Introducing transdisciplinary design thinking in early undergraduate education to facilitate collaboration and innovation

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Introducing transdisciplinary design thinking in early undergraduate education to facilitate collaboration and innovation

by

Edward Joseph Cupps

A thesis submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of

MASTER OF FINE ARTS

Major: Graphic Design

Program of Study Committee:
Roger E. Baer, Major Professor
Sunghyun R. Kang
Steven Herrnstadt

Iowa State University
Ames, Iowa
2014

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Innovation is the child of imagination.

-Sir Ken Robinson
ABSTRACT

*What we need are new choices – new products that balance the needs of the individuals and of society as a whole; new ideas that tackle the global challenges of health, poverty, and education; new strategies that result in differences that matter and a sense of purpose that engages everyone affected by them (Brown, 2009).*

The upcoming generations of college graduates will be inheriting the most complex world of opportunities and challenges that has ever existed. Professionals in many design, engineering, and other related fields will be forced to adapt to rapid change in our environment and resource constraints, and presumably in our social structures as well. We need to give the builders of the future the tools to address emerging problems effectively and collaboratively, without preconceived frames of the problems to be solved or the limits of their expertise in solving them.

Design thinking, a term that was coined only in recent decades, has been gaining increased attention as a definable process that allows rapid, innovative, and user-centric problem solving, much in tune with the rapid pace of change in a technology-driven world. Numerous designers and theorists have weighed in on this concept, and programs such as Stanford University’s graduate-level d.School have developed it as a practical curriculum that has immediate impacts on a world much in need of “out-of-the-box” thinkers; i.e., designers.

At Iowa State University (ISU), classes that touch on design thinking have been offered in several fields of design such as industrial design or architecture, but not specifically for visual or interaction design—and indeed, not in a context that encourages transdisciplinary innovation or that harness the creativity and ideas of disciplines outside design. Nationwide, there is a gap in
curriculum development at the undergraduate level—both for teaching undergraduate design students and for introducing design thinking to our future entrepreneurs and engineers who will be shaping our physical world.

My goal has been to capture insights on design thinking education, practice, and on the design students for which an undergraduate class could be offered. In Appendix A, I present such a prototype syllabus as a starting point for a full curriculum. This product, albeit only a beginning, was only possible after a prolonged and recursive research and ideation process, which constitutes the body of my thesis. As a practitioner of design thinking, I needed to understand at a deep level the challenges and benefits of such a class, through empathy with both undergraduate design students and those experienced design thinkers who teach or lead groups of designers. On the most basic level, I needed to discern, “What would such a class teach?” and “Is such a class necessary?”

My guiding questions were as follows:

Q1: What commonalities exist between the various design thinking process models that can be synthesized into a generalized theory of design thinking?

Q2: What does experience say are the basic tools and challenges in the practice of design thinking and therefore the most important educational tools of the practice to introduce to students?

Q3: Do undergraduate design students think in a way that is consistent with a general theory of design thinking?

In Chapter 2, I review the literature written about design thinking, including that which predates the exact term, but laid the groundwork for the explosion of conceptualization that followed. In Chapter 3, I describe my three basic lines of research: 1) What do professional
designers say about design thinking and teaching design thinking? 2) How do students “naturally” design, when given a design assignment? 3) What have I learned in my own career as a designer? In Chapter 4, the results of this research are presented. Chapter 5 analyzes the results and presents the next steps to take.

Specifically, I read extensively in the design literature, interviewed 8 professional designers and/or design teachers, and observed and interviewed 7 art and design students approaching a creative assignment, which I also participated in. These observations provided insights that will guide my future work.

Overall, I learned that the design thinking model can be generalized, despite the multiple forms of its articulation in the literature. I summarized the process as occupying three stages: Discover, Create, and Build. The various processes and the recursiveness of the model are captured by this explanatory graphic below:

Other assumptions and precepts of design thinking, that do not fit into this visual, were also collected in my model. These include the need for collaboration, optimistic thinking, etc.

The second important thing I learned is that students do need explicit training in the design thinking process and related methods. While certain aspects of the process, such as its recursive nature, come naturally to them, the key elements of empathy and user validation were
missing from my observations. Design is still a personal expression to these students.

Unfortunately, I was not able to examine collaborative work in the research I did, but there is plenty of anecdotal evidence to suggest that undergraduate students do not know how to collaborate effectively across disciplines.

My job, of course, is only 2/3rds done. I have arrived at a prototype syllabus and guidance for teaching such a class, but I have not validated or deployed it with apropos lessons or rubrics. In future research, I hope to extend the research of this thesis into the design thinking classroom, observing transdisciplinary student teams collaborating on a project, and possibly further into their student and professional careers.
CHAPTER 1 - INTRODUCTION

1.1 - Overview

The idea of using design thinking as a framework to address ill-defined or wicked problems has gained significant traction over the past several years. In disciplines ranging from experience design to industrial design, architecture, and business, the conscious application of design thinking has been having impacts on the way design and non-design professionals approach problems. There are many definitions of design thinking, but one my favorites is from Thomas Lockwood, who described it as “applying a designer’s sensibility and methods to problem solving, no matter what the problem is” (Lockwood, 2010). He goes on to note that the use of design thinking is not a substitute for design or for designers. Rather, it is an engaging approach to innovation that employs abductive reasoning (Martin, 2006), intuition (Cross, 1982), and empathic processes (Lockwood, 2010), often in transdisciplinary, and collaborative contexts.

Nationwide, some design educators have begun teaching the practices of design thinking in settings ranging from K-12 elementary schools to graduate and undergraduate programs, in particular for industrial design. The d.School graduate program at Stanford, highlighted in a recently aired PBS documentary Extreme by Design, is perhaps the most noteworthy (King & Schwartz, 2013).

At Iowa State University (ISU), classes that touch on design thinking have been offered in several fields of design such as industrial design or architecture, but not specifically for visual or interaction design – or more generally for transdisciplinary innovation that harness the creativity and ideas of disciplines outside design. Even nationwide there has been little in the way of curriculum advancement for teaching undergraduate design students in particular, much
less general undergraduate populations – our future civic, business, and nonprofit leaders – this
critical approach to divergent thinking and innovation. Why critical? Tim Brown of IDEO
perhaps said it best:

“What we need are new choices – new products that balance the needs of the individuals
and of society as a whole; new ideas that tackle the global challenges of health, poverty,
and education; new strategies that result in differences that matter and a sense of purpose
that engages everyone affected by them” (Brown, 2009).

The upcoming generations of college graduates will be inheriting the most problematic
world of opportunities and challenges that has ever existed. This ever-increasingly complex,
interconnected, and interdependent world must evolve into a innovative, creativity- driven
culture to tackle the wicked problems that conventional approaches often fail at (Riddel &
Webber, 1973). We need to give the innovation leaders of the future the tools to create such a
culture.

What is a creative culture? According to educator Sir Ken Robinson there are three
important processes in necessary in a creative culture, whether the workplace or in education.
First you must foster imagination. “The ability to bring to mind events and ideas that are not
present in our senses” (Robinson, 2011). Then you must inspire creativity. “The process of
having original ideas that have value” (Robinson, 2011). Lastly, you should cultivate
innovation.” The process of putting together original ideas into practice” (Robinson, 2011).

As will be described in detail in the following chapters, I believe that design thinking is
an emerging framework for addressing these process needs of imagination, creativity, and
innovation in a way accessible not only to designers, but to non-design disciplines as well. It is not a panacea for every challenge; however, when done right it is a flexible, collaborative, and empathetic approach. If broadly taught to the undergraduates of today, design thinking may unleash their potential for innovation leadership and creativity.

How might we introduce to undergraduates the principles of design thinking and its various methodologies that will foster not only interdisciplinary, but transdisciplinary innovation? It is proposed that a design thinking course or set of courses that integrates designers of all kinds, collaborates with other non-design disciplines and delivers results in a measurable and consistent way, is an ideal starting point in general college education. The central idea, one evoked recently by Agile and design thinking consultant Jeff Patton, is one where design isn’t left strictly to the designers, but becomes a forum for discovery that involves multiple disciplines (Patton, 2011).

1.2 - Purpose

It is the purpose of this research to define the constraints, syllabus, and basic pedagogy that will form the basis for a class curriculum for teaching design thinking to prospective student innovators at a foundational undergraduate level (freshmen through sophomores) at ISU. Ideally the class should teach design thinking to more than designers, involving students in advertising, marketing, business, engineering, education and other fields in a transdisciplinary, cross-college, collaborative environment that reflects the need for innovative and flexible solutions to today’s complex and ever-changing problems. This class should prove to be a foundational experience in a student’s academic career, preparing them with important workplace skills in collaboration, but also empowering them with new visions for problem-solving leadership.
To achieve the proposed objective, I will examine in detail current literature and scholarship focused on design thinking, collaboration, and current practices in teaching design thinking at the undergraduate and graduate levels, and even in K-12 schools. This knowledge, when synthesized with personal experience and two sources of primary data research, resulted in a curriculum, presented herein, that can be tested and implemented in an actual undergraduate classroom.

The first source is a participatory observation study to gain first-hand knowledge of how art and design students think and do their work. This was accomplished by attending a creativity-focused class that allows for a wide freedom of action. The students could therefore do ‘what is natural’ for them in designing. I observed to test whether their actions supported the basic assumptions of how designers think based on a general model of design thinking as defined by Brown (2009), Martin (2009), Cross (2011) and Lawson (2005). The observations also provided me an opportunity to reflect on how their nascent approaches to design might be best harnessed or guided by a design thinking curriculum.

The second data source consists of interviews with prominent design educators and professionals in the ISU community and beyond to gather input on the practical ideals of design thinking, i.e., those practices used in everyday real-world experience. These interviews will help to identify challenges and potential solutions to teaching not only the principles of design thinking but also their real-world, experiential implementation.
1.3 - Boundaries

This paper is not an attempt to contribute to theoretical research on design thinking or express an ideal framework or set of methodologies for it. Rather, its goal is to articulate a general theory of design thinking (a mobile or “working” framework, if you will) that can be taught to undergraduates within the limitations of the three primary research questions listed below. Ideally, this research should serve as a springboard for further study of design thinking in the classroom as well providing a potential framework for further iterations of design thinking curricula (e.g., second-level, third-level). The actual teaching of the class and details of lessons or rubrics are not within the boundaries of this research; however, its application could be part of subsequent studies. Lastly, while this research will look at recommended approaches for teaching design thinking, it will not focus on the ideal design methods taught in such a class. The validity of any methods will need to be tested in the context of the classroom environment.

1.4 - Research Questions

1.4.1 - Overview

The course is intended to span the theoretical and the practical, and at the same time be responsive to students’ intuitive approaches to problem-solving. Hence, the three questions of the present work reflect the theoretical, the practical, and the intuitive dimensions of the problem, How to Teach Design Thinking. To address these I designed the three sets of research previously described: a literature review, interviews with design professionals, and observations and interviews of beginning student designers.
The definition of design *processes* – related but not identical to design thinking – is itself a moving target. Hugh Dubberly had by 2008 alone cataloged over 150 variations (Dubberly, 2008) from analytic, to linear, to cyclic approaches; yet they are all equally designing. Conversely, Bryan Lawson writes that “designing is far too complex to be describable by a simple diagram” (2005). This does not refute Dubberly, but rather confirms his observation that, “if we wish to improve our products, we must improve our processes; we must continually redesign not just our products but also the way we design” (2008). So, essentially a good designer is constantly redesigning how they design.

Nonetheless, despite the acknowledgement that how a designer designs is on the face of it highly chaotic, design thinking theory is predicated on the idea that there *is* some kind of underlying commonality to all design processes - i.e. the way a designer thinks. The design thinking literature points out (e.g. Brown, 2009; Martin, 2009; Cross, 2011, etc.) that design thinking is based on the seemingly chaotic approaches that designers use, and by extension can be learned and adapted by non-designers for problems not traditionally considered a design problem.

There are of course practical considerations when approaching design thinking as an instructional exercise. The literature gives examples of a myriad of design methods (Jones, 1970; Brown, 2009) that can be applied to design thinking, beyond observational research, storyboarding and brainstorming. Ellen Lupton for instance specifically covered many of them such as forced connections, sprinting and physical thinking in a recent book (2012). There are also questions of how to foster effective communication between different disciplines in a collaborative environment, balancing implied hierarchies, and what pedagogical approaches may be most effective.
Lastly, when considering the intuitive aspects of design thinking and the aforementioned assumptions that designers think in a particular way, studies from Lawson (2006), and Cross (2011) bear out that designers do think in a generalized way that leverages their intuition, creativity, and insight toward abductive problem solving. However, Lawson warns us that, “design is a highly personal and multi-dimensional process (2006).” With this in mind, it is important to observe the developing design processes of a sampling of the students for which this study ultimately will be applied.

1.4.2 - Three Basic Questions

Q1: What commonalities exist between the various design thinking process models that can be synthesized into a generalized theory of design thinking?

Q2: What does experience say are the basic tools and challenges in the practice of design thinking and therefore the most important educational tools of the practice to introduce to students?

Q3: Do undergraduate design students think in a way that is consistent with a general theory of design thinking?

1.5 - Definitions of Key Terminology

Abductive Reasoning - An approach to reasoning that takes an partial set of observational data and though applied experience attempts to find the best fit solution to a problem. Good examples outside of design include a medical diagnosis or jury deliberations.

Convergent Thinking - A method for creative thinking that takes multiple potential answers to a
problem, organizes them, creating commonalities that converge to a potential option or options based on pre-determined constraints. It is commonly used in tandem with divergent thinking (see below).

*Design Methods* - The myriad rule systems, techniques, or approaches that designers employ in the course of their work. Sometimes used interchangeably with *Design Process*, but for purposes of this paper will be defined separately.

*Design Process* - An approach or framework to bringing multiple design methods together to create a systematic series of steps that is repeatable and can be applied to design challenges.

*Design Thinking* - A human-centered process-based approach to problem-solving that focuses on building empathy with a person’s problem, applying divergent/convergent thinking to produce multiple potential solutions, and through abductive reasoning to review, test, and apply the best option. While useful for design activities, design thinking can be applied to solutions outside of the realm of design, such as business or services.

*Divergent Thinking* - is a method for creative thinking that allows for the generation of multiple possible solutions based on the known constraints in a short (or time-boxed) period of time. The methods used (such as story-mapping, sprinting, brainstorming, or sketching) often encourage spontaneous and additive ideation and discourage overt criticism. It is commonly used in tandem with convergent thinking (see above).

*Empathy* - is the work of an observer to understand the emotional state and experience of another. This is more precisely defined as cognitive empathy, as opposed to affective empathy, which is an observer’s emotional response to another’s emotional state.

*Integrative Thinking* - Related to abductive reasoning, and divergent/convergent thinking,
integrative thinking is the ability for a thinker to, according to Martin, “hold two conflicting ideas in constructive tension” (2007), and instead of accepting one or the other, make an intellectual choice to integrate those ideas to create something novel and potentially more effective than its parts.

*Rapid Prototyping* - is the discipline of creating design prototypes that can be used to test design ideas and assumptions without a large investment in time, resources, or energy.

*Wicked Problem* - first coined by Horst Riddel and Melvin Webber (1973), a wicked problem is a unique and indeterminate problem that is not easily understood, is hard to measure, and for which any attempted solution cannot be true or false, merely good or bad. Kolko points out that not all difficult or ill-defined design problems are necessarily wicked, but those that have an “indeterminate scope and scale” tend to be (Kolko, 2012a).
CHAPTER 2 - REVIEW OF LITERATURE

2.1 - Introduction

Since the publication of Roger Martin’s *The Design of Business* in 2009 and Tim Brown’s *Change by Design* in 2008, and the articles by each author that immediately preceded them, design thinking has been gaining traction as an understandable design process that can be learned and applied systematically by designers and non-designers alike.

Recently, consultancies and firms beyond Brown’s IDEO have begun offering design thinking-related training and even certification to business, engineering, and design professionals. However, respected design luminaries have questioned whether the whole design thinking fascination is merely the latest business fad (Norman 2010) or simply a code word for the act of designing (Margolin 2012). Donald Norman notes quite eloquently that we have had creativity and intuitive “breakthroughs” throughout history. What makes design thinking different—if indeed, it is?

With this challenge in mind, the following review of literature will discuss the background of design thinking itself and its contemporary emergence, and the challenges - including Norman’s argument and partial retraction (Norman 2013). We will follow this with a review of several models of design thinking, several approaches to how designers think, and selected educational programs.

2.2 - Antecedents of Design Thinking

In order to construct an overview of the elements of design thinking to find commonalities to draw from in constructing a pedagogical approach, it is necessary examine
briefly several early contributors to the “prehistory” as it were of design thinking.

2.2.1 - Herbert Simon

One of the earliest influencers on what we call design thinking, though he never used that term, was Nobel Laureate Herbert Simon. Simon’s work on decision making cannot be understated. In *Sciences of the Artificial*, Simon laid out a model of decision making that resembles many subsequent design thinking frameworks. Simon’s three-phase model is deceptively simple:

- **Intelligence** - Search for and identify the problem, formulate how that problem relates to another possible situations to prevent solving the wrong problem, and then gather pertinent data that may inform potential solutions.

- **Design** - Ideate and review different rough solutions of the problem, judging each based on the underlying data and how well the problem is addressed. At this phase one is only trying to determine if an idea is a potential fit as a basic concept.

- **Choice** - The best solutions that come out of the Design phase are compared to each other and the merits of each weighed against both qualitative and quantitative measures. A ‘preferential’ solution should emerge, or if not, the process falls back to the Design or Intelligence phases for more data or more ideas depending on what factor is found to be lacking in the original solution options (Simon, 1969).

The ability to iterate ideas and incrementally improve designs is central to Simon’s model. To Simon, all of design activity is centered on constantly improving our artificial world
(or artifice) towards a preferential form—“preferential”, not “perfect,” as the ultimate artifice in Simon’s theory is the human brain, which by its nature cannot completely understand its environment, and so must try incrementally to improve its understanding. The problem is constantly being worked, with no final goal in mind. One must simply ask, ‘is this design good enough?’ (Simon, 1969).

To this end, Simon was an early proponent of what we today call rapid prototyping as well as concurrent observation and empathy. Simon noted, “to understand [the potential users], the systems had to be constructed, and their behavior observed,” meaning that to understand how people interact with a designed artifact, one needed to prototype that artifact, and observe how they engaged with it (Simon, 1969).

2.2.2 - John Chris Jones

In his work Design Methods (1970), John Chris Jones analyzed historical design processes and methods, identifying three critical phases that he believed were the “simplest and most common observations about designing.” (p. 63) The first is divergence, or breaking down the problem, determining its constraints, setting objectives, and creating the space to solve the problem. The second is transformation, or the point of highest creativity, where experience, inspiration, guesswork, and mistakes happen that help create patterns that Chris Jones calls, “everything that makes designing a delight.” (p. 66) The third critical area is convergence, where the designer narrows down all the possibilities, eliminates uncertainties, and ends up with one design to be “launched into the world” (p. 68).
2.2.3 - Horst Rittel and Melvin Webber

Rittel and Webber added to the foundations of design thinking with their coining of *wicked problems* in 1973 around the concept of planning (designing). They contrasted wicked problems with the types of problems found in science and nature, which could be addressed with the scientific method or similar rigid processes (Rittel & Webber, 1973). Wicked problems are unique and with no absolute solution. These types of problems require creativity to find potential solutions and judgment based on experience (abductive thinking) as to whether any particular approach should be “pursued and implemented” (Rittel & Webber, 1973).

2.2.4 - Nigel Cross

While not calling it *design thinking*, Nigel Cross in 1982 coined a related term called “designerly ways of knowing” (Cross, 1982). In the eponymously named paper, Cross opined that design is a “third culture,” with a way of thinking that is distinct from those of the sciences and the arts and humanities. Design’s underlying methods needed to be articulated in a new way if it was to become recognized as a distinct form of thinking (Cross, 1982). In the paper, Cross argues that design studies the “man-made world” and uses as its methods “modeling, pattern-forming, synthesis.” This is in contrast to scientific controlled experiments to learn about the natural world and the focus in the arts and humanities on exploring the human condition (Cross, 1982).

Effectively, Cross is arguing that designers’ way of solving problems is unique in comparison to non-designers—in effect a designer’s ability to make that creative leap of intuition was not guesswork, but the result of learned processes, methods, and a specific way of thinking. Cross cites Lawson’s early observational research on designers at work (Lawson, 1979), where
he notes that, “these studies tend to support the view that there is a distinct “designerly” form of activity” (Cross, 1982).

2.2.5 - Jay Doblin

In his seminal paper, “A Short Grandiose Theory of Design” (1987) industrial designer Jay Doblin offered a theory of design that he described as “ambitious, audacious, and probably offensive to the design fraternity.” He proposed that his simple guideline could be used “in solving all different kinds of design problems,” making it possible “to marry design processes to design problems” (p. 7). His starting point, the SPS model, is a simple proposition that design is “an event,” that starts with the state of what currently exists, journeys through a “process” and finishes with a preferred state that could be.

The two possible types of processes that Doblin sets in this event are direct design, where one executes a design through intuition-driven craft gained from training and experience; and indirect design, where the complexity of the design challenge forces the designer to use “messages, such as drawing and diagrams, to produce solutions” (p. 8). Doblin argued that indirect design breaks the process of getting from ‘what is’ to ‘what could be’ into three distinct phases: analysis, genesis, and synthesis.

- **Analysis** - Doblin defines this as “breaking something into its constituent parts”. By this he meant the breakdown of the design problem in the context of whatever relevant data is necessary (field research, interviews, data searches) to understand the underlying issues.

- **Genesis** – According to Doblin, the “essential activity” in this phase is “generating new information through the application of intelligence” (p. 9). The genesis phase is where
ideas are born based on the analysis, followed by a “search for insight” (1987) that leads to the right idea to take forward.

- **Synthesis** - In the third phase of synthesis, Doblin calls for the communication of the design idea through prototypes, what he would call ‘comps and models’. This is the execution of the design idea.

### 2.2.6 - Donald Schon

Schon, another early exponent of what we today call design thinking, opined that designing, “in its broader sense involves complexity and synthesis” (1987). This is not a mere observation of the facts of the design process, but one where Schon identifies several particularities of designing, especially in the nature of design framing—looking at a situation and through doubt and questioning, discovering the underlying problems to be solved—and in his observation that design is as unique and codified in its practice as science, with its own particular idioms (e.g., intuition, understanding context), traditions and expertise. In this way, Schon challenged the place of science as the prime discoverer of knowledge (Schon, 1987). Schon was also an advocate of the idea of reflection, wherein one takes a moment to step back and examine at how a particular design is working as well as the actions that have brought one to this point.

### 2.2.7 - Richard Buchanan

Buchanan noted the burgeoning interest in articulating design methodology as “strikingly evident” (1992), while still acknowledging that within the wide diversity of design methods and practices, no single definition covering all acts of design was possible. However, Buchanan did note that design (what he called *design thinking*) was ideally suited for addressing Rittel’s
notions of a wicked problem.

In particular, Buchanan noted two major points concerning the developing idea of design thinking. First was that design thinking is by definition a multidisciplinary practice that stands in opposition to the fragmented and self-siloed studies in the arts & sciences (Buchanan, 1992). The second was that Buchanan identified design thinking as a process for innovative problem solving beyond visual communications or physical artifacts. He identified two additional areas where design thinking can be found and applied successfully: “activities and organizations,” such as human experiences and businesses; and “complex systems or environments for living, working, playing, and learning,” such as broader questions of the human condition including ecological, social, and cultural challenges (Buchanan, 1992).

2.3 - Contemporary Design Thinking

Each of the pioneers listed above have had an effect on the designers and thinkers that follow and played a role in shaping their approach to design thinking. In this section we will examine two of these in particular, Tim Brown and Roger Martin, whose work has brought a spotlight on design thinking as a distinct, repeatable process for innovation inside and outside of traditional design practices. Their design frameworks form a baseline definition of “design thinking” against which earlier and subsequent approaches can be measured.

2.3.1 - Tim Brown

Tim Brown’s article in the Harvard Business Review, “Design Thinking” (2008), is perhaps one of the earliest and most oft-cited papers in the contemporary emergence of this concept. In this article, and his follow up book, Change by Design (2009), Brown focuses on the
experience of his Palo Alto-based company, IDEO, and its take toward design thinking in the areas of industrial, experience and service design. In effect, he suggests moving the act of designing away from a traditional, “downstream process” (Brown, 2008) to a strategic role in the discovery of new products (both physical and IT-driven products), processes, and ultimately business strategies. Brown’s work indirectly builds on much of the work of his antecedents, by acknowledging the role of the following aspects of design thinking and in particular design thinkers:

- **Collaboration** - Brown takes on the “myth of the lone creative genius” (Brown, 2008) by emphasizing the role of transdisciplinary design teams who not only work alongside one another, but also research, generate ideas, and prototype together.

- **Empathy** - Further, he notes the power of gaining a deep understanding of the user’s problems through direct observation and taking “multiple perspectives.” (Brown, 2008)

- **Integrative Thinking** - Whether using design methods such as brainstorming, lateral thinking (deBono, 1970) or divergent/convergent thinking, design thinkers use whiteboards, post-its, quick sketches, or whatever tool is handy to explore a wide variety of (often conflicting) ideas and discover potential solutions that are greater than the sum of their parts.

- **Optimism** - Brown sums this point up by noting that design thinkers, “assume that no matter how challenging the problem, at least one potential solution is better than the existing alternatives (Brown, 2008).

- **Experimentalism** - Brown calls for testing ideas and improving on them iteratively by using the minimal investment necessary to “learn the strengths and weaknesses of an idea
Brown divides the design thinking process itself into three phases. These are not pre-defined steps such as found in a waterfall process so much “as a system of spaces” (2006). By spaces, Brown implies that in each space there are a series of related, iterative activities that together create the framework of design thinking cycle. These spaces are inspiration, ideation and implementation.

- **Inspiration** is focused on identifying the constraints of the problem and/or opportunity. This means framing the problem loosely as further discovery may modify the nature of the problem. Inspiration calls for the designers to engage in “human-centered exploration”, gaining empathy for the nature of the user’s problem through observation and other qualitative research methods. This allows the team to set constraints for the ideation to follow.

- **Ideation** is focused on creation of a timeboxed divergent thinking session where as many ideas as possible are created to solve the problem. Here collaboration, communication, and positive attitudes are paramount. In *Change by Design*, Brown notes that in ideation all ideas are valid, crazy ideas are welcome and it is better to build on someone else’s idea than to be the devil’s advocate (the role of which should be avoided). Then the ideas are winnowed down through integrative thinking and applying constraints.

- Lastly, **Implementation** is the bridge from ideas to reality. This starts with prototyping, testing (internally and with real users), and iterating on the ideas. The results of this process may take one back into the Inspiration or Ideation phases as new discoveries are
made until a final design is accepted, engineered and marketed. This, Brown summarized, is where “the best ideas are developed into a concrete, fully conceived plan of action. (2009).

