary questionnaire, and focused on the selected faculty members. The primary
questionnaire began by asking general background information such as the faculty's rank, gender, teaching period, involvement in the program, and previous teaching experience. The next part asked if the faculty member had specific interdisciplinary teaching experience focusing on interdisciplinary design education between architecture and landscape architecture or any other environmental design discipline. Based on the answer to this question, respondents went to category 1 or category 2 questions. Category 1 questions were for respondents who had interdisciplinary design education experience, and category 2 questions were designed for those who did not. Each respondent had a chance to answer category 1 or category 2 questions only.

The category 1 questions asked the faculty members' actual teaching experience, courses, and their perceptions of interdisciplinary design education. Questions 1 through 10 dealt with interdisciplinary design courses. They were as follows.

1. What are the names of the interdisciplinary design courses?
2. What subject areas and disciplines are involved?
3. How many years have you taught this course?
4. Was this course taught prior to your involvement? Approximately when was it started?
5. Approximately, how many students are in the course and what are their majors?
6. Is it a sole instructor or a team taught course?
7. How many instructors/faculty are responsible for the course?
8. Faculty from which disciplines participated in the course?
9. Which semesters (quarters) is this course offered?
10. Does the course still exist? If no, why was the course discontinued?

Questions from 11 through 17 asked the faculty members' perceptions of interdisciplinary design education. They dealt with the importance of teaching interdisciplinary design courses, successful aspects, least successful aspects, benefits, development, advantages and disadvantages. They were as follows.
11. For all the courses listed above, what are some of the most important reasons for teaching them as interdisciplinary design courses?
12. What are the most successful interdisciplinary aspects of these courses?
13. What are the least successful interdisciplinary aspects of these courses?
14. Based upon your experiences, with these interdisciplinary design courses, what are the most important benefits to the students?
15. What could be done to encourage the development of more interdisciplinary design courses at your institution?
16. What do you think are the primary educational advantages and disadvantages of interdisciplinary design courses?
17. Additional comments:

The category 2 questions asked the faculty members' opinions of the current academic conditions related to interdisciplinary design education at their institutions. The category 2 questions had only 5 questions whereas the category 1 questions had 17 questions. They were as follows.

1. In your institution, are there any interdisciplinary design courses between architecture and landscape architecture? If yes, why do you not teach these courses? Please list specific reasons. If no, what do you think are the factors hindering interdisciplinary design courses in your institution?
2. As a design educator, do you think interdisciplinary design courses are beneficial to the students in design disciplines? If yes, what do you think are the benefits? If no, why not?
3. Is there any plan for interdisciplinary design courses in your institution for the near future? If yes, what will be the focus of the courses and what disciplines will participate in these courses?
4. If your institution did have interdisciplinary design courses involving architecture and landscape architecture disciplines, would you be willing to teach these courses? If yes, what are the reasons for that? If no, what are the reasons for that?
5. Additional comments:
4.7.1 Qualitative aspect of the primary questionnaire

Newman and Benz point out that "the qualitative approach is used when observing and interpreting reality with the aim of developing a theory that will explain what was experienced" (3). In this study, the major focus of the primary questionnaire is to investigate the faculty's perceptions and experiences of interdisciplinary design education to understand the current situations. Qualitative data are defined by Patton as "detailed descriptions of situations, events, people, interactions, observed behaviors, direct quotations from people about their experiences, attitudes, beliefs, and thoughts or entire passages from documents, correspondence, records, and case histories" (273).

For this study, a selected sample is used for the primary questionnaire. This group consists of faculty members specifically recommended. The department chair or head was asked to identify faculty who have experience in interdisciplinary studies.

This questionnaire has both quantitative and qualitative research characteristics. For example, question 12 asks the most successful aspects of interdisciplinary courses and question 14 deals with the most important benefits of interdisciplinary design courses. These questions are based on the selected group of faculty's qualitative perceptions of interdisciplinary design education. At the same time, the primary questionnaire includes some aspects of quantitative research; for example, question 3 asks the length of time the instructor has taught the course and question 5 deals with the number of students in the course.

4.7.2 Reliability of the primary questionnaire

Although the term "reliability" denotes a concept used for testing or evaluating quantitative research, the idea is most often used in all kinds of research. Eisner states that a good qualitative study can help us understand a situation that would otherwise be confusing (58). Reliability is a useful concept to evaluate quality in quantitative studies with a "purpose of explaining" whereas in qualitative studies the purpose is not to explain but to
"generate understanding." Because of this difference in purpose, the concept of reliability is less relevant in qualitative research than in quantitative. According to Stenbacka, "the concept of reliability is even misleading in qualitative research" (552).

On the other hand, Patton states that validity and reliability are two factors which any qualitative researcher should be concerned about while designing a study, analyzing results and judging the quality of the study. With regards to the researcher's ability and skill in any qualitative research, Patton indicates that reliability is a consequence of the validity in a study (Patton).

For this study, mixed methods are the major research method. Both the preliminary and primary questionnaires have characteristics of quantitative and qualitative research. Therefore, the scholars' view of Eisner, and Patton is considered in this study instead of the view of Stenbacka who believes reliability is less of a relevant factor in qualitative research than in quantitative. As Patton points out above, this study used reliability and validity as two factors in its design, results analysis, and judgement of quality.

The primary questionnaire was the major method of this research. It was more focused on the expertise of interdisciplinary design education as compared to the preliminary questionnaire. Through this primary questionnaire, many factors and elements causing interdisciplinary design education were revealed. The next chapter deals with all of the results of the research method and analyzes the data to explain the current and future conditions of interdisciplinary design education.
Web-based data collection

Preliminary questionnaire

Primary questionnaire

Qualitative research method:
Investigating faculty’s perceptions of interdisciplinary design education

University settings

Undergraduate

Department chair/director

Graduate

Internet email questionnaire

Faculty

Faculty’s experience

Yes

Category 1

Category 2

Actual teaching experiences, courses

Interdisciplinary design education

Perceptions: importance, success, benefits, development

Opinions, plan

Hindering factors, willingness to teach

Figure 4.6: Structure of primary questionnaire
For design professionals, interactions among design-related disciplines are crucial in developing ideas and incorporating them into the built environment. Some of the research findings such as literature review, web-based research, and preliminary questionnaire reveal that in the academic environment the majority of students are educated in an isolated design discipline separated from related design disciplines. Although numerous faculty members are aware of the importance of cross disciplinary interactions and the potential of interdisciplinary design education, it is hard to realize interdisciplinary efforts in this separated academic environment.

As the result of the preliminary questionnaire indicates, various design educators accept the importance of interdisciplinary design learning integrated between architecture and landscape architecture. However, this interaction has proved to be difficult, and communication between these design disciplines is also complicated based on academic situations. This research explores the issues related to the faculty’s viewpoints, perspectives and their experiences of causing less or more interdisciplinary design education and investigates what other factors affecting to the design educational environment.
CHAPTER 5

5. DATA ANALYSIS

5.1 Introduction of data analysis

Data analysis is the most complex and mysterious of all of the phases of a research project. As indicated in the previous chapter, this study deals with mixed methods research that covers two different aspects of the research methods.

Quantitative research techniques generate a mass of numbers that need to be summarized, described and analyzed. Characteristics of the data may be described and explored by drawing graphs and charts, doing cross tabulations and calculating means and standard deviations. Further analysis would build on these initial findings, seeking patterns and relationships in the data by performing multiple regression, or an analysis of variance. Advanced modeling techniques may be used to build sophisticated explanations of how the data address the original question. But many quantitative research projects would never need to go that far; the question would be answered by simple descriptive statistics.

Qualitative data analysis has the same aspect. The mass of words generated by interviews or observational data needs to be described and summarized. The question may require the researchers to seek relationships between various themes that have been identified or to relate behavior or ideas to biographical characteristics of respondents such as age or gender. Implications for policy or practice may be derived from the data, or interpretation sought of puzzling findings from previous studies. Ultimately, theory could be developed and tested using advanced analytical techniques. There are no quick fix techniques in qualitative analysis. Just as a software package such as the Statistical Package for the Social Sciences (SPSS) will not tell you which of the myriad of statistical tests available to use to analyze numerical data, there are probably as many different ways of analyzing qualitative data as there are qualitative researchers doing it. Many would argue that this is the way it should be – qualitative research is an interpretive and subjective exercise, and the researcher is intimately involved in the process (Pope and Mays). However there are some theoretical approaches to choose from, which will be explored in
the following section. Furthermore, there are some common processes no matter which approach you take. Analysis of qualitative data usually goes through some or all of the following stages.

5.2 Theories and methods in qualitative data analysis

To analyze qualitative data, there are numerous approaches available. Much of qualitative analysis falls under the general heading of thematic analysis. However, there are particular schools of thought, or theoretical approaches to qualitative analysis, which it is important to be familiar with, both for designing research and critically appraising qualitative research evidence. The aim of this section is to introduce two distinct approaches to qualitative analysis. The first one is Grounded Theory, and the second one is Framework Analysis. The key features of each approach will be explained in the next part.

Grounded theory: Grounded theory evolved out of research by sociologists Glaser and Strauss who were concerned with outlining an inductive method of qualitative research which would allow social theory to be generated systematically from data. That is, theories would be grounded in rigorous empirical research, rather than produced in the abstract. Grounded theory is a methodology; in other words, it is a way of thinking about and conceptualizing data. It is an approach to research as a whole and as such can use a range of different methods. However, researchers frequently use the analysis procedures outlined in grounded theory without taking on board the whole methodological approach to research design. Grounded theory analysis is inductive, in that the resulting theory emerges from the data through a process of rigorous and structured analysis. It is important to emphasize that what distinguishes grounded theory from many other approaches to qualitative analysis is this emphasis on theory as the final output of research. Whereas other forms of qualitative analysis may legitimately stop at the levels of description or simple interpretation, the aim of grounded theory is theoretical development. Its focus is clearly on what has also been called analytic induction. A grounded theory consists of plausible relationships among sets of concepts, which are directly developed from data analysis. Theory, in this sense, provides instead of absolute truths a set of testable propositions that help us to understand our social world more clearly. The appeal of grounded theory analysis is the structured and detailed procedures for the generation of theory from data. Grounded theory starts with a clear, but
often broad, research question. This question identifies the general area to be studied. The research then traditionally proceeds in stages, with the analysis performed after one stage of fieldwork determining what or who will be studied next and which methods will be used. As a result, qualitative and quantitative methods can be used within the same study at different stages (Strauss and Corbin).

In terms of analyzing qualitative data generated, at the heart of grounded theory is the idea of the constant comparative method. In this method, concepts or categories emerging from one stage of the data analysis are compared with concepts emerging from the next. The researcher looks for relationships between these concepts and categories, by constantly comparing them, to form the basis of the emerging theory. The researcher continues with this process of constant comparison until he reaches what is called theoretical saturation the point at which no new significant categories or concepts are emerging. In terms of the grounded theory analysis process, the researcher typically goes through several procedures. These are not linear stages; rather the process of grounded theory is cumulative and can involve frequent revisiting of data in the light of the new analytical ideas that emerge as data collection and analysis progress:

- open coding (initial familiarization with the data)
- delineation of emergent concepts
- conceptual coding (using emergent concepts)
- refinement of conceptual coding schemes
- clustering of concepts to form analytical categories
- searching for core categories
- core categories lead to identification of core theory

Grounded theory analysis requires theoretical sensitivity. This is described as an ability to see the research situation and its associated data in new ways and to explore the data’s potential for developing theory (Strauss and Corbin 44). This is a creative process but must be grounded in a scientific approach. In grounded theory texts there are also discussions of how to distance oneself from assumptions before the fieldwork and from the emerging analysis in order to return repeatedly to the data. All theoretical developments are to be seen as provisional until proven by the data and by validation from others. There is a strong
tradition in grounded theory that its proper execution can only be learned from experience. Mentoring and working in teams have been seen as important in developing research skills and in ensuring rigor of analysis and theory generation.

Framework analysis: A second, more recent, approach to qualitative analysis is gaining popularity in research, namely framework analysis (Ritchie). In contrast to grounded theory, framework analysis was explicitly developed in the context of applied policy research. Applied research aims to meet specific information needs and provide outcomes or recommendations, often within a short timescale. Framework analysis shares many of the common features of qualitative analysis and of what is often called thematic analysis. The benefit of framework analysis is that it provides systematic and visible stages to the analysis process. Also, although the general approach in Framework Analysis is inductive, this form of analysis allows for the inclusion of a priori as well as emergent concepts; one example would be in coding. Framework analysis has five key stages. These can be undertaken in a linear fashion and therefore all data can be collected before analysis begins, although framework analysis can equally be used when data collection and analysis occur concurrently.

Key stages of Framework Analysis
- Familiarization
- Identifying a thematic framework
- Indexing
- Charting
- Mapping and Interpretation

5.3 Analysis of preliminary questionnaire

The preliminary questionnaire is composed of two parts. In the first part, from question 1 to question 10, all of the answers require a number or check mark and include a scaled selection dealing with quantitative data using closed or fixed-response questions. The second part, from question 11 to question 13, uses open-ended questions dealing with qualitative data asking respondents' opinions and thoughts. The preliminary questionnaire is
aimed at finding the general perception of interdisciplinary design education of graduate level universities in the United States.

The preliminary questionnaire was sent to the twenty-six universities that were the subject of the web-based data collection and had both architecture and landscape architecture at a master level in the same college. The preliminary questionnaire investigates general understandings, thoughts, and attitudes on a range of issues and explores the general perception of the role of interdisciplinary design education in architecture and landscape architecture. The preliminary questionnaire was conducted through an internet email survey of all the architecture and landscape architecture faculty members of the twenty-six universities.

The preliminary questionnaire was distributed in July 2005 and collected over a one month period from August 1, 2005 to August 31, 2005.
Table 5.1: University list of architecture for preliminary questionnaire

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</tbody>
</table>

The above table shows the number of preliminary questionnaires sent to all of the architecture faculty of each institution, the state, the location, and the received number of preliminary questionnaires. The response rate is not very high as shown; it is about 6.83%. This rate clearly shows that when conducting a questionnaire directed to a specific group such as faculty, it is not easy to get information and responses. However, it is well distributed to all of the institutions and therefore it is valuable to investigate the results of the preliminary questionnaire. For data analysis, one of the 34 responses is not considered because the quality of the response is not objective. The respondent answered very emotionally so that
the data is erased for quality purposes. Therefore, only 33 answers are considered for the data analysis of the preliminary questionnaire.

Architecture (Master program)

![Figure 5.1: Preliminary questionnaire distribution map of architecture](image)

The above map shows the distribution of the preliminary questionnaire for the master program of architecture discipline in the United States. The blue dots indicate where the preliminary questionnaire was sent and received. The red dots indicate where the preliminary questionnaire was sent but not received. The sum of all blue and red dots indicates the total number of preliminary questionnaires sent to all of the institutions. The overall distribution of the responses of the preliminary questionnaire covers nearly all of the states from the east to the west and will provide a good representation. Therefore, the interpretation of this distribution map is able to provide potential development of interdisciplinary design education in the United States.
The preliminary questionnaire begins with asking faculty to indicate their current position in architecture discipline.

• **Analysis of current position**

<table>
<thead>
<tr>
<th>Position</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor</td>
<td>17</td>
<td>52%</td>
</tr>
<tr>
<td>Associate professor</td>
<td>9</td>
<td>27%</td>
</tr>
<tr>
<td>Assistant professor</td>
<td>7</td>
<td>21%</td>
</tr>
<tr>
<td>Lecturer</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>33</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

The above table indicates that 79% of the respondents are tenured professors (professors 52%; associate professors 27%) and 21% are assistant professors and 0% are lecturers. This data points out that tenured professors, including professors and associate professors, show more interest in responding to questions of interdisciplinary design education than do assistant professors and lecturers. One of the reasons for a higher response percentage of tenured professors might be that they have more information and accumulated knowledge in interdisciplinary design education because of their long-term teaching, research, experience, and cooperation with other disciplines. Assistant professors and lecturers possibly have interests in this field of study; however, they are usually more focused on a specific subject rather than on integrating various design disciplines. The institutional structure of curriculum also does not allow much integration among design related disciplines.
• Question 1: How many architecture classes do you teach each academic year in the architecture discipline?

• Question 1 analysis:

Table 5.3: Distribution of teaching architecture classes

<table>
<thead>
<tr>
<th>Curriculum</th>
<th>Studio</th>
<th>Lecture</th>
<th>Seminar</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sum</td>
<td>39</td>
<td>38</td>
<td>32</td>
<td>11</td>
</tr>
<tr>
<td>Percentage</td>
<td>32.5%</td>
<td>31.7%</td>
<td>26.7%</td>
<td>9.2%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td>120</td>
</tr>
</tbody>
</table>

Figure 5.2: Distribution chart of teaching architecture classes

The above chart shows the percentage of architecture classes taught. As studio is the major place for learning architecture, studio has the highest percentage (32.5%), then lecture (31.7%), then seminar (26.7%), and finally lab (9.2%). Studio and lecture are the two major teaching classes in architecture, as the chart indicates. This preliminary questionnaire clearly demonstrates that studio is the major learning place of architecture as was also indicated in the previous literature review chapter.
Question 2: What are the approximate distributions of disciplines of the students in your classes? Please indicate the approximate percentage in each blank.

Question 2 analysis:

Table 5.4: Disciplinary distribution of students

<table>
<thead>
<tr>
<th>Curriculum</th>
<th>Studio</th>
<th>Lecture</th>
<th>Seminar</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disciplines</td>
<td>Arch</td>
<td>L A</td>
<td>Other</td>
<td>Arch</td>
</tr>
<tr>
<td>Sum</td>
<td>2346</td>
<td>73</td>
<td>81</td>
<td>1669</td>
</tr>
<tr>
<td>Percentage</td>
<td>93.8</td>
<td>2.9</td>
<td>3.2</td>
<td>87.8</td>
</tr>
<tr>
<td>Total</td>
<td>2500</td>
<td>1900</td>
<td>2490</td>
<td>900</td>
</tr>
</tbody>
</table>

This table shows the overall distributions of disciplines of each class. Every class has three different disciplines including architecture, landscape architecture, and other disciplines. Within those, the table shows the sum, percentage, and total of each discipline of every class. Through this table, distributions of every class are collected and investigated.

Figure 5.3: Disciplinary distribution chart of students
The above chart represents the distributions of disciplines for each class. For example, studio has 93.8% architecture students, 2.9% landscape architecture students, and 3.2% students from other disciplines. In the lecture class, 87.8% are from architecture, 3.6% from landscape architecture, and 8.5% are from other disciplines. As we see from the chart, studio has the highest percentage (93.8%) and lab has the lowest percentage (84.4%) of the same discipline students. However, for the architecture discipline, all classes in the studio, lecture, seminar, and lab are approximately more than 85% filled with same discipline students. This means that the architecture discipline does not have a flexible curriculum allowing other discipline students to share information and work with architecture students. It is especially difficult to participate in the studio with students from other disciplines, as the percentage of 93.8 shows.

- Question 3: If your classes included landscape architecture students in your college or school, was their attendance in the classes mandatory or optional?

- Question 3 analysis:

<table>
<thead>
<tr>
<th>Curriculum</th>
<th>Studio</th>
<th>Lecture</th>
<th>Seminar</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disciplines</td>
<td>Mandatory</td>
<td>Optional</td>
<td>Mandatory</td>
<td>Optional</td>
</tr>
<tr>
<td>Sum</td>
<td>5</td>
<td>9</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Percentage</td>
<td>36</td>
<td>64</td>
<td>38</td>
<td>63</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>16</td>
<td>18</td>
<td>9</td>
</tr>
</tbody>
</table>

The above table indicates what percentage of landscape architecture students are required to attend each class as mandatory or optional.
The following chart shows the choices of class attendance for landscape architecture students. For example, studio is 36% mandatory and 64% optional for landscape architecture students. Lecture, with a similar percentage to studio, is 38% mandatory and 63% optional for landscape architecture students. As the previous questions represent, studio and lecture are the major classes of architecture discipline. Therefore, studio and lecture classes for landscape architecture students have a higher percentage of mandatory requirements compared to the other two classes.

Seminar class is 17% mandatory and lab class is 22% mandatory for landscape architecture students. However, even though landscape architecture students are required to take architecture studio and lecture classes, less than 40% are mandatory. This points out that still not many landscape architecture students are required to take mandatory architecture studio or lecture classes. Institutional curriculum as we see from this chart is not strongly integrated between architecture and landscape architecture.
• Question 4: In general, do you prefer to have in your classes students whose majors are in other disciplines within your college or school?

• Question 4 analysis:

Table 5.6: Preference of other disciplinary students

<table>
<thead>
<tr>
<th>Preference</th>
<th>Prefer very much</th>
<th>Neutral</th>
<th>Do not prefer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Sum</td>
<td>15</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Percentage</td>
<td>46.9%</td>
<td>21.9%</td>
<td>28.1%</td>
</tr>
<tr>
<td>Total</td>
<td>32</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 5.5: Preference chart of other disciplinary students

The above chart shows the preference of having students who are majors in other disciplines. For example, 46.9% prefer very much and 28.1% are neutral towards having
students in other disciplines. Almost 69% prefer to have students in other disciplines and only 3.1% do not prefer this. The result of this question clearly indicates that faculty prefer to have a disciplinary mixture of students. Through this question, the importance of interdisciplinary design education emerges and is highlighted.

- Question 5: Students benefit greatly from working frequently with students in other disciplines in same college or school.

- Question 5 analysis:

Table 5.7: Benefit of students working with other disciplines

<table>
<thead>
<tr>
<th>Preference</th>
<th>Strongly agree</th>
<th>Neutral</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Sum</td>
<td>14</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>Percentage</td>
<td>42.4%</td>
<td>36.4%</td>
<td>18.2%</td>
</tr>
</tbody>
</table>

Figure 5.6: Benefit of students chart working with other disciplines
The above chart represents the distributions of students' benefit from working with students in other disciplines. As we see from this chart, 42.4% responded with the strongly agree choice and 36.4% agreed with benefits from working with other disciplinary students. The total of 78.8% shows agreement that the students benefit from class interaction with students of other disciplines. Only 3.0% disagreed with this question. The analysis of this chart explains that there are advantages and benefits from working with other disciplinary students in same college or school. If students’ benefits are great, then why are there so few classes offered for studying interdisciplinary design education? The findings also indicate that there are some barriers or obstacles for realizing interdisciplinary design education.

- Question 6: It is not important for design students to learn from other design disciplines.

- Question 6 analysis:

Table 5.8: Preference of importance of learning

<table>
<thead>
<tr>
<th>Preference</th>
<th>Strongly agree</th>
<th>Neutral</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Sum</td>
<td>5</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Percentage</td>
<td>15.2%</td>
<td>3.0%</td>
<td>0%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>33</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
</tr>
<tr>
<td>23</td>
</tr>
<tr>
<td>69.7%</td>
</tr>
</tbody>
</table>
This chart shows the importance of learning from other design disciplines. The question was asked in a negative way to control reliability of the pilot questionnaire so that the degree of 5 means that they believe it is very important for design students to learn from other design disciplines. As the chart indicates, 69.7% strongly agree and 12.1% agree with the importance of learning from other design disciplines. In total almost 82% point out that interdisciplinary design education should not be ignored or removed for extension learning of design students to understand design problems between architecture and landscape architecture discipline.