In summary, Brown’s article brought many of the ideas of design thinking such as empathy, collaboration and integrative thinking into a flexible framework for innovation that can be repeated and extended to address design challenges – a concept he extended in Change by Design.

While “Design Thinking” introduces Brown’s views of design thinking, his follow-up book, Change by Design, builds on them. While much of the book is focused directly on Brown’s experiences at IDEO, Brown offers additional design methods employed by design thinkers and expands on the three innovation spaces of Inspiration, Ideation, and Implementation.

- **Design Thinking is Exploration** - While a design team’s navigation through the spaces of innovation may seem chaotic or disorganized to the outside observer, Brown believes that, if “done right, [design thinking] will invariably make unexpected discoveries along the way.”

- **Importance of Interdisciplinary Product Teams** - At IDEO, Brown extols the belief that, “all of us are smarter than any of us,” (2009) meaning that successful collaborators regardless of their particular discipline are more effective when they work together through each of the spaces of innovation.

- **The T-Shaped Person** - Any professional designer (or non-designer for that matter), should
have a depth of knowledge in their field. Brown notes that these ‘I’ shaped people have
this depth, but are not necessarily the best collaborators despite their effectiveness, “in
the downstream world of design execution.” Effective collaborators in his opinion “cross
the ‘T’” by having, “the capacity and – just as important– the disposition for
collaboration across disciplines.” (2009). Engineers who have studied marketing or
psychologists who have embraced interaction design are good examples.

● Empathy in the Field - Brown notes that we are limited in our personal experiences, so to
gain a connection with the user’s problem, he advocates ‘getting out of the building’ and
observing how people live to understand the problem one is asked to solve. This personal
engagement gives insights in two ways, first understanding the problem in a first-person
context, and second, looking for opportunities to discover latent needs, which Brown
defines as needs that “may be acute but that people may not be able to articulate.”

● Divergent/Convergent Thinking - Brown builds on his earlier examples by detailing the
ideation process, analysis of the concepts, and synthesis of the most promising ideas. A
major point is the list of IDEO’s rules for ideation: “Defer judgment. Encourage wild
ideas. Stay focused on the topic,” and perhaps most importantly to “Build on the ideas of
others.”

● Enthusiastic Acceptance of Constraints - Paraphrasing Charles Eames, Brown notes that
what makes a designer a designer is “a willing embrace of constraints.” Constraints
afford the possibility of design because without them, it is hard for innovation to occur.
Brown groups constraints into three basic types: desirability - is this what we need and
does it make sense, viability - do we have the wherewithal to do this sustainably, and
feasibility - do we have the expertise and technical basis to make it happen? Ultimately
the goal of a design thinker is to balance these constraints, and find innovation through them.

- **Rapid Prototyping** - Detailing the experimentation principles of *Design Thinking*, Brown discusses rapid prototyping as a design tool which allows for the exploration of varied ideas at the same time in a quick and dirty manner, or as he puts it, ‘fast, rough and cheap.”

- **Storytelling** - This design method especially appears in two areas of design thinking. First in gaining the user’s story, or the human experience helps a design thinker in the inspiration phase to gain empathy with the user and identify opportunities and constraints. The second is in the implementation phase where, “every new idea must have a story.” In Brown’s perspective, storytelling is a necessary means to communicate the final idea outside of the studio.

There are some academics and professionals in design who have noted that, ultimately, design thinking *is* designing (Norman, 2010; Margolin, 2012). The process itself is based on the premise that designers think in a particular way (Lawson, 2006), to which in particular Brown concurs (2008). However, Brown notes the participatory part of design thinking makes it unique to design. He sums it up succinctly, “Design is about delivering a satisfying experience. *Design Thinking* is about creating a multipolar experience in which everyone has the opportunity to participate in the conversation.” (2009, p.192)
2.3.2 - Roger Martin

The year before Tim Brown’s “Design Thinking” article that illuminated how IDEO approached designing, Roger Martin had written the *Harvard Business Review* about how design thinking would be the next revolution in management education. Recalling Simon, Martin calls for the “establishment of a rigorous body of knowledge about the design process as a means of approaching managing as designing (2006) as a potential way of shaking up the current state of business education, which had reached what was a considered a crisis of relevancy. Martin advocated teaching non-designers how to think like designers to solve problems. This is both akin to and beyond pulling non-traditional designers and T-shaped people into collaborative design as per Brown. According to Martin, “the concept of design thinking can potentially address many of the criticisms currently being leveled at MBA programs” (2006).

Martin’s article in the *Harvard Business Review* and the book that followed it, *The Design of Business*, are valuable due to its direct extension of the process of design thinking outside of the studio space. Martin notes (as with Rittel and Buchanan) that design thinking is particularly adept at addressing wicked problems such as management, systems design, or even marketing/pricing strategies (Martin, 2006). By looking into Martin’s advocacy for design thinking in management, we can gain insights into creating a more generalized pedagogical approach to transdisciplinary collaboration and innovation.

Martin compares the organizational structure of “traditional” businesses to design shops such as IDEO where collaborative ideation, integrative thinking and abductive logic are the norm. In particular, he argues against the assumption in the traditional business model that constraints “are the enemy” (Martin, 2006) rather than the impetus for the creative drive. Martin compares four additional factors beyond constraints that define each structure including: flow of
work life, style of work, mode of thinking, and the source of status.

Like Brown, Martin takes pains to distinguish the act of design from design thinking, which is, “how designers think: the mental processes they use to design objects, services of systems…” This way of thinking differs from traditionally strict managerial processes that do not favor interdisciplinary teams or high levels of collaborative input. To understand how design thinking is advantageous to management, Martin breaks down design thinking into three aspects: cognitive, affective, and interpersonal.

- **Cognitive Aspects** - Martin points out that design thinking embraces not only deductive and inductive thinking, but also abductive thinking, which is minimized by contemporary management education, and could be of great use there. “A designer uses abduction to generate an idea or a number of ideas, deduction to follow these ideas to their logical consequences and predict their outcomes, testing of the ideas in practice, and induction to generalize the results” (2006). This is complemented by a designer’s view of a problem from a system level as opposed to just its parts.

- **Attitudinal Aspects** - Constraints are seen as barriers to the traditional management mind. For design thinkers, constraints are “embraced as the impetus to creative solutions.” They are net positives. Another attitudinal aspect is that designers avoid the “decision attitude” of traditional management, and instead have a “design attitude” that sees challenges as a chance to question opinions and seek inspired solutions, in other words to, “find the best answer possible,” and not go with an option “already at hand” (2005).

- **Interpersonal Aspects** - Martin emphasizes the role of empathy in design thinking. This takes two forms: first is understanding the users themselves and their point of view.
Second are the empathetic connections of a shared understanding in collaborative problem solving.

Martin continued his exploration of design thinking in 2008’s *The Design of Business*. Martin offers design thinking as a balance between strict analytical approaches to innovation and the pure creative impulse. “The most successful businesses in the years to come will balance analytical mastery and intuitive originality in a dynamic interplay that I call *design thinking*.” (p. 6).

To further define design thinking, Martin identifies three dimensions of the design thinker’s personal knowledge system, a reference to the theory in his earlier work *The Opposable Mind* (2007): stance, tools, and experiences.

- **Stance:**
  - *Balancing Validity and Feasibility* - Unlike the traditional values of “reliability over validity” (2009), designers often take a stance of seeking innovative solutions despite some uncertainty. However, the design thinker can temper their desirable ideas, as per Brown, to ones that are feasible with available technology and having a viable deployment strategy, and therefore ones they can really make a success. It follows that innovation must address real problems to be successful, “striving for balance” pragmatically between abductive reasoning (the world of the creative impulse) and deductive/inductive reasoning (the world of data analysis), which is the stance of a design thinker.
  - *Timeboxing* - Quoting Bill Boxton of Apple, Martin notes that, “when in a time-
crunch, often the first thing a professional designer will do is block off a schedule, precisely so that they know how much time they have to play and explore before they have to deliver” (p. 159-160).

**Tools:**

- **Observation** – The designer gains empathy with the user’s problems through listening and watching, “in a way that is responsive to the subject.” This technique does not use surveys or a list of features the user may want, but careful observation of user behavior that identifies pain points and opportunities for innovation.

- **Imagination** - Martin notes that while natural for most creative people, imagination is rarely developed to a high extent. “Design thinkers programmatically hone imagination into a powerful tool, one comprised of an inference and testing loop.” (p. 162) The inference phase entails abductive reasoning based upon constraints and the testing entails the act of prototyping and observing the results of testing it to infer new insights.

- **Configuration** - How can the idea fit into the larger challenge (business or otherwise)? Martin give Steve Jobs as an exemplar of this tool, in particular the “activity system for iPod, including iTunes and Apple stores.”

**Experiences:**

- **Mastery** - Martin notes that a good design thinker leverages his own experiences to “deepen your mastery and nurture your originality” (p. 165-166), meaning using the skill of integrative thinking coupled with intuition based on experience to diagnose a problem.
○ *Originality* - However, Martin cautions that “mastery without originality becomes rote” (p. 166). In other words, a design thinker will constantly be honing and expanding their experiences to be better prepared for new challenges, else their design reactions will become predictable and unimaginative.

Lastly, Martin offers advice on how to create a better collaborative atmosphere for those who not accustomed to the team-based approach of design thinking. He offers primary points that are summarized below:

- “Reframe Extreme Views as a Creative Challenge”
- “Empathize with Your Colleagues on the Extremes”
- “Learn to Speak the Language of Both Reliability and Validity”
- “Put Familiar Concepts in Familiar Terms”
- “When It Comes to Proof, Use Size to Your Advantage” (p. 175-176).

These points call out for shared understanding across the team. This includes the need for the design thinkers to see the edge cases as opportunities, the need for empathy not only with the client’s needs, but with ones’ own teammates, the need to balance desirable innovation with reliability and validity, the need to not talk over people’s heads but to communicate in their language, and lastly, to gain trust by starting small and backing up your assumptions with observations and data over time. Shared understanding helps build confidence with the way designers think, which is foreign to most.
2.4 - Additional Models

The following are additional models that offer alternative approaches to design thinking.

2.4.1 - IBM

IBM’s Experience Design Method, which has existed in one form or another for 50 years (Clark & Smith, 2010), parallels design thinking in several respects. According to Kevin Clark, program director of brand and client experience design at IBM and Ron Smith, senior strategic designer of customer experience design at IBM, design must be expanded beyond just designers, becoming a “school of thought that can solve some of the world’s most pressing problems.” Like Brown and Martin, they assert that the transformative processes of design thinking can contribute to all professions grappling with complex problems, and develop in the professional. what they call “innovation intelligence.” A five-step process, IBM’s experience design method is as follows:

- **Understand** - What is currently understood about the problem?
- **Observe** - Conduct observational data gathering to glean both the spoken and unspoken details of the user’s problems and challenges.
- **Conceptualize** - Based on the observations, create new ideas that potentially address the problem.
- **Validate** - Test these new ideas and based on the results, reiterate the observation and/or conceptualization phases.
- **Implement** - Develop a deployment strategy and follow-through.
2.4.2 - Craig Vogel

In his 2005 book, *The Design of Things to Come*, Craig Vogel outlined an approach to design that draws upon Simon’s model of decision-making, that Vogel believes, “the best innovators seem to follow” (p. 58) The process is as follows:

- **Identify an Area of Strategic Importance** - Look for some problem that affects one’s company or customers that is feasible to solve, not “impossible.”

- **Research People** - Gather data on the SET factors (social, economic, technological) that pertain to the problem. Note, Vogel emphasizes real people in their environment, not just statistics. “Without direct interaction with real people, innovators do not truly know these key individuals” (p. 59).

- **Define the Opportunity** - Define the current situation with the problem for the people involved. “What do the people you researched value that is not currently provided?” (p. 60)

- **Define the Design Criteria** - What are the constraints and basic functions that the solution must address?

- **Achieve the Criteria** - Come up with multiple ideas that may solve the problem and simultaneously fit the constraints/criteria. Quickly prototype and test these ideas in turn and iterate, combine, and build on the ideas toward a ‘best’ solution.

- **Go/No-Go Decision** - Is the idea worthwhile to take further? Is it good enough? If so, the solution moves into a production phase. If not, reassess.

Note that many of the processes of design thinking, as later defined by Roger and Martin,
are present: the use of human-centered research, defining the problem, setting constraints and ideating on them, and rapid prototyping.

2.4.3 - Jeff Patton

Jeff Patton is an Agile software consultant whom has integrated design thinking into his approach to software innovation called *co-making*. According to Patton in his 2011 lecture, *Using Design Thinking to Stop Building Worthless Software*, design thinking is not only a process for innovation, but also a way of determining what one should design and develop in the first place: “it’s not about the software, we need to be focused on changing the world” (2011).

To understand design thinking, Patton opines that one has to understand the user’s world today, where one will find people who are not happy, who are underserved or dissatisfied by their current solutions. “We might call them problems, we might call them opportunities, but no matter what there is something we want to change about the world” (2011). After doing consulting with Edmunds.com, Patton distilled numerous approaches to apply design thinking, but tailored for Agile software development:

- **Understanding the Problem** - Get out of the building and observe and understand user’s situations to identify problems and determine opportunities to focus on.
- **Identify Solutions (Ideate)** - Come up with not just a few ideas but as many ideas as possible within a fixed time (timeboxing). Do not fixate on the first idea that may solve the problem, move past it and look for alternatives.
- **Refine and Validate (Iterate)** - After time is up synthesize the best of the ideas in a ‘better’ idea that can be prototyped and tested quickly with real users who experience the
problem in question. One measures the results and looks for data to improve the solution until it is good enough to deploy. “Iterating builds a simple version, validates it, then slowly builds up quality (2011).”

- *Create a Delivery Plan* - Understand what success is and measure how the solution delivers on the success. Continue iterating as more insights are derived over time as people use the solution.

Patton emphasizes not only ideation, rapid-prototyping and validation, but also including non-designers in the process (i.e. co-making), whether story-mapping, drawing up ideas, or conducting testing. One example method is that everyone sketches his or her ideas, independently, over a time-boxed period. Then the team all come back to the table and pitch their ideas and concepts. “What we are looking to find are the best ideas, not the best artist”. From these ideas, the team iterates, validates, and refines the solutions.

2.5 - Is This How Designers Think?

The sources on the contemporary approach to design thinking offer their frameworks predicated on the idea that designers—in general—think about and take on problems in a similar, if seemingly chaotic, way. Their groundbreaking works were largely prescriptive: follow these steps to become a more flexible, creative problem solver. While similar to the design thinking processes noted above, the following literature had a more modest, empirical approach: describing how actual designers think. In fact, one author, Hugh Dubberly, in his project, *How Do You Design?*, has gathered over 100 different paradigms of the design process. Rather than finding a Platonic ideal of design processes, these authors gather data, even perform experiments
to test whether their models are indeed how designers think. Their work will be useful in both creating an experiment specifically for observing how student designers think and in creating a learning framework for those same students to engage with design thinking in a simple, repeatable way.

2.5.1 - Nigel Cross

As noted above, Cross’ work *Designerly Ways of Knowing* (1982) is one of the antecedents to the contemporary idea of design thinking. In 2011 Cross followed up on this seminal work with *Design Thinking*. This work is useful due in part to his point of view on how designers think and work together, and is equally useful as a distillation of the former work from a contemporary perspective.

Cross’ thesis that designers think in ways that are different from those of other professions, echoes Martin (2009) and Brown (2008). Cross isolates several common features of creative designers. First are aspects of personality such as a passion for design and a willingness to take risks. Second are the process- or method-based similarities. Cross takes pains to note that designers are rarely “systematic” in a tactical sense; however on that tactical level, designers often engage in activities such as drawing as both a cognitive aid and a way to rapidly explore multiple parallel ideas at once. Additional commonalities are prototyping or “mock-ups” and active participation in visualizing an idea. On the strategic level, Cross notes three primary points of designer’s thinking:

- Designers tend to take a “systems approach” to any problem, thinking outside of the immediate challenge itself to how the solution will affect a broader situation. Whether
gaining empathy with a particular user or trying to understand how a design will function in its environment, the designer rarely thinks in isolation.

- Designers try to “frame” the problems in a unique, descriptive, and “sometimes rather personal way.” Framing the problem sets the tone for exploration and creates constraints to explore against.

- Designers design from some form of “first principles,” such as ‘form follows function,’ or focusing on usability, that allows them to both come up with ideas and then narrow down the options (p. 76-77).

Like Martin and Brown, Cross devotes time to exploring the design thinking process itself. Cross notes that often, the problem itself is ill-defined (i.e. potentially Wicked as per Riddel & Walker) and in theory, a designer could “go on almost forever gathering information and data about a design problem (Cross, 2011), noting that often times important insights may only be gained later in a design process. Cross opines that because of uncertainty, multiple designers have attempted to codify an “ideal” process and set of methods to “lead designers efficiently towards a good solution” (p. 121), but he discounts these attempts in favor of empirical variations. Standing by the plurality that his 1982 title asserts, Cross notes that despite ideal processes, “there is often a natural flow to design processes that run counter to a prescription for what should happen when.” (p. 126).

In the experimental example in the book, the participants wrote down one of these ideal models as a framework for their subsequent design challenge. The process was to:
1. Quantify the Problem,
2. Generate Concepts
3. Refine Concepts,
4. Select a Concept,
5. Design,

In the experiment, it was found that the collaborative team followed the process phases, but often recursively and not in a strict sequence. When they saw opportunities, they jumped ahead, making insights at a further phase that called for a re-examination of previous phases. Cross describes it best, “It seems quite normal in design work that there is an ongoing interactive exploration of the problem and solution (Cross, 2011). Cross calls this an “opportunistic pursuit of issues or partial solutions (Cross, 2011). Referencing Vinod Goel’s observation of architects and other design professionals (Goel, 1995), Cross notes that these partial solutions are part of an iterative, incremental design process that moves toward a final form.

2.5.2 - Bryan Lawson

Lawson’s *How Designers Think* is one of the foundational works in study of the designer’s mind. It is in effect a summary of Lawson’s research over four decades on designers, processes, and methods used derived from controlled experiments, observations, and interviews. Lawson questions the idea of a single “ideal” design process. This is a fair question, as Hugh Dubberly of DDO alone records over a hundred potential models for designing in, *How Do You Design?* (2008). The common factors in the various processes that Lawson maps out include
three very basic general phases:

- **Analysis** - this phase includes the discovery of relationships that affect the problem, finding patterns from that discovery, and then “classifying objectives”, which is akin to framing a problem as noted by Schon or Martin or gaining inspiration as per Brown. Lawson discusses the framing process as akin to a literal “window” looking toward the current design problem and putting it in terms that are understandable or at least understandable enough to begin coming up with solutions that may refine the problem further.

- **Synthesis** - this is the idea generation phase of the process, taking in all the information from the analysis and deriving potential solutions. Lawson calls this, “an attempt to move forward and create a response to the problem—the generation of solutions.”

- **Evaluation** - this phase looks at the objectives defined in the analysis phase and compares any potential idea against this benchmark. This is not unlike Brown’s focus on the application of constraints. Lawson also writes extensively on the need for internal and external constraints in any design activity.

Lawson notes that this is not a single route, but a “dash” from one phase to another in an iterative process. The exact choice of which is done is determined by the individual designer based on the needs of the project and on the designer’s experience. In short, Lawson believes that this model is a simplification of a highly complex mental process. It is “a highly personal and multi-dimensional process,” but Lawson does not abandon introducing a model of designing based on his research on the designer’s mind. The scope of Lawson’s model expands upon the general phases listed above (Lawson, 2006):
**Formulating** - Understanding the basic design problem; identifying the basic elements of the problem; and then framing the problem from different perspectives to better grasp possible routes of solving it.

**Representing** - Ideating by way of sketching, writing, modeling or other forms of representation, having conversations with these representations to gain understanding of their effects, and working simultaneously with multiple representations at a time allowing for iterative exploration at low cost.

**Moving** - Designing by comparing and moving different features of a solution, by applying guiding principles (or “primary generators”) that may have appeared even very early in the formulation phases. “Just as a frame can be seen as a window on the problem space, then a primary generator can be seen as a window on the solution space” (p. 295).

Following this, the design makes interpretive and developmental moves, transforming the original idea(s) to something new.

**Bringing the Problems and Solutions Together** - In Lawson’s view the problem and the solution are inseparable, meaning each speaks to the other as they develop. Similarly there is no “clear order of appearance” – the problem does not necessarily precede the solution in a conventional way; therefore the brief for the problem is a continuous process constantly refining and re-examining the design problem throughout the design. Lastly, designers must be able to hold parallel, possibly contradictory lines of thought—not unlike Martin’s description of integrative thinking—over long periods in order to reach a solution. According to Lawson, “judging when to drop some of them or try to resolve the conflicts between them seems to be one of the key skills required for creative design” (p.
Evaluating - Lawson notes that many proposed design models have an evaluation step where design options are considered against both objective and subjective constraints. This is a judgment call for the designer based upon experience, metrics, and testing results. In this process, Lawson adds one additional skill, that of suspending judgment “to allow creative thought to flow and ideas to mature” before taking on critiques.

Reflecting - Lawson credits Schon’s *Reflective Practitioner* (1987) as the genesis for the importance of this phase of his proposed design process. Reflection can be seen as “in action” by its repeated use during “the formulation, moving and evaluating phases” (p. 299). Another form of reflection is “on action” where one reflects on how well the process itself is moving as opposed to the design. This can be viewed as “a combination of asking which problems have been examined and which have been neglected,” followed by examining whether the processes themselves have been applied properly or at all. Much of this reflection is conducted as a comparative analysis of design ideas with a designer’s own values or philosophy, what Lawson calls “guiding principles” (p. 300). Lawson further considers this another form of reflection upon the rules one designs by. One final reflection opportunity common to most designers is to reflect upon precedent or “reference material.”

Lawson’s work is an essential reference for peering into the designer’s mind. From the elements and theories highlighted here to heuristic strategies and group dynamics, Lawson’s research is a baseline for the subsequently focused interviews and observations in this work.
2.6 - Design Thinking in Education

In this section we briefly review some of the approaches that have been used to apply design thinking in the classroom. Studying these previous trials have been valuable to me in creating an ISU class syllabus in which design thinking can be introduced for teaching transdisciplinary collaboration.

2.6.1 - Models of Design Education

In his book *Wicked Problems: Problems Worth Solving*, the founder of the Austin Center for Design, Jon Kolko, described three common models of design education (Kolko, 2012a). The first and most common is the Bauhaus model, which is predicated on a common core curriculum of foundational design and art study, usually in a studio environment. The student’s learning is a “hands-on” experience, touching on craft and the creation of artifacts from posters to websites.

The second model is what Kolko calls the Integrated Product Development model. Focusing on business concerns, this model is based on collaboration among student designers, engineers, and marketers as a product team to emulate real-world scenarios, usually partnering with industry.

The final, and most relevant model, the Design Thinking model, focuses on empathy and divergent thinking, usually in a collaborative, interdisciplinary way. Several institutions have deployed design thinking programs in the last few years, the most notable being Stanford’s d.School, spearheaded by IDEO’s David Kelley, but there are others as well who have embraced a design thinking approach as opposed to traditional approaches.
2.6.2 - d.School

Starting in 2009 (Stanford, 2011), the Hasso Plattner Institute of Design at Stanford, known as the d.School, began publishing their online introduction to design thinking, *Bootcamp Bootleg*, which in their words is, “an active toolkit to support your design thinking practice” (Stanford, 2011). The d.School’s effort is to encourage the proliferation of design thinking, described as a human-centered design process, as well as to offer design methods to employ within the design thinking framework. As described in the 2011 edition of the *Bootcamp Bootleg*, the d.School process is divided into five modes, akin to other design thinking processes.

- **Empathize** - In order to empathize with the user, the d.School encourages observation, direct engagement and immersion with the user’s daily experience. A designer who empathizes, gains insights into who to design for and the underlying challenges they face.

- **Define** - In this mode, the designer scopes out the design challenge by analyzing what is learned in the empathizing mode, giving focus to the problem and setting constraints. This includes an “actionable problem statement” (p. 5) that is based on the designer’s viewpoint of the problem at hand, insights on the users and their needs.

- **Ideate** - This mode is one of divergent, convergent and integrative thinking aspects. The specific method is less important than the concept of generating as many ideas as possible beyond the obvious and easy answers.

- **Prototype** - In this mode, the designer is moving from ideas to reality. “A prototype can be *anything* that takes a physical form” (p. 7). The d.School emphasizes the use of prototyping for achieving additional empathy with the user’s problems, exploring options beyond the drawing board, testing potential solutions and creating potential insights for
further ideation.

- **Test** - Lastly, the designer brings their solutions to the user to interact with them and through those interactions measure their success and gain insights on how to make the solutions better.

*Bootcamp Bootleg* not only suggests the phases/modes of design thinking, but also offers methods for achieving a design thinking mindset, engaging with users to gain empathy, and encouraging successful collaborative environments. Various methodological tools from empathy and journey maps to brainstorming and rapid prototyping are explored. Most of their efforts have the mission-based caste of Social Entrepreneurialism: devoting energy and creative activity to solve critical, often neglected, real-world/3rd-world problems in ways that sometimes escape the nonprofit model and potentially result in profitability.

### 2.6.3 - Design Thinking for Educators

While the d.School is a graduate program created by one of its founders, IDEO is also a proponent of teaching design thinking in K-12 education. Their *Design Thinking for Educators* (2011) program frames the design thinking process for primary and secondary school educators, offering techniques and methods for application in a collaborative classroom, along with multiple case-studies of its use. *Design Thinking for Educators*, which has high-school applications, was useful for this study as a counterbalance to the graduate-school-level d.School publications, as the course I am designing is aimed at college sophomore/juniors. The process is another variation on Tim Brown’s approach, but tailored for the K-12 environment, with concrete achievement statements and discovery questions linking the sequential processes:
● **Discovery** - “I have a challenge. How do I approach it?” (p. 4) This phase includes defining the problem, preparation of research goals, and the act of gathering inspiration through empathetic observation.

● **Interpretation** - “I learned something. How do I interpret it?” (p. 4) This phase focuses on telling a story about what was found in the discovery phase, interpreting meaning in the stories, and then framing the potential opportunities to be explored.

● **Ideation** - “I see an opportunity. What do I create?” (p. 4) This phase follows divergent/convergent reasoning model found in all design thinking approaches.

● **Experimentation** - “I have an idea. How do I build it?” (p. 4) This phase focuses on rapid prototyping, testing those prototypes, and then taking in feedback.

● **Evolution** - “I tried something new. How to I evolve it?” (p. 4) This last phase is based on evaluating what was learned in the experimentation phase, documenting those lessons, and planning what follows.

What is interesting about *Design Thinking for Educators* is the methodological breakdown of applied methods to each phase of the process. While on the surface simple, this pedagogical approach allows teachers to immerse their students, step-by-step, in a human-centered approach to problem solving. While “group-work” is a standard in contemporary K-12 pedagogy, it is often assumed that students intuitively know how to collaborate effectively. This framework puts process front and center as the thing being taught.
2.6.4 - Live Well Collaborative

A joint project of the University of Cincinnati and Proctor & Gamble since 2007, the non-profit Live Well Collaborative was formed to “specialize in research and development of products and services for the 50+ marketplace” (LWC, 2014). LWC employs a 12-week design thinking process led by faculty (including Craig Vogel) and students drawn from the UC Colleges of Design, Business, Engineering and more. The end result is real product value for their client companies and real-world experience for the students. Companies include P&G, Kraft Foods, Boeing, Citi and LG (LWC, 2013). Thus, while some of the processes are similar to those of the d.School, the goals are quite different: developing marketable products for multinational corporations, for whom capital-raising is less of an issue and profitability is the end-goal, not a welcome side effect.

The integration of design thinking education with business needs can be seen as a bridge between the Integrated Product Development Model and the Design Thinking Model (Kolko, 2012a) where the students learn by doing. The Live Well Collaborative is a prime example of this approach. The process is divided into five phases that are akin to established design thinking approaches.

- **Phase 0 (Identify / Lead-In)** - The partner company/organization and the LWC collaborate to create a project brief concerning the problem the semester before the project. The brief covers multiple factors including the “opportunity space,” scope, objectives, deliverables. It also asks a key metric question, “what does success look like?” for the problem (LWC, 2013).

- **Phase 1 (Research / Understand)** - The first five weeks of the semester are shaped around
data gathering. This may include interviews, observational research, and other qualitative methods of gaining empathy. The LWC participants “witness the problem” and “live the problem” (16) to create shared understanding. At the end of the five weeks, the resulting data is used to establish constraints and further frame the problem.

- **Phase 2 (Ideate / Conceptualize)** - The LWC takes the next five weeks to use design thinking methods – including co-creating with partner company stakeholders – to “translate insights into conceptual ideas” (16)

- **Phase 3 (Refine / Test & Detail)** - The last five weeks are dedicated to refining the Phase 2 ideas. The ideas are then prototyped and tested against the established constraints from the research and the “needs of the project sponsor” (16).

- **Phase 4 (Aftermath / Continue)** - Once the project semester is over, the LWC participants review the project’s results based on the factors set down in Phase 0. In addition, the team identifies what opportunities the project has opened for future discovery.

### 2.7 - Criticisms of Design Thinking

#### 2.7.1 - Donald Norman

While Design Thinking has been gaining traction within design circles, business, and education, it would be irresponsible not to note some of the criticisms design thinking has encountered. Donald Norman, one of the design world’s luminaries due to his foundational book *The Design of Everyday Things* and his continuing work on user experience, is one such critic.

In a review article published in *Core 77* (2010), Norman wrote that design thinking was, “a useful myth”, meaning that it was not anything special that has not been done in other fields of endeavor beyond design, from science and engineering to law and medicine. According to
Norman, design thinking is simply taking a holistic view of a problem and in the case of design firms, examining that problem with new eyes.

Design thinking in Norman’s view is simply a process for creativity. However, he does not argue that there is some legitimacy to the movement in transforming design into a discipline of problem-solving instead of simply aesthetics and form. Norman writes, “there is a second, more important, and more legitimate reason to embrace the term ‘design thinking.’ It positions design in a unique way, forcing companies to view design differently than before. The emphasis on ‘thinking’ makes the point that design is more than a pretty face: it has substance and structure. Design methods can be applied to any problem: organizational structure, factory floors, supply-chain management, business models, and customer interaction” (2010).

2.7.2 - Bruce Nussbaum

An early advocate of design thinking, Nussbaum recently wrote in Fast Company (2011) that the widespread adoption of design thinking “has given the design profession and society at large all the benefits it has to offer and is beginning to ossify and actually do harm”. Nussbaum noted that as institutions “bought into” design thinking as a good or fashionable idea, they didn’t necessarily buy into the design culture that came with it, one where chaos is given ample opportunity to bear fruit.

Instead, in many cases CEOs would apply their approach to efficiently culture (which is the antithesis of design thinking) to it. Their mistake was to think that design thinking is a rigid packaged process that if followed delivers creative output every time. In that kind of locked-down paradigm, design thinking would more often fail to deliver, or if it did, it would be only incremental in scope.
Nussbaum notes that it is not “design thinking” the idea that is at fault, but “design thinking” the buzzword for innovation strategies and the failure to implement it as a “scaffolding for the real deliverable: creativity” (2011). He notes that we have many things to be grateful for due to the emergence of design thinking, from moving designers into a much wider world of problem-solving compared to their previous role as producers of marketable artifacts.

2.7.3 - Donald Norman Redux

In 2013, Norman recanted somewhat from his earlier position in a follow-on article in Core 77. While he stands by the original points, Norman changed up his conclusion. Instead of a “useful myth” (2010), he opined that is should be an “essential tool” (2013) because when done right, “it is powerful.” By extension then, Norman asks, “Should not designers all be using it?” (2013). In particular, Norman points to the usefulness of techniques such as divergent/convergent thinking and the basic process of iterative, human-centered design: namely, observe, ideate, prototype, test (2013). For those who practice design thinking’s techniques, Norman notes that they can be “transformative” (2013) indeed. He closes his updated view on design thinking with a quote from Bill Moggridge, founder of IDEO:

The ‘Design Thinking’ label is not a myth. It is a description of the application of well-tried design process to new challenges and opportunities, used by people from both design and non-design backgrounds. I welcome the recognition of the term and hope that its use continues to expand and be more universally understood, so that eventually every leader knows how to use design and design thinking for innovation and better results. (Moggridge, 2010).
Table 2.1 - A comparison of the models of design thinking along common phases of discover, create, and build.

2.9 - Summary

The discourse on design thinking provides ample commonalities in the processes of design and the more formalized design thinking models to allow for the creation of a generalized framework. A cursory analysis of each process reveals higher-level commonalities such as the importance of empathy with the user in the information gathering or inspiration phase – what we can call *discover*, the critical part that divergent, convergent, and integrative thinking plays in idea generation – simply *create*, and the place that hands-on prototyping and testing fits with measuring the success of those ideas and their implementation – *build*. A deeper analysis of each model reveals some common tools used in design thinking—from observational research to
sprinting, storyboarding, and rapid prototyping—that can be employed in the classroom environment of a research- and engineering-based land-grant university such as Iowa State.
CHAPTER 3 - METHODOLOGY

3.1 - Introduction

My review of the literature on design thinking in Chapter 2 resulted in the prima facie conclusion that the design thinking process, despite numerous variations, essentially boils down to three phases, each of which is recursive: discover, create, and build. One could just as easily use Brown’s inspiration, ideation, and implementation paradigm (2009); my words have fewer syllables, and they are verbs. The terms themselves are not important, but their meaning is. I used this general “discover–create–build” design thinking framework in my analysis of the participatory observational research of design students.

Similarly, the literature identifies multiple concepts and design methods that are common in design thinking practice, such as the importance of empathy, multi-disciplinary (or trans-disciplinary) teams, divergent/convergent thinking, and rapid prototyping. While conducting interviews of educators and professionals in the field, it is an underlying goal to discern such practices when they are described, but allow for each interviewee to use his or her own language in describing design methods, and to take the conversation to its logical conclusion in an open interview format.

3.2 - Interviews with Educators & Professionals

3.2.1 - Overview

In order to discover common challenges with design thinking in education, multiple interviews were conducted with educators and professionals about their points of view on design
thinking practice, education, and theory. Fifteen potential interviewees were selected for contact with a goal of 5-8 participating in the process. Of those contacts, eight were finally interviewed.

3.2.2 - Goals

It is hoped that the experience of the interviewees would be able to shed light on the design thinking process, common pedagogical methods, and its application in education in order to answer the question:

What does experience say are the basic tools and challenges in the practice of design thinking and therefore the most important educational tools of the practice to introduce to students?

3.2.3 - Research Methods

The interviews were primarily freeform with a loose script asking about the interviewee’s thoughts on design thinking itself, design in general, the teaching on design thinking, and questions on pedagogy, methodology and best practices. The idea was to allow the interviewee freedom to hold forth on the subject of design thinking, thereby encouraging open discussion. As each interview was completed, subsequent interviews will have additional questions or conversational prompts to explore subjects brought up in the earlier interviews.
3.2.3 - Analysis Methods

Each interview was parsed into its individual subject matter, sorted by subject similarity and then reviewed for content applicable to the goal question and any other applicable insights or takeaways. Special care was taken to touch on the following subjects:

- Design thinking as a discipline
- Who is a design thinker?
- Collaboration (including communication, implied hierarchy, etc.)
- Empathy vs. Understanding
- Benefits of a transdisciplinary approach
- Models of teaching design thinking

3.3 - Observing the Undergraduate Design Process

3.3.1 - Overview

The underlying assumption of the literature on design thinking reviewed in Chapter 2 is that designers think differently. Brown asserts that the techniques designers employ can (and should) be extended beyond design into the realm of innovation and business (Brown, 2009). The idea of designers thinking differently is also found as early as the 1969 classic, *Operating Manual for Spaceship Earth*, where Buckminster Fuller asserts that designers have a “wider focus” in their approach to problems (1969). The present research focuses on creating a program for just this sort of approach. However, I thought it would be best to confirm this truism first hand, to gain evidence that designers approach problems and challenges differently than others—differently than, for example, students who were relatively naïve to design thinking techniques.
3.3.2 - Goals

Associate Professor Mark Chidister’s ArtIS 310 class offered an opportunity for direct observation and participation in a creative process akin (but not identical) to Design Thinking. The class is focused on developing artistic working methods based on a broader level of knowledge and experience. This is similar to fostering the “T” shaped person alluded to by Brown, who has a depth of knowledge in a subject, but broad interests or experience that makes them innovators (Brown, 2009). The gathering, reflecting, and making found in ArtIS 310 parallels the general design thinking process of discovering, creating and building, which is commonly found in multiple design thinking processes. By observing members of ArtIS 310 engage with these three streams of activity, I hoped to develop a better understanding on how student designers think. By participating in the work with them, I intended to empathize with their challenges as well. Together, it was hoped that the study would address the question:

*Do undergraduate design students think in a way that is consistent with a general theory of design thinking: discover, create, and build?*

3.3.3 - Research Methods

The student study included multiple deliverables that were completed to gain the information necessary for this thesis. In addition, the study was used to provide feedback to Prof. Chidister to help with analyzing the class’ progress and improving the class for the future. While the general class feedback is outside the scope of this thesis, the methods for gaining understanding on student design processes are listed below:
3.3.3.1 - Identification of Potential Study Candidates

ArtIS 310 is not strictly limited to designers indeed all artists are welcome. While there is no ideal candidate, the nine students who were asked to participate in this study were 5 from the Graphic Design program and 4 from the Integrated Visual Arts program. The selected students met with me as a group before the study began to establish expectations of both the observer and the participant within the confines of the study.

3.3.3.2 - Participatory Observation of Three Students each Period

The class was divided into three five-week project phases, in each of which I planned to engage with and observe three students’ approaches to the creative process while simultaneously engaging in a similar project. According to Geertz, participatory observation creates opportunities for empathy and understanding simply not possible using detached scientific observation techniques (Laurel, 2003). Plowman adds, “by engaging in their activities and observing where engagement is not possible the ethnographer (researcher) obtains deeper insights into the desires, beliefs, habits, motivations, and understandings of behavior in a given context” (Laurel, 2003). By doing the same kind of work as the students in the same environment, I hoped to be able to better empathize with the challenges they face as designers.

Each day’s observations included questions directed individually to the students concerning their motivation, ideation techniques, sketching, and other process-based queries as appropriate. Photographs were taken for additional documentation; however, the perspectives were such that the anonymity of the student was preserved.
3.3.3.3 - Student Documentation

As a prerequisite for the class, all students were required to document their work, including notes, drawings, photographs, prototypes, etc. Those participating in this research were asked to share their documentation, which could be used as supporting materials for the participatory observation.

3.3.3.4 - Individual Exit Surveys

After a project was completed, each student was given a short survey to complete via the online service SurveyMonkey. The survey included the following 10 questions designed to gather evidence of the student’s natural design process, design methods, and usefulness of materials within the context of the class. The research rationale for each question is presented to the right:

Q1 - *Who was the artist/designer you focused on for your project and why?*

The class project focused on gaining inspiration from a practicing artist/designer. Presumably this was the root of any research the student did.

Q2 - *What were the ideas, subjects or problems you researched?*

The class allowed the student to select any problem they wished to address or to be inspired to create as they saw fit. This question captures this initial idea.

Q3 - *What was your approach to gathering information and/or researching for the project?*

This question allows us to determine the primary method(s) of research the students were drawn to.

Q4 - *Did the ideas/subject/problem change as your research progressed? If so, why?*

As the research progressed, how did it affect the underlying goal for the work?

Q5 - *Did the class readings/videos/excursions affect your ideas/subject problem? If so, why?*
The class framework included inspirational material in the form of readings, in-class video, and field trips. This question looks as whether these were helpful or not.

**Q6 -** Did you wait to fully complete your research to begin reflecting on the idea/subject/problem? Please elaborate.

As the student researches, do they start right into design and ideation or is such work concurrent?

**Q7 -** Describe how your research drove your work or reflection of your work?

What was the effect of the research on ideation and revisiting of their work?

**Q8 -** Did you consult with peers inside or outside your discipline to help with your reflections?

While the class was not collaborative per se, this question looked at how much and for what reason the students shared their ideas, sketches, and prototypes with others outside the class both within and without their peer group.

**Q9 -** When exploring your ideas, how did you prototype them?

Did the students move beyond sketches into prototyping and if so, how did they do so? Did they skip prototyping altogether and leap to a finished product?

**Q10 -** As you were prototyping, did your work prompt additional research or reflection? If so, why?

For those who did prototype, did the prototypes inspire additional iterations on their ideas or prompt further research?

### 3.3.4 - Implementation

An IRB proposal was prepared and submitted in early August, which was subsequently approved. With the approval, I met with Prof. Chidister to introduce the research opportunity to the class. Before the first class session, each student was sent an email with a brief description of the project. This was followed by an announcement during the class after which students who were interested filled out their name, major, and age. After selection, the personally identifying parts of these records were duly destroyed as per IRB requirements.

Nine students were selected to participate in the study out of a potential pool of 24. The selection was made as randomly as possible with an eye to diversity of interests (i.e. art versus
graphic design) and gender. Each of the volunteer student participants was given an informed consent form, which was duly signed by each participant. Of the initial nine student participants, seven ended the class as qualified for the research. Of the two disqualified, one of the students changed subject problems and class goals midway through the semester and another did not attend class consistently enough for observation.

For each three-hour class session, my time was divided equally among the three students over the three project phases. As each project phase was five weeks, but with class trips and scheduled off days, there ended up being seven observation opportunities per student multiplied by nine students, assuming the student attended class on a regular basis.

3.3.5 - Analysis Method

Each observation opportunity was primarily coded based on the designing actions taken by the student participant. The discovery, creation, and building phases were subcategorized as shown in Table 3.1. An observation opportunity allowed for multiple codes as needed. For each primary code, a secondary code was added based on where the student is within a particular phase based on Table 2.1. These are summarized below:

<table>
<thead>
<tr>
<th>A) Discover</th>
<th>B) Create</th>
<th>C) Build</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Gain Empathy</td>
<td>5. Convergent Ideation</td>
<td>8. Validate &amp; Evaluate</td>
</tr>
</tbody>
</table>

These codes were used to analyze how closely the student participants adhered to the model, where they started, where they ended, and how often recursion occurred indicating
perhaps that they moved to an earlier phase based on what they had learned or were trying out another idea.

The exit surveys were analyzed using three methods. First, the respondent surveys were reviewed in the context of the coded observational data, either confirming or helping me revise my observations of their processes. Second, the survey questions were indexed for data by searching for families of terms or phrases that carry similar meaning and manually coding them. The summaries of these codes were checked for consistency and similarity while noting differences and omissions.

3.4 - Personal Reflections on Using and Teaching Design Thinking

In addition to the studying students at work and interviewing professional/educational interviews, I append my own personal anecdotal evidence, based on my experiences lecturing on design thinking at ISU, teaching 7th/8th graders at the Science Center of Iowa, and the applying design thinking professionally at WebFilings. While this anecdotal evidence is neither extendable to larger audiences, nor empirical, it may shed some light on the opportunities and challenges I will face introducing the concept of design thinking to audiences not familiar with it.
CHAPTER 4 - RESULTS AND FINDINGS

4.1 - Overview

The following are the results of each area of the research. As they are primarily qualitative and anecdotal in origin, they do speak to directional tendencies. In each, through framing the educational problem, gathering data for greater understanding and empathy of students and practitioners alike, and through personal experience, I attempted to establish constraints for a proposed class. In effect, I used design thinking techniques to create a class about design thinking. Like most problems addressed by design thinking, mine was an undefined problem which will require further testing and iteration outside the scope of this thesis, but nonetheless eminently worth pursuing.

4.2 - Proposed Model of Design Thinking

4.2.1 - The Model

The model described in Table 2.1 and used as a baseline for coding is shown below:

Figure 4.1. - *A visualization of the proposed design thinking model.*
I created this model based on my study of the myriad of design thinking processes and theories, both contemporary and historical, reviewed in Chapter 2. It is just one possible generalized approach to documenting design thinking that focuses on what I believe are the essential elements that allow the process to be conveyed and understood, especially by students.

This model should *never* be considered a rigid process. For example, another view of this model, independent of linear sequence, is shown below:

Figure 4.2. – *A non-linear visualization of the proposed design thinking model.*

It and the teaching of it are focused on solving problems and delivering designed solutions. It is a means and not an end. When referring to IDEO’s model for design thinking,
Moggridge emphasizes that, “every project is different, demanding a unique version of the general methodology” (2010). The same can be held here. The left-right sequence of the discover/create/build sequences reflect the general tendency for designers to move from the state of the past (hence discovering the problem through empathizing with users) through a burst of creativity in the present, toward a state of the future (through prototyping and testing with those same users).

The specific needs of any one project may demand entering into the model’s framework at any point and through the act of designing, move recursively to readjust one’s ideas as more empathy, ideation and learning is acquired. In general structure, the model follows most closely the IDEO model (Brown, 2009) as well as Doblin’s approach to design in general (1987). The nine-part model diagrammed above is based on several assumptions:

1. **Design thinking is empathetic.** It is focused on understanding real user problems, and through empathizing with, discovering opportunities to address those problems or perhaps redefining the problem itself. User empathy and involvement is a key element to achieving success with design thinking.

2. **Design thinking enthusiastically embraces constraints.** Starting with Brown’s trifecta of desirability, viability and feasibility (2009) and including constraints set through user research, we have seen that constraints focus the designer and give boundaries to innovate against.

3. **Design thinking is most successful in teams, preferably transdisciplinary.** The bringing together of transdisciplinary teams with shared understanding of a common goal can, in the right environment, offer more opportunities for innovation than designers working
alone as such a practice taps into a broader experience set. The designer’s “first principles” (2011), as discussed by Cross, become complemented by those of other disciplines.

4. *Design thinking optimistically embraces uncertainty.* It is okay not to know everything or have an ambiguous problem. In fact, design thinking encourages one to move past fixating on initial ‘knee-jerk’ ideas to look for other options. Design thinking often forces one to re-examine assumptions, and this is not only acceptable, but an expected and exciting part of engagement.

5. *Design thinking encourages rapid idea generation.* Leveraging creativity through divergent/convergent thinking, integrative thinking, and the use of abductive reasoning to make creative leaps is a foundational aspect of design thinking. Staying positive, building on the ideas of others, and discouraging the tendency to be a devil’s advocate (Brown, 2009) are among the ground rules that make the process of abductive reasoning work. Different methods exist to approach idea generation, such as sketching, brainstorming, story mapping and more, yet design thinking is flexible enough to allow for experimentation – and it should.

6. *In design thinking, it is okay to fail.* Failure offers insights to learn from and build upon. Quickly prototyping ideas with real users allow the design thinking team to validate their concepts and perhaps spark insights that would have been missed otherwise.
4.2.2 - Discover

The discover phase is best thought of as coming to understand the now. What is the problem that the user is having and what are the pain points that offer opportunities for innovation? It contains three primary elements:

- **Define** - As most design problems are ill-defined, this can be seen as more of a ‘soft’ definition of the problem space. What in general terms is the challenge to be addressed? One should ask oneself, “What does success look like?” and define the rough metrics for measuring that success.

- **Empathize** - Gain inspiration (Brown, 2009) from seeing the problem through the eyes of the users who deal with it. Who are the users and what is their pain? Other forms of research are fine as well to inform the observations, but without getting into the user’s shoes, you simply cannot know their world.

- **Frame** - From the data gained from building understanding of the problem through empathy, identify constraints to the creation of ideas we can focus on. What are the boundaries to our solution? What will success look like? Once a starting point of constraints are framed, one can effectively dive into the creation of solution ideas.

4.2.3 - Create

The create phase is where idea generation happens, preferably in a collaborative, transdisciplinary way. It too can be divided into three elements:

- **Divergence** - In a timeboxed period, how many ideas (and extensions of ideas) can the team come up with? It is important to stay positive, hold off on criticism, and push past
any initial ideas that might be the “easy” solution. Instead ask, “what are the limits of our imagination?”

- **Convergence** - From all the ideas, which ones fit within our constraints? Which ideas work well together and which do not? The idea is to narrow down the possible to what Brown calls the viable, desirable, and feasible ideas (2009).

- **Integrate** - It is possible that multiple ideas for solutions, even opposed ideas, can address a problem. How can these work together? How can the “constructive tension” (Martin, 2007) of those ideas offer insights to create something novel and innovative? This is where the ‘a-ha’ moments often happen.

### 4.2.4 - Build

The build phase is where the future begins to take form. It is where the team tests out their ideas with the same users who had the problem in the first place to see if the solution works, gain more data for iterations, and potentially discover unforeseen challenges or constraints:

- **Prototype** - An idea for a solution or set of ideas should be prototyped in the fastest, cheapest way possible. It can be as simple as paper prototypes or as ambitious as physical mock-ups or live data interfaces—whatever is necessary to communicate the idea. This is what Jeff Patton calls ‘right-fi’ prototyping (2011).

- **Validate** - While some problems with an idea can be tested with the team, for real insights it is important to take a prototype to the user for which it was designed. The design team is never the user – ever. Validation delivers insights to iterate upon for any phase of the design thinking process.
• **Deploy & Learn** - If a solution shows promise, adheres to the constraints, and can be seen as a potential success, the design (whether an artifact, experience or service) moves to deployment planning. A key part of deployment is that any design’s success, once deployed, should be measured by the metrics of success gleaned in the discovery phase. Insights gained from the active use of the design are critical to improving future iterations and may offer additional opportunities for innovation.

4.2.5 - Summary

The proposed model is predicated on being an easily teachable process for design thinking. It isn’t immutable, strictly linear, nor advocates any particular methods. It is, however, a process that I believe should be a teachable framework in a college studio setting. Further study will be needed to validate the efficacy of the sample class that will use this model as a base for learning (see Appendix A).

4.3 - Expert Opinion and Best Practices in Design Thinking

4.3.1 - Overview

One of the earliest observations I made when beginning this journey was that design thinking is not an established process. It is a framework, based on a human-centered approach to problem solving, but like any framework, it is not rigidly defined. Adam Kallish perhaps had the best explanation for this uncertainty when he said, “The problem is that in design thinking, there’s no shared language, there’s no core agreement on what it is, and there’s no protocols. People use different terms, analysis, synthesis, whatever, so there’s sort of an agreement in a way, in a very cloud-like way” (2012).
To piece together this cloud of ideas, I completed eight interviews of professionals who use, teach, or write about design thinking. The interviews were conducted over six months from July 2012 to January 2013. The thoughts of these professionals have been gathered here in categories to examine where they agree and in some cases disagree about the nature, attributes, and teaching of design thinking. The interviewees were:

- Hugh Dubberly - Founder of DDO (Dubberly Design Office).
- Jon Kolko - Founder of AC4D (Austin Center for Design).
- Victor Margolin - Professor Emeritus of Design History at the University of Illinois, Chicago.
- Annette Ferrara - Senior Writer at IDEO.
- Adam Kallish - Founder of Trope Collaborative.
- Seda Yilmaz - Assistant Professor of Industrial Design at Iowa State University.
- Patience Lueth - Senior Lecturer at Iowa State University
- Mark Chidister - Associate Professor of Integrated Studio Arts

4.3.2 - Design Thinking is a Form of Design

What is design thinking? Margolin makes the assertion that ultimately design thinking is designing. He states, “In my mode of thought, design thinking is designing. So if it's not designing, what is it? And this term has now become the buzzword everywhere” (2012). He notes further that design thinking (and design) means that, “designing is always like Schon says, a kind of a conversation with your project. You're going back and forth between your plan and
the final thing. You also have, in the design process you have iterations, you have feedback, ...all sorts of elements that are in the models” (Margolin, 2012).

Lueth notes also that designers have been doing processes similar to design thinking models for a long time. In her opinion, it has been in use since long before design thinking’s recent formalization. This matches assertions by Brown concerning Edison and Brunel (2009). Yilmaz opined that, “there is a methodology that is underneath and it’s been practiced in many design schools already that are called design thinking or creativity or studio-based projects or collaborative interdisciplinary. Whatever they want to call it, the essence is the same” (2013). She notes that the idea of design thinking, and how it can cross disciplinary barriers is important. This echoes Norman’s thoughts on design thinking as “powerful,” and a “useful tool” (Norman, 2013).

Lueth summarizes this plethora of approaches nicely: “We’re visual beings...when we explain something, it’s through a model” (2013). Kallish seems to agree with this opinion, noting that, “the design community seems dedicated to reinventing other people’s models using their language to make it unique, which is natural” (2012).

To that end, Dubberly states that while we have many, many models of design processes, we ironically do not have many models of “designing or design itself, design as a space” (2012). While the exploration of design itself is outside the scope of this thesis, it is interesting to note Dubberly’s observation that despite the variety of terms out there, “most of design thinks of the design process and design methods as being kind of settled, a settled affair” (2012). Creative processes in other disciplines from software to engineering, on the other hand, are not as settled. In fact it is, “actually the subject of intense, even religious debate right now” (2012).
4.3.3 - Broad Applications Beyond Traditional Design

Kolko notes that one aspect of design thinking that makes it different from “design” or more accurately a powerful extension of it, is its application to problems outside of the traditional areas of design. Design thinking is “the notion of taking everything that designers do when they make a chair and applying it to things other than chairs, whether their political system, social problems, or organizational behavior issues—just treating sort of all of the issues in the world as design problems” (2012b).