- **Question 7**: Interactions among design related disciplines in academic situations are fewer than interactions among the design professionals.

- **Question 7 analysis:**
Table 5.9: Preference of interactions

<table>
<thead>
<tr>
<th>Preference</th>
<th>Strongly agree</th>
<th>Neutral</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Sum</td>
<td>8</td>
<td>11</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Percentage</td>
<td>25.0%</td>
<td>34.4%</td>
<td>21.9%</td>
</tr>
<tr>
<td></td>
<td>12.5%</td>
<td>6.3%</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Percentage totals:
- 25.0% strongly agree
- 34.4% agree
- 21.9% neutral
- 12.5% disagree
- 6.3% strongly disagree
- 60% total agreement

This chart represents the perception of faculty dealing with interactions among design-related disciplines in academic situations and among design professionals. Through the above chart, faculty of architecture discipline show that 25% strongly agree and 34.4% agree with the fact that interactions in design disciplines are fewer than those in design professionals. Only 12.5% disagree and 6.3% strongly disagree. Almost 60% of the answers show agreement with the experience of fewer interactions among design disciplines in...
academic situations than among the design professionals. As the literature review points out, design disciplines need professional education through the various forms of classes such as studio, lecture, seminar, and lab. However, the analysis of this question suggests that academic situations of design disciplines still need more interactions in a range of diverse activities. Design students need to learn further how to interact with other design-related disciplines in academic situations to prepare them to become design professionals when they leave school.

• Question 8: Design students benefit far more from courses in their own discipline than from taking courses in other disciplines.

• Question 8 analysis:

<table>
<thead>
<tr>
<th>Preference</th>
<th>Strongly agree</th>
<th>Neutral</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Sum</td>
<td>3</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Percentage</td>
<td>9.4%</td>
<td>25.0%</td>
<td>21.9%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This table indicates the distribution of opinions about benefit from courses in their own disciplines and other disciplines.
Through this chart, we understand that faculty of architecture disciplines consider design students to benefit more when they take courses in other disciplines. Almost 22% disagree and strongly disagree with this question and 21.9% answered neutrally. Only 9.4% strongly agree with this question that indicates students benefit far more from courses in their own discipline than from taking courses in other disciplines. It also specifies interdisciplinary design education benefits design students by expanding their scope of design problems.

• Question 9: If you had a chance to increase or decrease your teaching to students in other disciplines, which would you do?

• Question 9 analysis:
The above chart represents that a majority of faculty choose to increase teaching to students in other disciplines. Almost 87% show the preference to increase interdisciplinary design education and only 3.3% answered to decrease the chance to teach interdisciplinary design. The analysis of this question also advocates that faculty in architecture discipline are willing to teach and increase their efforts and interests in interdisciplinary design education if there is a possibility of systematic development of curriculum or institutional support.
• Question 10: Please rank the following groups according to how the following phrase applies to them, with one being the most relevant.

The difficulties of interacting with other disciplines in the academic setting are mainly caused by

• Question 10 analysis:

<table>
<thead>
<tr>
<th>Table 5.12: Difficulty caused by faculty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rank</td>
</tr>
<tr>
<td>Sum</td>
</tr>
<tr>
<td>Percentage</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 5.13: Difficulty caused by students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rank</td>
</tr>
<tr>
<td>Sum</td>
</tr>
<tr>
<td>Percentage</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 5.14: Difficulty caused by administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rank</td>
</tr>
<tr>
<td>Sum</td>
</tr>
<tr>
<td>Percentage</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 5.15: Difficulty caused by other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rank</td>
</tr>
<tr>
<td>Sum</td>
</tr>
<tr>
<td>Percentage</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>
This question is proposed to rank the difficulties of interacting with other disciplines in the academic setting with the four suggested answers. Some of the respondents only choose one or two of the answers to rank. Therefore, each of the four suggested answers has a different total of responses as we see from the above charts. The charts show each answer's distribution of rank and what percentage covers each rank. For example, the total number of respondents who choose faculty is 20. Within that, 40% ranked faculty as first, 45% ranked faculty as second, 15% ranked faculty as third, and 0% ranked faculty as fourth. Each of the four tables specifies what percentage ranked each answer.

![Difficulties of interaction chart](chart.png)

**Figure 5.11: Chart of difficulties caused by factors**

The above chart indicates the four suggested answers and what percentage each was ranked from 1 to 4. It noticeably reveals that almost 82% of respondents who chose "other" ranked "other" first and this is the highest percentage from the chart. This analysis points out that the difficulties of interacting with other disciplines in the academic setting are mainly caused by other factors are not listed in this question. Respondents believe other factors may
cause difficulties of interaction with other disciplines. However, this question is unable to determine what the other factors are or possibly what factors hinder interdisciplinary design education. This type of question will be dealt with on the next primary questionnaire and some answers will be eventually suggested to give precise direction for desirable interdisciplinary design education in the academic setting.

For questions 1 to 10, all of the answers are designed for objective number selection. The quantitative research method is used and quantitative data analysis is also applied. The following preliminary questions, 11 to 13, are subjectively designed to be answered with opinions or thoughts. The qualitative research method is employed and qualitative data is analyzed.

**Landscape Architecture (Master Program)**

### Table 5.16: University list of landscape architecture for preliminary questionnaire

<table>
<thead>
<tr>
<th>University name</th>
<th>State</th>
<th>City</th>
<th>Number Sent</th>
<th>Number Received</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Arizona</td>
<td>AZ</td>
<td>Tucson</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Auburn University</td>
<td>AL</td>
<td>Auburn</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Ball State University</td>
<td>IN</td>
<td>Muncie</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>California State Polytechnic University</td>
<td>CA</td>
<td>Pomona</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>U.C Berkeley</td>
<td>CA</td>
<td>Berkeley</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>University of Colorado at Denver</td>
<td>CO</td>
<td>Denver</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>University of Florida</td>
<td>FL</td>
<td>Gainesville</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Florida International University</td>
<td>FL</td>
<td>Miami</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Harvard University</td>
<td>MA</td>
<td>Cambridge</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>University of Illinois</td>
<td>IL</td>
<td>Champaign</td>
<td>24</td>
<td>4</td>
</tr>
<tr>
<td>Iowa State University</td>
<td>IA</td>
<td>Ames</td>
<td>13</td>
<td>2</td>
</tr>
<tr>
<td>Kansas State University</td>
<td>KS</td>
<td>Manhattan</td>
<td>16</td>
<td>3</td>
</tr>
<tr>
<td>University of Minnesota</td>
<td>MN</td>
<td>Minneapolis</td>
<td>17</td>
<td>2</td>
</tr>
<tr>
<td>Morgan State University</td>
<td>MD</td>
<td>Baltimore</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>University of New Mexico</td>
<td>NM</td>
<td>Albuquerque</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>North Carolina State University</td>
<td>NC</td>
<td>Raleigh</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>Ohio State University</td>
<td>OH</td>
<td>Columbus</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>University of Oklahoma</td>
<td>OK</td>
<td>Norman</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>University of Oregon</td>
<td>OR</td>
<td>Eugene</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>University of Pennsylvania</td>
<td>PA</td>
<td>Philadelphia</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Rhode Island School of Design</td>
<td>RI</td>
<td>Providence</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Texas A&amp;M University</td>
<td>TX</td>
<td>College Station</td>
<td>24</td>
<td>3</td>
</tr>
<tr>
<td>University of Texas Arlington</td>
<td>TX</td>
<td>Arlington</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Virginia Tech</td>
<td>VA</td>
<td>Blacksburg</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>University of Virginia</td>
<td>VA</td>
<td>Charlottesville</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>University of Washington</td>
<td>WA</td>
<td>Seattle</td>
<td>11</td>
<td>1</td>
</tr>
</tbody>
</table>

**Total number** | **233** | **27**
The above table represents how many preliminary questionnaires were sent to the faculty of each institution. It also shows the state, location, and received number of preliminary questionnaires.

For landscape architecture, all of the universities are the same as for architecture, but the total number of preliminary questionnaires and response numbers are different from architecture. Landscape architecture shows a higher response rate of 11.59% compared to the architecture response rate of 6.83%. One of the reason for the higher rate is that my advisor is well known in landscape architecture so that more faculty desired to respond to the preliminary questionnaire. The distribution of the preliminary questionnaire is well represented, similar to architecture, so it is of value to explore the outcomes of the preliminary questionnaire. One response of 27 is deleted because of a partially answered response. Therefore, a total of 26 responses are analyzed.

Landscape architecture (Master program)

![Figure 5.12: Preliminary questionnaire distribution map of landscape architecture](image-url)
The above map indicates the overall distribution of the preliminary questionnaire for master programs of landscape architecture in the United States. As in architecture, the blue dots reveal the locations where the preliminary questionnaire was sent and from where responses were received. The red dots show where the preliminary questionnaire was sent but not collected. The sum of all blue and red dots indicates the total number of preliminary questionnaires sent to all of the institutions. As mentioned in the architecture distribution map, the general distribution of the responses of the preliminary questionnaire covers nearly all of the United States. For that reason, the understanding of this distribution map is valuable and able to suggest some exact direction in increasing interdisciplinary design education in the United States.

The preliminary questionnaire begins with asking faculty to specify their current position in the landscape architecture discipline.

• Analysis of current position

<table>
<thead>
<tr>
<th>Position</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor</td>
<td>9</td>
<td>36%</td>
</tr>
<tr>
<td>Associate professor</td>
<td>11</td>
<td>44%</td>
</tr>
<tr>
<td>Assistant professor</td>
<td>3</td>
<td>12%</td>
</tr>
<tr>
<td>Lecturer</td>
<td>2</td>
<td>8%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>25</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Similar to the preliminary questionnaire of the architecture discipline, the above table shows that tenured professors (professors 36%; associate professors 44%) make up 80% of all the respondents. Assistant professors are 12% and lecturers 8%.
The analysis of this data can be interpreted to learn that professors and associate professors have more concerns about the questions of interdisciplinary design education compared to assistant professors and lecturers. Usually tenured professors have spent a long period of time on their specific research as well as teaching. They are more familiar with interdisciplinary design education by contacting and interacting with other design disciplines. This might be one of the reasons for the higher response rate. However, this does not mean that assistant professors or lecturers do not have interests in interdisciplinary design education. The main reason is explored and answered through the next stage of the questionnaire.

- **Question 1**: How many landscape architecture classes do you teach each academic year in the landscape architecture discipline?

- **Question 1 analysis:**
Table 5.18: Distribution of teaching landscape architecture classes

<table>
<thead>
<tr>
<th>Curriculum</th>
<th>Studio</th>
<th>Lecture</th>
<th>Seminar</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sum</td>
<td>38</td>
<td>38</td>
<td>18</td>
<td>10</td>
</tr>
<tr>
<td>Percentage</td>
<td>36.5%</td>
<td>36.5%</td>
<td>17.3%</td>
<td>9.6%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td>104</td>
</tr>
</tbody>
</table>

Figure 5.14: Distribution chart of teaching landscape architecture classes

The above chart indicates the percentage of teaching each landscape architecture class. As previously mentioned, studio is the major teaching and learning place for landscape architecture, so studio has the highest percentage, 36.5%, the same as lecture. Compared to architecture, seminar has a lower percentage, 17.3%, and lab has a similar percentage, 9.6%. Just as in architecture, studio and lecture are the two major teaching classes in landscape architecture as the chart shows. This preliminary questionnaire visibly represents that studio is also an important place for students of landscape architecture.
• Question 2: What are the approximate distributions of disciplines of the students in your classes? Please indicate approximate percentage in each blank.

• Question 2 analysis:

Table 5.19: Disciplinary distribution of students

<table>
<thead>
<tr>
<th>Curriculum</th>
<th>Studio</th>
<th>Lecture</th>
<th>Seminar</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L A</td>
<td>Arch</td>
<td>Other</td>
<td>L A</td>
</tr>
<tr>
<td>Disciplines</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sum</td>
<td>2011</td>
<td>60</td>
<td>129</td>
<td>1279</td>
</tr>
<tr>
<td>Percentage</td>
<td>91.4</td>
<td>2.7</td>
<td>5.9</td>
<td>64.0</td>
</tr>
<tr>
<td>Total</td>
<td>2200</td>
<td>2000</td>
<td>1400</td>
<td>400</td>
</tr>
</tbody>
</table>

The overall distributions of disciplines in each class is presented in the above chart. Each class has different disciplines including landscape architecture, architecture, and other disciplines. For example, studio has 91.4% landscape architecture students, 2.7% architecture students, and 5.9% students from other disciplines. As question 1 points out, studio is the major place for both architecture and landscape architecture disciplines. However, this table clearly represents that studio is very limited to their own disciplinary students and not many other disciplinary students have a chance to learn from the studio environment. The inflexibility of studio may hinder an interdisciplinary design education that needs flexible and interactive activities.
Figure 5.15: Disciplinary distribution chart of students

The above chart shows the distributions of disciplines for studio, lecture, seminar, and lab class. Lecture class has 64.0% landscape architecture students, 8.2% architecture students, and 27.9% students from other disciplines. Lecture class has the highest percentage of opening of 36% for other disciplines including architecture. Landscape architecture shows more flexibility than architecture in all of four types of classes. Studio still shows rigidity of 91.4% only for landscape architecture students and a flexible opening of only 8.6%. Other than studio, the classes have flexible openings for architecture and other disciplines. This flexibility in landscape architecture possibly allows more potential for interacting with other disciplines and also expanding to interdisciplinary design education.
• Question 3: If your classes included architecture students in your college or school, was their attendance in the classes mandatory or optional?

• Question 3 analysis:

Table 5.20: Class attendance of students

<table>
<thead>
<tr>
<th>Curriculum</th>
<th>Studio</th>
<th>Lecture</th>
<th>Seminar</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mandatory</td>
<td>Optional</td>
<td>Mandatory</td>
<td>Optional</td>
</tr>
<tr>
<td>Sum</td>
<td>5</td>
<td>6</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>Percentage</td>
<td>45.5</td>
<td>54.5</td>
<td>13.3</td>
<td>86.7</td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
<td>15</td>
<td>9</td>
<td>3</td>
</tr>
</tbody>
</table>

The above table indicates the percentage of architecture students for each class required to attend as mandatory or optional. It shows that studio has the highest percentage of mandatory attendance, 45.5%, from the architecture discipline. As question 2 represents, studio has limited space for other disciplinary students and at the same time the highest percentage of mandatory classes for architecture students.

Figure 5.16: Class attendance chart of students
The above chart deals with architecture students' attendance type in each class. For example, studio is 45.5% mandatory and 54.5% optional for architecture students. Lecture, differing from studio, is only 13.3% mandatory and 86.7% optional for architecture students. As we see from the previous questions, studio and lecture are the major classes of the landscape architecture discipline. However, lecture has more optional classes for architecture students compared to landscape architecture students. Seminar class is 33.3% mandatory which is higher than for landscape architecture students which is 17% mandatory as found from the analysis of the architecture program. Architecture students show more variations than landscape architecture students in taking classes from different disciplines whether mandatory or optional. The number of students which is usually larger in architecture than landscape architecture may affect this variation. Architecture students take lecture class in landscape architecture program as optional with the percentage of 86.7 and that high percentage has possibilities of interacting with landscape architecture in various types with the form of lecture. Many architecture students are taking lecture in landscape architecture not required by the curriculum but due to their interests. This indicates that interdisciplinary design education between these two disciplines is able to provide more interactions and learning from each other.

- Question 4: In general, do you prefer to have in your classes' students who are majors in other disciplines within your college or school?

- Question 4 analysis:

<table>
<thead>
<tr>
<th>Preference</th>
<th>Prefer very much</th>
<th>Neutral</th>
<th>Do not prefer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Sum</td>
<td>11</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>Percentage</td>
<td>44.0%</td>
<td>32.0%</td>
<td>20.0%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5.21: Preference of other disciplinary students
The above table shows total of 25 answers and 11 of them are prefer very much and 8 are prefer respectively those are 44.0% and 32.0%.

![Preference chart of other disciplinary students](image)

**Figure 5.17: Preference chart of other disciplinary students**

The above chart shows that 44.0% prefer very much to have students whose majors are in other disciplines. It specifies that only 4.0% have a negative preference, 76.0% have positive answers and 20.0% have neutral answers. Faculty obviously prefer to have students who are majors in other disciplines. Compared to architecture, faculty of landscape architecture prefer having other disciplinary students slightly more by the percentage of 76.0% to 68.8%. Although there are small differences between architecture and landscape architecture, faculty of both disciplines clearly show the preference of having students whose majors are in other disciplines. These results also point out that crossing boundaries among the disciplines is critical for developing interdisciplinary design education.
• Question 5: Students benefit greatly from working frequently with students in other disciplines in same college or school.

• Question 5 analysis:

<table>
<thead>
<tr>
<th>Preference</th>
<th>Strongly agree</th>
<th>Neutral</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree</td>
<td>1 2 3 4 5</td>
<td>3 4 5</td>
<td></td>
</tr>
<tr>
<td>Sum</td>
<td>15 9 1 1 0</td>
<td>1 1 0</td>
<td></td>
</tr>
<tr>
<td>Percentage</td>
<td>57.7% 34.6% 3.8% 3.8% 0.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2 6</td>
<td></td>
<td>26</td>
</tr>
</tbody>
</table>

The above chart specifies the distributions of students' benefit from working with students in other disciplines in the same college or school.

![Pie Chart](image)

**Figure 5.18: Benefit of students chart working with other disciplines**
This chart explains that there are advantages and benefits from working with other disciplinary students in the same college or school. From this chart, 57.7% responded "strongly agree" and 34.6% agreed with benefits from working with other disciplinary students. Faculty of landscape architecture have more positive perspectives than architecture faculty as shown by their positive answers, 92.3% compared to 78.8%. Both architecture and landscape architecture faculty strongly agree with positive benefits from other disciplinary students. However, landscape architecture has a more flexible vision by thinking of benefits from working with other disciplinary students. Only 3.8% disagreed with this question.

• Question 6: It is not important for design students to learn from other design disciplines.

• Question 6 analysis:

<table>
<thead>
<tr>
<th>Preference</th>
<th>Strongly agree</th>
<th>Neutral</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Sum</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Percentage</td>
<td>15.4%</td>
<td>11.5%</td>
<td>7.7%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To control the reliability of the preliminary questionnaire, this question is designed to ask using the negative approach. The above chart shows the importance of learning from other design disciplines.
As the chart points out, 57.7% strongly disagree and 7.7% disagree with the unimportance of learning from other design disciplines. A total of 65.4% point out that it is important for design students to learn from other design disciplines. This indicates that interdisciplinary design education is important and should be developed to expand design knowledge and ultimately understand design problems that can be improved by collaboration between architecture and landscape architecture disciplines.

• Question 7: Interactions among design related disciplines in academic situations are fewer than interactions among the design professionals.

• Question 7 analysis:
The above chart presents the faculty's perception of interactions among design-related disciplines in academic situations and among design professionals. As the chart indicates, 33.3% of landscape architecture faculty strongly agree and 33.3% agree with the fact that interactions in design disciplines are fewer than those among design professionals. Only
4.2% disagree and another 4.2% strongly disagree with the question. Almost 67% of the answers agree with incidents of fewer interactions among design disciplines in academic situations than among design professionals. Compared to architecture faculty, faculty of landscape architecture strongly agree with the weakness of interactions among design disciplines in academic situations. This occurrence might be related to class distribution showing studio is strictly formed to open for the same disciplinary students and also might be curricular structure itself is only limited to some disciplines. The details behind fewer interactions in academic situations than among professionals will be intensely discussed at the questionnaire’s next level.

- Question 8: Design students benefit far more from courses in their own discipline than from taking courses in other discipline.

- Question 8 analysis:

<table>
<thead>
<tr>
<th>Preference</th>
<th>Strongly agree</th>
<th>Neutral</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Sum</td>
<td>0</td>
<td>6</td>
<td>13</td>
</tr>
<tr>
<td>Percentage</td>
<td>0.0%</td>
<td>23.1%</td>
<td>50.0%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This table shows the answers of the degree of benefit in taking courses from their own discipline over from other disciplines.

The following chart shows to some extent different a pattern compared to architecture discipline. Landscape architecture faculty answered 50.0% neutral and another 50.0% divided almost evenly with the agree and disagree opinions.
They have various answers for recognizing benefits from their own discipline or from other disciplines. However, none of them answered strongly agree and 7.7% shows those who strongly disagree. It still indicates that faculty of landscape architecture tend to believe that there is nearly the same benefit from their own discipline and from other disciplines nearly the same or a little higher in their own discipline. It is hard to say if they agree or disagree with this question.

- Question 9: If you had a chance to increase or decrease your teaching to students in other disciplines which would you do?

- Question 9 analysis:
Table 5.26: Chance to teach students

<table>
<thead>
<tr>
<th>Preference</th>
<th>Increase</th>
<th>Decrease</th>
<th>Stay the same</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sum</td>
<td>23</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Percentage</td>
<td>88.5%</td>
<td>7.7%</td>
<td>3.8%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>26</td>
</tr>
</tbody>
</table>

Figure 5.22: Chart of chance to teach students

The above chart shows that a noticeably high percentage of respondents would select to increase their opportunities to teach students in other disciplines. Very similar to those in architecture, almost 89% answered to increase interdisciplinary design education and only 7.7% answered to decrease the opportunity to teach interdisciplinary design. Both architecture and landscape architecture faculty desire to teach and increase the opportunity to interact with interdisciplinary design. This raises another question of why there are not very many actual interdisciplinary design education opportunities and classes although numerous faculty attempt to teach and desire to increase their efforts and interests in interdisciplinary design education. Some of the answers are presented in the primary questionnaire.
• Question 10: Please rank the following groups according to how the following phrase applies to them, with one being the most relevant.

The difficulties of interacting with other disciplines in the academic setting are mainly caused by

• Question 10 analysis:

Table 5.27: Difficulty caused by faculty

<table>
<thead>
<tr>
<th>Rank</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sum</td>
<td>9</td>
<td>3</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Percentage</td>
<td>64.3%</td>
<td>21.4%</td>
<td>14.3%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5.28: Difficulty caused by students

<table>
<thead>
<tr>
<th>Rank</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sum</td>
<td>2</td>
<td>1</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Percentage</td>
<td>20.0%</td>
<td>10.0%</td>
<td>50.0%</td>
<td>20.0%</td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5.29: Difficulty caused by administration

<table>
<thead>
<tr>
<th>Rank</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sum</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Percentage</td>
<td>50.0%</td>
<td>33.3%</td>
<td>16.7%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Total</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5.30: Difficulty caused by other

<table>
<thead>
<tr>
<th>Rank</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sum</td>
<td>9</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Percentage</td>
<td>81.8%</td>
<td>9.1%</td>
<td>0.0%</td>
<td>9.1%</td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Through this question, the four factors are ranked for making difficulties of interacting with other disciplines in the academic setting. Respondents may select one, two, three or all of the four answers and rank them. Therefore, the four suggested answers have different total numbers of responses as the above charts indicate. Each chart shows the distribution of rank and percentage for each answer. For example, a total of 14 respondents chose faculty and 64.3% ranked faculty as first, 21.4% ranked faculty as second, 14.3% ranked faculty as third, and 0.0% ranked faculty as fourth. All of the four tables state rank and percentage of each answer.