Kolko further states that the design thinking process uses the same basic toolkit whether the solution is an artifact or a social problem such as poverty (2012b). “Design is about a process, a method, a series of techniques, a way of thinking, but it is not about chairs, it is not about poverty. Dick Buchanan calls it a discipline with no subject matter, and I think that's nice” (2012).

Kallish’s take on the broader application of design thinking is focused on the division between “making,” the creation of artifacts and solutions, and “thinking,” the development of ideas that “inform the making” (2012). However, Kallish notes that there is a lack of what he calls “clear exemplars of design thinking” (2012) that are universal – examples that all practitioners of the process can agree with.

4.3.4 - Culture of Optimism

Kallish notes that, “design thinking is a process of intellectual scaffolding” (2012). As such it is a framework for the act of designing that has in his view (and that of IDEO) four primary attributes of being human-centered, collaborative, and experimental while also being optimistic (2012; Brown, 2009).
That optimistic culture is what Ferrara describes when she talks about IDEO. There, design thinking isn’t so much taught, “it’s just something that’s just kind of ingrained, it’s just part of the culture” (2012). Kallish notes that without the culture, it is difficult to make design thinking work. “The problem isn’t necessarily IDEO’s process, but it’s in others co-opting the process for their own ends without being IDEO, so again, they’re borrowing the terminology and the model without really understanding how to do it” (Kallish, 2012).

4.3.5 - Institutional Hierarchies

Ferrara continues on the importance of culture for design thinking success, noting that not just any company or organization can do it without a hierarchal process change. “All of a sudden you’re like, ‘brainstorm and be creative’” (2012), she exclaims, noting that in such organization there are people in authority who suppress ideas and don’t allow for failure. To be successful, authority figures must allow for equality in idea generation. Ferrara further notes that without that equality, institutional buy-in, and permission to fail, design thinking becomes only more “window dressing” (2012).

Kallish, while admiring the egalitarian ideal, notes that hierarchy is inevitable. “You can’t wish it away” (2012). However, he carefully defines two types of leaders. There are the official leaders, assigned to a team, with a title and theoretically in-charge, and there are the unofficial leaders. “These are the people that don’t have the title of leader but the devotional title of leader, so the leader who has the title may not have the power at all. It’s the emotional leader of the group that actually has more weight. What I find interesting in working in groups is that depending on the number of people you have collaborating, the role shift throughout the whole project cycle, depending on where you are throughout the project” (Kallish, 2012).
4.3.6 - Designers as Leaders or Facilitators

Design thinking leaders, or simply design leaders, are in demand. Kolko notes that, “all of the firms I'm aware of—so call these the mid to upper lever consultancies and agencies—they don't want somebody who can make a pretty looking thing. They want somebody who can think critically, manage a team, deal with technologists and business owners, understand the competencies of the company, understand the strategic imperatives of a business” (2012b). Yilmaz concurs. “Designers are the one who understand the entire process who can contribute to every single phase of an entire project” (2013). So they are supposed to be more project leaders than marketing people or engineers or managers. They are supposed to really know the entire process. So our contribution is not just in solving, approaching a problem” (2013). The type of leadership role Yilmaz is speaking of isn’t necessarily an official position, but more of what Kallish notes as an “unofficial” role, someone who leads from passion for the project.

4.3.7 - Ideal Design Thinker

Brown (2009) speaks of the T-Shaped person who has deep expertise, but a wide array of interests and passion, as an ideal design thinker, and therefore collaborator. Ferrara illuminates what that means to her: “We have a programmer who is also a classical violinist, and we also have a business designer who is also a professional ballerina. We look for people who move and shape themselves in different types of ways.” Additional key elements for design thinkers include passion for their work, self-motivation, a natural curiosity, and an ability to handle uncertainty—those who “don’t need to know an answer right away, which is really hard for a lot of people” (Ferrara, 2012).
In her own example as a writer, Ferrara has to draw upon her skillset and broad experiences and interests daily. She notes, “Within six months of my life here, I was helping design healthy dog treats, I was writing a copy for first-time tampon users for a new type of tampon applicator. I was working on Ford F150 trucks and then doing athletic shoes. Those are very different voices and very different skills that I was bringing to all those different things” (2012).

Kolko differs on the term T-shaped. He doesn’t necessarily categorize people into such terms. However, he agrees that the ideal design thinker is, “somebody who has process, who has passion, who has curiosity, who maybe isn't as good at icons, drawing, whatever, they'll pick that stuff up, but better yet they'll be able to facilitate a client conversation” (2012b). These people are often called “unicorns” in the design industry. Designers who can code, facilitate, draw, and have a passion for design, and the ability to think holistically about a problem. He states, “What usually differentiates them from everybody else is that they just try harder. They go home and they don't watch TV, they continue sketching. And on the weekends, they are not out milling about at the mall; they are sketching and they are getting better” (Kolko, 2012b).

Dubberly concurs, noting that, “today, we need designers who know how to program. This has been true for at least 25 years. There are a lot of designers who would like to bury their head in the sand and say, ‘well, this is just going to go away soon’” (2012). The Unicorn and the T-Shaped person are in many ways one and the same.

Ferrara concludes, “you can’t just be skilled in creating that thing, but you have to be skilled at thinking about all the other things that kind of surround it, because we are no longer thinking about things in isolation from each other” (2012). Margolin notes that the unicorn, or
“comprehensive designer” (2012), is not a new phenomenon, William Morris of the 19th century Arts & Crafts Movement is a good example. Lueth mentions Michelangelo as another (2013).

4.3.7 - A Non-Linear Process

Many different models have been used to describe design thinking. Due to the linear nature of language, many appear to be linear or step-wise—but they are not. To this end, Kallish notes that there is, “no one methodology to design thinking. It’s not a one-to-one process. It’s not” (2012). All the evidence, such as observations from Lawson (2006) and Jones (1970) back this up this assertion; however, a general commonality is evident that one most often starts with defining the problem.

Chidister backs up the non-linear, recursiveness of design thinking. He notes that, “designers I think start right, jump right into the middle of it and start thinking about ways of approaching their problem and that jumping in then can many times prompt questions or queries that require more detailed information to inform the process that they're going through” (2013). He follows this up by noting that, “design thinking is a very synthetic and cyclical way of approaching a problem.”

4.3.8 - Framing the Problem

Hugh Dubberly told a great story about what is essentially redefining a problem by understanding your audience and discovering opportunities that were not there on the surface. When he was the head of design at CBS, Lou Dorfsman received a call from the CEO, William Paley. At the time, comedian Jack Benny, one of CBS’s best known stars, was up for contract renewal after being with the network for decades. Wanting to keep Benny, Paley told Dorfsman
they needed to put together a great event for him. In Paley’s view, this would be a black-tie gathering at the Waldorf Astoria in New York. He asked Dorfsman to create an invitation for it.

Dubberly said, “Lou is a very smart guy. He was riding, going home on the train and was thinking, ‘jeez, another one of these Waldorf things.’ That’s got to be so boring and that’s so not Jack Benny” (2012). The Waldorf gathering idea smacked of elite society and big money. Conversely, Benny’s shtick was built on “being a kind of cheap guy” (2012).

Dubberly continues, “so, Dorfsman says, ‘hey, Jack Benny’s not really a Waldorf kind of guy. He’s more of an automat kind of guy’” (2012). Automats were cafeterias with nickel vending machines with cheap, mass-produced food. So instead of having the event at some expensive hotel, Dorfsman said they should have it in an automat. This approach matched Benny’s shtick much better.

Dorfsman went back to Paley without the invitation, but with this idea where they would rent an automat and give all the black-tied guests rolls of nickels as they entered. Paley was skeptical, but Benny though it was wonderful. The event was so unique the *New York Times* featured it on the front page and above the fold – great publicity and a rousing success. Benny afterwards signed a new contract. Says Dubberly, “Benny loved it, which was part of making the star happy for the network to do that and people had a lot of fun” (2012).

Dubberly noted that this was a great example of the problem being redefined once you understand the audience (in this case Benny). On the surface the problem was merely an invitation. But really the problem was, ‘how might we get Benny to sign a new contract?’ By understanding Benny, albeit a user group of one, Dorfsman redefined the problem and new opportunities for innovation surfaced. It is about understanding the underlying experience and not simply one artifact.
Kallish notes that designers are great problem solvers, not necessarily great problem seekers, though they easily could be. Seeking problems and the opportunities they offer is something that could (and should) be addressed in education. He says, “Problem seeking is a higher-order approach using observation and experience to identify something to be turned into a problem to be solved. That’s what problem seeking is. Unfortunately, in design education and most designers, they’re never given that chance to develop those skills” (2012). Kallish further echoes Jones when he says that designing is hard due to the fact that designers must use today’s data to predict the shape of tomorrow’s solution that only happens if their ideas for that tomorrow are correct in the first place.

4.3.9 - Importance of Empathy

Chidister asserts that regardless of the specific role he has, “understanding the collection of people who need to be involved in anything is an important part of design thinking” (2013). Understanding people and empathizing with how they feel is at the core of design thinking. Kolko makes a distinction between understanding and empathy. To Kolko empathy is:

…feeling what someone else feels and therefore it is impossible. You can't achieve it, but you can get really damn close. And so I can empathize with you by attempting to feel what you feel. And so there are ways I can gain that. I can ask you lots of questions, spend a lot of time with you, I could dress like you, I could read the books you read, I could become you as much as it is practicable to become you in order to feel what you feel. And again, I can never actually know for sure. But I can get close (2012b).
By contrast, understanding is a mere intellectual exercise. Kolko notes that the designer can “make a list of all the knowledge you have, and therefore I could understand your viewpoint, but to truly feel your viewpoint I think is a different game, and I think much harder, but I think that's core to this idea of design thinking” (2012b).

Kallish says that in design thinking you should start simply by observing the users dealing with whatever the problem may be. The goal is to just watch them, take notes, and do not judge. Kallish added that Margolin once told him that design, in its essence, is an “extension of culture first and foremost” (2012). While sometimes using the tools of science, the arts, and the humanities, design itself is a cultural action. Grasping and empathizing with any design problem is an analysis of culture. To that end, Kallish adds that the simple acts of listening and observing without trying to judge are absolutely essential. Instead of judging, he notes, one should ask questions, sort the answers, and generate insights. “Now I understand why those people did that,” he says, “well, I have a better understanding. I don’t understand everything about it, but I have a better appreciation as to why that is” (2012). Kallish notes that despite their importance, observation and listening are “very foreign to design students” (2012).

Indeed, most of the interviewees agreed that many students (and some design professionals) leave out empathy and understanding of the user they are designing for, but that such human-centered research is essential. Without it, design thinking does not work. Yilmaz asks the fair question, “How can you possibly design a product for a user without understanding users?” (2013). She advocates bringing the user into the entire design process, not just during the discovery phase.

Dubberly cautions that while talking to users is important and helpful, the user themselves rarely know what they need, only what they want - which is rarely the same thing. He
continues, “On the other hand, every time you talk to users, you get a better idea of the little
details which make products good and you can find places where products are not so good and
make those better” (2012).

4.3.10 - Ideation, Intuition & Abduction

Idea generation can be difficult. Yilmaz says that students have a hard time coming up
with ideas that have use. When they get what they think is a good idea, often they fixate on that
approach and do not ideate further (2013). Yilmaz notes that, “design thinking makes you go
beyond your initial ideas, make you explore new possibilities” (2013).

This act of divergence and then convergence of ideas, repeating as necessary is echoed by
Kolko. He says that, “you don't just do something once and call it done. You do it many times.
Do many of them, and it is a divergence, convergence, divergence, convergence” (Kolko,
2012b).

Kolko points out that the key piece to making the process work is abductive reasoning,
the “inferential leap” (2012b) that comes from experience. The assumption is that one is
constantly, “looking at the world and inducting things, using inductive logic, but then I am able
to use that inductive reasoning and combine two things that are disparate” (2012b). Kolko says
that the two different ideas or things, which normally would not be brought together, can be
merged through design thinking, creating something both unexpected and new.

Chidister too makes a point of acknowledging the role of intuition (or abductive
reasoning). The designer’s intuition is not based on nothing. He says that intuition is, “based on
experience and based on your own exposure to the world in which you live and that you're
drawing upon those things in a way that sometimes you can explain or rationalize, but sometimes you can't” (2013).

Chidister goes on to note that intuition is the action of one’s mind as it synthesizes a myriad of complex information, based on experiences and tacit knowledge, into an idea. The broader your experiences and deepen your knowledge, “the more that you got to work with”, says Chidister (2013).

Like Kolko and Chidister, Kallish is in agreement on the power of intuition or abductive reasoning; however, he noted that while designers are great at divergent thinking—his exact phrase was that they are “ninjas at it,”—they have trouble with convergent thinking, making that merger of ideas that Kolko notes above and Martin advocates as a key element in design thinking (Martin, 2009). Kallish calls this, “bridging what’s desired with what is possible, with what’s viable” (2012). It is difficult, Kallish says, but “that’s what innovation is” (2012).

4.3.11 - Prototyping

Dubberly reinforces the need for modeling and prototyping in design thinking. “A physical prototype is useful, but sometimes not always possible or not representative of the full scope of the thing that you’re actually dealing with, in which case, you’d need representations and models” (2012). Indeed, collaboration in his opinion needs this kind of visualization, where designers in particular can be useful in validating an idea—“even if that means nothing more than just going to the board and writing it up” (Dubberly, 2012).
4.3.12 - The Communication Gap

Chidister remarked that one of the main challenges in interdisciplinary instruction is that each discipline may have a different taxonomy and method of explaining ideas. In design thinking, the same can be held true with transdisciplinary teams, and there is a danger that poor communication will open up a gap in trust. He feels that if you don’t think the other members of the team have useful input or enthusiasm for a project, then “you're probably going to be less inclined to spend the extra effort it's going to take to communicate and to bridge that gap” (Chidister, 2013).

Yilmaz acknowledges this struggle when it comes to even the commonly close communications found between industrial designers and mechanical engineers, without which collaboration is difficult. “We do not end up getting to a collaboration. Meaning engineers are not so much involved in concept generation and industrial designers are not so much in detailing the design for manufacturing processes” (2013). Instead of a rich collaborative discovery, creation and building process, each discipline gets siloed into its separate role, isolated from each other and the user.

Kolko relates a similar problem while he was at Carnegie-Mellon. In the capstone project designed to work with a real client, each student tended to fall into his or her specialty even though in theory the project was supposed to be collaborative. It was not, as Kolko remarked, ‘it ends up with you're the developer so you do the development, and you are the graphic designer, so you do the graphic design, and you're the marketer, so you do the business” (2012b).

Kolko and Lueth both state that it is part of any discipline that after so many years of being taught and gaining experience that certain jargon and ways of working emerge in any discipline that are difficult to convey to another (2012b; 2013). Referring to shared
understanding and implied hierarchy, Margolin sums the communication challenge, stating, “a lot of this stuff comes down to how people are socialized in their professional training” (2012).

He goes on to explain that even today some professions are taught that they are special. Margolin believes this kind of “posturing”, as he calls it, “gets in the way of collaboration” (2012).

Kallish notes that designers are not innocent in this situation. “I do find it ironic that undergraduate design education emphasizes the centrality of the individual designer as a change agent” (2012). Yet design is about people and making their lives better. “We’re creating a very schizophrenic series of individuals that can’t bridge the need for individualism on one hand and the needs of a social group on the other and unless it’s a social group of designers” (2012)

4.3.12 - Closing The Communication Gap

There will inevitably be cultural clashes and communication challenges in collaboration, so how do you proceed? Dubberly says that for students in particular, it is a challenge for them to even to understand the difference between their professions. He suggests that early on the instructor can help define what the roles may be and how they fit together. “To the extent that you could draw a picture at the beginning for them, I think that’s helpful” (Dubberly, 2012).

Ferrara believes that simply sharing the same space helps to bridge the disciplinary gaps. While working on an online project for one client, they invited the third-party software developers to share their space and work directly with them. Collaborating in the same space, Ferrara believes, fosters better communication and therefore better design: “If you set it up and force people to be in the same room and they can’t hide in offices… and they can’t do the same kind of business as usual, it really helps” (2012). Quite similarly, Yilmaz and her colleagues are
trying to bridge that challenge by having engineers join design studio projects to be exposed to opportunities to address a problem from more than one perspective (2013).

Margolin refers back to the Bauhaus curriculum when there was the merging of design and making in a common core. The main pedagogical question was this: “What would be in the core course that would actually provide a shared experience that would then still remain alive as you went off into your specific practices, whereby you could then come back at some point with more, what I call domain knowledge, and share it?” (2012) He believes that there are two challenges: the first is the communication gap and the second is a gap based on a perceived hierarchy and the traditional roles of a particular career such as architecture or marketing. Yet, neither of these differences has had a chance to ossify yet in college: “I think these can be overcome in a class, because students don't yet have these attitudes so clearly formed” (2012).

Margolin maintains that language is the key to collaboration, where every team member has a stake in challenge, regardless of his or her discipline. From the start of any project, the team works to create some kind of common language to bridge the communication gap. He notes that Doblin would simply create the language and teach it to the team; however, Margolin makes another recommendation: the team members should visually map out their common language from the start. “This simplifies everything,” Margolin notes. “But the point is that if you get into some huge, complex project, obviously you've got to bring in mind mapping, charting, all sorts of other representational techniques to, you know, create a picture” (2012). This is similar to what Patton calls creating shared understanding using tools such as story or journey mapping (2011).
Chidister call for a similar theme with multi-modal communication to create understanding as different traditions have different taxonomies. “There's a strong power of communicating complex information in visual means” (2012).

Kallish uses a process to create shared understanding called *sunrising*. “It actually tries to acclimate people to talk to one another to develop some emotional bonds with one another in order to effectively collaborate” (2012). The process starts right at the beginning of a project with a series of discussions “about project scope, specific skills that people bring to the project, and what they want to get out of the project” (2012). He also asks what achievements and takeaways each member wants from the project other than the project itself. Kallish adds, “it has nothing to do with their skill set” (2012).

4.3.13 - Strengths of Transdisciplinary Design

Beyond what has already been discussed about collaboration in general, there are several aspects of transdisciplinary design that focus on non-designers, both what they gain and what they offer in the design thinking process.

According to Dubberly, “Most of the interesting work that’s being done necessarily involves people from many disciplines” (2012). Dubberly gives an example of a medical device. For such a design, you need transdisciplinary collaboration from biology and medicine to engineering and interaction design. “You need all of those people at the table in designing the product” (2012). With any complex system, it is extremely difficult or impossible to do so otherwise.

Kallish points out that “ideas don’t know what discipline they’re in” (2012). By extension, everyone is creative in his or her own way, and innovation is a birthright of simply
being human. “Particular disciplines have their spin on innovation and have their spins on creativity,” Kallish remarked, “but in and of itself, creativity and innovation is not owned by any particular field” (2012). It is important therefore to distinguish between the designer mind—one that comes from training and experience in some aspect of what is traditionally called a design vocation—and the design mind, which is a wider term for planning and problem-solving.

“Everybody on this planet has a design mind,” Kallish insists, “but there’s only a small group that are designer minds” (2012). The question becomes, how might we get these two groups to work effectively together?

Kallish believe that non-designers bring not only their subject matter experience, but also their own methods and concepts, which could be applied inside a process such as design thinking. “Half of collaboration is comparing and contrasting those experiences, those skills, and those methodologies, those belief systems” (2012), says Kallish.

Ferrara has experienced this kind of transdisciplinary design daily. She notes that feedback on her writing is not from the writing staff, but from other disciplines like designers and engineers. The advantage is that they “do not have the same biases” (2012). These multiple viewpoints encourage ideas that may not otherwise have been tried. She realized that, “sometimes people come up with much better tag lines, because they are just not encumbered by the same kind rules or the ways of thinking that I am” (Ferrara, 2012).

Lueth opines that the goal isn’t necessarily to change the way other disciplines think, but to be able to allow them leverage and participate in the process designers use successfully for human-centered problem-solving (2013). She is not advocating using design thinking, for example, to make a medical diagnosis, or as Kolko points out, one would not want to use design
thinking on the engineering aspects of an aircraft (Lueth, 2013; Kolko, 2012b). It might not fly that well, but it will sure be comfortable.

4.3.14 - Teaching Design Thinking - Onboarding

In addition to the communication challenge for collaboration, several interviewees had suggestions or observations on how to kick off teaching design thinking. Yilmaz believes everyone is creative, but his or her chosen profession may not value it. She gives the following advice concerning her own experience in teaching design thinking. “In the design thinking class, I make sure that I should start the first lecture by asking the question, ‘Who here is creative?’ and ‘Who’s not?’”. She notes, “There are so many hands in there [for the second question], which is very surprising to me because as a designer, I always think well, people should know that they are creative. They may not know the techniques to apply creativity to certain domains but they must know that intrinsically they are creative” (2013). She recommends that the students should go through the design thinking process completely a few times to mimic real-world scenarios.

Kolko recommends a design boot camp and a full run-through of the process, such as the one they conduct at AC4D. “So we do a one-day bootcamp and then when the students come, they do the entire curriculum of a year, they do in three days” (2012b). The idea of this is to first get the student familiar with what they are to learn, and to grasp the “rigor of the process” (2012b). “This way the students understand the process from end to end.”

Kallish has experience with bootcamps conducted at the School of the Art Institute in Chicago. He notes it is an “interesting way to … have an intense experience, they’re just being exposed to it” (Kallish, 2012). Kallish says that without a follow-through, a bootcamp alone is not enough and the students may see the experience as novel, but only a one-time thing.
4.3.15 - Teaching Design Thinking - Methods

Throughout the interviews, several specific instructional methods we offered that the interviewees had found to be helpful either in teaching design thinking, or in general design thinking practice.

- *Before the class starts, reach out to other college departments to recruit students and expertise*

  Lueth noted that it is important to reach out to different departments, such as business and engineering to promote the class early on to gain a wide variety of students for a true transdisciplinary experience. Kallish adds that design courses, whether graduate or undergraduate, rarely reach out to other disciplines and their subject matter experts. Despite institutional and time barriers, it is a good practice to try to build those relationships (Lueth, 2013; Kallish, 2013).

- *Be cognizant of young adult group dynamics*

  Kolko fully supports the practice of transdisciplinary design, despite the communication challenges discussed above. Kolko notes, however, that completely different social dynamics come into play with freshmen and sophomores. “It is not about the problem, and it’s not about the knowledge; it’s about who’s a jerk, who’s cute, who’s mean…” (Kolko, 2012b), he says. Kolko further suggests that finding a way to keep that kind of social tension, rivalries, and competition at a minimum will help make the class more effective.

  Kolko believes the greatest challenge with teaching this age group is motivation. He recommends that one should assume that 18 year olds are unmotivated to start with.
Therefore, the underlying goal is to “ignite the fire across the board to say, ‘Hey, this is worth your time, it is worth getting off the couch, because that's how cool, fun creative and challenging this discipline is going to be.”” (2012b)

● **Be a source of energy for the classroom**

An extension to understanding the social dynamics of the 18- to 19-year-old student is being able to inspire them. Kolko notes that the act of being an energy source for the room is necessary whether in the classroom or the boardroom. He explains, “Whenever I run creative workshops with Fortune clients, with upper management or whatever, you are the energy source for the room and when you are done, they've eaten it all, they've depleted it. Right, so you are exhausted, theoretically, so they are full of energy” (2012b). In the same vein, Kallish noted that you have to not come off as all-knowing with the students as empty vessels to fill. Instead, be empathetic and seduce with the ideas (2012).

● **Know what you want to accomplish for your students**

Chidister advised that for any course of this nature, the instructor should ask himself or herself what is success for the students? This is a concrete way for an instructor to describe his objectives and expectations. Having clarity about this question from the very beginning will ensure the students take away a clear learning experience from the course as well (2013).

● **Keep the projects simple and structured at a high level, but with flexible constraints.**

Chidister cautions that with a new student who has never been exposed to design thinking or the methods that go with it, the projects should be extremely well planned with an obvious
framework for conversation and ideation. Rather than having the students come up with their own problem to solve, the instructor should also provide a starting point to find problems for. Chidister adds, “To appreciate the contribution that each other student brings or each other discipline brings to the table, then you need to make sure that enough base information is there for people to draw from and to structure a conversation” (Chidister, 2013).

When it comes to the constraints within the framework, Yilmaz also recommends keeping them flexible and loose to prevent students from fixating too early on a solution and instead providing them an opportunity to approach the problem from multiple points of view. In her experience, designers love vague, undefined problems while engineers prefer to know “all the constraints”; they want “all the variables to be very precise so that they can rely on their own knowledge to solve them” (2013). She recommends erring on the side of uncertainty to encourage exploration.

Yet, like Lou Dorfsman, the students should feel free to reexamine the problem, regardless of how rigidly it is set up, if the evidence from human-centered research suggests it should be. Dubberly thinks students should be told from the very beginning, “You don’t have to accept the problem that you’re given, you should always question that. There’s always opportunity to make it broader or narrower” (Dubberly, 2012).

- **Employ a modular approach to projects**

  A modular approach (perhaps broken down by discovery, creation and building phases) is something Chidister can back regardless of whether it is three separate projects or three modules of one large project. He notes, “By doing it in three different modules, it gives
everybody enough of a safety net that after five weeks, I can figure out, are you getting it? Are you moving along? If you aren't, then we can make some corrections early.” (2013).

Kolko maintains that no matter the approach, the students should be given a real challenge—simple on the face of it—but one that may be a bit beyond their skills to push their boundaries. Kolko broke down a three-module approach based on his experience. The first is focused on discovery, in particular qualitative research and synthesis. The second is built around going from synthesis on to ideation. The last takes the ideas from creative origins to presenting them (Kolko, 2012b).

“‘Alright, here's a problem,’ I say, ‘go solve it. And I want you to use this process. I want you to go out into the world and talk to people. I want you to leave this room and go talk to people’” (2012b). Kolko notes that this terrifies people.

When the students ask How? Kolko encourages them to watch people, observe them doing whatever the problem is. Empathize with them. Then comes ideation, harnessing their creativity to come up with main ideas. Finally they refine ideas and present what they learned—“in a matter that is persuasive;” (2012b) he adds.

Kolko, like Chidister, cautions on making the problem too difficult. It is too much to ask 18-19 year olds to solve poverty or hunger. Kolko recommends staying easy and simple, “Take something really, really banal—a coffee maker. Go watch people making coffee. A chair, you know; a blender. Some silly piece of mass-produced electronics or consumer good” (2012b). But, Kolko notes, make sure whatever they do should get them out of the classroom and watching real people, not just each other.
Use the design studio environment

Yilmaz recommends bringing designers and non-designers alike into a studio environment. To her, everyone is creative – akin to the design mind concept proposed by Kallish (2012). The key is to use the studio to get them to explore that creativity together in the framework of design thinking. Lueth also recommends the studio space.