![Chart of difficulties caused by factors](image)

**Figure 5.23: Chart of difficulties caused by factors**

The above chart obviously suggests that nearly 82% of respondents who answered "other" ranked other first and this is the highest percentage as we see from the chart. This analysis is the same as architecture and indicates that the difficulties of interacting with other disciplines in the academic setting are mainly caused by other factors. Respondents consider other factors as the major difficulty of interacting with other disciplines. However, this
question is limited to a select answer from the listed answers and we are not able to find out what the other factors are. As mentioned in the previous analysis in architecture discipline, the specific reasons for their choice of the other factor are evidently revealed in the next primary questionnaire.

Compared to architecture, faculty have 64.3% as the first rank and higher than administration of 50.0% whereas architecture has administration of 68.2% and faculty of 40.0%.

5.4 Analysis of primary questionnaire

The primary questionnaire is composed of two parts. The first part focuses on general background information and the second part has two categories. Category 1 is answered by the group of people who have experienced any type of interdisciplinary design education and category 2 is answered by those who have not experienced any.

Questions 1 to 5 are focused on general background information.

There are 25 respondents total who answered the primary questionnaire. The distribution of the two disciplines is 6 respondents from architecture and 19 respondents from landscape architecture.

Question 1 asked the faculty's current position. As the following charts indicate, professors are 32%, associate professors are 48%, assistant professors are 20%, and lecturers, others 0%, tenured professors cover 80% of the respondents. And only 20% are assistant professors which shows that professors who are tenured are more likely to have experiences of interdisciplinary design education. They have spent more time and effort to expand their expertise and tend to focus on interdisciplinary design education. Although interested in interdisciplinary design courses, assistant professors and lecturers have had limited opportunities to teach or experience these courses.
Figure 5.24: Current faculty position

Figure 5.25: Distribution of current faculty position

Question 2 dealt with the gender of faculty. The male faculty is 60% and the female faculty is 40%. There are not much gender differences; however, the ratio of male to female
faculty in design disciplines is more than 6 to 4 as this data represents. For this primary questionnaire, female faculty participated in a more positive way than male faculty.

Figure 5.26: Distribution of gender of faculty

Question 3 asked the number of years teaching at the current university. This question is related to question 1 which indicates the length of teaching and position. As question 1 points out, tenured faculty have spent quite a long period of time teaching. The following table indicates the length of teaching periods and how many respondents are in each category.

Table 5.31: Years of teaching

<table>
<thead>
<tr>
<th>Length (Years)</th>
<th>Arch number of faculty (%)</th>
<th>LA number of faculty (%)</th>
<th>Total number of faculty (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1~3</td>
<td>2 (10%)</td>
<td>2 (8%)</td>
<td></td>
</tr>
<tr>
<td>4~6</td>
<td>3 (16%)</td>
<td>3 (12%)</td>
<td></td>
</tr>
<tr>
<td>7~9</td>
<td>4 (21%)</td>
<td>4 (16%)</td>
<td></td>
</tr>
<tr>
<td>10~</td>
<td>6 (100%)</td>
<td>10 (53%)</td>
<td>16 (64%)</td>
</tr>
</tbody>
</table>
The average years of teaching is 15. As indicated from the above table, all of the architecture respondents have more than 10 years of teaching and 90% of landscape architecture faculty have more than 4 years of teaching experience at the current university. As a whole, 92% of faculty have more than 4 years of teaching and 80% have more than 7 years of teaching. Similar to question 1, many of the faculty members have a long period of teaching experience. That is why they are specialized in interdisciplinary design education based on their expertise in each discipline.

![Chart of years of teaching](image)

**Figure 5.27: Chart of years of teaching**

Question 4 investigated the programs that faculty usually teach at the current university. Through this question, the relationships between expertise in interdisciplinary design and programs in undergraduate, graduate, and PhD are investigated. The following table indicates how many respondents teach in undergraduate, graduate, and PhD programs.
Table 5.32: Teaching program

<table>
<thead>
<tr>
<th>Program</th>
<th>Undergraduate (%)</th>
<th>Graduate (%)</th>
<th>PhD (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondents</td>
<td>24</td>
<td>19</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Percentage</td>
<td>96%</td>
<td>76%</td>
<td>16%</td>
</tr>
</tbody>
</table>

As we see from this table, most of the respondents have taught undergraduates (96%), seventy-six percent have taught graduates, and sixteen percent have taught in the PhD program. This percentage is similar to the overall distribution of the programs in general. There are not many differences between the overall distributions of programs and the percentage of respondents from each program. Through this data set, we understand that interdisciplinary design education can be approached in the various stages of undergraduate, graduate, or the PhD program. However, for a successful interdisciplinary design education,
each stage should develop what purpose and goal can be accomplished through the specific program and the interactions among various disciplines.

![Previous Teaching Experience Chart](image)

**Figure 5.29: Chart of previous teaching**

Question 5 deals with the previous teaching experience of faculty before they joined the current university. Almost 65% have previous teaching experience as the above chart shows.

### 5.4.1 Analysis of open ended questions of primary questionnaire

As mentioned before, the primary questionnaire is composed of two parts. The following diagram indicates the overall structure of the primary questionnaire. Part one deals with general background information of respondents including academic rank, gender, length of teaching, programs of teaching, and teaching experiences in other universities. Part two is made of category one and category two based on the answers of their experiences of interdisciplinary design education.
In this section, category one within part two of the primary questionnaire is analyzed. The category one comprises open-ended questions. Questions 1 through 10 deal with quantitative aspects of the primary questionnaire.

The following diagram represents how the quantitative approach of category one of the primary questionnaire has been analyzed using numbers and content analysis. The gray shaded part specifies the analysis of each question, 1 through 10, for the following sections.
Based on the above diagram, the following part clarifies the quantitative aspects of questions on interdisciplinary design education.

**Quantitative analysis of questions 1 through 10**

For the analysis of questions 1 through 10, all of the answers are collected and listed in the appendix and this part only shows the analysis of numbers and content. All of the respondents' answers are shown by chart and distribution diagram.
• Question 1: What are the names of the interdisciplinary design courses?

• Question 1 analysis:

This chart shows the number of courses named as various interdisciplinary design courses. As indicated, the names of interdisciplinary courses vary including the word 'Interdisciplinary design' and 'Urban design' showing seven answers each. 'Design in general' shows nine answers which has various interdisciplinary names including extremely specific or abstract meaning for the courses. For example, one of the answers is 'East St. Louis Neighborhood Design Studio' which indicates very specific information about the course and 'Design communications' which is somewhat abstract for understanding the aim of the course.
The above chart shows the distribution and percentage of the names of interdisciplinary design courses. As we see, interdisciplinary design courses have a variety of names indicating approaches or directions of interdisciplinary design. Interdisciplinary design courses include the word ‘Interdisciplinary design,’ and ‘Urban design’ (16%). Others have the highest percentage (34%) which represents that interdisciplinary design courses are taught in institutions with a variety of different names. There are no strict patterns or rules of the names representing the courses of interdisciplinary design.
• Question 2: What subject areas and disciplines are involved?

• Question 2 analysis:

![Figure 5.34: Involved disciplines](image)

This chart clearly indicates that architecture and landscape architecture are the two major disciplines of interdisciplinary design courses. As indicated, the column 'Others' implies disciplines not shown by the column name of common disciplines. Although the number of 'Others' disciplines is higher than rest disciplines, the actual answers are the total number of various disciplines such as sculpture, anthropology, geography, philosophy, law, journalism, and graphic arts. There are many different disciplines within the column of 'Others.' Therefore, the total number of 16 is higher than the remaining columns of disciplines.
The above chart shows the distribution and percentage of the disciplines involved in interdisciplinary design courses. As previously indicated, architecture and landscape architecture have the highest percentage (24% and 30%) planning has 11%, and various disciplines are engaged in interdisciplinary design courses. The current interdisciplinary design courses show the secure relationship between architecture and landscape architecture for realizing interdisciplinary design courses.
• Question 3: How many years have you taught this course?

• Question 3 analysis:

![Figure 5.36: Years of teaching](image)

This question deals with the number of years interdisciplinary design courses have been taught. The chart represents 20 courses which have been taught for 0–3 years and 10 courses which have been taught for 4–6 years. Only 5 courses have been taught for more than 10 years. Thus far many interdisciplinary design courses are usually taught within a 6-year teaching period.
Figure 5.37: Distribution of years of teaching

The above chart shows the distribution and percentage of years an interdisciplinary design course has been taught. 0~3 years taught has the highest percentage (47%), 4~6 years taught has 24%, and more than 10 years taught only has 12%. Almost 50% of interdisciplinary design courses have been taught between 0~3 years. Not many interdisciplinary design courses have been taught for a long period of time.
• Question 4: Was this course taught prior to your involvement? Approximately when was it started?

• Question 4 analysis:

As the above chart shows, there is not much difference between the percentage of courses taught by someone or not taught before the respondents became involved in teaching the interdisciplinary design courses. Approximately half of the courses were taught by previous faculty and half of the courses have been taught since the beginning of the respondents' involvement.
The above chart indicates the starting years of interdisciplinary design courses. More than 50% of the courses started in the 1990s and 26% started in the 2000s. Almost 80% of the interdisciplinary design courses started in the 1990s and later. The history of interdisciplinary design courses is not long compared to other design courses. Since the 1990s, various institutions have tried to create courses related to interdisciplinary design.
• Question 5: Approximately, how many students are in the course and what are their majors?

• Question 5 analysis:

![Distribution of Students Number](chart)

**Figure 5.40: Distribution of students number**

The above chart indicates the number of students in each interdisciplinary design course. The current interdisciplinary design courses have almost 60% of classes with 11~30 students. This is the approximate size of design studio, seminar, or lecture. Only 10% of the classes have more than 41 students and only 12% have less than 10 students.

The majors of students are shown in the chart below. Architecture and landscape architecture are the two most frequent majors of the interdisciplinary design courses.
Figure 5.41: Major of students

The chart below indicates the distribution of students' majors and the percentage. As we see, architecture and landscape architecture have 31% each and those two disciplines are strongly related to each other.

Figure 5.42: Distribution of major of students
• Question 6: Is it a sole instructor or a team taught course?

• Question 6 analysis:

The chart below points out that almost 70% of the interdisciplinary design courses are taught by a team and 30% are taught by a sole instructor. This shows that to understand other disciplines and learn from them, team effort is needed even by instructors.

Figure 5.43: Distribution of teaching type
Question 7: How many instructors/faculty are responsible for the course?

Question 7 analysis:

The chart below points out that almost 50% of the interdisciplinary design courses are team taught by 2 or 3 instructors and almost 30% are taught by one instructor as the previous question indicates. And 25% have more than 4 instructors. Once the interdisciplinary design courses are taught by a team, 2 or 3 instructors tend to participate in the interdisciplinary design courses.

![Distribution of Instructor Numbers](image)

Figure 5.44: Distribution of instructor numbers
• **Question 8**: Faculty from which disciplines participated in the course?

• **Question 8 analysis:**

The chart below points out that architecture and landscape architecture are the two major faculty disciplines.

![Faculty participation disciplines](image)

**Figure 5.45: Faculty participation disciplines**

As we see from the distribution chart below, almost 70% of the interdisciplinary design courses are taught by faculty from architecture and landscape architecture disciplines. Faculty also have very similar pattern to the students distribution of disciplines. The column of 'Others' includes a variety of disciplines as sculpture, theater arts, music, geography, anthropology, and philosophy. All of the detailed answers are collected and listed in the appendix.
Figure 5.46: Distribution of faculty participation disciplines

• Question 9: Which semesters (quarters) is this course offered?

• Question 9 analysis:

As the following semester distribution chart indicates, there is not much difference between the offering of interdisciplinary design courses in the spring or fall. Courses are open in the fall, spring, or summer session and it seems to not affect interdisciplinary design courses.
• Question 10: Does the course still exist? If no, why was the course discontinued?

• Question 10 analysis:

The following course existence distribution chart indicates that 73% of the interdisciplinary design courses still exist. Once interdisciplinary design courses are opened and taught, institutions tend to maintain the courses rather than eliminate them. Some examples for discontinuing courses are because of change in the college organization, administrative reasons, curriculum structure, lack of funding, lack of support, and difficulties organizing among departments.
Questions 11 through 17 of category one deal with qualitative aspects of the focused questionnaire. In particular, respondents are asked to answer the questions qualitatively with their opinions, thoughts, and experiences. These questions investigate more fundamental and critical reasons of why interdisciplinary design education is situated as it is in the current American higher education systems.

The analysis of these qualitative questions is organized around four headings of why, what, how, and therefore. These headings were decided after collecting all of the respondents data from the primary questionnaire. Even within the same question, the respondents answers deal with the full range of headings including why the question is important, what the main objectives are, how these issues can be accomplished, and therefore what we can learn through these questions and issues. These four headings are applied to questions 11 through 17. Some questions generate responses related to all four headings of why, what, how, and therefore; others relate to only two or three of the headings.

Underneath these headings, responses have been organized in response categories. Each category represents the main theme of the similar contents of a group of answers.
Each category also has been placed in an order to show the numeric hierarchy of the percentage of responses to the question.

The following diagram represents how the qualitative approach of category one of the focused questionnaire has been analyzed using four headings and the category technique. The gray colored part specifies the analysis of each question 11 through 17 for the following sections.

![Diagram](image)

**Figure 5.49: Qualitative approach of category one of primary questionnaire**

Based on the above diagram, the analysis of each question represents how the respondents answered and what important issues emerged through the primary questionnaire. The following part explains the qualitative aspects of questions on interdisciplinary design education.
Qualitative analysis of questions 11 through 17

For the analysis of questions 11 through 17, all of the answers are collected and listed in the appendix and this part only shows the headings and response categories. All of the respondents' answers are categorized by headings. Each response category represents a number of individual responses. For example, question 11 has all of the four headings of why, what, how, and therefore. Within these headings, each response category has various answers;

'Why' heading shows one response category:
1. Has complex issues.

'What' heading shows four response categories:
1. Exposes students to disciplinary learning.
2. Understands collaboration.
3. Promotes integration/communication.

'How' heading shows three response categories:
1. Needs a team effort.
2. Expands the sharing of information.
3. Needs to share a common language.

'Therefore' heading shows two response categories:
1. Prepares for a real world experience.
2. Learns expertise.

Questions 11 through 17 are individual multiple answers questions. Therefore, the total number of answers collected is more than the total number of respondents, twenty five. The number of answers vary from only one to two, three, or four based on the respondents' answers.

Each response category has two different numbers, the first is the percentage of answers to the total of all the answers generated by the question and the second is the percentage of answers for a specific heading.
• Question 11: For all the courses listed above, what are some of the most important reasons for teaching them as interdisciplinary design courses?

• Question 11 analysis:

![Distribution of Heading](image)

Figure 5.50: Distribution of heading of question 11

This chart shows the distribution and percentage of headings. In this question, the heading of 'What' (44.7%) and 'How' (36.8%) covers 81.5% of the total answers. Almost 82% of the responses deal with 'What' the main objectives for this question are and 'How' these issues can be accomplished and answered this question with a more pragmatic view as opposed to theoretical reasons such as those falling under the 'Why' and 'Therefore' headings. For example, the most important reasons for teaching interdisciplinary design courses are team effort, expanding the sharing of information, and sharing a common language. It also indicates that a great number of responses realized the reasons for this question and they provide some clues as to how to solve this question. Only 5.3% of
responses fall under the 'Why' heading and 13.2% under the 'Therefore' heading as we see from this chart.

The above diagram shows that answers to this question fall under all four headings of why, what, how, and therefore. The category of 'Needs team effort' within the 'How' heading has the highest percentage (18.4%) for this question.

A variety of answers emphasize team work and learning. For example:

1. design as practiced is a team effort and requires the ability to work together and utilize the strengths of each discipline

2. in order to succeed in interdisciplinarity after graduation, team working knowledge, skills, and abilities must be learned and practiced during the formal education of professionals
3. the subject matter itself is transdisciplinary to give students the experience of working with others

4. understanding of relationships between architecture and landscape, working on group projects can elicit a more powerful response to the above relationships

5. students need to learn to work across disciplines

These are examples of the actual answers that support the 'Needs team effort' category.

The second ranked categories, falling under the 'What' heading, are 'Exposes students to disciplinary learning' and 'Understands collaboration.' Both have the same percentage 15.8, and these two categories are 70 percent (35 percent each) of all the answers in the 'What' heading.

The analysis of this question also indicates that 50 percent (18.4%, 15.8%, 15.8%) of the answers are in these three high ranked categories out of a total of ten categories as shown in the above diagram. It represents that half of the responses point out the following elements are the most important reasons for teaching interdisciplinary design courses.

1. Needs team effort (18.4%, 'How' heading)
2. Exposes students to disciplinary learning (15.8%, 'What' heading)
3. Understands collaboration (15.8%, 'What' heading)
Question 12: What are the most successful interdisciplinary aspects of these courses?

Question 12 analysis:

The above chart represents that 59.5% of answers deal with 'How' heading and 28.6% with 'What' heading. These two headings cover 88.1% of the total answers. Similar to question 11, question 12 also shows that the responses are concentrated in these two headings. Through the 'How' heading, many responses suggested 'How' this issue can be accomplished and answered this question. It is a practical view with a methodological perspective for solving this question rather than theoretical perspectives falling under the 'Why' and 'Therefore' headings. For this question, numerous responses present 'How' to make successful interdisciplinary design courses. For example, the most successful interdisciplinary aspects can be accomplished by presenting differing viewpoints, expanding disciplinary learning, and promoting the sharing of information. This chart also indicates that
only 2.4% of responses fall under the 'Why' heading and 9.5% of the 'Therefore' heading compared to the other two headings.

As the above diagram illustrates, question 12 also has four headings, the same as question 11. For this question, many of the respondents point out the heading of 'How' to make the most successful interdisciplinary aspects of the courses. It indicates obviously that respondents have a variety of opinions with methodological perspectives for providing a successful interdisciplinary approach to design education. Analysis of this question also specifies that the faculty of a variety of universities have their own answers of 'How' to make successful interdisciplinary design courses although not many of the current university systems are providing concrete interdisciplinary related design courses. A majority of respondents recognize the importance of interdisciplinary design education as we see through the previous literature review and the pilot questionnaire that were studied to understand the general perspective of interdisciplinarity in design disciplines.
The above diagram also shows that the category of 'Presents differing viewpoints' has the highest percentage of 19.0% for this question.

These are examples of the actual answers composing the category of 'Presents differing viewpoints.'

1. Differing viewpoints of the same basic knowledge
2. Exposure to different ideas
3. Students experience thinking outside of disciplinary terms/approaches
4. Interchange and dialogue among students from different disciplines
5. The debate that ensues among different ways of seeing and thinking about the issues
6. Learning to work from outside of professional discipline and comfort zone
7. Fostering of dialogue across disciplines educational enrichment
8. Students realizing that each discipline takes a different approach towards a design problem

The second ranked category, also falling under the 'How' heading, is 'Expands disciplinary learning' with 16.7 percent. And the third ranked category is 'Promotes the sharing of information' also within the 'How' heading with 14.3 percent of all the answers. Compared to question 11, all of the highest three ranked categories are from the 'How' heading.

The analysis of this question shows that a total of 50 percent (19.0%, 16.7%, 14.3%) of the answers are in these three high ranked categories as the above diagram indicates. All of these categories are in the 'How' heading and it clearly shows that answers to this question are focused on the methodological perspectives of 'How' to make the most successful interdisciplinary aspects.

These are three high ranked categories of this question.

1. Presents differing viewpoints (19.0%, 'How' heading)
2. Expands disciplinary learning (16.7%, 'How' heading)
3. Promotes the sharing of information (14.3%, 'How' heading)
• Question 13: What are the least successful interdisciplinary aspects of these courses?

• Question 13 analysis:

This chart shows the heading of 'What' (18.9%) and 'How' (78.4%) covers 97.3% of the total answers. Similar to questions 11 and 12, question 13 also demonstrates the similar pattern of the heading distribution with a higher percentage of 'What' and 'How' headings than 'Why' and 'Therefore' headings. It also indicates that only 2.7% of responses fall under the 'Why' heading and 0% under the 'Therefore' heading.

Around 98% of the responses deal with 'What' the main objectives for this question are and 'How' these issues can be accomplished with more methodological perspectives for suggesting solutions for this question than abstract and theoretical perspectives which usually fall under the 'Why' and 'Therefore' headings. This question has the highest percentage under the 'How' heading (78.4%) compared to the previous two questions.
Question 11 has 36.8% and question 12 has 59.5% under the 'How' heading. Through this question, many of the respondents attempt to find 'How' to improve the least successful interdisciplinary aspects of providing courses. For example, the least successful interdisciplinary aspects of courses can be overcome by considering the complexity of operational logistics, time consumed, and time required to teach the team process. All of these are practical and fundamental suggestions for overcoming elements of the least successful interdisciplinary aspects of courses.

As the above diagram indicates, question 13 has three headings of 'Why,' 'What,' and 'How' compared to questions 11 and 12 that have all of the four headings. The analysis of this question clearly represents that the 'How' heading has the highest percentage (78.4%) of all the answers.
The first ranked category is 'Complexity of operational logistics' with 29.7 percent of the answers. These are examples of the actual answers formulating the category.

1. Scheduling
2. Linear nature of real projects
3. Matching scheduling and credit hour requirements. Identifying a shared meeting time
4. Logistics
5. Difficulty scheduling
6. Some difficulty coordinating class meeting times and getting the whole group together to review and discuss work progress
7. Not being able to build up the relationships between students within the timeframe of a one semester course—it needs to be sequential and developed in subsequent years or studios
8. Difficulty in maintaining a curricular balance that meets the needs for all three programs
9. Scheduling / credits / coordination / space / time
10. Different skill set among disciplines
11. Coordinating the time and credits across the disciplines so that students felt it was fair

The second ranked category, also situated under the 'How' heading, is 'Overly time consuming' with 21.6 percent of the answers. These are some of actual examples of this category.

1. Requires a larger amount of time to plan and build consensus or community between faculty in course preparation
2. Appreciation for the extra effort to make it happen
3. Time to learn the “language & processes” of different disciplines
4. Time commitment required of faculty
5. The additional time required to develop interactions
The third ranked category is 'Time required to teach team process' also within the 'How' heading with 16.2 percent of all the answers. Similar to question 12, all of the three high ranked categories are also under the 'How' heading in this question.