But get out of the building sometimes

Yilmaz maintains that even in a college environment, the students need to get out, observe the users, ask questions, and gain insights. “How do you possibly get that voice of customers if you do not know how to find the right customer, how to ask the right questions? So it’s very related to the whole process” (2013).

Balance collaborative and individual efforts

Throughout his teaching experience, Chidister has found that when working with groups of students it is more effective if there is an alternation between pure group work and individual ideation. The group sets the same parameters or constraints down together; each individual may work individually for a time, and then they all bring their contributions back to the group and work from there.

When considering his career as a landscape architect, designer, and artist, Chidister note that it “was impressed upon me the importance of bringing many different voices to the table to contribute information and expertise that will help to solve the problem or generate new ideas” (2013).
Chidister says that this way, “everybody has the same amount of air time to put their ideas on the table or their perspective that hopefully through that, there will be a gain, a better understanding of what each person can contribute, but also not have one person dominate as if you were sitting around the table “(2013). He believes that this method encourages a broader set of ideas to build from together.

Margolin echoes this view, but cautions that shared understanding of the problem must be in evidence before the group breaks up for individual exploration (2012). Margolin recommends having the students ask themselves, “what are the characteristics of what you’re doing?” (2012). These can include what goes into the project component-wise, how do the components relate, and what is the end goal. “Breathe in and you're all sitting there together trying to figure out the characteristics of what you're doing and what each contributes,” Margolin says. “And then you breathe out, where everybody goes off and does something that they then bring back. And so you're going back and forth until you actually can see the final shape” (2012).

- Encourage multiple leaders across disciplines, not just designers

Natural leaders or “unofficial” leaders will emerge as a matter of course. Yilmaz recommends encouraging leaders in each discipline that are engaged with the project, not just a single designated “leader”: “Do not put the entire load of responsibility onto one person” (2013), she recommends.

Chidister also advises on leadership and facilitation; however, he recommends perhaps having one person who is focused on keeping the conversation balanced with equal time for both the outgoing students and the more quiet students so that no one dominates the conversation. “The importance and the power of this is that everybody has
a chance to contribute, even though their personality might be more quiet and introverted.” Chidister notes that “if you don't hear everybody's voice, then you lose something in the conversation” (2013).

- **Evaluate on a regular basis**

  In Chidister’s experience, it is important to grade and give constructive feedback to each student at fixed points during the semester, especially for a single project that takes place over the duration. “It puts them in a great deal of risk because they don’t really know the rules of the game” (2013). By evaluating at several points (such as a three-part project based on the three phases of design thinking), the instructor gives the student opportunities to improve himself or herself versus an ominous final grade. Both instructor and self-evaluations are recommended.

  A major challenge, Chidister notes, is breaking down individual work and group work in a collaborative context. Chidister thinks, “the burden is maybe on the faculty to make it clear about the work that's being done whether it's the individual work or whether it's be done in the group context” (2013).

- **The goal is not a final product but learning the process**

  Yilmaz questions whether the students need a final product at the conclusion of the class, or is it the fact the students went through the process often enough? There are precedents for this approach (2013).

  For example, Chidister’s own class, ISU’s ArtIS 310, uses a modular project-based approach without a requirement to complete a piece. Instead the students go through the process of exploration, making and reflecting on their work. If the work is
inspiring to the student, it is hoped they will complete it in future classes on his or her own (2013).

Kolko concurs with this approach because he feels that at the end of 15 weeks it is unlikely the students will have solved the problem, regardless what it may be, due to inexperience. However, they will have engaged the process, and that is the entire goal—to introduce design thinking. He point out that “the whole point is an introduction; they need to feel that sense of passion, mystery, amazement about the process at the end of it, so that they then go throw themselves at it to become the unicorn” (Kolko, 2012b).

4.3.16 - Institutional Inertia

Kallish asks an important question concerning teaching design thinking and that is whether the class will be an isolated experience or continued through the entirety of a student’s education. What he calls for is follow-up and reinforcement of the tenants of design thinking throughout a curriculum, versus a single experience. He states, “there has to be a change at the faculty level because I still think many faculty are not are still into that ‘expression to production’ model, are still into the ‘let’s talk about creativity as a mystical process’ that can’t be repeated.” Such faculty resist talking about a more systematic approach to design thinking, because they see it as “a systemization of design”, which is antithetical to what they see design as being about (2012).

The curriculum model Kallish asks for would start with basic design thinking principles taught at the core classes with those being reinforced and built-upon from class to class and year-to-year, with each faculty member reinforcing the collaborative, human-centered approach in a consistent way.
Ferrara has a similar feeling on the idea of reinforcement; otherwise the experience, she believes, is superficial. “It seems like a novelty if it’s just a class,” she said, noting that, “I mean you probably have to start that way” (Ferrara 2012). Ideally, Ferrara believes the study of design thinking should be integrated into the curriculum and practiced often. Perhaps treating the class as its own startup would be a good approach to show what the students can do.

Lueth says integrating design thinking into a curriculum is ideal, but difficult. “We’re trying to teach them the foundations of design,” she notes. Yet many colleges cannot come to a consensus on what those foundations are, much less setting up collaborative environments. Lueth agrees with Kallish that in the end, it is the faculty who must reinforce design thinking, but instructors of design commonly take pride in their own pedagogy, each being different and with a curriculum based on their experiences. The assumption is “Every individual is different, we have our own method of teaching; therefore, respect that” (2013). One cannot simply tell another faculty member how to teach, she acknowledges.

Yilmaz is fairly optimistic based on her experiences teaching industrial design and architecture students. She encourages students to use their own outside projects or other classes as subjects in her design thinking class. “Once they learn the basic understanding of design thinking, it’s hard to not use it” (2013).

4.4 - How Design Students Think

The following figures show the results of the participatory observation in the class and the exit survey. Of the nine students who started, seven were able to complete the research. The connecting lines merely show a general path and do not preclude a student jumping back and forth multiple times during the studio time. It should be stated that the assignment was for each
student (working individually) to create a design inspired by a particular designer. This assignment certainly shaped, if not limited, the student’s scope of research; also, the element of collaboration so key to design thinking was missing from the get-go. Nonetheless, I was able to capture a graph of each student’s design process, and learned much about pitfalls and students’ “natural inclinations” in the process. It should be said that this graphing procedure—tracing students’ activities (horizontal) on the seven studio days (vertical) devoted to the assignment—follows X (200X) and Y (200Y), albeit with my own terms inserted. A hollow circle in the empathy column indicates that while the student did conduct research, any human-centric empathic approach was missing from the student’s process.
4.4.1 - Observational and Survey Evidence by Student

4.4.1.1 - Student 1

Figure 4.3. - Tracking of Student 1’s designing mode along the design thinking model.

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*Problem:* Create a fashion design fabric inspired by Robert Wu employing marbling.

*Research:* None empathetic. Web, books, articles

*Changes problem:* Yes

*In-class material:* Unhelpful

*Discover, then create:* Yes

*Changes ideas:* Yes

*Prototype:* No

*Validate:* No

Student 1 was methodical about researching the correct techniques and understanding all the physical constraints of the project. Ideation was fairly short, but methodical. Student 1 never produced a prototype, instead created a single piece at the end of class. This could be due to the costs involved and the difficulty in prototyping this kind of fabric beyond sketches.
“(I) cross reference books, websites and articles on the process of marbling. Each resource described the process in different ways.” - Student 1

4.4.1.2 - Student 2

Student 2 got into sketching up ideas right away and getting feedback on those ideas; however, the student was not motivated to finish the work, being unhappy with the initial idea, despite progress. This could be because Student 2 only set vague constraints early on. Ideation

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**Problem:** Create an organic stationery design inspired by designer Jessica Hische  
**Research:** None empathetic. Web, photography  
**Changes problem:** Yes  
**In-class material:** Helpful  
**Discover, then create:** Continuous  
**Changes ideas:** Some  
**Prototype:** Yes  
**Validate:** Yes. Late phase from prototyping  
**Revise from prototype:** No (Note some feedback fed to final, not an additional prototype)
continued evolving throughout the process (dozens of versions), but without a specific goal for the use of the type. At the end, the student decided to redefine the use of the font and therefore the initial problem and constraints, which helped bring the ideas together. The project was left unfinished.

“I thought my results got better as I progressed. This showed my development of my understanding of pattern.” - Student 2

4.4.1.3 - Student 3

Figure 4.5. - Tracking of Student 3’s designing mode along the design thinking model.

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**Problem:** Challenge conventional perceptions of time in film, inspired by Darren Aronofsky

**Research:** *None empathetic. Web, photography, film, on-site visits

**Changes problem:** Yes

**In-class material:** Helpful

**Discover, then create:** No

**Changes ideas:** Some

**Prototype:** Yes
Validate: Yes. Kept up continuous feedback with peers on approach and ideas
Revise from prototype: No. No raw edit of the film was created as a prototype

The student had a fairly strong idea of what they wished to accomplish from the beginning of the project. While coming up with ideas, several new explorations were made by the student in the first weeks. The student continuously conferred with both classmates and peers in outside disciplines for feedback. No rough cuts or storyboards (prototypes) were created of the movie; however, a final product consisting of a short initial cut of the film was delivered. Given the student in question, it is likely this can be seen as a prototype itself with continual iterations to follow once the class ended.

“I use mostly the Internet for the gathering of my information.” - Student 3

4.4.1.4 - Student 4

Figure 4.6. - Tracking of Student 4’s designing mode along the design thinking model.

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Problem:  Explore modern beauty self-image distorted through Photoshop, inspired by Nicolas Henri

Research: *None empathetic. Web only

Changes problem: Yes

In-class material: Helpful

Discover, then create: Continuous

Changes ideas: Yes

Prototype: Yes

Validate: Yes. Primarily sketches early on, with designers and non-designers

Revise from prototype: Yes. Finished prototype shown for reactions and feedback. Revised for final.

This student also had a strong idea of what they wished to accomplish. However, early on they fixated on a particular approach, which became the focus of several prototypes that spurred additional research, but no additional approaches to the problem at hand. The student continually reworked on the piece’s prototype, reframing her constraints not by her original research, but through insights gains as she prototyped and did follow-up research. In effect, she changed her constraints to match her design and not the other way around. With the exception of some early feedback and right before turning the project in, the student worked in isolation.

“*I researched as I go along, I don't really think you can complete research. At least, that isn't the way I learn, I always gather new ideas.*” - Student 4
### 4.4.1.5 - Student 5

Figure 4.7. - Tracking of Student 5’s designing mode along the design thinking model.

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*Problem:* Conveying the power of nature through mixed media collage inspired by Beatriz Milhazes, Yinka Shonibare, and Matthew Richie.

*Research:* *None empathetic. Web, books, video*

*Changes problem:* Yes

*In-class material:* Helpful

*Discover, then create:* Continuous

*Changes ideas:* Yes

*Prototype:* Yes

*Validate:* Yes. Interested primarily in initial reactions to prototypes

*Revise from prototype:* Yes. Revised for final.

The student had a rough idea of what they wanted to convey from the beginning. As the problem was ill-defined, it took some weeks and experimentation to frame the constraints of what they would work with. The student went through a lot of ideas really quickly and then began prototyping after getting more inspirational research based on their ideas. The prototyping was continuously refined with feedback from peers and outsiders until a final was delivered.
“I research as I go along, I don't really think you can complete research. At least, that isn't the way I learn, I always gather new ideas.” - Student 5

4.4.1.6 - Student 6

Figure 4.8. - Tracking of Student 6’s designing mode along the design thinking model.

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The student got into sketching up ideas right away and getting feedback on those ideas; however, the student was not motivated to finish the work despite an initial passion for it. The student also only set vague constraints early on. Ideation continued evolving throughout the process (dozens of versions), but without a specific goal for the use of the type. At the end, the
student decided to redefine the use of the font and therefore the initial problem and constraints, which helped bring the ideas together. Ultimately the project was left unfinished.

“No, I didn't really do a whole lot of research, I kind of just dove in and starting looking at type and creating my own.” - Student 6

4.4.1.7 - Student 7

Figure 4.9. - Tracking of Student 7’s designing mode along the design thinking model.

<table>
<thead>
<tr>
<th>Day</th>
<th>Discover</th>
<th>Create</th>
<th>Build</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Define</td>
<td>Empathy*</td>
<td>Frame</td>
</tr>
<tr>
<td>1</td>
<td></td>
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<td>2</td>
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<td>3</td>
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<td>4</td>
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<td>6</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Problem:* Write and illustrate a surrealistic story that based on the overlapping styles of graffiti and commercial illustration. Inspired by Hiroshi Yoshi.

*Research:* *None empathetic. Books primarily*

*Changes problem:* Yes

*In-class material:* Helpful

*Discover, then create:* Continuous

*Changes ideas:* Some

*Prototype:* Yes. Only for self

*Validate:* No

*Revise from prototype:* Yes
The student rapidly defined the rough ideas they wanted to explore, leading to additional research and more ideas. The student constantly was integrating multiple ideas, both complementary and contrasting throughout the process. As the project approached the midpoint, the ideas that were being prototyped began to be reframed and ultimately the goal of the project was redefined. The project was not completed within the timeframe of the class; however, it was extended after the class ended, but that work is outside the scope of this thesis.

“My research was about half finished before I started working on ideas. I knew I had enough of a starting point after the first artist study, but tried to get something out of each new set of research. It helped to have existing stuff to graft new ideas onto.” - Student 7

4.4.2 - Derived Statistics Based on Observations and Survey

Figure 4.10. - All student design mode tracks overlaid.

<table>
<thead>
<tr>
<th>Day</th>
<th>Discover</th>
<th>Create</th>
<th>Build</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Define</td>
<td>Frame</td>
<td>Diverge</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
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<td></td>
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<td>3</td>
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<td>4</td>
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<td>5</td>
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<td></td>
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<td>6</td>
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<td></td>
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<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
This figure illustrates the wide variety of paths each student took as a whole.
As isolated incident, each student path was unique to them. The only framework they had was provided by the class. The students were encouraged to research, but not required to; encouraged to ideate and explore - but allowed to do so in whatever way they wished to; and encouraged to reflect on their work - questioning their premises, asking others, testing their ideas.

Looking at Figure 4.9, by itself and without dimensional context, it is difficult to locate patterns other than a general progression from top to bottom, right to left through the process over time. The data needs to be refined further to create meaning.

Figure 4.11. - Best case path as determined by removing single and double impression design mode events.

The figure above takes the data of Figure 4.9 and expressed the count for each instance of student action through different-sized dots. The outliers of a single instance and then of two
instances were removed until a general pattern of connections emerged. This pattern roughly follows a designerly process as described in much of the literature and specifically in the generalized process presented in Chapter 4.21.

Several caveats must be made. First the left-right progression in a single day is an assumption based on observations. Second, while the students were observed in various phases of the process, with only a sample size of 7, it is merely a directional impression and not easily generalizable. Lastly, any work the students did outside of the studio space could not be observed, though by inference and questioning it was found that they tended to focus on the last task I had observed the day before, or the first task of any day was a continuation of the out of studio work.

Figure 4.11. - Number of days out of seven when a particular phase of the design thinking process was employed. *No actual empathetic research was conducted by the students. The number represents all other research that normally would complement a human-centered approach.

Looking at Figure 4.11, it should be noted that it is possible for multiple phases to be entered in a single day. In addition, unobserved days between class periods were outside of the
observation scope. The majority of the students’ energy seemed to be focused on the *create* phase, either concurrently or after the *discover* phase. While the exact amount of time a student spent in each phase or sub-phase of the process, it is likely that the act of discovery was somewhat less important than the act of creation. Actual *building* was slightly less engaged in than discovery, with time spent on finalizing the project being the least concern. As noted earlier, the students knew none of these phases as a framework and more importantly, while students were encouraged to complete their projects, it was not a requirement for grading; rather, the effort and insights they gained was.

Table 4.13. *Source of student discovery research.*

<table>
<thead>
<tr>
<th>Source of Student Discovery Research</th>
<th>Online</th>
<th>Print</th>
<th>Other</th>
<th>Empathy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web Search</td>
<td>86%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blogs</td>
<td>14%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Journal Articles</td>
<td>14%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Books</td>
<td>57%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Photography or Video</td>
<td>29%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>People</td>
<td>0%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Online research by far was the focus of most of the students. Of the other methods, only books stood out. However, the studio space contained a library of readily accessible books on multiple subjects, so this number may be skewed by the convenience factor.

As noted above, the practice of empathy was completely absent. Regardless of their origin as art or design students, none of the students examined whether their initial ideas had merit with others, was solving a problem others experienced, or filled a void that could be addressed. This could be for many reasons, such as the art students may only be interested in
expression, but for the design students given free reign, they too were mostly interested in expressing their own ideas, without any need or use for the idea beyond a grade, portfolio piece, or personal satisfaction. There is nothing inherently wrong with this; however, it is interesting that none of the students searched for a problem to be addressed that might help others. Two of the students could be seen as bringing a product to market (a new typeface and stationery design). All else on the face of it is purely expression.

Figure 4.14. - *Effects of research upon student’s initial ideas, whether they completed research first, and subsequent designing work affected by research.*

The students all were affected to varied degrees by the research they conducted. Of the opening ideas they started with on the first day, all but one were affected or changed by the initial research phase. Only one of the students claimed (or was observed) to finish their research first before moving into the creation phase. For most, the sketching, idea generation and eventually prototyping opened up more questions that prompted more research. Again, for all but one student (Student 4), this research
drove their work’s direction. For Student 4, the work drove the research, where they looked to use research to justify their prototyping approach. In doing so, the student seemed to be reframing problem to match what was in development.

Figure 4.15. - Percentage of students who sought outside collaboration/validation versus going strictly on their own.

Of all the students, all but one (Student 7) solicited feedback at various phases of the process. Of those who solicited feedback, all sought both classmates and outside feedback (primarily friends and family). According for Figure 4.14. one student looked only for initial feedback on ideas, two only looked for some form of validation of their prototype, and two were engaged in continuous feedback loops. It should be noted that this feedback is neither properly called ‘collaboration’ nor ‘validation’ in the strictest sense; however, it is interesting that the great majority of the students did not go it alone and work in isolation. Feedback from others was both desired and useful in their work.
4.5 - Anecdotal Evidence

Since starting working on the idea of design thinking as a focus of research, I have been given the opportunity to employ design thinking in three environments: six lectures at the ISU College of Design, a discovery workshop with 7th/8th grade students at the Science Center of Iowa, and my daily work as a design lead at WebFilings, Inc. The following are some short descriptions of those experiences.

4.5.1 - Lectures at the ISU College of Design

Of the six lectures I have given to design students on the topic of design thinking, two have been to sophomores, one to juniors, two to seniors (in specific the capstone class kickoff), and one to graduate students. All of the following evidence is anecdotal only; however, they reflect first-person human-centered observations of students learning the basics of design thinking—empathetic observation that will likely inform my final proposed classroom approach.

The lectures to undergraduates followed the same basic framework: 20-30 minutes to provide an overview of design thinking, followed by 1 of 3 exercises. The graduate lecture focused almost entirely on the discovery phase of design thinking as the class was focused on research.

One exercise used in two of the undergraduate lectures focused on integrative thinking. A dozen sets of two contrasting brands were presented to multiple groups of 3-4 students. Each group was encouraged to research the underlying values of each brand and propose a solution that integrates them into a single approach. They then presented their ideas to the class. The sophomores seemed to embrace the idea of design thinking more readily than the juniors, were
more engaged, and came up with more subjectively interesting, out-of-the-box solutions to the brand problem

**Brand Merger - Integrative thinking (40-45 minutes)**

“How many of you have heard of a recent company merger? It happens all the time, and sometimes one brand takes precedence over another and sometimes they merge to form a new brand. Each group has been given two logos representing brands that will be merging soon. Some are complementary and others are not. Using Design Thinking principles, let's make a new brand that will successfully convey the underlying value of both starting brands. Today, you will focus on researching each brand quickly (it is okay to use your computers), both online and based on how each of you feels about that brand as a customer. Then you will ideate as many concepts as possible and present the best of those ideas to the class.”

**Step 1: Inspiration.**
Hand out two company logos and ask the students use their laptops and each other’s experience to learn about who the brand is are and who their clients are. This should take 10 minutes.

**Step 2: Ideation.**
Come up with ways to merge these company's brands. Sketches optional. We are not looking for a logo, but an underlying value and idea. A brand personality that a logo would be based on later. If you need to create a quick logo(s), go for it. This should take 20 minutes.

**Step 3: Presentation**
Based on your ideas, have your team vote for which one you believe is the strongest. What is your idea and how will that idea convey the two former brand’s underlying value? Everyone will hand in his or her ideas.

A second exercise was adapted from a similar idea presented in the d.School *Bootcamp Bootleg* (2011). This exercise was used twice, once for sophomores and once for seniors. The basic premise of the exercise is that the students pair up and interview each other about their ideal wallet, and more importantly how they use it. They then ideate a few quick concepts based on their interviews and then paper prototype their integrated idea. Like the initial brand exercise the sophomores had the greatest enthusiasm and out-of-the-box ideas, but with the prototyping the seniors tended to be able to craft more quickly and in a way that conveyed their idea’s functionality.
Wallet Design - Packaging your life (40-45 minutes)

"How many of you carry a wallet or something similar in a purse or computer bag? Most everyone, right? One of the most fun aspects of graphic design is packaging. Your wallet is nothing more than a convenient package for little, but important, parts of your life: identity cards, debit cards, tickets, receipts, etc. Using Design Thinking principles, let's make a better wallet for your neighbor (and yourself). Today, you will explore a human-centered solution for your mutual wallet needs."

Step 1: Discover or "How might we make a better wallet for you?"
Take 5 minutes to describe to your neighbor your perfect wallet. Let them empathize with you by going over what you use it for, your concerns, your problems with previous wallets, and pull out your current wallet to demonstrate your likes and dislikes. They will write this all down on the paper provided. When you hear the signal, switch and start another 5 minutes. Your neighbor will ask you the same things. Similarly, you write down these observations on the paper provided to you.

Step 2: Define
Take 5 minutes to work together to define the constraints you find in common regarding your wallet needs. What factors are different? List them.

Step 3: Ideate
Take 10 minutes to create/sketch as many crazy wild ideas as you can to solve your mutual wallet problem using the constraints as a guide. Create at least 5 ideas that address both of your concerns, the more the better.

Step 4: Share Your Ideas
Pick an idea that you both love. If picked, tell the class the constraints and your top idea. We will likely pick 10 groups of two. Everyone will hand in this exercise.

A more recent exercise (inspired by Jeff Patton) was presented to seniors for their capstone class and for graduate students conducting usability research. Patton, when discussing his approach to story mapping, asked, “Write down everything you did before leaving for work, from hearing the alarm to closing the front door.” Instead this exercise asks the question, “Why are you late for class in the morning?” Both the seniors and the graduate students responded well to this exercise, fairly quickly isolating common roadblocks students run into while getting ready for school.

Experience Design - Don’t be late (40-45 minutes)

"How many of you have never been late for your first class in the morning? My guess is at least once, you have been late, if not more than once. I certainly have. What we are going to do today is use the story mapping method to gain a little empathy and understanding for everybody in your group’s morning routine.
By gaining this knowledge, perhaps we can draw some constraints to help ideate on ways to improve the morning grind. We will form into groups of 3-4 to get started.”

**Step 1: The Morning Journey**
Take 10 minutes to ask yourself, “What are all the activities I did this morning from the alarm going off until the door closed behind me?” Write them down in order on post-it notes. If you wish, have one of the group act as an interviewer/facilitator.

**Step 2: Find Commonalities**
Take 15 minutes to work together to group each of the activities together with similar ones. For instance, if you all brushed your teeth, or something similar, they go in one pile. Shower in another. Hit snooze in another. If there is anything that cannot be grouped, place it into another pile called ‘outliers.’

**Step 3: What is the Ideal Path**
Take 10 minutes to create a possible ‘happy path’ story map based on the common piles of activities in front of you. This path should be the one of least resistance that you as a team think is ideal. Note what activities could be done at a different time than the morning, which slow you down, and which could be combined or eliminated.

**Step 4: Share Your Ideas**
Over the next 10 minutes, we will call a couple groups to present their story map. What is the path? What insights did you make on what tended to make people late? Were their outliers that need to be considered? Everyone will hand in this exercise.

The primary takeaway of these lectures is that the basic concepts of design thinking seem to resonate with students fairly quickly, with younger students who have not developed design process habits being more eager to engage and older students displaying a higher degree of craft skills. The latter is to be expected, but it interesting to note how much the younger students were engaged in the process and how many out-of-the-box ideas came from them versus the older students.

### 4.5.2 - Teaching 7th/8th Graders at the Science Center of Iowa

A colleague (Clifford Gentry) and myself were invited through the ISU Graphic Design Department to conduct a design thinking primer with a dozen 7th/8th graders at the Science Center of Iowa’s Design Challenge camp over 3 hours on July 21st, 2012. This bootcamp focused on inspiring creativity in the kids using the Design Thinking Educator’s Toolkit (IDEO, 2011).
• **Icebreaker** - The session started with an icebreaker exercise. The students divided into two working groups were given a very simple (and classic) challenge: “how many uses can you think of for a paper clip?” The students then wrote or drew their ideas on to Post-its and put them up on the wall, each team racing to get over a hundred ideas, which each did.

• **Discovery** - The next step was to create a challenge for the students. We asked each of them to come up with the top 3-5 chores they did at home and list them. They then picked the top two most common chores they wanted to address. Both teams selected walking the dog and mowing the lawn.

• **Interpretation** - The students were asked to tell their stories about these two chores. How hard, fun, time consuming, etc. They were encouraged to discuss the problems and look for opportunities to solve them. Both teams decided to solve the problems together and an innovative challenge.

• **Ideation** - Using markers and paper, the students sketched up ideas for solving the dog-walking and lawn-mowing conundrums, ultimately coming up with two takes on a ‘dog-powered lawn mower’ quite independently.

• **Experimentation** - With cigar cleaners, popsicle sticks, paper, tape, and paper clips, each team proceeded to prototype their inventions. Once they finished their prototypes the teams presented their solutions.

Despite a coincidentally similar premise, the actual mechanisms the students came up with were quite different. Most importantly, the students were engaged in the process of framing a problem, empathizing with each other’s challenges with it, coming up with many, many
solutions and then prototyping them. Design thinking appeared to be exciting to them, and participation and enthusiasm were seen in all the students in different degrees.

4.5.3 - Employing Lean UX/Design Thinking Principles at WebFilings

At WebFilings the user experience team employs a modified Lean UX (Gothelf, 2013) approach, which is foundationally based on design thinking and Agile principles of software development with approaches from Patton such as story mapping (2011) integrated as part of the process. This modified Lean UX process is fundamentally a human-centered one focused on several basic steps:

- **Discovery** - What pains are our customers having? While quantitative data analysis may give indications that there is a problem/opportunity for the product to solve, it takes qualitative data to gain insights from the user. Types of research typically include customer visits, interviews, and observations to gain empathy with the user’s challenges and frame the problem’s constraints. These desirable ends are further constrained by whether the problem is a viable one to address and whether the resources available make any solution feasible.