The analysis of this question shows that a total of 67.5 percent (29.7%, 21.6%, 16.2%) of the answers are in these three high-ranked categories as the above diagram represents. It also indicates that responses to this question concentrate on the methods of 'How' to improve the least successful aspects of interdisciplinary courses to become the most successful ones.

These are the three high ranked categories investigated through this question.

1. Complexity of operational logistics (29.7%, 'How' heading)
2. Overly time consuming (21.6%, 'How' heading)
3. Time required to teach team process (16.2%, 'How' heading)
• Question 14: Based upon your experience, with these interdisciplinary design courses, what are the most important benefits to the students?

• Question 14 analysis:

![Figure 5.56: Distribution of heading of question 14](image)

This chart shows that the distribution of headings of 'How' (42.9%) and 'Therefore' (33.3%) covers 76.2% of the total answers. Compared to question 13 that has 0% 'Therefore' heading, this question's 'Therefore' heading has the second highest percentage (33.3%) and still the 'How' heading has the highest percentage similar to questions 12 and 13. This chart also indicates that 0% of responses fall under the 'Why' heading and 23.8% the 'What' heading.

The analysis of this question indicates that respondents try to give an idea about not only practical perspectives falling under the 'What' and 'How' heading but also theoretical perspectives falling under the 'Why' and 'Therefore' headings. For this question, one third...
of the answers suggest 'Therefore' what can we learn through this question as the distribution of headings represents. For example, the most important benefits to the students of interdisciplinary design courses can be accomplished by promoting the learning of team work and expanding disciplinary thinking. Therefore, as the 'Therefore' heading noticeably indicates, we can broaden learning, provide real world experiences, improve communication, and promote better solutions.

Figure 5.57: Headings and response categories of question 14

Question 14 also has three headings of 'What,' 'How,' and 'Therefore.' The above diagram points out that 'Promotes the learning of team work' under the 'How' heading has the highest percentage of 21.4 of all of the answers. However, for example, team work is one of the most important benefits of learning from interdisciplinary design courses and at the same time team work is the least successful aspect of interdisciplinary design courses. As the actual answers indicate, team work can be a benefit and also a barrier to interdisciplinary design education. In design disciplines, many large scale projects can be approached and
accomplished by team work. On the other hand, students tend to hesitate to work with other students although they realize this is an important learning process of expanding their knowledge by understanding diverse perspectives.

The second ranked categories, under all of the three various headings, are 'Builds respect and recognition' under the 'What' heading, 'Expands disciplinary thinking' under the 'How' heading, and 'Broadens learning' under the 'Therefore' heading have the same 14.3% distribution of the answers.
• Question 15: What could be done to encourage the development of more interdisciplinary design courses at your institution?

• Question 15 analysis:

As this chart indicates, the headings of 'What' (13.9%) and 'How' (86.1%) cover all of the total answers. The question itself deals with more pragmatic matters of encouraging interdisciplinary courses so that the answers deal with a pragmatic view as opposed to theoretical answers usually falling under the 'Why' and 'Therefore' headings. The heading of 'How' covers 86.1% of the total answers. Respondents clearly answered what could be done to encourage the development of more interdisciplinary courses and in what way under the 'How' heading. For example, to encourage the development of more interdisciplinary design courses we should create flexible curricular structure and promote a supportive administrative approach. It also indicates that a variety of answers provide the methods of encouraging development of interdisciplinary design courses. The category of answers are
shown on the diagram below. As we see from this chart, most of the respondents who have expertise in interdisciplinary design education answered this question with clear ideas and methods. However, they are not sure of the results of these methods as the 'Therefore' heading shows 0% of the answers.

Figure 5.59: Headings and response categories of question 15

The above diagram shows that for question 15, there are only two headings answered, what and how. The question itself, asking the method of encouraging more interdisciplinary design courses, leads to a lot of answers suggesting how to do it. The above diagram explains what types of methods can be used to encourage the development of more interdisciplinary design courses in every institution. The category of 'Broaden perspectives' and 'Show other institution's efforts' have the same highest percentage (5.6%) within the 'What' heading.
To accomplish 'Broaden perspectives' these are answers from the respondents.
• Not thinking about the world in a silo
• Students need to look beyond themselves in order to learn how to work with others to learn

To accomplish 'Show other institution's efforts' these are answers from the respondents.
• Show them that higher ranked institutions are doing it
• One course is all we need

Within the 'How' heading, the category of 'Create flexible curricular structure’ has the highest percentage (22.2%) and the category of 'Promote supportive administrative approach' has the second highest percentage (16.7%) of the answers.

There are various answers to the category of 'Create flexible curricular structure.’ For example:
• Curricular structures that allow for students to “count” these types of courses as meeting degree requirements and not just elective credits
• Create regular courses in the curricula of collaborating disciplines that offer the same credit hours and meet at the same time blocks
• Review curriculum to find common linkages
• Publicity as to the course offerings
• Exposure through public invitations to course events
• Commit to interdisciplinary teams so that efforts continue and evolve (not just a one shot effort)
• Refine course schedules to allow work across studios

The second highest percentage the category of 'Promote supportive administrative approach' also has various answers. For example:
• Administrative understanding
• Take the initiative to set them up
• Administrative philosophy that supports interdisciplinary work
• Simplify administration of the courses (currently there are sections for each discipline)
• Administrators (department chairs) need to support the idea
• Institutional administrative barriers need to be overcome on my campus (accounting for space, instructional units, teaching load credits, etc.)

Through this diagram, we understand that creating flexible curricular structure, promoting supportive administrative approach, increasing institutional support, increasing faculty support, and providing incentives are the major elements of developing more interdisciplinary design courses in many institutions. It also indicates that in the current situation, there are not a lot of institutions that have the institutional structure for providing interdisciplinary design courses in various forms and contents.
• Question 16: What do you think are the primary educational advantages and disadvantages of interdisciplinary design courses?

• Question 16 analysis:

![Distribution of Heading](image)

**Figure 5.60: Distribution of heading of question 16 (advantages)**

Question 16 has only two headings of 'What' and 'How' similar to question 15. The headings of 'What' (27.9%) and 'How' (72.1%) cover 100% of the total answers. This chart represents that respondents deal with educational advantages of interdisciplinary design courses with a more pragmatic view as opposed to theoretical reasons falling under the 'Why' and 'Therefore' headings. For example, educational advantages can be obtained by the categories of 'Broadens knowledge' (16.3%), 'Better team building skills' (16.3%), and 'Broadens viewpoints' (16.3%). Respondents are focusing more on methods of how to make educational advantages of interdisciplinary design courses than on why it is important and therefore what can be accomplished. Similar to question 15, respondents are not dealing with the results of this method.
The above diagram shows that there are two headings, what and how for question 16. As the above diagram indicates, numerous respondents point out that learning from interdisciplinary design courses is the primary advantage such as within the categories of 'Broadens knowledge,' 'Better team building skills,' 'Broadens viewpoints,' and 'Enhances critical thinking.' The educational advantages of interdisciplinary design courses are mainly understandings of disciplinary differences, respecting each discipline, recognizing collaboration, and expanding knowledge to develop critical thinking, team building skills, communication skills, and broadening viewpoints. For example, within the first ranked category of 'Broadens knowledge' (16.3%) various answers emphasize broadening knowledge.
• Broadens the students knowledge
• Enhances life-long learning skills
• To be able to generate planning and design alternatives that cannot be classified by discipline
• Students learn from each other
• Stimulating and creative learning environment
• Ability to see how one set of knowledge relates to another
• Wider research focus

Other first ranked categories are 'Better team building skills,' 'Broadens viewpoints,' and 'Builds respect & recognition' which have the same highest percentage (16.3%) for this question.

These are some of the examples of making 'Better team building skills.'

• Ability to design/plan/organize a course that educates students about each others (both individual and discipline based) strengths and to develop a team based approach to generate a better design or planning solution that an individual student or individual discipline could not generate if working alone or in a discipline based approach
• Work as teams
• Group thinking and dynamics
• Shared opportunities to engage larger scale projects
• Learning team skills

The analysis of this question shows that the following categories are the highest ranked out of a total of eight different categories as shown in the above diagram.

1. Builds respect & recognition
2. Broadens knowledge
3. Better team building skills
4. Broadens viewpoints
5. Enhances critical thinking
• Question 16 analysis:

Figure 5.62: Distribution of heading of question 16 (disadvantages)

Similar to the advantages of question 16, disadvantages also have only two headings of 'What' and 'How' as shown in the above chart. The headings of 'What' (33.3%) and 'How' (66.7%) cover 100% of the total answers. Respondents also deal with educational disadvantages of interdisciplinary design courses with a more pragmatic view as opposed to theoretical reasons falling under the 'Why' and 'Therefore' headings. For example, educational disadvantages can be seen by the category of 'Too time consuming' (30.3%) within the 'How' heading and 'Diverse & ambiguous references' (18.2%) within the 'What' heading. Respondents deal more with methods of how educational disadvantages of interdisciplinary design courses happen and the disadvantaging factors of interdisciplinary design courses. Similar to question 15, respondents are not dealing with the results of this method, as the heading of 'Therefore' has 0% of the answers.
The primary educational disadvantages of interdisciplinary design courses are shown in this diagram. The category of 'Too time consuming' within the 'How' heading has the highest percentage (30.3%) for this question. For example, these are some of the answers represented in this category.

- Time to navigate multiple ways of knowing
- Time intensive for professors
- Interdisciplinary courses take more preparation time and they require more competent faculty members who are comfortable crossing the disciplinary boundaries to teach and
get involved in interdisciplinary scholarly and creative endeavors.

• Extra time to create and manage
• “Lead-time” in bringing students to acceptance of the premise of the course
• Time-consuming for faculty to coordinate
• Longer periods of time to prepare the projects
• Time intensive if all faculty are not on board
• Timing issues of disciplines related to real world interdisciplinary teams

The second ranked category, falling under the 'What' heading, is the 'Diverse & ambiguous references' (18.2%). These are some of the answers from the category.

• In an upper-level design studio, it can be difficult to have students contribute their disciplinary expertise in the development of a project, either individual or group, as students have a tendency to try to become the other discipline without the coursework to back it up.
• More questions than answers
• Scary not understanding another profession
• If not planned and organized in advance with due diligence, interdisciplinary courses may encourage watering down of the professional or disciplined based theories, knowledge, skills, and abilities. This is one of the most common reasons for unsuccessful interdisciplinary courses.
• Wider, diverse and sometime ambiguous references

Disciplinary arrogances and ambiguity may hinder interdisciplinary design. In addition, the burden is time consuming to overcome in order to have successful interdisciplinary design courses. Many existing courses and the structure of curriculum are focusing on one discipline rather than interdisciplinary disciplines.
• Question 17: Additional comments;

• Question 17 analysis:

![Distribution of Heading](image)

**Figure 5.64: Distribution of heading of question 17**

Question 17 deals with additional comments from respondents. This chart shows the distribution and percentage of headings. Only two of the headings appeared in this question, the 'What' and 'How' headings. As mentioned in the previous analysis of questions, question 17 shows that respondents try to suggest the method of providing more interdisciplinary design courses within the 'How' (92.3%) heading. For example, for the development of interdisciplinary design courses, institutions should develop the category of 'Needs for interdisciplinary courses,' 'Institutional support,' 'Inflexible curricular structures,' 'Academic context/traditions,' and 'Increased faculty efforts.'
The above diagram represents respondents' comments about how to make successful interdisciplinary design courses in the educational environment. It clearly shows that more than 92 percent focused on the 'How' heading. The highest ranked category is 'Needs for interdisciplinary courses' (30.8%). Within that category, a variety of answers point out the needs for interdisciplinary courses. For example:

- These courses are essential to future practitioners and academics.
- They need to occur across disciplines from other academic units.
- They provide community service possibilities.
- I believe in interdisciplinary study as a way to educate students about relationships that are similar and different between areas of study.
The second ranked categories, also falling under the 'How' heading, are 'Lacks institutional support,' 'Inflexible curricular structures,' 'Academic context/traditions,' and 'Requires increased faculty efforts.' All of these have the same percentage of 15.4 and these answers constitute more than 92 percent of the total answers.
6.1 Review of the findings

The previous chapter analyzed the collected data from the preliminary and primary questionnaires with a variety of methods for quantitative and qualitative aspects of this research. This chapter summarizes the findings of this study from the previous chapters. The review of the findings indicates the overall findings from the preliminary and primary questionnaires. The comparison of the findings also shows the similarities and differences of understanding interdisciplinary design education between the two disciplines. Through the findings of this study, this chapter indicates the current status of interdisciplinary design education in higher educational systems between architecture and landscape architecture in the United States by exploring the outcomes of the preliminary and primary questionnaires both quantitatively and qualitatively.

6.1.1 Preliminary questionnaire

As was mentioned in the previous chapter, the main objective of the preliminary questionnaire was to understand the broad perception of the role of interdisciplinary design education among the faculty at the selected institutions in the United States.

The preliminary questionnaire was sent to the twenty-six universities that were the subject of the web-based data collection and had both architecture and landscape architecture at a master level in the same college. Through the preliminary questionnaire, general understandings, thoughts, and attitudes on the range of issues of interdisciplinary design education in architecture and landscape architecture were investigated. The preliminary questionnaire was conducted through an internet email survey.
The preliminary questionnaire dealt with quantitative data using closed or fixed-response questions in the first part and dealt with qualitative data asking respondents' opinions and thoughts in the second part.

Architecture

Table 6.1: Summary of architecture preliminary questionnaire

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<th>Professor</th>
<th>Associate professor</th>
<th>Assistant professor</th>
<th>Lecturer</th>
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Q1. Teaching environment
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<th>Seminar</th>
<th>Lab</th>
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Q2. Distributions of disciplines
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<tr>
<th>Studio</th>
<th>Lecture</th>
<th>Seminar</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>93.8%</td>
<td>2.9%</td>
<td>3.2%</td>
</tr>
</tbody>
</table>

Q3. Class attendance
<table>
<thead>
<tr>
<th>Man</th>
<th>Opt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>36%</td>
</tr>
</tbody>
</table>

Q4. Other disciplines
<table>
<thead>
<tr>
<th>Prefer very much</th>
<th>Neutral</th>
<th>Do not prefer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>46.9%</td>
<td>21.9%</td>
</tr>
</tbody>
</table>

Q5. Benefits
<table>
<thead>
<tr>
<th>Strongly agree</th>
<th>Neutral</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>42.4%</td>
<td>36.4%</td>
</tr>
</tbody>
</table>

Q6. Not important
<table>
<thead>
<tr>
<th>Strongly agree</th>
<th>Neutral</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>15.2%</td>
<td>3.0%</td>
</tr>
</tbody>
</table>

Q7. Interactions
<table>
<thead>
<tr>
<th>Strongly agree</th>
<th>Neutral</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>25.0%</td>
<td>34.4%</td>
</tr>
</tbody>
</table>

Q8. Benefits
<table>
<thead>
<tr>
<th>Strongly agree</th>
<th>Neutral</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>9.4%</td>
<td>25.0%</td>
</tr>
</tbody>
</table>

Q9. Chance
<table>
<thead>
<tr>
<th>Increase</th>
<th>Decrease</th>
<th>Stay the same</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>86.7%</td>
<td>3.3%</td>
</tr>
</tbody>
</table>

Q10. Rank
<table>
<thead>
<tr>
<th>Faculty</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>40.0%</td>
<td>45.0%</td>
<td>15.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Students</td>
<td>13.3%</td>
<td>6.7%</td>
<td>60.0%</td>
<td>20.0%</td>
</tr>
<tr>
<td>Administration</td>
<td>68.2%</td>
<td>18.2%</td>
<td>4.5%</td>
<td>9.1%</td>
</tr>
<tr>
<td>Other</td>
<td>81.8%</td>
<td>0.0%</td>
<td>9.1%</td>
<td>9.1%</td>
</tr>
</tbody>
</table>

The above table represents the overall summary of the preliminary questionnaire for architecture discipline.
Findings from the preliminary questionnaire sent to the faculty in architecture programs revealed that almost 80% of the respondents are tenured, 52% at the rank of professor and 27% at the rank of associate professor. Assistant professors and lecturers are only 21% of the total. Also it is clear that the studio is the major learning place of architecture as also indicated in the previous literature review chapter. Studio and lecture are the two major teaching environments of architecture faculty.

All of the classes in the form of studio, lecture, seminar, and lab are more than 85% filled with the same discipline students. As the highest percentage of 93.8 of architecture discipline in studio shows, it is subsequently restricted to participate in the studio from other discipline students. When asked "If your classes included landscape architecture students, was their attendance in the classes mandatory or optional?" respondents answered that studio and lecture are mandatory classes for landscape architecture students with the higher percentage mandatory compared to seminar and lab classes. Less than 40% of architecture studio and lecture classes are mandatory for landscape architecture students.

Architecture faculty prefer to have students in their classes from a variety of disciplines. Almost 80% of them agreed that the students benefit from working with students in other disciplines. They also emphasize that interdisciplinary design education is important for design students to learn from other design disciplines. Taking courses in other disciplines benefits students by not limiting them to their own discipline.

Design disciplines need professional education through various forms of classes. However, when asked if "interactions among design related disciplines in academic situations are less than interactions among the design professionals," the answers suggest that the academic situations of design disciplines still need more interactions and students need to learn further how to interact with other design-related disciplines in academic situations to prepare design professionals.

Architecture faculty are willing to teach and increase their efforts of interdisciplinary design education if the possibility of well-organized improvement of curriculum or institutional support is provided. They also indicate the difficulties of interacting with other disciplines in the academic setting are mainly caused by other factors that are not specifically listed in this question. Administration and faculty are ranked as the second and third groups.

Until question 10, the quantitative research method and data analysis were used. The following preliminary questions from question 11 to 13 are subjectively designed to be
answered by opinions or thoughts. The qualitative research method and data analysis are employed for these questions.

**Landscape Architecture**

**Table 6.2: Summary of landscape architecture preliminary questionnaire**

<table>
<thead>
<tr>
<th>Current position</th>
<th>Professor</th>
<th>Associate professor</th>
<th>Assistant professor</th>
<th>Lecturer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Percentage</strong></td>
<td>36%</td>
<td>44%</td>
<td>12%</td>
<td>8%</td>
</tr>
</tbody>
</table>

**Q1. Teaching environment**

<table>
<thead>
<tr>
<th>Studio</th>
<th>Lecture</th>
<th>Seminar</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Percentage</strong></td>
<td>36.5%</td>
<td>36.5%</td>
<td>17.3%</td>
</tr>
</tbody>
</table>

**Q2. Distributions of disciplines**

<table>
<thead>
<tr>
<th>Studio</th>
<th>Lecture</th>
<th>Seminar</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Disciplines</strong></td>
<td>LA</td>
<td>Arch</td>
<td>Other</td>
</tr>
<tr>
<td><strong>Percentage</strong></td>
<td>91.4%</td>
<td>2.7%</td>
<td>5.9%</td>
</tr>
</tbody>
</table>

**Q3. Class attendance**

<table>
<thead>
<tr>
<th>Studio</th>
<th>Lecture</th>
<th>Seminar</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Disciplines</strong></td>
<td>Man</td>
<td>Opt</td>
<td>Man</td>
</tr>
<tr>
<td><strong>Percentage</strong></td>
<td>45.5%</td>
<td>54.5%</td>
<td>13.3%</td>
</tr>
</tbody>
</table>

**Q4. Other disciplines**

<table>
<thead>
<tr>
<th>Prefer very much</th>
<th>Neutral</th>
<th>Do not prefer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Percentage</strong></td>
<td>44.0%</td>
<td>32.0%</td>
</tr>
<tr>
<td><strong>Q5. Benefits</strong></td>
<td>Strongly agree</td>
<td>Neutral</td>
</tr>
<tr>
<td><strong>Percentage</strong></td>
<td>57.7%</td>
<td>34.6%</td>
</tr>
<tr>
<td><strong>Q6. Not important</strong></td>
<td>Strongly agree</td>
<td>Neutral</td>
</tr>
<tr>
<td><strong>Percentage</strong></td>
<td>15.4%</td>
<td>11.5%</td>
</tr>
<tr>
<td><strong>Q7. Interactions</strong></td>
<td>Strongly agree</td>
<td>Neutral</td>
</tr>
<tr>
<td><strong>Percentage</strong></td>
<td>33.3%</td>
<td>33.3%</td>
</tr>
<tr>
<td><strong>Q8. Benefits</strong></td>
<td>Strongly agree</td>
<td>Neutral</td>
</tr>
<tr>
<td><strong>Percentage</strong></td>
<td>0.0%</td>
<td>23.1%</td>
</tr>
</tbody>
</table>

**Q9. Chance**

<table>
<thead>
<tr>
<th>Increase</th>
<th>Decrease</th>
<th>Stay the same</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Percentage</strong></td>
<td>88.5%</td>
<td>7.7%</td>
</tr>
</tbody>
</table>

**Q10. Rank**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Faculty</strong></td>
<td>64.3%</td>
<td>21.4%</td>
<td>14.3%</td>
</tr>
<tr>
<td><strong>Students</strong></td>
<td>20.0%</td>
<td>10.0%</td>
<td>50.0%</td>
</tr>
<tr>
<td><strong>Administration</strong></td>
<td>50.0%</td>
<td>33.3%</td>
<td>16.7%</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>81.8%</td>
<td>9.1%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

The above table shows the general review of the preliminary questionnaire for landscape architecture discipline.
Eighty percent of the landscape architecture respondents were tenured professors, 36% at the rank of professor and 44% at the rank of associate professor. Assistant professor and lecturer are 20% of the total.

Studio and lecture are the major classes for teaching and learning landscape architecture. However, studio is very restricted to their own disciplinary students and other disciplinary students have the lowest chance to take and learn from the studio environment.

When asked "If your classes included architecture students, was their attendance in the classes mandatory or optional," architecture students take optional lecture class in landscape architecture program with the percentage of 86.7. It is not mandatory curriculum, and that high percentage shows their interests in landscape architecture.

Landscape architecture faculty prefer to have students in their classes who are majors in other disciplines. It clearly shows the preference of having students whose majors are in other disciplines. They have a flexible vision and strongly agree with the positive benefits by thinking of accepting advantages from working with other disciplinary students.

Landscape architecture faculty strongly agree with the weakness of interactions among design disciplines in academic situations when asked if "Interactions among design related disciplines in academic situations are less than interactions among the design professionals." This result might be related to class distribution showing that the studio is strictly designed to provide for the same disciplinary students and also it might be that curricular structure itself is limited to specific disciplines.

Landscape architecture faculty tend to believe that they benefit from their own discipline and other disciplines nearly the same or a little higher in their own discipline by responding the question of "Design students benefit far more from courses in their own discipline than from taking courses in other discipline." Also they desire to teach and increase opportunities to interact with interdisciplinary design.

The difficulties of interacting with other disciplines in the academic setting are mainly caused by "other" or outside factors. Respondents consider other factors as the major difficulty of interacting with other disciplines. Nonetheless, this question is designed for answers to be selected from the list and it is hard to find out what the other factors are. The specific reasons for their answers are revealed in the primary questionnaire.
6.1.2 Comparison of preliminary questionnaire

Similarities and differences between two disciplines

Through the comparison of the two disciplines, there are some similarities and differences in the responses to the same questions. For example, the assistant professors and lecturers have similar answer distribution. However, it shows a different pattern between professor and associate professor in the same question. Overall distribution for tenured professor has a similar percentage.

Similarities are indicated below between architecture and landscape architecture.

The question of how many architecture or landscape architecture classes taught each academic year represents very similar pattern showing respondents' courses are similarly distributed for both disciplines. Studio and lecture are the two major courses with the highest percentage of them being taught as indicated previously. However, as question 2 points out, studio is very restricted to its own disciplinary students and other disciplinary students have the lowest chance to take and learn from the studio environment.

Faculty for both disciplines prefer to have students in their classes from a variety of disciplines. This also represents that crossing boundaries among the disciplines is significant for developing interdisciplinary design education. The two disciplines have similar patterns showing there are advantages and benefits from working with other disciplinary students in the same college or school.
Architecture and Landscape Architecture

Table 6.3: Comparison of preliminary questionnaire

<table>
<thead>
<tr>
<th>Current position</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor</td>
<td>Arch 52%</td>
</tr>
<tr>
<td></td>
<td>LA 36%</td>
</tr>
<tr>
<td>Associate professor</td>
<td>27%</td>
</tr>
<tr>
<td></td>
<td>12%</td>
</tr>
<tr>
<td>Assistant professor</td>
<td>21%</td>
</tr>
<tr>
<td></td>
<td>8%</td>
</tr>
<tr>
<td>Lecturer</td>
<td>0%</td>
</tr>
</tbody>
</table>

Q1. Teaching environment

<table>
<thead>
<tr>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arch 32.5%</td>
</tr>
<tr>
<td>LA 36.5%</td>
</tr>
</tbody>
</table>

Q2. Distributions of disciplines

<table>
<thead>
<tr>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arch 93.8%</td>
</tr>
<tr>
<td>LA 91.4%</td>
</tr>
<tr>
<td>Other 3%</td>
</tr>
</tbody>
</table>

Q3. Class attendance

<table>
<thead>
<tr>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arch 36%</td>
</tr>
<tr>
<td>LA 45.5%</td>
</tr>
</tbody>
</table>

Q4. Other disciplines

<table>
<thead>
<tr>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arch 46.9%</td>
</tr>
<tr>
<td>LA 44.0%</td>
</tr>
</tbody>
</table>

Q5. Benefits

<table>
<thead>
<tr>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arch 42.4%</td>
</tr>
<tr>
<td>LA 57.7%</td>
</tr>
</tbody>
</table>

Q6. Not important

<table>
<thead>
<tr>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arch 15.2%</td>
</tr>
<tr>
<td>LA 15.4%</td>
</tr>
</tbody>
</table>

Q7. Interactions

<table>
<thead>
<tr>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arch 25.0%</td>
</tr>
<tr>
<td>LA 33.3%</td>
</tr>
</tbody>
</table>

Q8. Benefits

<table>
<thead>
<tr>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arch 9.4%</td>
</tr>
<tr>
<td>LA 0.0%</td>
</tr>
</tbody>
</table>

Q9. Chance

<table>
<thead>
<tr>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arch 86.7%</td>
</tr>
<tr>
<td>LA 88.5%</td>
</tr>
</tbody>
</table>

Q10. Rank

<table>
<thead>
<tr>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arch 40.0%</td>
</tr>
<tr>
<td>LA 64.3%</td>
</tr>
</tbody>
</table>

The above table compares architecture with landscape architecture. Through question 6, the importance of learning from other design disciplines is revealed. With a similar pattern,
82% and 65% of respondents emphasize that interdisciplinary design education is important for design students to recognize and solve design problems between architecture and landscape architecture disciplines.

The perception of faculty dealing with interactions among design-related disciplines shows that almost 60% and 67% of the answers agree that there are fewer interactions among design disciplines in academic situations than there are among the design professionals. This question suggests that academic situations of design disciplines need more interactions and students need to learn further how to interact with other design-related disciplines in academic situations to prepare them to become design professionals. Faculty for both disciplines strongly agree with the weakness of interactions among design disciplines in academic situations. This might be related to class distribution showing that studio is strictly designed to provide for the same disciplinary students, and also it might be that curricular structure itself is limited to some disciplines.

Faculty in both disciplines strongly feel that a chance to increase teaching students from other disciplines in their classes is desirable by showing positive answers of almost 87 and 89 percent. This question proves that faculty in architecture and landscape architecture disciplines are willing to teach and increase their efforts and interests in interdisciplinary design education if the possibility of well-structured curriculum or institutional support is provided. The question is raised of why there are not many actual interdisciplinary design education opportunities and classes although numerous faculty attempt to teach and increase their efforts and interests in interdisciplinary design education. Answers for this question are presented using the primary questionnaire.

Through question 10 it is learned that the difficulties of interacting with other disciplines in the academic setting are mainly caused by other factors that are not specifically listed in this question. For both disciplines, almost 82% of respondents choose "other" as the first rank answer, and this is the highest percentage. Respondents consider other factors may cause difficulties of interaction with other disciplines. However, this question is designed to select an answer from the list and is limited to find out what the other factors are or possibly what factors hinder interdisciplinary design education. The primary questionnaire deals with these types of questions.
Differences are indicated below between architecture and landscape architecture.

Landscape architecture shows more flexibility of providing opportunity for taking classes from other disciplinary students than architecture in all of four types of classes. Lecture and seminar show different patterns representing landscape architecture with a higher percentage of flexible openings for other disciplinary students including architecture. For these two courses, landscape architecture shows possibilities for interacting with other disciplines and expanding to interdisciplinary design education.

Students' attendance of classes shows differences between the two disciplines. Less than 40% of landscape architecture students are required to take architecture studio and lecture classes. This percentage points out that not many landscape architecture students are required to take architecture studio or lecture classes.

Architecture students take lecture classes in landscape architecture program optionally with the percentage of 86.7 and that high percentage has possibilities of interacting with landscape architecture in various types of lecture. Architecture students are taking lecture in landscape architecture usually not by mandatory curriculum but out of their interest. This emphasizes that interdisciplinary design education between these two disciplines should be provided with more interactions and activities for learning among each other.

Architecture faculty strongly feel that design students benefit more when they take courses in other disciplines. This question suggests that taking courses in other disciplines benefits students not limited to their own discipline. It also states the interdisciplinary design education benefit to design students by expanding their range of design problems. A different pattern shows that landscape architecture faculty answered 50% neutral and the other 50% almost divided in half by those who agree and those who disagree. They have various answers about benefits from their own discipline or from other disciplines.

6.1.3 Primary questionnaire

The primary questionnaire focused on specific questions related to barriers, advantages, disadvantages, examples, and experiences of interdisciplinary design education in American
academic settings including undergraduate and graduate levels. For the primary questionnaire, a different methodology was used for selecting the sample. Whereas the preliminary questionnaire covered all of the faculty members in the institution, the primary questionnaire was distributed only to the faculty who were identified as having expertise in interdisciplinary design education.

The department chair or director, it was felt, would be the most familiar with all of faculty members and their specialized field of study in their institutions. This expertise was determined by input from department chairs or directors from both architecture and landscape architecture disciplines. They identified faculty members who they felt have expertise in interdisciplinary design education.

The primary questionnaire was also conducted through an internet email survey as was the preliminary questionnaire and focused on the selected faculty members. The primary questionnaire has two parts. Part one is composed of general background information such as the faculty's rank, gender, teaching period, involvement in the program, and previous teaching experience. Part two comprises category one and category two. Category one deals with the group of faculty who have experienced any form of interdisciplinary design education and category two deals with those who have no experience with interdisciplinary design education. Each respondent was only allowed to answer one set of questions, either category one or category two.

The following chart shows the overall structure of part one focusing on general background information from questions 1 to 5.
Part one of Primary questionnaire

Table 6.4: Summary of part one of primary questionnaire

<table>
<thead>
<tr>
<th>Part One ; General background information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1. Current position</td>
</tr>
<tr>
<td>Professor</td>
</tr>
<tr>
<td>Percentage</td>
</tr>
<tr>
<td>Q2. Gender</td>
</tr>
<tr>
<td>Percentage</td>
</tr>
<tr>
<td>Q3. Teaching years</td>
</tr>
<tr>
<td>1~3 years</td>
</tr>
<tr>
<td>4~6 years</td>
</tr>
<tr>
<td>7~9 years</td>
</tr>
<tr>
<td>10~ years</td>
</tr>
<tr>
<td>Q4. Teaching programs</td>
</tr>
<tr>
<td>Undergraduate</td>
</tr>
<tr>
<td>Graduate</td>
</tr>
<tr>
<td>PhD</td>
</tr>
<tr>
<td>Q5. Previous teaching</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
</tbody>
</table>

As the above table represents, respondents of the primary questionnaire are mostly tenured professors covering 80% of the total respondents. It does not indicate that assistant professors and lecturers have less interest in interdisciplinary design education than tenured professors including professors and associate professors. Nonetheless, the percentage still shows lower responses compared to the percentage of tenured professors.

There is not much variation in gender. Thus, gender differences might not affect the primary questionnaire.

For teaching years, 92% of faculty have more than 4 years of teaching and 80% have more than 7 years of teaching experience. As question 1 shows, a great percentage of faculty have a long period of teaching experience. Based on their expertise in each discipline, they are specialized in interdisciplinary design education.
Through question 4, we note that interdisciplinary design education can be accomplished through a range of undergraduate, graduate, or PhD programs.

Undergraduate and graduate level programs have a higher percentage than the PhD program because a limited number of faculty are involved in the PhD level as shown in this chart.

Question 5 deals with their previous teaching experience before they joined the current university. More respondents have previous teaching experience because of their long term of teaching as questions 1 and 3 point out.

Part two of Primary questionnaire

Part two of the primary questionnaire comprises category one and category two. Category one follows those who have experienced any form of interdisciplinary design education and category two follows those who have not experienced any form of interdisciplinary design education.

The following chart summarizes the structure of category one of part two which deals with the quantitative approach from questions 1 to 10. They are in particular composed of open ended questions.
### Table 6.5: Summary of part two of primary questionnaire (quantitative approach)

#### Part Two: Experience in interdisciplinary design education

<table>
<thead>
<tr>
<th>Yes → Category One → Question 1~10 (Quantitative approach)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1. Name of Interdisciplinary design course</td>
</tr>
<tr>
<td>Percentage</td>
</tr>
<tr>
<td>Q2. Subject and disciplines</td>
</tr>
<tr>
<td>Percentage</td>
</tr>
<tr>
<td>Q3. Teaching years</td>
</tr>
<tr>
<td>Percentage</td>
</tr>
<tr>
<td>Q4. Previous taught</td>
</tr>
<tr>
<td>Percentage</td>
</tr>
<tr>
<td>Course started</td>
</tr>
<tr>
<td>Percentage</td>
</tr>
<tr>
<td>Q5. Number of students</td>
</tr>
<tr>
<td>Percentage</td>
</tr>
<tr>
<td>Student majors</td>
</tr>
<tr>
<td>Percentage</td>
</tr>
<tr>
<td>Q6. Teaching type</td>
</tr>
<tr>
<td>Percentage</td>
</tr>
<tr>
<td>Q7. Number of instructors</td>
</tr>
<tr>
<td>Percentage</td>
</tr>
<tr>
<td>Q8. Faculty disciplines</td>
</tr>
<tr>
<td>Percentage</td>
</tr>
<tr>
<td>Q9. Semesters</td>
</tr>
<tr>
<td>Percentage</td>
</tr>
<tr>
<td>Q10. Course existence</td>
</tr>
<tr>
<td>Percentage</td>
</tr>
</tbody>
</table>

The above table especially reveals the quantitative aspects of the primary questionnaire on interdisciplinary design education.

As the table indicates, the names of interdisciplinary design courses vary including the word 'Interdisciplinary design,' 'Urban design,' 'Community design,' 'Design in general,' or 'Others.' Interdisciplinary design courses are named using specific words such as
interdisciplinary, urban, and community. ’Others’ have the highest percentage because it includes interdisciplinary design courses with a variety of different names, sometimes very specific and sometimes very vague. No strict patterns or rules of the names are presented for the courses of interdisciplinary design. However, the words interdisciplinary, urban, and community are mostly used for structuring interdisciplinary design courses.

Architecture and landscape architecture are the two major disciplines of interdisciplinary design courses. As indicated, the column ’Others’ implies disciplines not shown by the column name of common disciplines. There are many different disciplines within the column of ’Others’ such as sculpture, anthropology, geography, philosophy, law, journalism, and graphic arts. Therefore, the total number is higher than in other columns of disciplines. The current interdisciplinary design courses show a strong relationship between architecture and landscape architecture in introducing interdisciplinary design courses.

Interdisciplinary design courses are usually taught by instructors with 6 years of teaching or less. 0~3 years of teaching has the highest percentage (47%), 4~6 years of teaching has 24%, and more than 10 years of teaching only has 12%. Almost 50% of interdisciplinary design courses have been taught by instructors with 3 years of teaching or less.

There is not much difference in percentages between courses being taught by someone before the respondents were involved in teaching the interdisciplinary design courses and those courses not previously taught. Approximately half of the courses are taught by the previous faculty and half of the courses are taught at the beginning of the respondents' involvement.

More than 50% of the courses started in the 1990s and 26% started in the 2000s. Almost 80% of the interdisciplinary design courses started in the 1990s and later. The history of the interdisciplinary design courses is not long compared to other design courses. After the 1990s, various institutions tried to create courses related to interdisciplinary design.

Almost 60% of the current interdisciplinary design courses have 11~30 students. This is the approximate size of design studio, seminar, or lecture. Only 10% have more than 41 students and only 12% have less than 10 students. Architecture and landscape architecture are the two most frequent majors of those taking interdisciplinary design courses.

Almost 70% of the interdisciplinary design courses are taught by a team and 30% are taught by a sole instructor. This means that to understand other disciplines and learn from them, team effort is an important factor even among instructors.
Almost 50% of the interdisciplinary design courses are taught by 2 or 3 instructors as a team and almost 30% are taught by one instructor as the previous question indicates. Also 25% have more than 4 instructors. Once the interdisciplinary design courses are taught by a team, 2 or 3 instructors tend to participate in the interdisciplinary design courses.

Architecture and landscape architecture are the two major faculty disciplines. Almost 70% of the interdisciplinary design courses are taught by faculty from architecture and landscape architecture disciplines. Faculty also have very similar pattern to that of the students in the distribution of disciplines. The column of 'Others' has a variety of disciplines such as sculpture, theater arts, music, geography, anthropology, and philosophy.

As the chart indicates, there are not many semester or quarter differences in offering interdisciplinary design courses. They can be open in fall, spring, or summer sessions and interdisciplinary design courses do not seem to be affected.

The course existence indicates that 73% of the courses still exist in the interdisciplinary design courses. Once the interdisciplinary design courses are opened and taught, institutions tend to maintain the courses rather than removing them. Some reasons for discontinuing the courses are because of the change of college organization, administrative issues, curriculum structure, lack of funding, lack of support, and difficulties organizing among departments.
Table 6.6: Summary of part two of primary questionnaire (qualitative approach)

<table>
<thead>
<tr>
<th>Heads</th>
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<tbody>
<tr>
<td><strong>Q11. Important reasons</strong></td>
<td>Exposes students to disciplinary learning (15.8%)</td>
<td>Needs team effort (18.4%)</td>
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<tr>
<td></td>
<td>Understand collaboration (15.8%)</td>
<td>Expands the sharing of information (13.2%)</td>
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<tr>
<td></td>
<td>Promotes integration/communication (7.9%)</td>
<td>Prepares real world experience (7.9%)</td>
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<tr>
<td></td>
<td>Complex issues (5.3%)</td>
<td>Builds recognition &amp; respect among disciplines (5.3%)</td>
<td>Needs to share a common language (5.3%)</td>
<td>Learns expertise (5.3%)</td>
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**Q12. Successful aspects**

<table>
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<tbody>
<tr>
<td></td>
<td>Builds recognition &amp; respect among disciplines (11.9%)</td>
<td>Needs to share a common language (5.3%)</td>
<td>Learns expertise (5.3%)</td>
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<tr>
<td></td>
<td>Increases communication (7.1%)</td>
<td>Emphasizes the need for a team approach (9.5%)</td>
<td>Stimulates real world experience (8.5%)</td>
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<tr>
<td></td>
<td>Builds an understanding of disciplinary contributions (4.8%)</td>
<td>Fosters productive collaboration (4.8%)</td>
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<tr>
<td></td>
<td>Complex issues (10.8%)</td>
<td>Varying student perceptions (10.8%)</td>
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**Q13. Least Successful aspects**

<table>
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<th>Heads</th>
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<tbody>
<tr>
<td></td>
<td>Complexity of operational logistics (29.7%)</td>
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<tr>
<td></td>
<td>Overly time consuming (21.6%)</td>
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<thead>
<tr>
<th>Heads</th>
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<tbody>
<tr>
<td></td>
<td>Inconsistent expectations &amp; expectations (5.4%)</td>
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<td></td>
<td>Presents of disciplinary hierarchy (2.7%)</td>
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<tr>
<td></td>
<td>Complexity of operational logistics (29.7%)</td>
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<tr>
<td></td>
<td>Varying student perceptions (10.8%)</td>
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**Q14. Important benefits**

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<tr>
<td></td>
<td>Builds respect &amp; recognition (14.3%)</td>
<td>Expands disciplinary thinking (14.3%)</td>
<td>Broadsens learning (14.3%)</td>
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<tr>
<td></td>
<td>Expands disciplinary learning (7.1%)</td>
<td>Provides real world experiences (9.5%)</td>
<td>Improves communication (7.1%)</td>
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<td></td>
<td>Forms relationship (4.8%)</td>
<td>Promotes collaboration (4.8%)</td>
<td>Promotes better solutions (2.4%)</td>
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**Q15. Encourage**

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<tbody>
<tr>
<td></td>
<td>Create flexible curricular structure (22.2%)</td>
<td>Promote supportive administrative approach (16.7%)</td>
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<td></td>
<td>Increase institutional support (11.1%)</td>
<td>Increase faculty support (11.1%)</td>
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<td></td>
<td>Provide incentives (11.1%)</td>
<td>Provide funding (8.3%)</td>
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<td></td>
<td>Broaden perspectives (5.6%)</td>
<td>Provide moral support (2.8%)</td>
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<td></td>
<td>Show other institution's efforts (5.6%)</td>
<td>Encourage voluntary participation (2.8%)</td>
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**Q16. Advantages & Disadvantages**

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<tbody>
<tr>
<td></td>
<td>Builds respect &amp; recognition (16.3%)</td>
<td>Broadsens knowledge (16.3%)</td>
<td>Enhances collaboration (11.6%)</td>
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<tr>
<td></td>
<td>Broadsens views (16.3%)</td>
<td>Enhances critical thinking (14.0%)</td>
<td>Improves communication skills (7.0%)</td>
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<tr>
<td></td>
<td>Too time consuming (30.3%)</td>
<td>Enhances understanding of other disciplines (2.3%)</td>
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<table>
<thead>
<tr>
<th>Heads</th>
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<tbody>
<tr>
<td></td>
<td>Diverse &amp; ambiguous references (18.2%)</td>
<td>Needs for interdisciplinary courses (30.8%)</td>
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<td></td>
<td>Deals with disciplinary arrogances (15.2%)</td>
<td>Results in large groups of students (15.2%)</td>
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<td></td>
<td>Requires team teaching (6.1%)</td>
<td>Requires a new vocabulary (3.0%)</td>
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**Q17. Comments**

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<tr>
<th>Heads</th>
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<tbody>
<tr>
<td></td>
<td>Lacks institutional support (15.4%)</td>
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<td></td>
<td>Inflexible curricular structures (15.4%)</td>
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<td></td>
<td>Academic context/traditions (15.4%)</td>
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<td></td>
<td>Requires increased faculty efforts (15.4%)</td>
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<td></td>
<td>Needs more collaboration (7.7%)</td>
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The above chart from questions 11 through 17 of category one deals with the overall distributions of all of the qualitative aspects of the focused questionnaire. These questions investigate more fundamental and critical reasons of why interdisciplinary design education is situated as it is in the current American higher education systems.

The qualitative questions are organized around four headings of why, what, how, and therefore. Even in the same question, the respondents’ answers deal with the full range of headings including why the question is important, what the main objectives are, how these issues can be accomplished, and what we can learn through these questions and issues. Some questions generate responses related to all four headings of why, what, how, and therefore: others relate to only two or three of the headings.

Underneath these headings, responses have been organized in response categories. Every category is represented to explain the main theme of the similar content group of answers. Each category also has been placed in order by color variations to show the numeric hierarchy of the percentage of responses answering the question. The darker blue color denotes a higher percentage and lighter blue for a lower percentage of responses.

The above chart shows that the headings of what and how have more answers compared to why and therefore headings. Numerous respondents indicate that dealing with what and how headings is concentrating on the issues of what the main objectives are and how these issues can be accomplished. Only a few of the answers deal with the headings of why and therefore. Respondents are more likely to suggest methodological ways to approach interdisciplinary design education as opposed to theoretical ways of dealing with the importance of interdisciplinary design education.

Teaching interdisciplinary design courses can best be accomplished by team effort, expanding the sharing of information, and sharing a common language. The chart also indicates that a great number of respondents realize the most important reasons for teaching interdisciplinary design courses and they provide some clues as to how to solve this question. The category of 'Needs team effort' within the 'How' heading has the highest percentage (18.4%) for this question. The second ranked categories, falling under the 'What' heading, are 'Exposes students to disciplinary learning' and 'Understands collaboration.' Both have the same 15.8 percentage. This question indicates that 50 percent (18.4%, 15.8%, 15.8%) of the answers are in these three high ranked categories out of a total of ten categories.
The most successful interdisciplinary aspects can be accomplished by presenting differing viewpoints, expanding disciplinary learning, and promoting the sharing of information. A majority of the respondents point out the heading of 'How' to make most successful interdisciplinary aspects of the courses. Respondents have a variety of opinions with methodological perspectives for providing a successful interdisciplinary approach to design education.

The category of 'Presents differing viewpoints' has the highest percentage of 19.0 and the second ranked category, also falling under the 'How' heading, is 'Expands disciplinary learning' with 16.7%. The third ranked category is 'Promotes the sharing of information' also within the 'How' heading with 14.3 percent of all the answers. A total of 50 percent (19.0%, 16.7%, 14.3%) of the answers are in these three high ranked categories and all of these categories are in the 'How' heading, focusing on the methodological perspectives of 'How' to make the most successful interdisciplinary aspects.