- **Ideate** - Once the problem is framed, an ideation session is started. Usually this will include at least one designer, a product manager, and an engineer. However, depending on the problem, marketing, accounting or other professionals may be brought in as subject matter experts. An ideation method or methods are used to diverge as many solutions as possible in a timeboxed period.

    Common methods include story mapping (Patton, 2011), problem canvases, sketch sprinting, and affinity diagramming. The principles of ‘all ideas being valid’,
‘building on ideas’, ‘keeping out the devil’s advocate’, and ‘optimism’ are encouraged. These ideas are then converged and integrated to a few potential solutions based on the
constraints from discovery.

- Build - A rough idea of the designed solutions is wireframed/prototyped as quickly and inexpensively as possible. The complexity of the prototype is directly linked to who the audience for the design is, and what needs to be tested.

- Measure - The design is tested with internal and then external (actual) users. The tests are primarily observational and qualitative in nature, but tools such as Google Analytics are often employed to gain additional insights.

- Learn - The lessons learned are taken and used to iterate on the design, which is further refined and sent through the process. If the lessons indicate a change in the problem or the primary ideas, then the whole process (or parts of it) may be repeated.

The Build-Measure-Learn (Gothelf, 2013) loop is designed to keep things simple, inexpensive, and most importantly to connect with the needs of the user. The main tenets of design thinking: empathy, collaboration, ideation, and optimism are a constant companion to the Lean UX process. Like IDEO (Brown, 2009; Ferrara, 2012), WebFilings believes the underlying culture of the company fosters successful discovery and design. The company backs this effort completely and is constantly iterating upon itself to build the kind of environment where a Design Thinking culture can thrive.

So far, the results of employing these processes in concert with management buy-in have been primarily positive. The main thrust of collaborative discovery with users and design with transdisciplinary teams has delivered actionable results for product improvements that users have
responded to favorably. While not within the scope of this thesis, it would be a possible option for further research to conduct a comparative study of the adoption and success of design thinking practices, for instance between large, medium and small companies as well as a comparative study looking at the impact of design thinking processes with Agile versus traditional models such as Waterfall.

WebFilings serves as a complementary example to IDEO’s approach, where Ferrara makes it clear that without a company-sanctioned creative culture of innovation (which IDEO and WebFilings have adopted), Design thinking approaches face difficulty (Ferrara, 2012). The same may be said for educational institutions. While one class is an interesting isolated experience which may help, ideally the educational culture—if it wants to successfully integrate design thinking—should carry the lessons, methods, and approach forward as the student progresses from class to class (Ferrara, 2012; Kallish, 2012; Lueth, 2012; Robinson, 2011).
CHAPTER 5 - ANALYSIS AND CONCLUSION

5.1 - Introduction

The explorations conducted through reviewing current literature, interviewing design professionals, and observing sophomore and junior art and design students at work were predicated on answering three basic questions:

Q1: What commonalities exist between the various design thinking process models that can be synthesized into a generalized theory of design thinking?

Q2: What does experience say are the basic tools and challenges in the practice of design thinking and therefore the most important educational tools of the practice to introduce to students?

Q3: Do undergraduate design students think in a way that is consistent with a general theory of design thinking?

While it can be argued that attempting to answer these questions may have produced more questions than answers, I believe that for each there is certainly more known now than before.

5.2 - On a Generalized Theory of Design Thinking

Returning to Dubberly, there are an enormous number of process models and frameworks for the act of designing (2008), from Doblin’s Short, Grandiose Theory of Design (1987) to Gothelf’s Lean UX (2013). However, when the subject is narrowed down to specifically design thinking, it may be argued that the more limited set of models lends itself to generalization while still being flexible on the methods employed. All the models can be said to have a common phase where human-centered research occurs. They all touch on collaborative ideation and
creation of possible solutions. Lastly, all the models have some kind of building phase where prototyping, validation and delivery occur.

5.2.1 - Basic Insights

Kallish relates a story, which was an inspiration for the comparative chart (Table 2.1) seen in Chapter 2 that takes the various models of design thinking and puts their phases in the context of one another. What I did with a small number of books and articles, Kallish himself did with the cacophony of opinion found on design thinking discussion boards over three weeks (2012). Ultimately he made three important observations, which this study has confirmed as true.

First, the various terms for design thinking and its process phases are not universal. Each design educator, design writer, or design innovator has a description of the process that resonates with his or her practice and observations. However, regardless of the terms, the meanings of those terms are nigh identical. Kallish sums it up this way, “it seems like the design community seems dedicated to reinventing other people’s models using their language to make it unique, which is natural” (2008).

The second observation is that design thinking is ultimately a framework for ideas, what Kallish calls “intellectual scaffolding” (2012). This idea is echoed (in different terms) in Cross, Brown, Martin and others. In the simplest terms, design thinking is an optimistic, human-centered, and collaborative framework for discovering the essence of a problem, creating potential solution ideas, and building, testing, and learning from those ideas. That is it.

The third observation is that there is little agreement on the specific methods that bring design thinking from a conceptual framework to actual practice. The research indicates that once you remove the veneer of the design thinking model, you find each studio, agency, or school has
its favorite methods such as rapid prototyping, affinity diagramming, opportunity canvases, user observations, or story mapping. Even the methods have sub-methods. Story mapping, journey mapping, experience mapping, feature mapping are all flavors of a method for understanding user behavior. Similarly for gaining empathy and understanding, some favor user collaborative techniques throughout the process (LWC, 2011), and others objectively observe and query the user at the discovery phase, and use the building phase to validate the idea (Brown, 2009; Patton, 2011). Those methods, however, can change as the needs of a project change. This does not even get into protocols on how to set up ideation groups, what ground rules are set, how long one should ideate, if there really are ideal participants, etc.

5.2.2 - Significance for Education

Design thinking is a seemingly chaotic process and its growing library of methods (as shown above) is equally chaotic. In industry, that is okay. Each business or organization can adjust the overarching design thinking process for their needs and employ the methods their team finds most effective. The process is iterative unto itself. And it should be.

However, in education, a rigorous common set of methods, terms, and protocols would be helpful in teaching design thinking in a consistent manner – the caveat being that that iteration is the norm, the linear is really cyclical, and change is welcomed as new observations are made.

So if the first question of generality is true, there are enough commonalities to establish a design thinking model that is both consistent and comprehensive enough to be taught. Yet the research begs the question, Are there ideal methods for each phase of a design thinking process?, regardless of the minute differences in models and terms? Should there even be ideals? What are the protocols that frame each method and when do you decide to push forward, or go back to an
earlier phase? Some possible answers can be gleaned from the interview results below; however, a full exploration of potential approaches is a logical next step, followed by testing those approaches in an actual collaborative learning environment.

5.3 - Best Tools to Introduce Design Thinking Practice to Students

There is broad agreement amongst the interviewees on the best tools and approaches for teaching design thinking. These are not specifically the methods or protocols referred to above, but pedagogical approaches to teaching design thinking and the advantages and challenges of doing so in a transdisciplinary manner. The insight from the interviews can be broadly scoped to three areas: theoretical, pedagogical, and methodological, which help define the constraints for any class design.

5.3.1 - Theoretical Insights

It is important to realize that design thinking is not new. Only the frameworks, language, and protocols that surround and define design thinking may be – and that itself is a matter of debate. The historical depth of practices like design thinking, for example using Edison as an exemplar (Brown, 2008), is a useful tool in introducing the practice of design thinking to students. These historical examples—especially ones that cross disciplinary barriers (Yilmaz, 2013)—illustrate the “aha moments” and integration of ideas better than rhetoric or theory alone.

The crossing of disciplines, the transdisciplinary aspect of design thinking, is key to any instruction on design thinking. As both Kallish and Kolko note, the collaborative power of
design thinking is one of the main distinctions it has from other design models, the others being human-centrism, experimentalism, and optimism (Brown, 2009; Kallish, 2012; Kolko, 2012).

Optimism is an essential element of design thinking for itself and to teach, especially for students who in other classes are taught to be “critical thinkers”. Brown notes in any divergent ideation process, keeping a positive attitude, accepting uncertainty, and more importantly suppressing the “devil’s advocate” are key. Another piece that leads to an optimistic viewpoint is the willingness to push past the obvious and look for other solutions that perhaps are better, within enthusiastically embraced constraints, and with the acceptance that not every idea may work (Brown, 2009). An optimistic outlook can be highly influenced by the culture that surrounds design thinking or design in general (Ferrara, 2012; Robinson, 2011). A classroom is in effect a sub-culture, albeit a small one, therefore it is incumbent upon the design thinking instructor to convey an atmosphere of enthusiasm and curiosity (Kolko, 2012), while understanding the dynamics that come with teaching undergraduates, especially 18-19 year olds (Kolko, 2012b).

One of the underlying motivations for teaching such a class, or series of classes is the perceived need for graduates—both designers and non-designers—who can work in a collaborative, human-centric way with a wide range of skills at their disposal (Martin, 2008; Dubberly, 2012; Kallish, 2012). Whether leaders, facilitators or participants; T-shaped people or unicorns, the innovators of tomorrow cannot be specialists or ignore the insights of other disciplines. We need systems thinkers who can holistically look at a problem, not just for itself, but also for how it and its potential solutions affect the systems and people surrounding it. As Dubberly notes, any complex problem needs each discipline “at the table designing the product” (2012).
Lastly, design thinking isn’t just for designers. It is for everyone else involved in solving a problem or providing a need, including the user/client/customer and other professions. Trained designers already ‘think’ like designers (Lawson, 2006). But their intuition, or abductive reasoning skills, benefit from exposure to a broader view. Similarly, as Lueth notes, non-designers benefit by leveraging a process that encourages divergent thought and keeps people as the primary focus and concern (2013).

5.3.2 - Methodological Insights

The design thinking process is a framework for innovation, or as Kallish calls it, “intellectual scaffolding for problem-solving” (2012). This study has confirmed that the various models called design thinking, designerly ways of knowing (Cross, 1977), etc., describe nearly identical processes. The methods—for problem framing, human-centered research, ideation, and prototyping—are many and wide-ranging. Books that teach these methods are equally many, from Jones’s Design Methods (1970) and deBono’s Lateral Thinking (1970), to Laurel’s Design Research (2003) and Lupton’s Graphic Design Thinking (2012). But the underlying process is the same.

Perhaps the most important insight from the interviews concerning methods lies in the understanding that for any transdisciplinary collaboration to occur in design thinking, there needs to be a common language and from that an understanding of how each member of the team is contributing to the framing of the question and generation of a solution. Patton calls this “shared understanding” (2011), and he frequently uses story mapping techniques to cross that bridge. Kallish employs his “sunrising” (2012) method to get buy-in from each design team member and empathy with each other before reaching out to the end-user.
Besides its inherent simplicity and the need to establish a common language, another point of agreement is design thinking’s non-linear nature. Kallish (2012) and Chidister (2012) back up Brown (2009) and Moggridge’s (2010) assertions that while there may be a general tendency to move from discovery through creation to building; there is nothing wrong with jumping back, skipping ahead, making leaps of insight, or questioning one’s initial assumptions. The design thinking process allows for such recursive insights, helping participants stay aware of their process without judging it, such that innovation and optimal solutions can be achieved in place of a rush or methodical drive toward a [sub-optimal] final product.

This cyclical nature of design thinking is a method in a way. It is the method of learning from failure, trial and error, or experimentalism. For example, if a prototype’s testing with real users reveals that some of constraints found in the discovery phase were wrong, the philosophy encourages designers to reexamine those constraints and the research that led to them. In a linear process, this may be considered a failure. In the design thinking process, failure produces insights, which inform the design.

Of course, a design thinking class may not be able to be fully cyclical, as students need feedback, graded outcomes, etc. (Chidister, 2013). But the process lends itself to natural division for review/grading, for example the top-level phases of the generalized theory, as long as it is understood that in a later part of the semester one is encouraged to re-examine earlier work or assumptions due to new insights without drawing a penalty.

5.3.3 - Pedagogical Insights

Ideally any approach to teaching design thinking would be in the form of a program of courses, beginning with the freshman core through the senior capstone. In this manner
collaborative, human-centered practice would be taught, problems addressed in a
transdisciplinary context, and those methods reinforced from year to year so the students would
be ready to be the “unicorns” (Kolko, 2012b) that are desired by organizations and industry.

While it is a valid criticism that a single “Design Thinking” class would have limited
effect without a larger, curricular approach (Ferrara, 2012, Kallish, 2012; Lueth, 2013), I believe
that a single class, taught to either freshmen or sophomores is a reasonable starting point for
larger-scale pedagogical evolution. How then does one introduce design thinking given the
constraint of it being only a single class?

Any class on design thinking should be cross-college, or at the very least open to more
than design students. An honors class is one option. This would allow for the foundations of a
transdisciplinary approach to be successful. Efforts should be made to promote the class to the
other colleges (Lueth, 2013) through contacts with faculty, student groups, and direct marketing
of the class. Ideally this promotion should be early enough, perhaps a semester before to build
interest, though the best method to promote it is an open question.

At ISU the typical semester is 16 weeks, with design studio classes typically being 3
hours and 2 days a week. Based on the interviewees’ feedback, in that time one could conduct in
a studio framework a form of onboarding exercise to acclimate students to one another (Kallish,
2012; Kolko, 2012b, Yilmaz 2013), followed by a bootcamp approach where the students work
together in the same space (Ferrara, 2012) rapidly running through the entire design thinking
process in a short time. Preferably this should include getting out of the building and observing
real people as a team (Kolko, 2012b)—essentially diving into the process in an intense, perhaps
overwhelming way, and then repeating it the next day.
Based on the interviews, once the bootcamp is completed, the semester would be divided ideally into thirds with one design thinking module per third, reflecting the “discover–create–build” paradigm in a project-based learning format.

The first module, Discover, would focus on methods of discovery and actual human-centered research on some basic—but very real—partially defined problem, for example bus wayfinding (Chidister, 2013; Kolko, 2012b). This gives the students a basic but flexible structure to work with (Yilmaz, 2013) that they can either accept, or redefine as the research reveals insights (Dubberly, 2012). Potential methods include observation, active listening, surveys, story mapping, and setting constraints. This module will highlight the importance of empathy over simply understanding a user or their problem (Kolko, 2012b), withholding judgment, asking questions, and listening (Kallish, 2012). As will been seen below, most of the human-centered methods are unknown to design students, and not something they do instinctively, confirming Kallish and Yilmaz’s assertions (2012, 2013). At the end of the module, the students could present what they have learned, allowing for evaluation and feedback (Chidister, 2013).

The second module, Create, would focus on methods of creative ideation and the use of those methods in the context of the research. This would include lectures and practice on divergent, convergent, and integrative thinking with a focus on collaboration and optimism along the ground rules set by Brown for idea generation (2009). Potential methods include brainstorming, idea sprinting, sketching, and timeboxing—all with the knowledge that, as noted above, the processes are non-linear (Kolko, 2012b, Chidister, 2013). The fundamental idea is to teach methods that hone the student’s intuition and abductive thinking skills. Like the first third, an evaluation and feedback opportunity should be included.
The final module, *Build*, would focus on the students building the ideas into something that can be validated. Rapid prototyping, paper prototypes, user testing, and other validation methods, representations or models (Dubberly, 2012) would be introduced to the students. They would accordingly make prototypes and test them with real users and get data to refine their ideas, eventually compiling a persuasive in-class presentation of those ideas for evaluation and grading (Kolko, 2012b). This module is ideally a merging of design and making, where the students get hands-on shared experiences (Margolin, 2012).

For the instructor, the interviews revealed some strong advice on how to be the teacher of a design thinking class. This advice will be used as additional constraints when designing the sample design thinking class itself:

- Know what constitutes success for the students going in (Chidister, 2013), with the goal being learning design thinking, not necessarily solving the given problem (Kolko, 2012b; Yilmaz, 2013).
- Be the source of energy for the class; your enthusiasm is their enthusiasm and it affects the learning environment (Ferrara 2012, Kallish, 2012; Kolko, 2012b).
- Be cognizant of the typical social dynamic of the students, especially freshmen and sophomores (Kolko, 2012), and understand that is process is new to them—even the design students (see below).
- Frame the problem somewhat at the start, but make sure the problem is something real that the students can observe and learn from (Kolko, 2012b; Chidister, 2013).
- Tell stories as exemplars of design thinking in action (Dubberly, 2012; Kolko, 2012b; Margolin, 2012).
● Balance collaborative and individual efforts (Margolin, 2012; Chidister, 2013).

● Encourage natural leadership and facilitation efforts that give everyone a chance to contribute (Kallish, 2012; Chidister, 2013; Yilmaz, 2013).

5.3.4 - Significance for Education

In conducting the interviews, while there were some outliers on a particular pedagogical or design thinking point, it was both surprising and encouraging that the interviewees were highly consistent in their answers even though the interviews themselves were primarily free-form. Where there were disagreements—for instance Dubberly not seeing user research as driving products as much as refining ideas and Ferrara having an opinion that suggests the opposite—the differences were nuanced and the viewpoints equally valid.

What the interviews fundamentally revealed was both the need for a design thinking program at the undergraduate level and techniques that could be tried to establish, teach, and evaluate such a class, as illustrated above. As noted in the introduction to this thesis, the ultimate goal is to gather data to be used to create a class that facilitates a creative culture of collaboration, empathy, experimentalism and optimism. I believe there is enough data to create such a class, a sample syllabus of which will be found in Appendix A. However, some of the assumptions of design thinking and the weight upon which areas should be focused on with design students in particular must also be considered (see below).

5.4 - Is Design Thinking Natural for Design Students?

The results of the observational research would suggest that many aspects of design thinking, contrary to the design models of trained designers (Lawson, 2006; Cross, 2011), are not
common in early college design students (or art students either). Note that the study was purely qualitative in nature, offering no definitive answers; however, the observations offered directional insights on which parts of the process students excelled at, and which they had difficulty with or simply did not attempt through lack of experience or a perceived need.

5.3.1 – General Insights

The students’ design mode tracking graphs demonstrate a general tendency to fall naturally into a designerly process. They started with some form of problem, an idea, or a goal, researched that goal in some form and then kicked off the creative process at some point in that research, regardless of whether that research was completed or the problem effectively framed. Figure 4.10 illustrates this tendency.

Figure 4.10 also reveals that the students may already embrace the non-linear nature of designerly approaches including design thinking. Recursion to earlier phases in the model happened often, especially in the 2nd thru 4th days of the observations.

5.3.2 – Discovery Insights

The most fascinating insight of the discovery process was first, that no student chose to engage people whatsoever when searching for or researching a problem. Zero. It should be noted that 3 of the 7 students were art students and not designers; all the four designers were inexperienced; and the class did not explicitly require them to solve a problem. Still, Student 1 could have asked if there was a demand for the fabric they were designing, Student 6 could have asked their peers if they would use the typeface being designed, and Student 2 could have gone to a stationary store to observe what designs were popular – or simply asked.
The importance of empathy, brought up again and again in the literature and in the professional interviews is underscored here, not in its use but in its absence. As Kallish notes, this kind of human-centric approach is out of our students’ comfort zones (2012). In any class, special efforts must be made to reinforce the importance of human-centered research and its impact on design.

This could be simply because of convenience. The high prevalence of web research (86%), plus book research in a readily accessible library (57%), seems to bring home the idea that 18-19 year old students, in general are an unmotivated lot as Kolko points out (2012b). The evidence suggests the students are definitely looking for what is at-hand versus delving into the depth of the problem in unconventional ways. This view segues into Kallish’s assertion that design students are not the best problem seekers by default, but they have the ability to be great ones if given the right tools, motivation, and a chance to practice problem-seeking skills (2012).

For all the students, the research—albeit without an empathetic context—affect their problem or idea. For 72% of the students, the research made them rethink and reframe their problem and its constraints. Of the 7 students, all but one (86%) continually researched in some degree throughout the project, with those same students seeing the continuing research driving and modifying their work as the project continued. While not definitive, the data suggests that these students valued the insights they were given from their research and were perfectly willing to re-evaluate their assumptions and not (for the most part) fixate on one idea.

5.3.3 – Creation Insights

Students seemed to practice the “create” part of the design thinking model with the most assurance, matching the model’s predicates either from innate tendencies or previous training. In
total, the creative impulse took up the majority of the students’ time. All students sketched out numerous ideas and were enthusiastic in the process. As has been pointed out, design students are good at divergent thinking. It is the convergence that is difficult (Kallish, 2012). The research somewhat bears this out as much more energy was spent on divergence versus convergence (3.57 days versus 2.29 days).

What was interesting was the level of integrative thinking, where students tried—with varying degrees of success—to bring two or more approaches together, 2.14 days. With some exceptions, most of the students tried to meld multiple ideas into one approach by combining what they considered to be the most promising aspects of various designs.

5.3.4 – Building Insights

The idea of validating a prototype with others is somewhat absent with the students. For the most part for the students, validation occurred sporadically, haphazardly, primarily either during the creation phase, or in the last couple days of the project during the build phase. In the case of validation during the create phase, the typical approach was “What do you think of these ideas?” There is nothing wrong with this. Such validations are a type of collaboration with peers and outside feedback (see Figure 4.14.). One should note, however, that at no time was any validation, feedback or opinion sought from what would be the actual users, consumers, or buyers of the idea.

In all, 71% of the students did seek some form of validation during their project. Of that validation, about 80% was about prototypes. Looking at Figure 4.10, the majority, or 60% of those who sought validation on their prototypes did so one day before the project was due, then leaped to a final design.
Like the empathy question, the evidence does point to a lack of initiative, desire, or simply knowledge of the need to get feedback. This may be an artifact of students being trained as schoolchildren not to “cheat” or seek outside assistance, as well as a lack of awareness that feedback is possible or desirable. Any design thinking course should early on make it clear that prototyping and validation of those prototypes with real people is essential. A future study on this aspect of student behavior may be in order, as it does not seem on the face of it to be “natural” instinct in the Midwestern university setting to test and validate one’s ideas. Instead, the prototypes only serve for the most part as a method of self-reflection—which is certainly useful.

5.5 – Conclusion

Before beginning this thesis, I believed that design thinking was based on the apparently chaotic design processes that most designers tend to employ when solving a problem. The literature (Brown, 2009; Martin, 2009) seems to suggest this. However, when it comes to student designers, this assumption does not hold true—though there is evidence that suggests the potential for learning design thinking.

While they do “naturally” follow a designerly process in a rudimentary way, students in design and other fields that require interdisciplinary, user-centered problem-solving must be explicitly taught how to think like a designer through studio practice, repetition, and continual critique of their work and methods. The interviews point out many holes in much of current undergraduate design education that do not foster key skills of design thinking such as transdisciplinary collaboration, facilitation of a design session, user observation/listening (empathy), or prototyping/user testing. They also point out that there little agreement among
design professionals on what particular methods or protocols are the most successful. What my interviewees did agree on is that the current teaching models at many schools, including ISU, do not easily foster a design thinking approach either because of academic tradition and inertia. The interviews do point out that given the hypothesis that one wishes to teach design thinking to undergraduates, there are some best practices to draw from.

The general process of design thinking itself, despite its myriad of names and terms for what are essential identical concepts, can be boiled down to a simple model that I would propose can easily be taught at an undergraduate level. While recursive, the model (Figure 4.1) contains enough of a structure for students to grasp a linear progression, learning one piece at a time, while being flexible enough to allow the non-linear essence of the process to also be grasped. Only through testing in a classroom environment, with supporting best practices and commonly used methods and protocols gained from experience, can this model be fully explored.

Like any design thinking problem, this one needs to be prototyped, tested, and iterated upon to create new insights and frame new problems and solutions not gained strictly from research, but from users—students—deploying it in practice.

5.6 - Suggestions for Further Research

There are several open questions worthy of further exploration. First and foremost is the application of the insights and design thinking model in a transdisciplinary college studio. Appendix A contains a sample syllabus for such a class, though it would need to be tailored for the dynamics of students and the school it is validated at.

A second area of research is a thorough exploration of the methods and protocols used in design thinking, both in industry and in education. Many works exist that present various
methods, but there is no agreement upon the most effective methods for innovation. There may be no answer to this, but a modern take on design thinking methods on the scale of John Chris Jones’ *Design Methods*, may be useful for students and educators, especially if each method was given a level of rigorous examination to determine its effectiveness and the background protocols to determine when such a method should or should not be used.

A third area of research would be a more comprehensive exploration of the student designer and how their skillset and intuition evolve over time. The research completed for this thesis was directional only and of limited scope and duration. However, a more comprehensive exploration that followed students from freshman year through graduation, graduate school and then into their careers, may give possible insights into the designerly mind and how the practice of design is evolving from the making of artifacts to seekers of the future.

5.7 - Postscript

As a practicing designer, student and sometimes teacher I strongly believe that the teaching of design thinking, in a transdisciplinary manner, with a focus on collaboration and principles that foster innovation is absolutely essentially to student success and preparing them as professionals in innovation.

Rarely will the designers of today work in isolation. In my personal experience, I daily collaborate with disciplines from engineering, to marketing, to management. Working with a wide variety of skilled colleagues using design thinking approaches has delivered leaner, faster, more human-centered results than working in isolation or in skill-based siloes. Finding and hiring designers with the level of collaborative experience needed by industry is very difficult. Similarly it is also rare that recently graduated professionals in other disciplines have any
exposure to innovative solution approaches routinely used by design—such as design thinking. Or have even heard of them or the possibilities they offer. Few of my colleagues, including myself, were ever taught human-centered, collaborative skills in college. However, after being taught design thinking, and using it for work, the majority opined they would liked to have been given the opportunity to learn about it while still in college.

I am convinced by experience and by the evidence, that if we start teaching design thinking to students—designers and non-designers alike—early in their college careers, we can give them the tools to be the innovators, not just of the future, but of today, right out of the gate. These are the skills that are in demand in industry as noted by Kolko, Dubberly and the others (2012b; 2012). These are the skills routinely employed to tackle the tough challenges such as solving inner-city poverty or the more routine challenges of making a better software experience. These are the skills that frankly colleges and universities (with some notable exceptions) are only now beginning to see as important. If this thesis ends up being a part of expanding such education in any positive way or inspires others to do so, then I feel that everything I have done was worthwhile. I for one will continue to advocate for this approach and evolve it iteratively as any good design thinker would.
APPENDIX A - SAMPLE CLASS SYLLIBUS

The following is a proposed syllabus for an honor course to be taught at Iowa State University in transdisciplinary design thinking at the sophomore level. The course is a distillation of the lessons learned, observed, and documented in my research. It is not a comprehensive lesson plan. Depending on the final circumstances of the class being picked up by ISU, the specific lessons (for example the Cy-Ride project) may change. My goal for this syllabus is to start a conversation on getting such a project started. Ideally, this would be the first of a series of classes progressing though the sophomore, junior, and senior years that collectively would prepare students – designers and non-designers alike – for a career as innovators and leaders in product, experience, and service development.
ART: GRAPHIC DESIGN 244H
Fall 2014 | TR 8:00-10:50 a.m.
Instructor: Joan Example

Office Hours: DSN 040 MW 8:00 – 10:00 a.m. OBA
Email: example@iastate.edu
Phone: 515.555.5555

Instructor: Joan Example

Course Description
This course is an introduction to the process of Design Thinking, a human-centered creative approach. This course is not simply for design students. The course endeavors to foster transdisciplinary collaboration between design, engineering, social sciences, business, advertising and more with the understanding that we innovate best when we work together to solve a problem. In this course your will be introduced to Design Thinking, discuss its uses, and use it to offer a solution(s) to a possible problem right here on campus or in Ames.