Respondents attempt to find 'How' to improve the least successful interdisciplinary aspects of providing courses. The least successful interdisciplinary aspects of courses can be overcome by considering the complexity of operational logistics, time consumed, and time required to teach team process. All of these are practical and fundamental suggestions for overcoming the least successful interdisciplinary aspects of courses.

The first ranked category is 'Complexity of operational logistics' with 29.7 percent of the answers. The second ranked category, also situated under the 'How' heading, is 'Overly time consuming' with 21.6 percent of the answers. The third ranked category is 'Time required to teach team process' also within the 'How' heading with 16.2 percent of all the answers. All of the three high-ranked categories are also under the 'How' heading in this question. A total of 67.5 percent (29.7%, 21.6%, 16.2%) of the answers are in these three high ranked categories. Responses to this question concentrate on the methods of 'How' to improve the least successful aspects of interdisciplinary courses to become the most successful ones.

The most important benefits to the students of interdisciplinary design courses can be accomplished by promoting the learning of team work and expanding disciplinary thinking. Therefore, as the 'Therefore' heading noticeably indicates, we can broaden learning, provide real world experiences, improve communication, and promote better solutions.
The category of 'Promotes the learning of team work' under the 'How' heading has the highest percentage of 21.4 of all of the answers. The second ranked categories, under all of the three various headings, are 'Builds respect and recognition' under the 'What' heading, 'Expands disciplinary thinking' under the 'How' heading, and 'Broadens learning' under the 'Therefore' heading with the same 14.3% distribution of the answers.

Team work is one of the most important benefits of learning interdisciplinary design courses and at the same time team work is the least successful aspect of interdisciplinary design courses. Team work can be a benefit and also a barrier to interdisciplinary design education. In design disciplines, many of the large scale projects can be approached and accomplished by team work. On the other hand, students tend to hesitate to work with other students although they realize this is an important learning process of expanding their knowledge by understanding diverse perspectives.

Respondents answered what could be done to encourage the development of more interdisciplinary courses and in what way under the 'How' heading. For example, to encourage the development of more interdisciplinary design courses we should create flexible curricular structure and promote a supportive administrative approach.

Within the 'How' heading, the category of 'Create flexible curricular structure' has the highest percentage (22.2%) and the category of 'Promote supportive administrative approach' has the second highest percentage (16.7%) of the answers. The categories of 'Broaden perspectives' and 'Show other institution's efforts' have the same highest percentage (5.6%) within the 'What' heading.

Creating flexible curricular structure, promoting a supportive administrative approach, increasing institutional support, increasing faculty support, and providing incentives are the major elements of developing more interdisciplinary design courses in many institutions.

Educational advantages can be accomplished by the categories of 'Broadens knowledge' (16.3%), 'Better team building skills' (16.3%), and 'Broadens viewpoints' (16.3%). Respondents are focusing more on methods of how to make educational advantages of interdisciplinary design courses than on why it is important and therefore what can be accomplished.

Learning from interdisciplinary design courses is the primary advantage in the categories of 'Broadens knowledge,' 'Better team building skills,' 'Broadens viewpoints,' and 'Enhances critical thinking.' The educational advantages of interdisciplinary design courses are mainly
understanding disciplinary differences, respecting each discipline, recognizing collaboration, expanding knowledge to develop critical thinking, strengthening team building skills and communication skills, and broadening viewpoints. In the first-ranked category of 'Broadens knowledge' (16.3%), the answers emphasize broadening knowledge. Other first-ranked categories are 'Better team building skills,' 'Broadens viewpoints,' and 'Builds respect & recognition,' and they have the same highest percentage (16.3%) for this question.

Educational disadvantages can be seen in the categories of 'Too time consuming' (30.3%) within the 'How' heading and 'Diverse & ambiguous references' (18.2%) within the 'What' heading. Respondents deal more with methods of how educational disadvantages of interdisciplinary design courses happen and what the factors are in making disadvantages of interdisciplinary design courses.

The category of 'Too time consuming' within the 'How' heading has the highest percentage (30.3%) for this question. The second ranked category, falling under the 'What' heading, is the 'Diverse & ambiguous references' (18.2%).

Disciplinary arrogances and ambiguity may hinder interdisciplinary design. In addition, the burden is time consuming to overcome to have successful interdisciplinary design courses.

Through the additional comments, respondents try to suggest the method of providing more interdisciplinary design courses in the educational environment within the 'How' (92.3%) heading. For the development of interdisciplinary design courses, institutions should develop the categories of 'Needs for interdisciplinary courses,' 'Institutional support,' 'Inflexible curricular structures,' 'Academic context/traditions,' and 'Increased faculty efforts.'

The highest ranked category is 'Needs for interdisciplinary courses' (30.8%). The second ranked categories, also falling under the 'How' heading, are 'Lacks institutional support,' 'Inflexible curricular structures,' 'Academic context/traditions,' and 'Requires increased faculty efforts.' All of these have the same percentage of 15.4 and these answers cover more than 92 percent of the total answers.
6.2 Comparison to literature

6.2.1 Importance of interdisciplinarity

The importance and value of interdisciplinarity in design disciplines are represented in the previous literature review chapter.

Salter and Hearn point out that interdisciplinarity has been at times associated with intellectual fads and fashions that interdisciplinary research lacks both substance and good scholarship. However, in recent years several universities in Canada, in the United States, and elsewhere have come to value interdisciplinarity. It is seen to represent the best efforts of researchers not only to focus on societal issues but to explore the social and practical applications of their expertise (3).

Similar to this viewpoint, the primary questionnaire noticeably indicates that faculty for both architecture and landscape architecture emphasize the learning of expertise and preparing for real world experience which is a very practical application of their expertise to the professional environment.

Mitchell also indicates that “every up-to-date university in the United States has its commitment to interdisciplinary research and training. Institutes, councils, consortia, collaborative groups, and workshops are set up to encourage conversations across disciplines” (540). As the trial programs of interdisciplinary efforts are increased in the academic environment in a variety of forms, the preliminary questionnaire reveals that university faculty are willing to increase their opportunities for teaching interdisciplinary design if they have a chance to encourage learning between the two disciplines. In addition, the primary questionnaire reveals that the trend of interdisciplinary development is in suggesting more collaboration, interdisciplinary courses, institutional support, and curricular structure for collaborative academic communication.
Seipel addresses the concept of interdisciplinarity and the role of interdisciplinary studies in liberal arts and sciences. He says that for more than fifty years, higher education has relied on academic disciplines to generate new knowledge and provide a process by which it becomes accepted: “This discipline-based structure has become dominant in most universities, controlling the resources that go into teaching, research, and outreach activities. This structure capitalizes on the benefits of specialization—allowing specialists within a discipline to refine theories, methods, and technologies and push outward the bounds of knowledge within that field” (2).

However, through this study including the web-based data collection, the preliminary and the primary questionnaire, it is discovered that interdisciplinary attempts in design disciplines are growing and a variety of universities are trying to communicate among specialists to expand their knowledge for disciplinary learning and collaboration.

Nadler, professor of industrial and systems engineering at the University of Southern California, claims that if college education emphasized integration and use of knowledge, then necessary skills and the principles behind them would be learned by a broader cross-section of the workforce and in ways that would promote more effective use. Rather than educating students for just one life-long career, it is hoped to educate them to be instrumental in contributing and managing technological change (Nadler). As Nadler suggests, the answers of faculty advocate the broader integration of disciplines by presenting differing viewpoints, expanding disciplinary learning, sharing of information, emphasizing the need for a team approach, and understanding of disciplinary contributions. In the academic environment, faculty recommend a range of interdisciplinary activities for creating flexible curricular structure, promoting a supportive administrative approach, and increasing institutional and faculty support. The goal is for students to develop a deeper understanding of their own discipline, an appreciation of what several related disciplines bring to their problems and strong collaboration skills. Therefore, interdisciplinarity is significant to make an effective and strong disciplinary bridge within design disciplines.

National Academies Committee approaches interdisciplinarity in a variety of disciplines and fields in the book Facilitating Interdisciplinary Research. They indicate Interdisciplinarity in various fields, including the design disciplines can be one of the most productive and inspiring of human pursuits. It can be the basis of communications and connections that lead to new knowledge. Interdisciplinarity has resulted in many
accomplishments in different fields. It has long been accepted in many industrial and
government laboratories and other nonacademic settings; such settings traditionally
emphasize teams and problem-driven research, and they permit researchers and
scholars to move easily between laboratories, to share and learn their skills (1).

In the academic environment, such collaboration is often impeded by administration, funding,
and cultural barriers between departments. However, successful interdisciplinarity in the
design fields may reduce existing gaps that can cause less than desirable environmental
outcomes.

The primary questionnaire agrees with the important reasons of teaching
interdisciplinary design courses from the qualitative aspect. The result indicates that by
exposing students to disciplinary learning using a team effort and by sharing a common
language, students are prompted to understand collaboration, integration, and
communication. Therefore, they prepare for real world experiences by learning expertise in
their academic background.

As the literature indicates, the importance and value of interdisciplinarity in design
disciplines are evidently presented through the preliminary questionnaire and also shown in
the primary questionnaire. The result of the preliminary questionnaire shows that almost
82% of the respondents point out interdisciplinary design is very important for design
students to learn from other design disciplines.

Interdisciplinary design includes a wide range of different fields of study by connecting
various disciplines to understand the relationships among those disciplines. Interdisciplinary
design education is one aspect of design focusing on the interdisciplinarity which integrates
design disciplines to promote design solutions from the approach of diverse design
perspectives. Interdisciplinary design allows designers to communicate and solve territorial
design problems between professional and academic environments by integrating the
relationship and learning from each environment. Interdisciplinary design also breaks down
perceived barriers prohibiting integration and collaboration among design disciplines.
Therefore, the importance of interdisciplinary design education should be emphasized in the
professional as well as the academic environment.
6.2.2 Benefits and advantages of interdisciplinarity

In design education, interdisciplinarity can demonstrate its important strengths because of its significant qualities such as professional work in teams, practical skills and creativity. Thomas Kuhn described knowledge as intrinsically the common property of a group or else nothing at all, explaining that the discoveries of sciences or the products of arts to be recognized as it shall be shared between the members of a certain community (Kuhn). Interdisciplinary teamwork approaches in colleges and universities have not a clear answer yet. Collaborative learning is used to describe new procedures in education, intended to help students learn by working together (Bruffee). Literature points out the same situation: interdisciplinary teamwork performs with advantages and disadvantages at the same time. Answers to the primary questionnaire indicate that students broaden knowledge by building teamwork skills, expanding viewpoints, and improving communication skills using critical thinking. It also indicates that teamwork needs time in order to teach, to acquire a new vocabulary, and to increase institutional support.

Ross and Parncutt explain why interdisciplinary work can be of benefit for various disciplines:

Disciplines are carried forward by individual researchers; one might define a discipline as a coherent field of research whose size is limited by that constraint. This idea can explain why, when a field of research becomes too big for one person to deal with, the field tends to split into smaller fields. If the concept of discipline is defined in this way, it becomes clear that one person cannot be an expert in two disciplines at once. Therefore, interdisciplinarity can benefit from collaboration with one of those experts ("Definitions").

However, the key feature of successful interdisciplinary practice is not the disparity of the chosen disciplines. What demonstrates real interdisciplinary thinking is the use of each discipline as a valid source of knowledge in its own right and a valuable contribution to the discussion at hand. According to Seipel, “Successful interdisciplinary thinkers not only generate new knowledge through integration and synthesis as they explore the issue or topic at hand. They also acquire a fuller appreciation for the epistemological similarities and distinctions between and among the disciplines” (5). As he emphasizes, successful interdisciplinary design also needs to generate new knowledge from diverse design
disciplines by integrating and accepting design ideas and thoughts. The answers to the primary questionnaire are in agreement with the above statement of literature; to be successful interdisciplinary aspects need recognition and respect among disciplines. By increasing communication between and among the disciplines, interdisciplinary design courses are able to provide understanding of disciplinary contributions, foster productive collaboration, and increase awareness of complex design issues.

The benefits and advantages of interdisciplinary design education are revealed through the preliminary questionnaire and also shown in the primary questionnaire. In response to questions 5 and 8 of the preliminary questionnaire, almost 80% agreed with benefits from working with other disciplinary students in the same college or school. Faculty for both disciplines show a strong agreement with the benefits and advantages of interdisciplinary design education. Also they provide what factors should be considered for the successful development of interdisciplinary design courses and the least successful elements which can be prohibitive such as the time consuming, disciplinary arrogance, disciplinary hierarchy, and various expectations of students. By controlling these indicated less successful aspects of interdisciplinary design courses, the benefits and advantages are going to expand to generate new knowledge from a variety of design disciplines not limited to architecture and landscape architecture.

Questions 12, 14, and 16 of the primary questionnaire also deal with the benefits and advantages of interdisciplinary design education from the qualitative aspect. The answers of respondents represent that there are a variety of benefits and advantages of interdisciplinary design education. For example, the most successful interdisciplinary aspects are able to present different viewpoints from the approach of sharing information and of teamwork. Therefore, students build recognition and respect among disciplines by understanding disciplinary contributions for productive collaboration. Also they understand complex design issues not limited to the academic environment so that they prepare for real world experiences by improving communication skills, expanding disciplinary thinking and learning, promoting collaboration using critical thinking, and understanding other disciplines.

The most important benefits of interdisciplinary design courses are also addressed through the primary questionnaire. Students benefit by promoting the learning of teamwork, expanding disciplinary thinking, and improving communication skills for better design solutions and collaboration. Through interdisciplinary design education, students broaden
learning by building disciplinary respect and recognition. Therefore, students have real world experiences by forming the relationship among design disciplines.

Educational advantages of interdisciplinary courses are also revealed through the question. Architecture and landscape architecture faculty believe educational advantages are very similar to the previous questions of the most successful interdisciplinary aspects and the most important benefits of interdisciplinary design courses. Faculty mentioned that students are able to understand what other disciplines are by broadening knowledge and viewpoints, enhancing critical thinking and collaboration, building team work skills, and recognizing other design disciplines.

In design studio, students learn design as a creative model for interpreting projects with complex, interdisciplinary challenges in our environment. There is a demand for students to understand the same environmental problems from multiple perspectives and to integrate these perspectives into creatively designed solutions. To achieve these goals, design education and increasingly all disciplines should provide concrete experience in integrating closely related interdisciplinary majors such as architecture and landscape architecture. This interdisciplinary approach to design education demands that the relevant knowledge base be expanded to include expertise not currently being required of architecture, landscape architecture and other design students. Interdisciplinary understanding has the potential power to provide diverse views for the same design problems, previously not emphasized much in architecture, landscape architecture, and other design fields. Interdisciplinary approach in design studio may have more power to see our environmental issues with different perspectives, but it is critical for our understanding to not only focus on architectural but also landscape architectural concepts.

6.2.3 Barriers and disadvantages of interdisciplinarity

Before implementing an interdisciplinary education based on collaborative learning, there are several major barriers, reflecting both cultural and institutional patterns that act as disincentives to change. However, it is possible to overcome such barriers by developing strategies to enable implementation.

Ross and Parncutt define
Interdisciplinarity is an interaction between or among academic disciplines. There are many different levels of interaction between disciplines, ranging from superficial reference to relevant work done by another discipline without incorporating its findings to the fundamental assumptions and methods of one discipline. Another problem is the fuzziness of the boundaries of disciplines ("Definitions").

Bauer states, "In the realm of the intellect and its variety of cultures, we are still at the primitive level of tribalism, complete with xenophobia, much more likely to wage war on other tribes than to regard them as equals worthy of meaningful collaboration" (111). As Bauer says, interdisciplinary approaches in various disciplines are still struggling with issues related to the methods, territories, and applications of interdisciplinarity.

In 1979, the first Interdisciplinary Research Management Conference showed that such research was of growing importance but many barriers to its introduction and efficient use were being encountered. Most of them were a matter of getting people coming from diverse disciplinary backgrounds to overcome institutional obstacles and personal inhibitions (Epton, Payne and Pearson).

In the late 1980s, a number of reports announced the relatively disruptive nature of the construction industry in the UK compared with Japan, USA and other European countries (Collier, Bacon and Burns). There was the need for greater collaboration among professionals, and attempts to encourage an interdisciplinary approach in many disciplines including design (Andrews and Derbyshire).

Despite increases in interdisciplinary activity in postsecondary education, disciplinary frameworks still organize most faculty members’ understanding and interpretations of information and experience (Lattuca). The disciplines may still be adequate for coordinating teaching activities within a university, but they are misleading simplifications of research areas and the intellectual domains that sustain them (Becher).

Palmer indicates the difficulties of being interdisciplinary. "Interdisciplinary accumulation is complicated by the need to bring together knowledge from multiple domains. Structural and cultural boundaries get in the way. To successfully promote interdisciplinary inquiry, all aspects of the accumulation process need to be recognized and supported, especially the work at the boundaries between disciplinary communities." His analysis has concentrated on
the boundary crossing practices and strategies of the researchers, the major influences in
the work setting, and how the interdisciplinary process is currently accommodated by formal
and informal bridge-building structures (Palmer).

Klein argues that any interdisciplinary activity embodies a complex network of historical,
social, psychological, political, economic, philosophical, and intellectual factors. The concept
of interdisciplinarity is an important means of solving problems and answering questions that
cannot be satisfactorily addressed using singular methods or approaches. As Klein notes,
interdisciplinarity is a concept of wide appeal, but it is also one of wide confusion. She
identifies three major reasons for this confusion: 1) general uncertainty about the meaning
of the term; 2) widespread unfamiliarity with interdisciplinary scholarship; and 3) the lack of
a unified body of discourse. “While all three contribute to the background context for any
proposed definition of interdisciplinarity, it is the last confusion, the dispersion of discourse
on interdisciplinarity, which is most fundamental. Accordingly, it is necessary to propose a
provisional, working definition of the concept that is sufficiently structural or formal,
specifically, one that is broad enough to accommodate within its semantic scope the diverse,
and even competing, types of interdisciplinary interaction. As such, it will function as a
preliminary interpretive orientation to interdisciplinarity as a complex, vast, and diverse
phenomenon” (Klein).

The Reinvention Center is a national center focusing on undergraduate education at
research universities. On their web site, they deal with achieving an interdisciplinary general
education. The barriers to interdisciplinary education are presented below. This view is not
limited to design disciplines; however, designers can reinterpret these barriers and
overcome them to developing successful interdisciplinary design education.

Faculty members are frequently reluctant to teach general education courses,
perceiving them merely as a necessary service load for their department. They also seem
particularly reluctant to teach formal interdisciplinary general education courses. This
reluctance stems partly from a lack of time to develop new courses, especially those
requiring new thinking about how to teach. It may also stem from a lack of understanding of
the structure of an interdisciplinary course sequence and a sense that they do not know how
to design such a course.

Students can potentially play a large role in institutional reform. A growing number of
students want to be exposed to material in new and different ways. However, many students
persist in the mentality that they will acquire knowledge by memorizing the lectures and the
text, and will manifest this knowledge by performance on individual assessment tools.

Most university classrooms are box-like structures with students limited to fixed seating
in a crowded room with a professor at the front. If we are interested in using collaborative
learning as a framework for launching interdisciplinary general education classes, we need
classroom space that has a better layout. The creation of more flexible learning spaces and
the use of technology to increase the potential for collaborative work can have a significant
impact on student learning.

Current approaches to design education tend to emphasize individual work, learning
facts, and the analysis of artifacts. Not many of the programs emphasize integrative
activities as a fundamental part of the design curriculum. Based on the method of web-
based data collection, approximately 25 percent of the sample shows the word
‘interdisciplinary’ in university mission statements; however, an actual interdisciplinary
program is not provided in their real curriculum. Therefore, many of the students graduate
knowing a lot of disconnected facts and concepts without knowing how or when to use those
facts in responding to complex problems. They are not ready for the workplace when
students graduated. Nor are they prepared to collaborate well, to transfer their skills from
one domain to another, or to learn and consider concepts beyond those learned in academic
conditions.

As indicated in the literature, the barriers and disadvantages of interdisciplinary design
education are revealed through the preliminary and primary questionnaires.

Question 10 of the preliminary questionnaire indicates the difficulties of interacting with
other disciplines in the academic setting. The result shows that other factors that are not
specifically listed in the questionnaire have the highest rank for both architecture and
landscape architecture. Administration and faculty follow the next rank and students are
ranked at the lowest percentage.

Question 13 and 16 of the primary questionnaire also deals with the barriers and
disadvantages of interdisciplinary design education from the qualitative aspect. The following
answers represent the respondents’ experiences of what factors exist as barriers and
disadvantages of interdisciplinary design education.
Faculty for both disciplines point out the least successful interdisciplinary aspects such as the time requirement for organizing the team teaching process, disciplinary issues including a new vocabulary, disciplinary arrogances, and disciplinary hierarchy. Students also have various perceptions, expectations, and complex disciplinary hierarchy for each discipline.

Despite the apparent benefits of interdisciplinarity in design research and education, researchers, educators, and designers interested in pursuing it often face obstacles and disincentives in the university educational environment. Some of them take the form of personal communication or cultural barriers; others are related to the traditional form in academic institutions of organizing and teaching activities by discipline-based departments.

"Interdisciplinarity as understood and practiced today is not a miraculous solution to all the difficulties to understand the complex world, but rather that interdisciplinarity poorly understood and badly practiced leads to nonsensical intellectual constructs which deepen the disciplinarian divide. At all times when we talk about interdisciplinarity, nobody is an expert" (Finkenthal). As he emphasizes, doing interdisciplinary work successfully needs an accurate approach to the problems with the right methods, techniques, and directions.
CHAPTER 7

7. CONCLUSIONS

This study presented a literature review, definition of research questions, various research methods, data analysis including quantitative and qualitative approaches, and data interpretation about interdisciplinary design education in higher educational systems. The intent of this study was to explore interdisciplinary design education of environmental design disciplines and to utilize this study as a starting point to conduct a research effort that contributes to our understanding of the significant factors affecting design education collaboration.

At this point, this research has identified the current situations of interdisciplinary design education through the practical research questions and research methods. This research also has approached the main goal of discovering what the advantages and disadvantages of interdisciplinary design education are and what types of barriers or obstacles hinder and limit the extension of interdisciplinarity in design education. Through this study, some of the interdisciplinary design issues have emerged.

Institutional curriculum is not strongly integrated yet between architecture and landscape architecture because it is not mandatory for many students to take architecture or landscape architecture studio or lecture classes. Studio is the major educational place for both disciplines. Nonetheless, studio is very restricted to its own disciplinary students and other disciplinary students have fewer opportunities to take and learn from the studio environment. The stiffness of studio may hinder interdisciplinary design education that needs interactive learning.

Faculty for both disciplines prefer to have students who have a combination of disciplinary variations. This reveals that crossing boundaries among the design disciplines is significant for developing interdisciplinary design education. Faculty strongly agree that there is weakness of interaction among design disciplines in academic situations. This might be
related to class distribution showing that studio is strictly designed to provide for the same disciplinary students and it also might be because curricular structure itself is limited to some disciplines. Faculty for both disciplines are willing to teach and increase their efforts and interests in interdisciplinary design education if there is a possibility of well-organized improvement of curriculum or if institutional support is provided.

Students benefit from working with students in other disciplines. Faculty also have positive perspectives about the benefits received from working with other disciplinary students.

The importance of interdisciplinary design education is revealed and should be developed to expand design knowledge and eventually recognize design problems that can be improved by collaborating between architecture and landscape architecture disciplines. Design disciplines need professional education through the various forms of classes. However, academic situations of design disciplines still need more interactions and students need to learn further how to interact with other design related disciplines in academic situations to prepare students to become design professionals.

7.1 Limitations of the study

Interdisciplinary design education can be approached from a variety of design perspectives. This research has a couple of limitations. The main limitation is the inadequate sample size of the pilot questionnaire and focused questionnaire based on the number of respondents from the university faculty. The initial idea of this study was to use statistical data analysis from a fairly large sample size to generalize what has been investigated through the process of this study. However, the number of collected questionnaires was not large enough to use the statistical research method so instead the data has been represented generally by percentage and distribution pattern to summarize what has been found and discovered through this interdisciplinary design education research.

The next limitation of this study is the academic program within design disciplines focusing on the two specific fields of design study; those are architecture and landscape architecture. Design disciplines have a variety of fields of design study dealing with diverse
design research questions and problems such as architecture, landscape architecture, urban planning, graphic design, industrial design, and all of these disciplines have the potential to engage in interdisciplinary design education. However, this study is mainly focused on the limited two design disciplines to understand the current situation of interdisciplinary design education in design disciplines. The study might be extended to other design disciplines whereas this study merely deals with limited fields.

Another limitation is the academic environment focusing on design education to investigate one aspect of interdisciplinarity in design. The approach can be expanded to design research or design practice. Nonetheless, this study aims to explore educational perspectives with what types and forms of interdisciplinary design education happen to the students in design disciplines. Interdisciplinary design education is a way of understanding interdisciplinarity of design education in design disciplines.

The last limitation is the academic settings only focusing on the university faculty. Even in the academic environment, there are a lot of factors affecting design education. However, this study is limited to deal with the perspectives of faculty who are assumed to be a major element influencing others in the university setting such as students and administrators. In this research, university faculty were considered the most important factor for understanding the current interdisciplinary design education in the academic environment. As indicated, this research has some limitations that can not be explored due to limited time and perspective. However, this research functions as a preparatory position of understanding interdisciplinary design education and expanding the concept of interdisciplinarity to other design disciplines.

7.2 Application to interdisciplinary design education

This research contributes to the understanding of interdisciplinarity in design education. In the design field, the concept of interdisciplinarity has not been introduced with active research efforts. The separation of each design discipline has created its own design principles and theories. Since the beginning of this separation, the opportunities for integrating with other design disciplines have been reduced. Therefore, this research tries to understand design issues and problems with the broader interdisciplinary perspectives for
developing integrations among design disciplines by educating design students using the notion of interdisciplinary design education.

The findings of this study can be applied to design disciplines in a variety of ways. In the academic setting of current universities, many researchers and scholars from design disciplines became interested in interdisciplinary design due to the need to integrate different environmental perspectives in order to improve design solutions. By integrating these various disciplinary perspectives, researchers and scholars were able to expand and connect boundaries of related design disciplines.

Design students also express interest in exploring design careers that cross disciplinary boundaries. To understand the differences and similarities among design disciplines and respond to design activities becoming more complex, an interdisciplinary approach to design is important for academic as well as professional environments. However, as previously indicated, limited research has been done specifically focusing on interdisciplinary design education. Through this study, designers, researchers, and scholars are able to obtain a better understanding of the separation of design disciplines and how to overcome this separation to develop a more successful model of interdisciplinary collaboration in the academic setting.

This study is valuable for understanding the current situations of interdisciplinary design education in the United States at the university level. Interdisciplinary trial in design disciplines is growing in many contemporary universities with various forms of classes including studio, lecture, and seminar.

This study is beneficial for design discipline faculty who develop and organize interdisciplinary design classes as a guideline of what is important for introducing interdisciplinary courses and how to develop this class structure in a more successful way. As the results of this study represent, design discipline faculty are willing to participate in teaching interdisciplinary design courses and yet there is not much research dealing with practical information or knowledge of how to develop interdisciplinary design courses in academic settings. In this manner, this study can be applied to form successful interdisciplinary design courses.
This study is also beneficial for university administrators who manage and support the curriculum structure for making interdisciplinary design courses. Based on the findings and limitations from this study, university administrators are able to frame what factors are necessary and crucial for efficient developing of interdisciplinary design courses and curriculum potentially integrating with non design disciplinary coordination for solutions of larger scale design issues and problems. This study is a starting point for providing practical information and can be expanded by adding more realistic experiences through developing academic interdisciplinary design curriculum.

The benefit is also applied to design students who need interdisciplinary perspectives that lead to integration of what they learned in the academic environment to their professional practice. Interdisciplinary design education is a way of breaking down, expanding, and integrating design knowledge and information that students' own disciplines usually do not perform. By understanding the concept of interdisciplinary design education, students are able to prepare practical knowledge applicable to the academic as well as the professional environment. The role of interdisciplinary design education is not limited to design disciplines and the ultimate purpose can be realized through the interdisciplinary application to numerous disciplines and integrative academic collaboration not restricted to design disciplines.

This study also shows the potential for collaboration between design education and design practice. Interdisciplinarity in design disciplines has influenced design faculty including architecture and landscape architecture to provide more opportunities and effort to break the disciplinary boundaries and share their territory, knowledge, and information to create broader perspectives of design.

7.3 Suggestions for future research

As indicated in the previous section, this research has been limited to the settings of design education for understanding interdisciplinary efforts in design disciplines. Interdisciplinarity can be approached and interpreted in a variety of different ways not only limited to design education. This research has identified the interdisciplinary relationships between architecture and landscape architecture focused on design education.
Future research would build on this research by breaking disciplinary boundaries not limited to architecture and landscape architecture disciplines. Design disciplines have numerous other disciplines which need to be integrated with design issues or questions related to each other. To find a design solution, it is necessary for designers to work with other design disciplines. This research is a step to explore what design disciplines are related to and incorporated with other design disciplines utilizing interdisciplinary activities. By investigating various interconnected design disciplines, the concept of interdisciplinarity is a crucial factor for improving the design environment. The diagram below represents a suggestion for further research.

![Diagram showing the relationship between different design disciplines](image)

**Figure 7.1: Future research expanding design disciplines**

As the diagram indicates, the extension of design disciplinary scope to other design disciplines such as urban design, interior design, and art is expected and the learning and
findings from this research can be applied to the next level of interdisciplinary design education with more design disciplines involved.

Future research would also expand the scope of interdisciplinarity in design disciplines to design research and design practice to cooperate with design education. Interdisciplinary design education is a way of developing interdisciplinarity in design disciplines as indicated in the diagram below. Ultimately, design disciplines need all of these elements to work together to incorporate and find enhanced design solutions in the professional as well as the academic environment. All of the findings and learning from this research might be applied to future research for expanding interdisciplinary understandings of design disciplines to other non-design disciplines such as medicine, law, engineering, and sciences.

Figure 7.2: Future research including design research and design practice

This research dealt with interdisciplinary design education at the university level concentrating on the perspectives of faculty. In future research, institutional settings should
be varied to recognize a range of perspectives including students and administrators. Their perspectives and conceptions of interdisciplinary design education might be different from or similar to those of faculty. For accomplishing design education, faculty is one of the most important factors, however, students and administrators are also significant contributors to make design education achievable. In addition, by comparing the outcomes of future research, designers will be able to proceed to learn the best design solutions for improving and developing our environment.

![Diagram of future research expanding university setting]

**Figure 7.3: Future research expanding university setting**

The main goal of future research is to answer questions by using research methodologies not described or used in this research and to identify how to approach the successful development of interdisciplinary design education with rigid and obvious designer's perspectives.
The importance of interdisciplinary design education is revealed through this study and should be developed to expand design knowledge and eventually recognize design problems that can be improved by collaborating between architecture and landscape architecture discipline.
REFERENCES


---. *Ten Cheers for Interdisciplinarity: The Case for Interdisciplinarity Knowledge and Research*. Print.


APPENDICES
Appendix A

To: Professor of Architecture discipline  
From: Tae Seo Koo, College of Design PhD student of North Carolina State University

I am a PhD student of College of Design at North Carolina State University and I am doing my research on design education and curriculum structures. This questionnaire is a preliminary survey for my dissertation and your opinion will be important to my research effort. (The attached questions should only take 10-15 min. to complete)

This short e-mail survey will ask you some questions about design education, design methods, and design courses, and your responses will be organized and stored in a manner that will protect your confidentiality. After responses have been recorded all individual email responses will be deleted. 

There is no compensation or direct benefit to participants but I hope to develop a better understanding among the design disciplines, designers, and design educators. The participation is voluntary and refusal to participate involves no penalty or loss of benefits. There should be no risk to you for participating.

If you feel your rights as a research subject have been violated please contact the Institutional Review Board of North Carolina State University: [919.515.4514] or Matt Zingraff: [919.513.1834].

Thank you very much for spending your time to do this survey.

I appreciate you sharing your opinions and responses.

At the conclusion of my research I would be happy to share with you any and all findings. If you have any questions about this research, or would like the survey results sent to you, please indicate so in your return email. My email address is tskoo@ncsu.edu and telephone number is 919.000.0000.

Please reply to this email no later than MM/DD/YYYY.
Please indicate “X” mark your position in architecture discipline

Professor (  ) Associate professor (  ) Assistant professor (  ) Lecturer (  )

Please put numbers in each blank. (Question 1~2)

1. How many architecture classes do you teach each academic year in the architecture discipline?
   Studio (  ) Lecture (  ) Seminar (  ) Lab (  )

2. What are the approximate distributions of disciplines of the students in your classes? Please indicate approximate percentage in each blank.
   Studio: Architecture (  %), Landscape architecture (  %), others (  %)
   Lecture: Architecture (  %), Landscape architecture (  %), others (  %)
   Seminar: Architecture (  %), Landscape architecture (  %), others (  %)
   Lab: Architecture (  %), Landscape architecture (  %), others (  %)

Please place an “X” mark on your answer. (Question 3~9)

3. If your classes included landscape architecture students in your college or school, was their attendance in the classes mandatory or optional?
   Studio: Mandatory (  ) Optional (  )
   Lecture: Mandatory (  ) Optional (  )
   Seminar: Mandatory (  ) Optional (  )
   Lab: Mandatory (  ) Optional (  )

4. In general, do you prefer to have in your classes’ students who are majors in other disciplines within your college or school?
   Prefer very much 1 (  ) 2 (  ) 3 (  ) 4 (  ) 5 (  )
5. Students benefit greatly from working frequently with students in other disciplines in same college or school.

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<thead>
<tr>
<th>Strongly agree</th>
<th>Neutral</th>
<th>Strongly disagree</th>
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<td>1 ( )</td>
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</table>

6. It is not important for design students to learn from other design disciplines.

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<tr>
<th>Strongly agree</th>
<th>Neutral</th>
<th>Strongly disagree</th>
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7. Interactions among design related disciplines in academic situations are less than interactions among the design professionals.

<table>
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<tr>
<th>Strongly agree</th>
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<th>Strongly disagree</th>
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8. Design students benefit far more from courses in their own discipline than from taking courses in other disciplines.

<table>
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<th>Strongly agree</th>
<th>Neutral</th>
<th>Strongly disagree</th>
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<td>4 ( )</td>
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9. If you had a chance to increase or decrease your teaching to students in other disciplines you would?

Increase ( ) Decrease ( )

Please rank the following groups according to how the following phrase applies to them, with one being the most relevant.

10. The difficulties of interacting with other disciplines in the academic setting are mainly caused by

<table>
<thead>
<tr>
<th>Faculty ( )</th>
<th>students ( )</th>
<th>administration ( )</th>
<th>other ( )</th>
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</table>
Please write your opinions or thoughts. (Question 11~13)

11. If you have to choose one other discipline to work with within the same college/school, then what discipline would you choose and what is the reason for that?

12. What do you think are the advantages and disadvantages of teaching students in other majors?
   Advantages:
   Disadvantages:

13. Please write if you have other comments or concerns regarding current Design Education and Curriculum.
   Comments:
   Concerns:
Appendix B

To: Professor of Landscape Architecture discipline
From: Tae Seo Koo, College of Design PhD student of North Carolina State University

I am a PhD student of College of Design at North Carolina State University and I am doing my research on design education and curriculum structures. This questionnaire is a preliminary survey for my dissertation and your opinion will be important to my research effort. (The attached questions should only take 10-15 min. to complete)

This short e-mail survey will ask you some questions about design education, design methods, and design courses, and your responses will be organized and stored in a manner that will protect your confidentiality. After responses have been recorded all individual email responses will be deleted.

There is no compensation or direct benefit to participants but I hope to develop a better understanding among the design disciplines, designers, and design educators. Your participation is voluntary and refusal to participate involves no penalty or loss of benefits. There should be no risk to you for participating.

If you feel your rights as a research subject have been violated please contact the Institutional Review Board of North Carolina State University: [919.515.4514] or Matt Zingraff: [919.513.1834].

Thank you very much for spending your time to do this survey.
I appreciate you sharing your opinions and responses.
At the conclusion of my research I would be happy to share with you any and all findings. If you have any questions about this research, or would like the survey results sent to you, please indicate so in your return email. My email address is tskoo@ncsu.edu and telephone number is 919.000.0000.

Please reply to this email no later than MM/DD/YYYY.
Please indicate “X” mark your position in landscape architecture discipline
Professor (   ) Associate professor (   ) Assistant professor (   ) Lecturer (   )

Please put numbers in each blank. (Question 1~2)

1. How many landscape architecture classes do you teach each academic year in the landscape architecture discipline?
   Studio (   ) Lecture (   ) Seminar (   ) Lab (   )

2. What are the approximate distributions of disciplines of the students in your classes? Please indicate approximate percentage in each blank.
   Studio: Landscape architecture (   %), Architecture (   %), others (   %)
   Lecture: Landscape architecture (   %), Architecture (   %), others (   %)
   Seminar: Landscape architecture (   %), Architecture (   %), others (   %)
   Lab: Landscape architecture (   %), Architecture (   %), others (   %)

Please place an “X” mark on your answer. (Question 3~9)

3. If your classes included architecture students in your college or school, was their attendance in the classes mandatory or optional?
   Studio: Mandatory (   ) Optional (   )
   Lecture: Mandatory (   ) Optional (   )
   Seminar: Mandatory (   ) Optional (   )
   Lab: Mandatory (   ) Optional (   )

4. In general, do you prefer to have in your classes’ students who are majors in other disciplines within your college or school?
   Prefer very much Neutral Do not prefer
   1 (   ) 2 (   ) 3 (   ) 4 (   ) 5 (   )
5. Students benefit greatly from working frequently with students in other disciplines in same college or school.

Strongly agree  Neut ral  Strongly disagree
1 ( )  2 ( )  3 ( )  4 ( )  5 ( )

6. It is not important for design students to learn from other design disciplines.

Strongly agree  Neut ral  Strongly disagree
1 ( )  2 ( )  3 ( )  4 ( )  5 ( )

7. Interactions among design related disciplines in academic situations are less than interactions among the design professionals.

Strongly agree  Neut ral  Strongly disagree
1 ( )  2 ( )  3 ( )  4 ( )  5 ( )

8. Design students benefit far more from courses in their own discipline than from taking courses in other disciplines.

Strongly agree  Neut ral  Strongly disagree
1 ( )  2 ( )  3 ( )  4 ( )  5 ( )

9. If you had a chance to increase or decrease your teaching to students in other disciplines you would?

Increase ( )  Decrease ( )

Please rank the following groups according to how the following phrase applies to them, with one being the most relevant.

10. The difficulties of interacting with other disciplines in the academic setting are mainly caused by

Faculty ( )  students ( )  administration ( )  other ( )
Please write your opinions or thoughts. (Question 11~13)

11. If you have to choose one other discipline to work with within the same college/school, then what discipline would you choose and what is the reason for that?
   Discipline:
   Reason:

12. What do you think are the advantages and disadvantages of teaching students in other majors?
   Advantages:
   Disadvantages:

13. Please write if you have other comments or concerns regarding current Design Education and Curriculum.
   Comments:
   Concerns:
Appendix C

From: Tae seo Koo, College of Design, PhD candidate at North Carolina State University

Dear Professor ( ).

My name is Tae seo Koo, PhD candidate at North Carolina State University. I am doing my PhD research on interdisciplinary design education and curriculum structures. My committee chair and adviser is Prof Art Rice.

I am trying to find faculty who have specialties and/or experiences in interdisciplinary design education in this university. As a department chair/director/head, would you recommend faculty including yourself that has expertise on interdisciplinary or multidisciplinary design education within your department? Based on your consideration, the numbers of faculty that you recommend are not limited; however, the faculty should be in the same department that you are working in. According to your recommendation, I will send brief email questionnaire to ask their experiences, thoughts, and ideas about interdisciplinary design education. Thank you so much for reading this email and please let me know their names that you selected by reply email.
Appendix D

REMINDER: Interdisciplinary design education research; College of Design, NC State University

To: Professor (  )
From: Tae seo Koo, College of Design, PhD candidate at North Carolina State University

Please respond to this reminder. This email was sent a couple of weeks ago to investigate your recommendation. However, I did not receive your valuable answer yet. I know that you are so busy, but please spend your time to answer this email to move forward my PhD research effort.

My name is Tae seo Koo, PhD Candidate College of Design, North Carolina State University. My PhD research is on interdisciplinary design education and curriculum structures. My committee chair and adviser is Art Rice, Professor of Landscape Architecture.

I am trying to identify faculty who have specialties and/or experiences in interdisciplinary design education between architecture and landscape architecture. As a department chair/director/head, would you recommend faculty, including yourself, who have expertise in it within your department?

Based on your recommendation, I will send a brief email questionnaire to the faculty focusing on their experiences, thoughts, and ideas about interdisciplinary design education.
Thank you in advance for your assistance with regard to this research.
Appendix E

To: Professor ( ) in Architecture/Landscape Architecture discipline  
From: Tae Seo Koo, College of Design, PhD candidate at North Carolina State University

I am a PhD candidate in College of Design at North Carolina State University and I am doing my PhD research on interdisciplinary design education and curriculum structures. My committee chair and adviser is Prof Art Rice. Your name was given to me by your Department Chair as someone who has experience in this area. This questionnaire is a major component of my dissertation research and your opinion will be important to my research effort. (The attached questions should not take more than 30 minutes to complete)

This short e-mail survey asks some questions about interdisciplinary design education, methods, and design teaching experiences. Your responses will be organized and stored in a manner that will protect your confidentiality and after the responses have been recorded all individual emails will be deleted. There is no compensation or direct benefit to participants but I hope to develop a better understanding of interdisciplinarity among the design disciplines, designers, and design educators.

The participation is voluntary and refusal to participate involves no penalty or loss of benefits. There should be no risk to you for participating. If you feel your rights as a research subject have been violated please contact the Institutional Review Board of North Carolina State University: [919.515.2444].

Thank you very much for spending your time to do this survey. I appreciate you sharing your opinions and responses. At the conclusion of my research I would be
happy to share with you a summary of my findings. If you have any questions about this research, please indicate so in your return email.

My email address is tskoo@ncsu.edu and telephone number is 919.000.0000.

Please return the attached Microsoft Word Document by MM/DD/YYYY in order to move forward in this research effort.
Please reply this email questionnaire no later than Apr/16/2008.

Questions 1~5; general background information. Please indicate “X” mark.

1. What is your current faculty position?
   Professor (  )
   Associate professor (  )
   Assistant professor (  )
   Lecturer (  )
   Other (  ) Please specify: (  )

2. What is your gender?
   Male (  ) Female (  )

3. Approximately how many years have you taught at this university? (  years)

4. In which programs do you usually teach at this university? (Check all that apply)
   Undergraduate (  ) Graduate (  ) PhD (  )

5. Have you ever taught at other universities before you joined this current university?
   Yes (  ) No (  )

   If you check yes, then please answer these questions.
   What were the names of the universities? (from the most recent)
   1.
   2.
   3.

   What were the names of the colleges or schools within the universities? (from the most recent)
   1.
2.
3.
How long have you worked in these universities? (from the most recent)
1.
2.
3.
For the purpose of this study, an interdisciplinary design course is defined specifically to serve students from at least two different design disciplines and may also include participation of faculty from at least two different design disciplines.

Lattuca defines the term ‘interdisciplinary’ as “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”.

**Questionnaire begins from here.**

- Have you ever taught interdisciplinary design courses in your college/department focusing on architecture and landscape architecture or any other environmental design disciplines in recent years?
  
  Yes ( )  No ( )

- If you check yes, please go to the category 1 questions only.

- If you check no, please skip the category 1 questions and go to the category 2 questions starting on page 7.

---

1 Professor of education at Penn State University, focusing her research on the intersections of curriculum, teaching, student learning, and faculty work in higher education
If yes, please answer these category 1 questions;

1. What are the names of the interdisciplinary design courses? (Please be consistent in the order you list courses in questions 1-10)
   Course 1)
   Course 2)
   Course 3)

   For each course answered above, answer the following questions.

2. What subject areas and disciplines are involved?
   Course 1)
   Course 2)
   Course 3)

3. How many years have you taught this course?
   Course 1)
   Course 2)
   Course 3)

4. Was this course taught prior to your involvement? Approximately when was it started?
   Course 1) Yes ( ) No ( ) _________
   Course 2) Yes ( ) No ( ) _________
   Course 3) Yes ( ) No ( ) _________

5. Approximately, how many students are in the course and what are their majors?
   Course 1) Majors;
   Course 2) Majors;
   Course 3) Majors;

6. Is it a sole instructor or a team taught course?
   Course 1)
7. How many instructors/faculty are responsible for the course?
   Course 1)
   Course 2)
   Course 3)

8. Faculty from which disciplines participated in the course?
   Course 1)
   Course 2)
   Course 3)

9. Which semesters (quarters) is this course offered?
   Course 1)
   Course 2)
   Course 3)

10. Does the course still exist?
    Course 1) Yes (  )  No (  )
    Course 2) Yes (  )  No (  )
    Course 3) Yes (  )  No (  )
    If no, why was the course discontinued?
    Course 1)
    Course 2)
    Course 3)

11. For all the courses listed above, what are some of the most important reasons for teaching them as interdisciplinary design courses?
    •
    •
    •
12. What are the most successful interdisciplinary aspects of these courses?
   •
   •
   •

13. What are the least successful interdisciplinary aspects of these courses?
   •
   •
   •

14. Based upon your experiences, with these interdisciplinary design courses, what are the most important benefits to the students?
   •
   •
   •

15. What could be done to encourage you to develop more interdisciplinary design courses at your institution?
   •
   •
   •

16. What do you think are the primary educational advantages and disadvantages of interdisciplinary design courses?

   Advantages:
   •
   •
   •

   Disadvantages:
   •
17. Additional comments;

(If you are willing to share information, please attach a copy of the syllabus to your email reply to this questionnaire. Please number the syllabi to match questions 1-10.)