Important Note
The details of this syllabus – including project/reading assignments, deadlines, grading, etc. – may change as the semester progresses. It is in the student’s best interest (and their responsibility) to track syllabus changes if and when they occur.

Required Texts

Recommended Reading


References:
An expanded bibliography of books, articles, and online resources will be handed out the first day of class. The five recommended books listed above and those on the bibliography can be used as the subject of your book report.
**Learning Objectives**

The primary objective of this class is to experience and then demonstrate the techniques of Design Thinking and how it can be to solve design and experience challenges. This includes learning the basics of human-centered research and observation, how to generate ideas that innovate, and how to rapidly prototype your ideas. This is *not* about creating a finished and polished system, but about persuasively demonstrating a prototyped solution(s) that will logically lead to that system. The idea is to immerse yourself in a Design Thinking challenge as you engage with the material, learn from your mistakes – mistakes are in fact good – and dive headlong into a series of possible solutions.

**What if I Don’t Design?**

While not everyone is a *designer*, everyone can *design* and be creative. You do not have to be in the Design College for this course. This class is about generating ideas collaboratively with the end-user as the focus. Each member of a team should employ their skills and experience to best of their ability, and this transdisciplinary approach is at the core of Design Thinking. The idea is to learn from and leverage each other’s unique experiences and skills. It has been said that ideas do not know what discipline they come from. This class exists to facilitate such ideas.

**Primary Goals/Outcomes**

What I would like you to take away from this course is not just a basic knowledge of Design Thinking, but real experience in solving problems in a collaborative, human-centric and enthusiastic fashion. You should:

1. Be able differentiate a wicked or ill-defined problem from a general problem and explain why traditional problem solving is often simply inadequate for such challenges

2. Be able to explain how to discover, experience, observe and document human interactions as a source of inspiration. These interactions are not necessarily focus groups or surveys, but actual real-life observations of people and how they engage with the challenges that face them every day.

3. Be able to demonstrate how constraints can be your best friend in fostering innovation, and how to create constraints when none exist.

4. You will able to express leadership and facilitation skills in a collaborative environment that energize creativity and passion in your colleagues as they do the same for you.

5. You will be able to demonstrate how to test your ideas with the actual user of the solution, document and measure your results, and draw insights for improvement on your ideas.

6. Be able to describe how Design Thinking can be used for solving process-based, managerial, and systemic challenges in any discipline. This means that if you are not a designer by name, you should be able to demonstrate how to think like one, but within your own specialty.
Methodology & Grading

The course will consist of few lectures. We want to get you up and running right away with the process. However, there will be some assigned readings, in-class small and large group discussions, exercises, a book analysis, a semester-long group project, and your project journal. Grades for the class will primarily be based on four assignment factors totaling 100%. There is no extra credit.

1. **Individual Book Analysis** 10%
2. **Group Project** (weighted by peer review) 60%
   i. Discover Phase Presentation & Report 20%
   ii. Create Phase Presentation & Report 20%
   iii. Build Phase Presentation & Final Report 20%
3. **Project Journal** 15%
4. **Class Participation and In-Class Challenges** 15%

Grading Scale

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<td>A-</td>
<td>90-96%</td>
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<tr>
<td>B+</td>
<td>87-90%</td>
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<tr>
<td>B</td>
<td>84-87%</td>
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<tr>
<td>B-</td>
<td>80-84%</td>
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<td>C+</td>
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The letter grades are based on the criteria established for each assignment factor and the rubric for each is based on the project’s deliverables as described in the individual assignment and project section handouts.

Please note that your work on the project phases are graded as a group; however, at the end of each phase you will have the opportunity to submit peer reviews evaluating each other’s performance based on expectations defined earlier in the project. In addition, we will conduct ‘retros’ where we discuss what went right, what went wrong, and how we can improve in the next project phase. Your grade for the project phases will be weighted by your contributions. In short, you get out of it what you put into it.

Assigned Readings & Lectures

The assigned readings and lectures will introduce you to Design Thinking, terminology, methods, and models of ideation (e.g. mapping, affinity diagrams, etc.) Be prepared each day to answer and ask questions on the assignments and discuss the concepts presented. Class may also include multi-media presentations and a guest lecturer or two.

Individual Book Analysis

You will be required to read, digest, and summarize the main points of a book relating to design thinking, creativity, innovation, or problem-solving. In addition, you should include your thoughts and opinions on how the book does or does not apply to your field of study. As noted above, a bibliography of proposed books will be provided for you to select from, or you can research one for yourself (subject to instructor approval). The report should be approximately 3000 words, be concise, and with proper formatting and writing standards. Additional details
will be included on the bibliography handed out electronically the first day of class.

**Team Project/Process**

Design Thinking is about collaboration and innovation. Discovering the human equation of an ill-defined problem and attempting to solve it is best done in groups. Depending on the final class size, teams of 4-5 persons will be formed by skill set, availability outside class, and in all other way randomly. This will set the foundations for diverse teams with overlapping skills that are central to the Design Thinking process. A large part of your grade depends on how well your teams collaborate on the semester long primary project (see Team Conflicts below). This project is divided into three phases (Discover, Create, Build) each of which will be part of your grade. Each section's deliverables differ and will be detailed in the project handouts along with a grading rubric; however, all phases will include a *persuasive* presentation, a report and concise documentation of the process your team used and what your discovered along the way.

**Individual Work**

While there is a deep focus on collaboration, several design methods such as sketching are best done on an individual level. Depending on the method used, there will be times for students to work individually and then bring that information, solutions, or ideas back to the team for group evaluation and consideration. As each method is explained, opportunities for balanced individual versus group work will be identified.

**Class Participation/Challenges**

When lecturing, I encourage students to ask questions, challenge assumptions, and offer ideas as long as they as of a constructive nature (e.g. no Devil's advocates). Since the entire point of the class is to foster innovation through collaborative problem solving, your participation in discussions, exercises, and other in-class challenges is a major part of your grade. By participating, you are not only helping yourself, but more importantly you are offering insights that the rest of the class can learn from and perhaps build upon to inspire new ideas. Participation also includes being a good listener as well. Give everyone an opportunity to speak, offer ideas, or try new techniques. As we discuss Design Thinking in general early in the semester, we will review the finer points of collaborative participation.

**Leaving the Studio**

One of the most important elements of Design Thinking is finding empathy with the people for whom you wish to solve a problem. To this end, often we will as a class or as teams leave the studio space to research, observe, and listen to people. Be prepared to walk a lot and explore campus as necessary to gain shared understanding.

**Team Conflicts**

In any social dynamic, conflicts happen from time to time. Early in the semester, we will be moving very quickly with onboarding, icebreaking, and other get-to-know each other activities that should help alleviate some of this. As this is not the only class you have we will endeavor to form the teams in a way that each team member has similar availability for convenient collaboration; however, planning sufficient analysis, creative, and preparation time is ultimately the
responsibility of each team/team member. It is encouraged that you take extensive notes so your expectations are clear and in writing. If conflicts occur, we can together attempt to solve them, but ultimately the team dynamics are your responsibility. If a team member is not contributing enough, willing to collaborate, or being disruptive, the team itself may submit a written request where the team lists the challenges and ideas for resolution. This request should be submitted to both the team member and myself. Depending on the severity, an ad hoc ‘retro’ may be called where we openly discuss the challenge.

**Deadlines**

Please don’t be late. When you are employed in the working world, it is critical to make your deadlines. More importantly, each section of the semester project builds on the previous one, so it is hard to really move ahead if you are not done with the previous section. Late assignments – due at the start of class – will be adjusted one-third of a letter grade down per day past due. This means all days, not just class days. If you have an assignment due on Thursday and turn it in on the following Tuesday, you maximum grade will be a C+. If some serious circumstance challenges a deadline, please see me during office hours to discuss it.

**Attendance**

Each student is expected to arrive promptly for class. As you teammates are depending on you and you on them, this is critical. If you are a bit late a few times (<5 minutes), that won’t necessarily count against you, but don’t make it a habit. Missing entire days or leaving early without prior conversation can be more of a problem, but with the general incidence of sickness and unforeseen issues, you are allotted two (2) absences. A third absence may result in a penalty to your final grade (e.g. a B+ becomes a B). Further absences or sudden departures will continue this penalty. If you have extenuating circumstances on lateness, departures or absences, please see me to discuss.

**Release Form**

As this is an experimental class, I would like to use the work created in the class, recordings, photos, etc. for further research or within a publication. To this end, I would like to ask you to sign a release form in the event the University wishes to publish the work or your image associated with it.

**Disability Statement**

Any student who feels he or she may need an accommodation based on the impact of a disability should contact me privately to discuss your specific needs. Please contact the Student Disability Resource Office at 515-294-7220 in room 1076, Student Services Building to coordinate reasonable accommodations for students with documented disabilities.

**Sexual Harassment**

"Sexual Harassment" refers to an unwelcome sexual advance, a request for sexual favors, and/or any other physical or verbal conduct of a sexual nature. Conduct of this nature can unreasonably interfere with the classroom experience and with an individual’s academic performance by fostering an intimidating, hostile, or offensive environment in any University activity or program. This behavior is unacceptable at Iowa State. If you feel you are being harassed or witness such harassment, speak with the offender and convey your concerns. If
you are uncomfortable doing so, are dismissed/threatened by the harasser, please contact me or with the Graphic Design Program Director or Honors Director. For additional information, please consult the Dean of Students Policy: http://policy.iastate.edu/policy/students/sexualmisconduct#Harassment

**Classroom Etiquette**

You are Honors students so I hold you to a bit of a higher standard then the student body as a whole. I expect you will treat everybody involved in the class, from myself to your fellow students, with dignity and respect.

1. To this end, please no cell phones. Turn them off. If you have an upcoming call/emergency, please let me know and we can make an exception. The only exceptions to this rule are to use them to take photos or videos of class discussions (which is encouraged) or of ideation sessions, etc.

2. No laptops or tablets except as directed for some in-class exercises and during studio work time for research. Clever uses of social media for research are fine; keeping up with what is going on with your friends is not.

3. Please avoid creating unnecessary classroom distractions such as being purposely argumentative, conducting unrelated chatting, using social media or doing outside work. Have fun, but keep it in context to what you are doing.

4. Lastly, I expect you all to follow the ISU Code of Conduct. If you are unfamiliar, please follow the link here: http://policy.iastate.edu/policy/SDR.

Disregarding any of the above standards may affect your grade.

If you have any questions, please ask me immediately before class, immediately after class, by email or during office hours.
# Class Schedule

The following is the planned schedule for the semester.

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Assignment</th>
<th>Date</th>
<th>Topic</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-25</td>
<td>Introduction: &quot;What is Design Thinking?&quot;</td>
<td>None</td>
<td>8-27</td>
<td>Bootcamp Day 1</td>
<td>Watch: IDEO Shopping Cart Video:</td>
</tr>
<tr>
<td></td>
<td>- Onboarding and Icebreaking Exercises</td>
<td></td>
<td></td>
<td>Lecture &amp; Two Process Runs</td>
<td><a href="http://www.youtube.com/watch?v=taJOV-YCel">http://www.youtube.com/watch?v=taJOV-YCel</a></td>
</tr>
<tr>
<td></td>
<td>- All about the Book Report</td>
<td></td>
<td></td>
<td></td>
<td>Read: CBD Chapter 1</td>
</tr>
<tr>
<td>9-1</td>
<td>Labor Day – No Class</td>
<td>Read: Richard Buchanan</td>
<td>9-3</td>
<td>Bootcamp Day 2</td>
<td>Watch: Tim Brown urges designers to think big:</td>
</tr>
<tr>
<td></td>
<td>- &quot;Wicked Problems in Design Thinking&quot;</td>
<td>&quot;Wicked Problems in Design Thinking&quot;</td>
<td></td>
<td>Lecture &amp; Two Process Runs</td>
<td><a href="http://www.youtube.com/watch?v=UAinLaT42xy">http://www.youtube.com/watch?v=UAinLaT42xy</a></td>
</tr>
<tr>
<td>9-8</td>
<td>Lecture: &quot;Defining the Problem&quot;</td>
<td>Start of Project Phase 1</td>
<td>9-10</td>
<td>Lecture: Journey mapping, Story mapping, and other techniques.</td>
<td>What do you know about Cy-Ride brief.</td>
</tr>
<tr>
<td></td>
<td>- Potential problem: Cy-Ride Wayshowing</td>
<td>Read: CBD Chapter 2</td>
<td></td>
<td>Practice in studio</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Interview practice and planning.</td>
<td>Journey map a friend's day.</td>
<td>9-17</td>
<td>Get Out of the Studio</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Observation &amp; listening exercises</td>
<td></td>
<td></td>
<td>Split up and ride the bus.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Observation &amp; listening exercises</td>
<td>Journey map a friend's day.</td>
<td></td>
<td>Talk to people who ride the bus and more.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- &quot;Interviewing People&quot;</td>
<td></td>
<td></td>
<td>Sync up.</td>
<td></td>
</tr>
<tr>
<td>9-22</td>
<td>Lecture: &quot;Interviewing People&quot;</td>
<td>Turn in Observation Summary</td>
<td>10-1</td>
<td>Defining Constraints</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Interview practice and planning.</td>
<td></td>
<td></td>
<td>Insight Statements:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Observation &amp; listening exercises</td>
<td></td>
<td></td>
<td>What did we discover?</td>
<td></td>
</tr>
<tr>
<td>9-29</td>
<td>Lecture &quot;Defining Constraints&quot;</td>
<td>Turn in Interview Summary</td>
<td>10-8</td>
<td>Presentations</td>
<td>Team Report, Presentation PDF, and Peer Reviews.</td>
</tr>
<tr>
<td></td>
<td>- &quot;Interviewing People&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Observation &amp; listening exercises</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-6</td>
<td>Discover Work Day</td>
<td>Turn in Interview Summary</td>
<td>10-15</td>
<td>Start of Project Phase 2</td>
<td>Read: CBD Chapter 3</td>
</tr>
<tr>
<td></td>
<td>- &quot;Interviewing People&quot;</td>
<td></td>
<td></td>
<td>- Lecture: Divergent/Convergent Thinking, Brainstorming, Timeboxing,</td>
<td></td>
</tr>
<tr>
<td>10-13</td>
<td>Retro Day</td>
<td>Come to class with 1 thing that went right, 1 wrong, and 1 kudos.</td>
<td>10-15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>Activity</td>
<td>Date</td>
<td>Activity</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>10-20</td>
<td>Lecture: Visual Braindumping, Sprinting, Affinity Diagramming</td>
<td>10-22</td>
<td>Create Work Day: Focus on Divergence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-27</td>
<td>Create Work Day: Focus on Convergence</td>
<td>10-29</td>
<td>Create Work Day: Focus on Integration</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Insight Statements: What did we create?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11-3</td>
<td>Create Work Day</td>
<td>11-5</td>
<td>Presentations</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Turn in Team Insight Statements</td>
<td></td>
<td>Team Report, Presentation PDF, and Peer Reviews.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11-10</td>
<td>Retro Day</td>
<td>11-12</td>
<td>Start of Project Phase 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Come to class with 1 thing that went right, 1 wrong, and 1 kudos.</td>
<td></td>
<td>Lecture: Rapid Prototyping, Metrics, User Testing, and Delivery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11-17</td>
<td>Build Work Day</td>
<td>11-19</td>
<td>Build Work Day</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Work on prototype</td>
<td></td>
<td>Continue on prototype</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Turn in Book Analysis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11-24</td>
<td>No Class</td>
<td>11-26</td>
<td>No Class</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12-2</td>
<td>Build Work Day</td>
<td>12-3</td>
<td>Build Work Day</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Complete Prototype</td>
<td></td>
<td>Testing Day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12-8</td>
<td>Build Work Day</td>
<td>12-10</td>
<td>Build Work Day</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Measure Day</td>
<td></td>
<td>Turn in Team Insight Statements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12-15</td>
<td>Final Presentations</td>
<td>12-17</td>
<td>No Class – Last day to turn in anything</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Team Report, Presentation PDF, and Peer Reviews</td>
<td></td>
<td>Everything due, including Project Journal PDF.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

"Creativity is the process of having original ideas that have value. It is a process; it's not random."  
- Sir Ken Robinson
APPENDIX B - STUDENT RESEARCH PROJECT MATERIALS

B.1 – IRB Approval Letter

Institutional Review Board
Office for Responsible Research
Vice President for Research
1516 Pearson Hall
Ames, Iowa 50011-1207
515 294-4560
FAX 515 294-4187

Date: 8/13/2012
To: Edward Cupps
2717 Brockway Dr
Des Moines, IA 50320

CC: Dr. Roger Baer
158 College of Design
Dr. Sunghyun Kang
282 Design

From: Office for Responsible Research

Title: A Study of Artist/Designer Inspiration, Ideation, and Prototyping Found in ArtIS 310 Sources & Methods of Visual Design

IRB ID: 12-369

Study Review Date: 8/10/2012

The project referenced above has been declared exempt from the requirements of the human subject protections regulations as described in 45 CFR 46.101(b) because it meets the following federal requirements for exemption:

• (1) Research conducted in established or commonly accepted education settings involving normal education practices, such as:
  o Research on regular and special education instructional strategies; or
  o Research on the effectiveness of, or the comparison among, instructional techniques, curricula, or classroom management methods.

• (2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey or interview procedures with adults or observation of public behavior where
  o Information obtained is recorded in such a manner that human subjects cannot be identified directly or through identifiers linked to the subjects; or
  o Any disclosure of the human subjects’ responses outside the research could not reasonably place the subject at risk of criminal or civil liability or be damaging to their financial standing, employability, or reputation.

The determination of exemption means that:
• You do not need to submit an application for annual continuing review.
• You must carry out the research as described in the IRB application. Review by IRB staff is required prior to implementing modifications that may change the exempt status of the research. In general, review is required for any modifications to the research procedures (e.g., method of data collection, nature or scope of information to be collected, changes in confidentiality measures, etc.), modifications that result in the inclusion of participants from vulnerable populations, and/or any change that may increase the risk or discomfort to participants. Changes to key personnel must also be approved. The purpose of review is to determine if the project still meets the federal criteria for exemption.

Non-exempt research is subject to many regulatory requirements that must be addressed prior to implementation of the study. Conducting non-exempt research without IRB review and approval may constitute non-compliance with federal regulations and/or academic misconduct according to ISU policy.

Detailed information about requirements for submission of modifications can be found on the Exempt Study Modification Form. A Personnel Change Form may be submitted when the only modification involves changes in study staff. If it is determined that exemption is no longer warranted, then an Application for Approval of Research Involving Humans Form will need to be submitted and approved before proceeding with data collection.
B.2 – Participant Materials

**Email Script**

Dear xxxx,

I am looking for participants who are 18 years of age or older and also a student in graphic design, industrial design or the visual arts (painting, printmaking, sculpture, etc.) for a study on creative inspiration, ideation, and implementation concurrent with your taking of ArtIS 310. The objective of this research is to study how creative individuals approach visual communications or expression challenges by observing their distinctive approaches in the studio space. I will also participate in the studio experience with you, asking questions and documenting your progress (notes, photos, and video) but not interfering in your work or studio time in a significant manner.

The observations will only be made during one of your three projects. Following the observations, you will be asked to submit a survey on your creative experiences and may be asked to share your class documentation. After the class concludes, all of the participants will be asked to join a focus group to discuss your experiences to better improve the class.

Participation is completely voluntary. All of the information participants provide will be kept strictly confidential and reported in summary form only. No individual will be identified, nor will participants’ names be attached to any data. At the project’s end, researchers will destroy any identifying personal information.

If you are willing, please respond to this email. We will email you an informed consent document for you to review. I will make an additional announcement in class as well as be available for questions. Before the beginning of the study, you will be given the informed consent document in class for your signature.

Again, you may choose to withdraw from participating at any time without penalty.

If you have any questions or concerns, feel free to contact me at any time.

Edward Cupps
Principal Investigator
515-451-1779
ejc@iastate.edu

Thank you for your time and consideration.
Good Morning.

My name is Edward Cupps and I am a graduate student here at the College of Design working on my MFA in graphic design. I am in the process of working on my thesis and I would like to ask for some of your help.

Did you all receive my email?

I am looking for creative who are over 18 and also a student in graphic design, industrial design or the visual arts (painting, printmaking, sculpture, etc.) for a study on creative inspiration, ideation, and implementation concurrent with your taking of ArtIS 310; however all visual artists are welcome.

The objective of this research is to study how creative individuals like yourselves approach visual communications or expression challenges by observing your distinctive approaches in the studio space. I will also participate in the studio experience with you, asking questions and documenting your progress (notes, photos, and video) but not interfering in your work or studio time in a significant manner.

The observations will only be made during one of your three projects. Following the observations, you will be asked to submit a survey on your creative experiences and may be asked to share your class documentation. After the class concludes, all of the participants will be asked to join a focus group to discuss your creative experiences to help improve the class.

Participation is completely voluntary and everything is strictly confidential. No names will be revealed in the published data and any identifiers will be redacted or destroyed. Before the beginning of the study, you will be given an informed consent document here in class for you to sign. Please read it over and feel free to ask me any questions. Again, you may choose to withdraw from participating at any time without penalty.

If you are willing or simply have any questions, please meet me after class.

If you have any questions or concerns, feel free to contact me at any time. I’ll write my information on the board.

Thank you for your time and consideration.
Initial Participant Survey

Name:_____________________________________________

Age:___________

Major:_____________________________________________
INFORMED CONSENT DOCUMENT

Title of Study: An Independent Study of Artist/Designer Inspiration, Ideation, and Prototyping Found in ArtIS 310 Sources & Methods of Visual Design

Investigators: Edward Cupps (Principal Investigator)

This is a research study. Please take your time in deciding if you would like to participate. Please feel free to ask questions at any time.

INTRODUCTION

The purpose of this study is to observe, document and discover the methods that may be common among creative individuals in their pursuit of art or design. You are being invited to participate in this study because as a creative (artists, designers, etc.), your personal methods of finding inspiration, generating ideas, and prototyping your work, once documented, may lead to new insights for teaching creativity methods at the undergraduate level. As ArtIS 310 is a creativity course itself, it serves as an ideal workspace for this kind of study. You should not participate if you are less than 18 years old or not admitted to the College of Design.

DESCRIPTION OF PROCEDURES

If you agree to participate, you will be asked to help with the study in the following ways:

1. Initial Meeting
   Before any observations occur, you will be invited to meet with the Principal Investigator as a group to establish expectations of both the observer and the participant within the confines of the study.

2. Participatory Observation
   In one of the five-week class phases, the Principal Investigator will work next to you, observing your approach to the creative process while simultaneously engaging in their own project. Each day’s observations will include questions directed to you concerning your motivations, ideation techniques, sketching, and other process-based questions. Photos and/or video may be taken of work-in-progress and the workspace.

3. Student Documentation
   As a prerequisite for ArtIS 310, you are already required to document your work, including notes, drawings, photographs, prototypes, etc. If you participate in this research, you will be asked to share a copy of this documentation, which will be used as supporting materials for the participatory observation.

4. Individual Exit Survey
   After a project is completed, you will be asked to please complete a short survey via SurveyMonkey. The survey will not include any demographic or identifying information.
requests, focusing only on your approach to the observed project. This survey should take no more than 30 minutes.

5. Focus Group
After the class is completed and the surveys turned in, a small focus group will be held for one hour with the participating students and the Principal Investigator. This focus group will be based on the results of the participatory observations, student documentation, and the exit surveys and is primarily used to improve the class.

Your participation will last for the duration of ArtIS310, but as this study is primarily observational, you will not have to change your routine. With the exception of the Focus Group, you will not meet with the Principal Investigator outside of the classroom or the College of Design.

RISKS
There are no foreseeable risks at this time from participating in this study.

BENEFITS
If you decide to participate in this study there will be no direct benefit to you. However, it is hoped that the information gained in this study will benefit society by revealing how undergraduate designers and artists approach problems. This may allow for improved learning experiences that focus on creativity as well as extending these methods for interdisciplinary collaboration and problem solving.

COSTS AND COMPENSATION
You will not have any costs from participating in this study. You will not be compensated for participating in this study.

PARTICIPANT RIGHTS
Your participation in this study is completely voluntary and you may refuse to participate or leave the study at any time. If you decide to not participate in the study or leave the study early, it will not result in any penalty or loss of benefits to which you are otherwise entitled. Concerning any surveys or focus groups, you can skip any questions that you do not wish to answer.

CONFIDENTIALITY
Records identifying participants will be kept confidential to the extent permitted by applicable laws and regulations and will not be made publicly available. However, federal government regulatory, auditing departments of Iowa State University, and the Institutional Review Board (a committee that reviews and approves human subject research studies) may inspect and/or copy your records for quality assurance and data analysis. These records may contain private information.
To ensure confidentiality to the extent permitted by law, the following measures will be taken: for the duration of the study, all notes, photographs (identifying or no), interviews, and other records of an electronic nature will be stored on a password-protected laptop with encrypted backups. Similarly, all physical artifacts (hand-written notes, observations, copies of artwork, etc.) will be stored in a locked filing cabinet for the duration. After the conclusion of the study, all research will be thoroughly vetted for identifiers. Any identifiers (faces, names, etc.) will be either cropped out/obfuscated by the Principal Investigator using Adobe Photoshop if electronic, or by physical removal (i.e. cutting with scissors or a knife) or heavy black marker if non-electronic. If the results are published, your identity will remain confidential.

QUESTIONS OR PROBLEMS
You are encouraged to ask questions at any time during this study.

- For further information about the study contact:
  Edward Cupps
  Principal Investigator
  515-451-1779
  ejc@iastate.edu

  Prof. Sunghyun Kang
  Co-Investigator
  515-294-1669
  shrkang@iastate.edu

- If you have any questions about the rights of research subjects or research-related injury, please contact the IRB Administrator, (515) 294-4566, IRB@iastate.edu, or Director, (515) 294-3115, Office for Responsible Research, Iowa State University, Ames, Iowa 50011.

******************************************************************************

PARTICIPANT SIGNATURE
Your signature indicates that you voluntarily agree to participate in this study, that the study has been explained to you, that you have been given the time to read the document, and that your questions have been satisfactorily answered. You will receive a copy of the written informed consent prior to your participation in the study.