This is the end of category 1 questions. Thank you so much for spending your time to answer these questions. You do not need to complete category 2 questions.
Please email the completed questionnaire to tskoo@ncsu.edu.
If no, please answer these category 2 questions;

1. In your institution, are there any interdisciplinary design courses between architecture and landscape architecture?
   Yes (  )  No (  )
   If yes, why do you not teach these courses? Please list specific reasons.
   •
   •
   •
   If no, what do you think are the factors hindering interdisciplinary design courses in your institution?
   •
   •
   •

2. As design educator, do you think interdisciplinary design courses are beneficial to the students in design disciplines?
   Yes (  )  No (  )
   If yes, what do you think are the benefits?
   •
   •
   •
   If no, why?
   •
   •
   •

3. Is there any plan for interdisciplinary design courses in your institution for near future?
   Yes (  )  No (  )
If yes, what will be the focus of the courses and what disciplines will participate in these courses?
Course 1)
Course 2)
Course 3)

4. If your institution did have interdisciplinary design courses involving architecture and landscape architecture disciplines, would you be willing to teach these courses?
   Yes (  )  No (  )
   If yes, what are the reasons for that?
   •
   •
   •
   If no, what are the reasons for that?
   •
   •
   •

5. Additional comments;
   •
   •
   •
   (If you are willing to share information, please attach a copy of the syllabus to your email reply to this questionnaire).

This is the end of category 2 questions. Thank you so much for spending your time to answer these questions.
Please email the completed questionnaire to tskoo@ncsu.edu.
Appendix F

**REMINDER:** Questionnaire; Interdisciplinary design education research, NC State University

**To: Professor ( )**  
**From: Tae seo Koo, College of Design, PhD candidate at North Carolina State University**

Please respond to this reminder. This email questionnaire was sent a couple of weeks ago to investigate the interdisciplinary design education. However, I did not receive your valuable answer yet. I know that you are so busy, but please spend your time to answer this email to move forward my PhD research effort.

I am a PhD candidate in College of Design at North Carolina State University and I am doing my PhD research on interdisciplinary design education and curriculum structures. My committee chair and adviser is Prof Art Rice. Your name was given to me by your Department Chair as someone who has experience in this area. This questionnaire is a major component of my dissertation research and your opinion will be important to my research effort. (The attached questions should not take more than 30 minutes to complete)

This short e-mail survey asks some questions about interdisciplinary design education, methods, and design teaching experiences. Your responses will be organized and stored in a manner that will protect your confidentiality and after the responses have been recorded all individual emails will be deleted. There is no compensation or direct benefit to participants but I hope to develop a better understanding of interdisciplinarity among the design disciplines, designers, and design educators.
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Thank you very much for spending your time to do this survey. I appreciate you sharing your opinions and responses. At the conclusion of my research I would be happy to share with you a summary of my findings. If you have any questions about this research, please indicate so in your return email.

My email address is tskoo@ncsu.edu and telephone number is 919.000.0000.

Please return the attached Microsoft Word Document by MM/DD/YYYY in order to move forward in this research effort.
## Appendix G

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**Notes:**
- **Q1** represents the number of students enrolled in the program.
- **Q2** indicates the number of teaching staff.
- **Q3** shows the number of courses offered.
- **Q4** reflects the number of seminars conducted.
- **Q5** represents the number of lab sessions.
- **Q6** indicates the number of lecture hours.
- **Q7** shows the number of studio hours.
- **Q8** represents the number of office hours.
- **Rank** indicates the priority ranking of the program.
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Appendix L

Q11

For all the courses listed above, what are some of the most important reasons for teaching them as interdisciplinary design courses?

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<th>Why</th>
<th>What</th>
<th>How</th>
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<td>Promotes integration</td>
<td>Needs team effort</td>
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<td>• promotes integration of majors in the School</td>
<td>• design as practiced is a team effort and requires the ability to work together and utilize the strengths of each discipline</td>
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<td>• Community design pedagogy</td>
<td>• In order to succeed in interdisciplinarity after graduation, team working knowledge, skills, and abilities (KSA) must be learned and practiced during the formal education of professionals just as the professional KSA must be learned and practiced in the school</td>
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<td>• responis to community needs with all of the necessary perspectives</td>
<td>• The subject matter itself is interdisciplinary. To give students the experience of working with others</td>
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<td>Builds recognition &amp; respect</td>
<td>• Understanding of relationships between architecture and landscape, working on group projects can elicit a more powerful response to the above relationships</td>
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<td>• Can build recognition and respect between disciplines</td>
<td>• Students need to learn to work across disciplines</td>
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<td>• Interdisciplinary courses cannot absolve the curricular demands of all the disciplines involved — they represent a new synthesis that should not be forced to address specific learning outcomes central to each discipline</td>
<td>• Coordination among faculty is essential and time-consuming, and therefore should be compensated in some way (such as reduced teaching load)</td>
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<td>Exposes students to disciplinary learning</td>
<td>• to help students learn how to work with other disciplines</td>
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<td>• Nature of Urban Design</td>
<td>Shares a common language</td>
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<td>• exposure to a variety of disciplinary ways of thinking &amp; processes</td>
<td>• design of the built environment shares a common language, which can be lost if students and faculty are not actively engaged in work with allied disciplines</td>
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<td>• Architecture students learn more about site and planning landscape issues</td>
<td>• Engage students in the continuing dialogue of what constitutes the beautiful</td>
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<td>• Students learned about open space within and outside buildings</td>
<td>Expands sharing information</td>
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<td>• Explore the relationship of drawing with design thinking</td>
<td>• Cover similar information for all of the design disciplines</td>
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<td>• Requires coordination between LA's and Arch's. Both must understand the interior / exterior relationships.</td>
<td>Broaden students' perception of historic design practice</td>
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<td>Understands collaboration</td>
<td>Broaden students' perception of emerging design practice</td>
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<td>• Digital Media is a natural collaborative exercise</td>
<td>Expand students' knowledge of related disciplines</td>
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<td>• Better design and planning solutions could be achieved through and interdisciplinary collaboration that has problem focused approach as opposed to a profession focused approach</td>
<td>Efficiency across the disciplines</td>
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<td>• Helps students to understand the importance of collaboration</td>
<td>Preparing real world experience</td>
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<td>• Project focus on neighborhood revitalization in disinvested communities requires a collaborative approach</td>
<td>• Preparing students for real life work</td>
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<td>• Shared curricular content / collaborative practice</td>
<td>• Planning and design do not take place in the real world. Professionals will have to work on either the multidisciplinary approach (the most common case) or the interdisciplinary approach (the best case) in the real world to succeed</td>
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<td>Students in these courses are all beginners and benefit from learning about the different professions as a way of introducing them to their chosen fields and exposing them at an early stage to collaborative opportunities</td>
<td>• Get students exposed to the real world</td>
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Needs expertise

• Need for more expertise
• Students may be frustrated initially, but many later report that the interdisciplinary experience was very helpful to their later professional careers.
Appendix M

Q12: What are the most successful interdisciplinary aspects of these courses?

**Why**
- Increase communication
  - how to communicate with other professionals
  - cross-discipline perspectives
  - dialogue between students from different disciplines helps students learn more about their own discipline as well as other disciplines

**What**
- Builds recognition & respect
  - building respect and understanding of buildings between students, and sometimes faculty, on commonalities and differences in the core knowledge areas of each discipline
  - building awareness of the combined and unique contributions each discipline offers in the larger lived-in world
  - mutual respect and willingness to view others' perspectives of the same issue
  - in-discipline awareness
  - the increased understanding of the design process of other disciplines

**How**
- Needs team approach
  - team approach for professors
  - ability to design and organize a course that educates students about each other (both individual and discipline-based) strengths and to develop a team-based approach to generate a better design and planning solution that individual student or individual discipline could not generate if they were to work alone or in a discipline-based approach.
  - student experience with x-discipline, working with clients
  - group work and dynamics

**Therefore**
- Expands disciplinary learning
  - peer to peer learning
  - learning across disciplinary/ professional boundaries in productive ways
  - to be able to generate, plan and design alternatives that cannot be classified by discipline
  - learning about site analysis and site orientation of architecture
  - expand student's knowledge of related disciplines
  - allows for a much more comprehensive examination of the regulatory and environmental design issues than any one discipline could accomplish
  - students learn about the other discipline

- Has real world experience
  - working on a real project, capitalizing on strengths of disciplinary knowledge
  - ability to design and organize a course that eliminates the student's tendency to go to their own comfort zones of their own discipline/ professions only to come back to generate a patchwork similar to multi-disciplinary approach of the profession after graduation. (Do not allow architectural students to work on building plans, landscape architecture student to work on site design then come together to present.)
  - the students produced a neighborhood plan to be used by our community partner
  - realistic training for interdisciplinary work in later professional careers

- Shares information
  - cross fertilization of professional ideas
  - better product
  - engage students in open discussions of theory and ideology
  - understanding the power of design thinking through the use of graphic tools
  - trans-discipline outcomes
  - the shared conceptual thinking, stronger solutions

- Creates collaboration
  - collaborating with and learning from allied disciplines
  - team collaborations

- Differs viewpoints
  - differing viewpoints of the same basic knowledge
  - exposure to different ideas
  - students experience thinking outside of disciplinary terms/ approaches
  - interchange and dialogue among students from different disciplines
  - the debate that ensues among different ways of seeing and thinking about the issues
  - learning to work from outside of professional discipline and comfort zone
  - fostering of dialogue across disciplines, educational enrichment
  - students realizing that each discipline takes a different approach towards a design problem
Appendix N

Q13

What are the least successful interdisciplinary aspects of these courses?

Why

- Disciplinary arrogance
  - disciplinary and professional arrogance is occasionally an issue, more so between faculty than between students
  - differing rigor from differing programs
  - reluctance to accept other disciplines as equal to one's own
  - tendencies to marginalize other viewpoints

- Complex issues
  - complexity in the semester timeframe

- Disciplinary hierarchy
  - occasional issues with the perceived hierarchies of disciplines between students

What

- Time consuming
  - requires a larger amount of time to plan and build consensus or community between faculty in course preparation
  - time consuming
  - appreciation for the extra effort to make it happen
  - time to learn the 'language & processes' of different disciplines
  - communications and workload
  - time commitment required of faculty
  - the additional time required to develop interactions

- Operational logistics
  - scheduling
  - linear nature of real projects
  - matching scheduling and credit hour requirements, identifying a shared meeting time
  - logistics
  - difficulty scheduling
  - some difficulty coordinating class meeting times and getting the whole group together to review and discuss work progress
  - not being able to build up the relationship between students within the timeframe of one semester course—it needs to be sequential and developed in subsequent years or studies
  - difficulty in maintaining a curricular balance that meets the needs for all three programs
  - scheduling/credits/coordination/spaces/time
  - different skill set among disciplines
  - coordinating the time and credits across the disciplines so that students felt it was for

- Teaching/learning team process
  - teaching and learning the team process regardless of disciplinary or interdisciplinary approach and collaboration
  - time needed to convince students (particularly architecture students) to even try working on a team
  - students did not initially respect each other's contributions
  - students from the 3 schools working together on design projects
  - size of the groups and the complexity of the project
  - need for instructional content time such as lecture—this is sometimes minimized due to the work needed to develop group dynamics

How

- Student's perception
  - students' perception that only their discipline faculty will assign grade for them, which is not the case
  - students feel that they already know the material
  - planning students are not accustomed to studio as an environment for exploring and learning
  - addressing frustrations when students did not want to do work they felt outside their field (i.e., some architecture students wanted to design buildings and didn't feel that other parts of the project were worthwhile)
Appendix O

Based upon your experiences, with these interdisciplinary design courses, what are the most important benefits to the students?

What

Builds respect & recognition

- building respect and understanding the buildings between students, and sometimes faculty, on commonalities and differences in the core knowledge areas of each discipline
- building awareness of the combined and unique contributions each discipline offers in the larger lived-in world
- learning to respect each other
disciplines
- understanding the knowledge and awareness of related fields
- in discipline awareness
- appreciation for wider range of design and planning problems

Forming relationship

- forming lasting connections with students from related majors
- major benefit is to see how their individual knowledge fits with someone else's

Make collaboration

- learn how to collaborate with other professionals
- develop framework for cooperation, engagement and discovery

How

Learns team working

- working to gether amongst disciplines that work together in the profession
- team building skills
- Learning and getting comfortable to work with allied disciplines and professions.
- teamwork
- speaking the language of various professions and working together
- Team and group dynamics in emerging professional practice
- working with others (negotiating skills)
- teamwork
- increased ability to work with others and understanding differing perspectives

Realizes disciplinary thinking

- Learning how persons in other disciplines think
- Critical thinking skills
- students realizing that each discipline takes a different approach towards a design problem
- cross discipline perspectives
- moving students outside their comfort zone – questioning the artificial boundaries they sometimes put on what they consider the professions.

Expands disciplinary learning

- learning how knowledge is seen and valued by other disciplines
- learning how to value others work and participate in the overall processes
- designs and graphic presentations were significantly better than individual, discipline-specific work

Therefore

Having real world experiences

- work up to the level of the hardest working professionals
- Having the real world experiences while they are still in the school.
- Student experience working with “clients”
- Better prepared to enter into the profession

Improving communication

- speaking the language of landscape architects and architects as an exchange
- improving ability to present and debate ideas
- how to communicate with other professionals

Reaching better solutions

- Having more creative, feasible, reliable, defensible solutions.

Having broader learning

- students seeing outside the architecture box
- Students experience thinking outside of disciplinary terms/approaches
- Broader historical perspective
- the learning was deeper and more significant (more thorough background research)
- exposing students to the expertise of others
- understanding how to look at something familiar at a new angle
Appendix P

Q15 What could be done to encourage the development of more interdisciplinary design courses at your institution?

<table>
<thead>
<tr>
<th>What</th>
<th>How</th>
<th>How</th>
</tr>
</thead>
<tbody>
<tr>
<td>Needs broader perspectives</td>
<td>Institutional support</td>
<td>Provides funding</td>
</tr>
<tr>
<td>* not thinking about the world in a holistic manner</td>
<td>* institutional value of interdisciplinary studies – especially in promotion &amp; tenure review (additional work for interdisciplinary activity and the studio approach)</td>
<td>* funding</td>
</tr>
<tr>
<td>* Students need to look beyond themselves in order to learn how to work with others to learn</td>
<td>* institutional support</td>
<td>* Give funds to help set up and administer the courses</td>
</tr>
<tr>
<td>* Departments need to commit resources so that interdisciplinary courses can be more valuable for college and university</td>
<td>* possibly moving such courses to the college level so that we wouldn't have to coordinate all the pre-existing expectations from each of the departments – i.e. fitting in the course titles, credits, times, etc.</td>
<td>* provide resources (time and funding) to develop interdisciplinary projects</td>
</tr>
<tr>
<td>Shows other institution's efforts</td>
<td>Provides incentives</td>
<td></td>
</tr>
<tr>
<td>* show them that higher ranked institutions are doing it</td>
<td>* incentives for more teachers willing to take on the extra work</td>
<td></td>
</tr>
<tr>
<td>* One course is all we need</td>
<td>* reduction of teaching loads</td>
<td></td>
</tr>
<tr>
<td>Expresses value of interdisciplinary class</td>
<td>Encourages voluntary participation</td>
<td></td>
</tr>
<tr>
<td>* I continue to teach one of these and, with the exception of a possible design studio, I don't think that I can do more with my personal and professional commitments</td>
<td>* Do not force interdisciplinary courses as a required part of the curriculum as it may bring uninterested, unmotivated students and faculty together to ensure a successful, satisfying educational experience. Let the successes of voluntary participation with inclusive opportunities to guide the encouragement and involvement process.</td>
<td></td>
</tr>
<tr>
<td>Supports administrative approach</td>
<td>Needs moral support</td>
<td></td>
</tr>
<tr>
<td>* administrative understanding</td>
<td>* moral support</td>
<td></td>
</tr>
<tr>
<td>* take the initiative to set them up</td>
<td></td>
<td></td>
</tr>
<tr>
<td>* administrative philosophy that supports interdisciplinary work</td>
<td></td>
<td></td>
</tr>
<tr>
<td>* simplify administration of the courses (currently there are sections for each discipline)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>* administrators (department chairs) need to support the idea</td>
<td></td>
<td></td>
</tr>
<tr>
<td>* institutional administrative barriers need to be overcome on my campus (accounting for space, instructional units, teaching load credits, etc.)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix Q

Q16

What do you think are the primary educational advantages and disadvantages of interdisciplinary design courses?

Advantages

What

• building respect and understanding of the buildings between students, and sometimes faculty, on campuses and differences in the core knowledge areas of each discipline
• building awareness of the combined and unique contributions each discipline offers in the larger lived world
• students learn differences between disciplinary presuppositions
• more conducive to experimentation with ways of teaching and obtaining student feedback
• learn to respect each other
• gains new perspectives of other disciplines
• in discipline awareness

How

• learning the other languages

Learning languages

• Broadens the students knowledge
• enhances life-long learning skills
• To be able to generate planning and design alternatives that cannot be classified by discipline
• students learn from each other
• stimulating and creative learning environment
• ability to see how one set of knowledge relates to another
• Wider research focus

Critical thinking

• professional understanding
• enhances critical thinking
• Modeling acting as a whole person
• Critical thinking skills
• expanded ways of thinking about design issues
• level of work can take on more complex problems

Communication skills

• enhances communication skills
• interactive communication skills
• communication skills

• enhances team building skills
• Ability to design/plan organize a course that educates students about each others (both individual and discipline based) strengths and to develop a team based approach to generate a better design or planning solution that individual student or individual discipline could not generate if they were to work alone or in a discipline based approach

Work as teams

• Group thinking and dynamics
• Shared opportunities to engage larger scale projects
• Team building skills
• learning team skills

• cross fertilization of design ideas
• Ability to design/plan organize a course that eliminates students' tendency to go to their own corners or comfort zones of their own disciplines/professions only to come back to generate a patch work similar to multi-disciplinary approach of the professionals after their graduation. (Do not allow architectural student to work on building plans, landscape architecture student to work on site design then come together to present.)
• the work is expanded in depth based on various points of view
• Broad perspective on issues
• multiple points of view on common problems
• Prepares students better for practice
• expanding design to new scales, approaches, etc.
Appendix R

Q16

What do you think are the primary educational advantages and disadvantages of interdisciplinary design courses?

**Disadvantages**

**What**

- Dealing with professional or disciplinary arrogances
- Becoming more conversant in the disciplines - broader awareness of other disciplines needed by all faculty involved
- Working through culture of devaluing other disciplines work
- Faculty who are involved in interdisciplinary research and scholarly activities tend to be looked down by their disciplinary colleagues. This is a serious limiting consideration for why younger/junior faculty is not as willing to get involved in interdisciplinary work
- Departmental barriers

**How**

- More work for the instructor
- Extra care is needed in defining learning outcomes and measures for different students
- Takes more coordination and preparation effort (usual faculty complaint)
- Can be compartmentalized into preconceived roles if not organized and lead properly
- Time to navigate multiple ways of knowing
- Intensive for professors
- Interdisciplinary courses take more preparation time and they require more competent faculty members who are comfortable crossing the disciplinary boundaries to teach and get involved in interdisciplinary scholarly and creative endeavors.
- Extra time to create and manage
- "Lead-time" in bringing students to acceptance of the premise of the course
- Time-consuming for faculty to coordinate
- Longer periods of time to prepare the projects
- Time intense if all faculty are not on board
- Timing issues of disciplines related to real world interdisciplinary teams
- Time commitment

**Ambiguous references**

- In an upper level design studio, it can be difficult to have students contribute their disciplinary expertise in the development of a project, either individual or group. As students have a tendency to try to become the other discipline without the coursework to back it up.
- More questions than answers
- Scary not understanding another profession
- If not planned and organized in advance with due diligence, interdisciplinary courses may encourage wateraing down the professional or disciplined based theories, knowledge, skills, and abilities. This is one of the most common reasons for unsuccessful interdisciplinary courses.
- Wider, diverse and sometime ambiguous references
- Lack of commitment from departments

**Team teaching**

- Teaching has to be very focused with team teachers
- Team teaching less faculty autonomy

**Large group of students**

- Students tend to remain within areas of expertise
- In some instances, typically when students are not at the same level, skills with representation and design may vary and result in an imbalance in the quality of work conducted by students in one major relative to another.
- Large group of students
- Individual is often times hidden within work, so it is hard to evaluate how one student progresses
- Dynamics of group can interfere with establishing and following through with project goals

- New vocabulary

- Need for additional question and answer periods in every class due to new vocabulary
Appendix S

Q17 Additional comments:

What

Needs for interdisciplinary courses:

- These courses are essential for future practitioners and academics.
- They need to occur across disciplines from other academic units (health, business, etc.).
- They provide community service possibilities.
- I believe in interdisciplinary study as a way to educate students about relationships that are similar and different between areas of study.

How

Needs more collaboration in the professional schools:

- We need more design collaboration in the professional schools.

How

Requires increased faculty efforts:

- As professionals in landscape architecture, if we wish to lead in the real world (post-graduation), then as faculty we have to take the lead to create opportunities for interdisciplinary courses by going and convincing our colleagues in allied disciplines. They will usually not come to us and seek such joint efforts. In other words, if we are going to talk to talk of interdisciplinary, we got to take the walk in the school.

- This is a topic that about which I am passionate and have only been able to do individual projects, rather than a full course, as interdisciplinary learning. Why? Curricula tend to be loaded with discipline-specific learning objectives that may be infeasible. It is difficult to meet pedagogical goals for two different disciplines in one course. The interest in interdisciplinary projects/courses usually comes from the faculty. If they teach students at different levels, they may never have the opportunity to collaborate. Many administrators (deans/chairs and deans) do not support interdisciplinary initiatives for any number of stupid, and often personal, reasons. Therefore, it is risky for tenure track faculty to pursue interdisciplinary education. My points here are that it is not easy to do. On the other hand, I currently teach landscape architecture in a college of agriculture. Our students are physically and intellectually isolated from the other design disciplines and could benefit tremendously from interdisciplinary courses.

How

Lacks institutional support:

- Without institutional support these courses are not sustainable.
- Institutional emphasis & valuation of traditional lecture models for teaching & learning.

Inflexible curricular structures:

- Disciplinary curriculum which focus on enculturation of students into their discipline.
- University curricular structures which segment student learning into semesters. Limitation on faculty, created by accreditation requirements for different professions.

Academic constrictions:

- Time and effort limitations of tenure stream faculty with high research & grant expectations by the university limit ability to explore new teaching pedagogies – such as developing integrated studio experiences.
- The major barriers I see are: traditions of disciplinary autonomy in the classroom.