Participant’s Name (printed) ____________________________________________

(Participant’s Signature) ___________________ (Date) ___________________
Post Observational Survey

1. Who was the artist/designer you focused on for the project?

2. Why did you select that artist/designer?

3. What were the ideas, subjects or problems you addressed?

4. What was your approach to gathering information and/or researching for the project?

5. Did the idea/subject/problem change as your research progressed?

6. Did the readings affect your idea/subject/problem?

7. Did the outside events affect your idea/subject/problem?

8. Did you wait to fully complete your research to begin reflecting on the idea/subject/problem?

9. Describe how your research drove your reflections?

10. Did you consult with peers inside your discipline to help with your reflections?

11. Did you consult with peers outside your discipline to help with your reflections?

12. When exploring your ideas, how did you prototype them?

13. Did your prototyping prompt additional research?

14. Did you prototyping prompt additional reflection?

NOTE: This survey was later revised to only 10 questions (See below)
Permission from Professor Chidister

IOWA STATE UNIVERSITY

Memorandum

Date: 16 July 2012
To: Institutional Review Board
From: Mark Chidister, Associate Professor
Subject: Edward Cupps Graduate Research

Edward Cupps, a graduate student in Graphic Design, has requested to conduct a research project involving students enrolled in ArtIS 310 - Sources and Methods of Visual Design. I am the instructor of record for this course and approve of his project and participation in the course.

The project would involve meeting periodically with a handful of students who volunteer for this project to discuss and understand the process they go through to generate new ideas. In addition to these conversations, Edward will gather enough demographic information to ensure that student participants are at least 18 years old and to provide necessary context for his findings.

I would be glad to answer any questions you might have and encourage your approval.
The project referenced above has been declared exempt from the requirements of the human subject protections regulations as described in 45 CFR 46.101(b) because it meets the following federal requirements for exemption:

- (1) Research conducted in established or commonly accepted education settings involving normal education practices, such as:
  - Research on regular and special education instructional strategies; or
  - Research on the effectiveness of, or the comparison among, instructional techniques, curricula, or classroom management methods.

- (2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey or interview procedures with adults or observation of public behavior where
  - Information obtained is recorded in such a manner that human subjects cannot be identified directly or through identifiers linked to the subjects; or
  - Any disclosure of the human subjects’ responses outside the research could not reasonably place the subject at risk of criminal or civil liability or be damaging to their financial standing, employability, or reputation.

The determination of exemption means that:

- You do not need to submit an application for annual continuing review.

- You must carry out the research as described in the IRB application. Review by IRB staff is required prior to implementing modifications that may change the exempt status of the research. In general, review is required for any modifications to the research procedures (e.g., method of data collection, nature or scope of information to be collected, changes in confidentiality measures, etc.), modifications that result in the inclusion of participants from vulnerable populations, and/or any change that may increase the risk or discomfort to participants. Changes to key personnel must also be approved. The purpose of review is to determine if the project still meets the federal criteria for exemption.

Non-exempt research is subject to many regulatory requirements that must be addressed prior to implementation of the study. Conducting non-exempt research without IRB review and approval may constitute non-compliance with federal regulations and/or academic misconduct according to ISU policy.

Detailed information about requirements for submission of modifications can be found on the Exempt Study Modification Form. A Personnel Change Form may be submitted when the only modification involves changes in study staff. If it is determined that exemption is no longer warranted, then an Application for Approval of Research Involving Humans Form will need to be submitted and approved before proceeding with data collection.
B.4 – IRB Revised Survey

**Post Observational Survey**

1. Who was the artist/designer you focused on for your project and why? Why did you select that artist/designer?

2. What were the ideas, subjects or problems you researched?

3. What was your approach to gathering information and/or researching for the project?

4. Did the idea/subject/problem change as your research progressed? If so, why?

5. Did the class readings/videos/excursions affect your idea/subject/problem?

6. Did you wait to fully complete your research to begin reflecting on the idea/subject/problem? Please elaborate.

7. Describe how your research drove your work or reflection of your work?

8. Did you consult with peers inside or outside your discipline to help with your reflections? Please elaborate.

9. When exploring your ideas, how did you prototype them?

10. As you were prototyping, did your work prompt additional research or reflection? If so, why?
### B.5 – Survey Results

#### ArtIS 310 Research Survey Part 1

**Q1 Who was the artist/designer you focused on for your project and why?**

*Answered: 7  Skipped: 0*

<table>
<thead>
<tr>
<th>#</th>
<th>Responses</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Robert Wu. His work gave me the ideas of designing small concentrated marbling on paper.</td>
<td>12/12/2012 5:15 PM</td>
</tr>
<tr>
<td>2</td>
<td>Jessica Hische. She is a great typographic design and illustrator who is still in her twenties. I relate to her that way, except for the fact that she is extremely successful. I was inspired by her use of texture and pattern.</td>
<td>12/11/2012 11:09 PM</td>
</tr>
<tr>
<td>3</td>
<td>Damen Anonkiefy was the artist I had for this project. The reason was that I wanted to try I media that I always felt interested about and that the College of Design doesn't have. I love this film director movies. Personally I think he is brilliant in his work.</td>
<td>12/10/2012 10:01 PM</td>
</tr>
<tr>
<td>4</td>
<td>Nicolas Henri. I also looked at several body-touching articles. I enjoy Nicolas Henri because he does portraiture but with a macabre twist. Without really trying his work has a commentary about beauty that intrigues me.</td>
<td>11/9/2012 2:05 PM</td>
</tr>
<tr>
<td>5</td>
<td>I focused on Beatriz Milhazes, Matthew Ritchie, and Yinka Shonibare MBE</td>
<td>11/9/2012 12:23 AM</td>
</tr>
<tr>
<td>6</td>
<td>Mary Blair. Because I am a really big fan of Disney and Mary Blair did a lot of Disney illustrations/paintings they were for Disney but they weren't what the characters and scenes usually looked like and I found that very interesting. Also found her style of not &quot;perfect&quot; lines and strokes really beautiful and unique.</td>
<td>9/30/2012 5:37 PM</td>
</tr>
<tr>
<td>7</td>
<td>Hiroshi Yoshii. His flair for whimsical, cute, simple designs is enviable. When I found out how many toy designs he made before gaining that skill, I knew I needed to change my approach. I usually rehash an existing idea or one I've had for years and overpolish it, but I needed his images to remind me to make more complex characters than I can ever use.</td>
<td>9/27/2012 1:48 AM</td>
</tr>
</tbody>
</table>
**ArtIS 310 Research Survey Part 1**

**Q2 What were the ideas, subjects or problems you researched?**

Answered: 7  Skipped: 0

<table>
<thead>
<tr>
<th>#</th>
<th>Responses</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>very in different instructions between books and websites, how to best go about researching and drawing a conclusion from the research that will work best for the time and materials I have.</td>
<td>12/12/2012 5:15 PM</td>
</tr>
<tr>
<td>2</td>
<td>I researched stationary design and was inspired by food.</td>
<td>12/11/2012 11:09 PM</td>
</tr>
<tr>
<td>3</td>
<td>I research Time and the perception that people have about Time.</td>
<td>12/10/2012 10:01 PM</td>
</tr>
<tr>
<td>4</td>
<td>Beauty, self-esteem, beauty editing.</td>
<td>11/9/2012 2:05 PM</td>
</tr>
<tr>
<td>5</td>
<td>I researched collage and color and how these can change and develop my projects.</td>
<td>11/9/2012 12:23 AM</td>
</tr>
<tr>
<td>6</td>
<td>I looked at typography and a little bit of illustration. I mostly looked at type being more then just spelling out a word and making them art themselves. Making the word giggle look like &quot;giggle&quot; Making the word silly look silly. Matching the meaning or a certain feeling of the word.</td>
<td>9/30/2012 5:37 PM</td>
</tr>
<tr>
<td>7</td>
<td>I compared graffiti with commercial art, their goals, subject matter and style. I observed how they influenced each other. Graffiti had a broader range of quality and was harder to pull messages from. Stuff aimed at the youth was where there was the most overlap between commercial and personal (Wario on a brick wall, flowing witches on Axe bottles etc.)</td>
<td>9/27/2012 1:48 AM</td>
</tr>
</tbody>
</table>
### ArtIS 310 Research Survey Part 1

**Q3 What was your approach to gathering information and/or researching for the project?**

Answered: 7  Skipped: 0

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<thead>
<tr>
<th>#</th>
<th>Responses</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>cross reference books, websites and articles on the process of marbling, each resource described the process in different ways.</td>
<td>12/12/2012 5:15 PM</td>
</tr>
<tr>
<td>2</td>
<td>I looked at professional food photographs. I took their shapes, simplified them, and make them into patterns.</td>
<td>12/11/2012 11:09 PM</td>
</tr>
<tr>
<td>3</td>
<td>I use mostly the internet for the gathering of my information.</td>
<td>12/10/2012 10:01 PM</td>
</tr>
<tr>
<td>4</td>
<td>I go on the internet a lot. I am constantly reading articles about beauty, feminism, self-esteem. I also research different ways one can use photoshop.</td>
<td>11/9/2012 2:05 PM</td>
</tr>
<tr>
<td>5</td>
<td>I used the internet mostly, as well as some of the books in class and art 21 videos.</td>
<td>11/9/2012 12:23 AM</td>
</tr>
<tr>
<td>6</td>
<td>I just looked at a lot of blogs on type that I follow and looked at a few books. But I mostly used google search and picture blogs that focused on the type of typography that I liked.</td>
<td>9/30/2012 5:37 PM</td>
</tr>
<tr>
<td>7</td>
<td>There was not much of an approach to research, and I wasn't picky. I knew whatever I picked or whatever was dropped in my lap would find some way into my thinking without having to think about it. Only twice did I have a specific project or utility in mind before choosing what to research, but they were things I felt like I knew already and I didn't learn that much. On the fringe was the Disney book on the classroom shelf: the subject matter was familiar and relevant, but not specifically chosen for anything.</td>
<td>9/27/2012 1:48 AM</td>
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</tbody>
</table>
**ArtS 310 Research Survey Part 1**

Q4 Did the ideas/subject/problem change as your research progressed? If so, why?

Answered: 7  Skipped: 0

<table>
<thead>
<tr>
<th>#</th>
<th>Responses</th>
<th>Date</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>I was able to take the &quot;medium&quot; of all the materials and come up with a recipe that will work best for what I got.</td>
<td>12/12/2012 5:15 PM</td>
</tr>
<tr>
<td>2</td>
<td>I thought my results got better as I progressed. This showed my development of my understanding of pattern.</td>
<td>12/11/2012 11:09 PM</td>
</tr>
<tr>
<td>3</td>
<td>I think that the idea original in a project is something organic, it can grow, it can deteriorate, it can die...</td>
<td>12/10/2012 10:01 PM</td>
</tr>
<tr>
<td>4</td>
<td>I don’t know if it really changed, maybe evolve to more of a purpose.</td>
<td>11/9/2012 2:05 PM</td>
</tr>
<tr>
<td>5</td>
<td>Some what, as I found how some ideas weren’t working out as I had thought. I had to find new solutions to these problems.</td>
<td>11/9/2012 12:23 AM</td>
</tr>
<tr>
<td>6</td>
<td>Yes, at first I was really interested in illustrations and type. And I strayed away from that and kind of went a whole different direction. I don’t think that as an end result it was very successful because I just wasn’t in to it. But I hope this next round I have picked something that I can really research and get ideas for.</td>
<td>9/30/2012 5:37 PM</td>
</tr>
<tr>
<td>7</td>
<td>In &quot;the cure,&quot; the wife was unimportant and the zombie virus plot was trite and hard to establish, leaving the chemist, his boxes and the bionic rubber duck he created as the only things left I wanted to draw. The other ideas only worked in novel form, not as one-shot comics.</td>
<td>9/27/2012 1:48 AM</td>
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</table>
### Q5 Did the class readings/videos/excursions affect your ideas/subject problem? If so, why?

Answered: 7  Skipped: 0

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<th>#</th>
<th>Responses</th>
<th>Date</th>
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<tbody>
<tr>
<td>1</td>
<td>I don’t think any of the class material related towards what I was researching for round 3</td>
<td>12/12/2012 5:15 PM</td>
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<tr>
<td>2</td>
<td>I can’t say they specifically applied to project II, but they confirmed my overall design thinking ideas.</td>
<td>12/11/2012 11:09 PM</td>
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<tr>
<td>3</td>
<td>I think it kept me motivated to do my project. Because of all the different artists we were introduce and seeing how his ideas were developed makes you think in all the possibilities that our ideas have.</td>
<td>12/10/2012 10:01 PM</td>
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<tr>
<td>4</td>
<td>It inspired me and got me thinking about a great deal of different ideas.</td>
<td>11/9/2012 2:05 PM</td>
</tr>
<tr>
<td>5</td>
<td>Yes, very much so, I wouldn’t have found Yinka if not for the art 21 video, when I read about him I didn’t see the words I wanted to use and I probably wouldn’t have found them by myself of the internet.</td>
<td>11/9/2012 12:23 AM</td>
</tr>
<tr>
<td>6</td>
<td>No I don’t think that affected my ideas at all but I think they inspired me to really do/create something that I am passionate about.</td>
<td>9/30/2012 5:37 PM</td>
</tr>
<tr>
<td>7</td>
<td>If anything, most of the explanations in the videos for pieces were less interesting than the works themselves and what they meant without words. Now when I need too many words to explain a story, I throw it out. An underlaying philosophical proposition can be important as an undertone or a personal motivation, but the resulting weirdness and craft are a better measurement of success in the end. For example those seemingly infinite mirror-bottles by the glass smith were awesome. I can’t for the life of me remember what they &quot;meant&quot; but that doesn’t change anything about them.</td>
<td>9/27/2012 1:48 AM</td>
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</table>
ArtS 310 Research Survey Part 1

Q6 Did you wait to fully complete your research to begin reflecting on the idea/subject/problem? Please elaborate.

Answered: 7  Skipped: 0

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<thead>
<tr>
<th>#</th>
<th>Responses</th>
<th>Date</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>I finished all my cross referencing research before i began to attempt the process of marbling. i wanted to figure out what other people did and how they resolved their mistakes before i began my experiments and waiting time and materials.</td>
<td>12/12/2012 5:15 PM</td>
</tr>
<tr>
<td>2</td>
<td>I did not. I often looked at the designer's work throughout the duration of my project.</td>
<td>12/11/2012 11:09 PM</td>
</tr>
<tr>
<td>3</td>
<td>No, I actually had an image in my head of how my final project would look even before I had started my research, so I started right away.</td>
<td>12/10/2012 10:01 PM</td>
</tr>
<tr>
<td>4</td>
<td>I researched as I go along, I don’t really think you can complete research. At least, that isn’t the way I learn, I always gather new ideas.</td>
<td>11/9/2012 2:05 PM</td>
</tr>
<tr>
<td>5</td>
<td>No, I researched as I developed. I like working in this way as it gives me sort of a timeline of how my ideas evolved in my sketchbook.</td>
<td>11/9/2012 12:23 AM</td>
</tr>
<tr>
<td>6</td>
<td>No I didn't really do a whole lot of research I kind of just dove in and starting looking at type and creating my own.</td>
<td>9/30/2012 5:37 PM</td>
</tr>
<tr>
<td>7</td>
<td>My research was about half finished before I started working on ideas. I knew I had enough of a starting point after the first artist study, but tried to get something out of each new set of research. It helped to have existing stuff to graft new ideas onto.</td>
<td>9/27/2012 1:48 AM</td>
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</table>
ArtIS 310 Research Survey Part 1

Q7 Describe how your research drove your work or reflection of your work?

Answered: 7  Skipped: 0

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<thead>
<tr>
<th>#</th>
<th>Responses</th>
<th>Date</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>the further i dove into researching marbling the more i read of different techniques that resulted in amazing outcomes, so instead of just simply marbling i have notes on performing more experienced ways that have stronger ways.</td>
<td>12/12/2012 5:15 PM</td>
</tr>
<tr>
<td>2</td>
<td>I don't feel it did, to be honest. I just strengthened my respect for Jessica as a designer.</td>
<td>12/11/2012 11:09 PM</td>
</tr>
<tr>
<td>3</td>
<td>I think it didn’t affect my work much but rather my knowledge about it to be able to explain my approach better.</td>
<td>12/10/2012 10:01 PM</td>
</tr>
<tr>
<td>4</td>
<td>It helped framed how I was actually going to do it, process wise, and it also inspired the ideas behind it</td>
<td>11/9/2012 2:05 PM</td>
</tr>
<tr>
<td>5</td>
<td>It gave me lots of new ideas and structure. I'm glad I had it or my project might have gotten too scattered.</td>
<td>11/9/2012 12:23 AM</td>
</tr>
<tr>
<td>6</td>
<td>The main research I did was just an image bank and looking at typography so I guess it inspired me and gave me certain ideas for my own work.</td>
<td>9/30/2012 5:37 PM</td>
</tr>
<tr>
<td>7</td>
<td>My research either motivated my quality level or became an idea instantly. Conscious analysis rarely came into play at the time, and when I operated most intuitively was when my best ideas surfaced. The exception was Cubert the cube-dog. Cubert actually came from several Layla all paintings, not getting more analytical than &quot;many teeth, a headdress and weird native american clothes, bizarre detailing, tiny simple legs, clothing-focused silhouette, earthy contrasting colors&quot; but I don't remember ever having to sit and think before doing something.</td>
<td>9/27/2012 1:48 AM</td>
</tr>
</tbody>
</table>
Q8 Did you consult with peers inside or outside your discipline to help with your reflections?

Answered: 7  Skipped: 0

<table>
<thead>
<tr>
<th>Answer Choices</th>
<th>Responses</th>
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<tbody>
<tr>
<td>Inside my discipline</td>
<td>0%</td>
</tr>
<tr>
<td>Outside my discipline</td>
<td>0%</td>
</tr>
<tr>
<td>Both</td>
<td>71.43%</td>
</tr>
<tr>
<td>Neither</td>
<td>28.57%</td>
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<tr>
<td>Total</td>
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<tr>
<th>#</th>
<th>Please elaborate</th>
<th>Date</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>I usually shy about this. I don't tend to ask other about my work, I usually</td>
<td>12/11/2012 11:09 PM</td>
</tr>
<tr>
<td></td>
<td>find glitches or mistakes in my work, so I tend to not ask anyone how my work</td>
<td></td>
</tr>
<tr>
<td></td>
<td>is unless I see it perfect.</td>
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<tr>
<td>2</td>
<td>I like to get all sorts of perspectives on my work, I think that helps make it</td>
<td>11/9/2012 2:05 PM</td>
</tr>
<tr>
<td></td>
<td>more approachable.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Most of my friends are engineers and I got some of their opinions as well as</td>
<td>11/9/2012 12:23 AM</td>
</tr>
<tr>
<td></td>
<td>family and friends, who are mostly all artists.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Acted my classmate what they thought about my sketches also my roommates who</td>
<td>9/30/2012 5:37 PM</td>
</tr>
<tr>
<td></td>
<td>aren't in design. Like what they saw or felt when they looked at my sketches.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>I was mainly interested in gauging people's initial reactions.</td>
<td>9/27/2012 1:48 AM</td>
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ArtS 310 Research Survey Part 1

Q9 When exploring your ideas, how did you prototype them?

Answered: 7  Skipped: 0

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<tr>
<th>#</th>
<th>Responses</th>
<th>Date</th>
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<tbody>
<tr>
<td>1</td>
<td>only prototyping is done by actually experimenting.</td>
<td>12/12/2012 5:15 PM</td>
</tr>
<tr>
<td>2</td>
<td>I sketched out my ideas first, then moved to the computer. I kept all my work ideations into the same proportions.</td>
<td>12/11/2012 11:09 PM</td>
</tr>
<tr>
<td>3</td>
<td>I didn’t.</td>
<td>12/10/2012 10:01 PM</td>
</tr>
<tr>
<td>4</td>
<td>I worked mainly through my laptop, and would go back and forth between that, my research and my sketches.</td>
<td>11/9/2012 2:05 PM</td>
</tr>
<tr>
<td>5</td>
<td>I made little mock ups in my sketchbook. This gives me a basic idea of what I need to think about and what will and will not work.</td>
<td>11/9/2012 12:23 AM</td>
</tr>
<tr>
<td>6</td>
<td>I'm not sure what this means. But I just sketched out type and letters in my sketchbook.</td>
<td>9/30/2012 5:37 PM</td>
</tr>
<tr>
<td>7</td>
<td>I lay them out in the most inadequate, unflattering format and judge them like a hungry man &quot;judged&quot; free samples with no thought or reflection. That comes much later. I made it intentional to create as many random characters and ideas as possible without overthinking things. Once some good images and jokes surfaced, I branched off from there.</td>
<td>9/27/2012 1:48 AM</td>
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</table>
## Q10 As you were prototyping, did your work prompt additional research or reflection? If so, why?

**Answers:** 7  **Skipped:** 0

<table>
<thead>
<tr>
<th>#</th>
<th>Responses</th>
<th>Date</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>no prototyping done.</td>
<td>12/12/2012 5:15 PM</td>
</tr>
<tr>
<td>2</td>
<td>No, I don't remember this happening throughout my project. I am happy with my results. At first I didn't think I would succeed with mixing the ideas of food and pattern. But I was happy with my results. I think I explored a lot of different ideas.</td>
<td>12/11/2012 11:09 PM</td>
</tr>
<tr>
<td>3</td>
<td>I did some extra research on Video Editing Software that I wasn't planning on doing at the very beginning. I had a lot of problems to edit my video and that drove me to research other alternatives for software to edit my short video.</td>
<td>12/10/2012 10:01 PM</td>
</tr>
<tr>
<td>4</td>
<td>Yes, my process isn't really linear, it's more cyclical.</td>
<td>11/9/2012 2:05 PM</td>
</tr>
<tr>
<td>5</td>
<td>Yes, it made coming up with project #3 very easy because there were lots of areas I wanted to explore more and didn't get a chance to. I want to develop my final project #2 piece more as well as explore color schemes and patterns to see how these can really change the essence of the piece.</td>
<td>11/9/2012 12:23 AM</td>
</tr>
<tr>
<td>6</td>
<td>not sure. at the end I just knew that I wanted to do a lot more different things with my typography and really push myself to create unique work.</td>
<td>9/30/2012 5:37 PM</td>
</tr>
<tr>
<td>7</td>
<td>After I picked a comic about videogame glitching, I watched some hilarious footage of a Tony Hawk game with horrible physics programming, but none of it was usable as a source for still image humor. It's the research that didn't even pick myself that helped the most, like Lay'a Ali and the trip to Reiman Gardens.</td>
<td>9/27/2012 1:48 AM</td>
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<tr>
<td>Name</td>
<td>Student 1</td>
<td>Student 2</td>
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<tr>
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<th>Student 8 - Dropped Out</th>
<th>Student 9 - Not Enough Data, Absent</th>
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<td>Day 7</td>
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X Student was in this phase this day
O Student was in this phase but did no empathy-related research
APPENDIX C - INTERVIEWS WITH EDUCATORS & PROFESSIONALS

C.1 - Hugh Dubberly

Dubberly: The argument is that Nonaka’s [SECI] model of organizational learning is isomorphic with what Shelly Edmondson and Rick Robinson and I have called the bridge model in design, which is a model that’s often used by designers and we have a dozen or more examples of other designers, having very similar models, maybe with slightly different terminology. There’s clearly something going on there within the design world where it’s a sort of archetype within design, but then Nonaka provides -- and others, he’s not alone in this. There are others who are dealing with organizational learning, where it also appears to be an archetype. It’s a way of saying that designing is learning and for a designer that might not be particularly a revelation or an insight, but should be able to offer that as almost an academic argument or an argument to people in business who are interested in organizational learning and say, well designing isn’t really an act of organizational learning. A kind of reframing, at least in the business context.

Edward: I’ve noticed a lot … just take parallel off that. My own personal experience, I’ve tried to work with business people, just applying Roger Martin’s take on design thinking, which is similar. I wouldn’t say exactly the same by any means, but definitely similar, the idea of the rapid prototyping and the idea are similar, which goes along with what you’re saying. There are a lot of takes on this.

Dubberly: Yeah. The bridge model or the SECI model, I think involves a kind of making explicit of knowledge, like taking from a level of concrete to a level of abstraction. It basically says that there’s modeling involved and while I think that that's true in all forms of design, I’m not sure I see Roger or Tim Brown or others putting a lot of emphasis on it. There might be a slight difference of emphasis. I don’t think it’s a disagreement; it’s just a difference of emphasis.

Edward: One of the things I’ve been looking at is the opportunity here for collaborative innovation with other disciplines. I know they talk about that a lot, but most firms can’t afford that by any stretch that I know of, as far as bringing in advisors from all different types of groups, hiring psychologists, lawyers, whatever.

Dubberly: I would argue that today, most of the interesting work that’s being done necessarily involves people from many disciplines.

Edward: I don’t disagree.

Dubberly: So, if you’re making a medical diagnostic device, you have people who understand biology, medicine, chemistry, electrical engineering, mechanical engineering, physical product design interface design, regulation. You need all of those people at the table in designing the product. What that means is that, well I think it kind of shifted design where throughout the 19th century as design arises when we move to the end of the industrial revolution and when we separate production from the planning for production. That is, when we separate design from making, then at that point much of what was being made … so, if you’re making a chair, a chair designer can keep all the issues involved in making a chair in mind at once. If you’re making a logo, a poster or even a book, for the
most part, the book designer can keep the issues in mind. That was never really true for architecture because architectural projects are systems projects by their nature.

Edward: The architect, the engineer, the contractor, etc.

Dubberly: Now, the systems got even more complex as you have electrical, plumbing, HVAC, not to mention the structural and the contractor. It's already a collaborative effort. When we make movies, movies are clearly a collaborative effort.

Edward: Good point.

Dubberly: You could make it by yourself, but the notion of making Star Wars or Finding Nemo alone, by oneself is a daunting task. What I'm saying is that I think the arc of change in practice is towards collaborative endeavors and if you buy that, then the group needs a sense of where they're going and that means that there have to be shared manifestations of the goal, of the plan to get to the goal and on top of this, I think we see a change that we're dealing with things that are less and less easily seen all at once. These are things that are dynamic. They change over time. They get revealed over time. People interact with them. You just may not be able to see them all at once. They may not exist all in one place or all in one time. In which case, we need some kind of abstract representation. A physical prototype is useful, but sometimes not always possible or not representative of the full scope of the thing that you're actually dealing with, in which case, you'd need representations and models. This is all my way of saying that collaborative work, I think cries out for modeling and the designers can be very helpful in that, in making the model of the things you're collaborating about tangible, visible people. If that means nothing more than just going to the board and writing it up.

Edward: How early in the process do you think the designer should be or should they be involved in the entire process, the entire time?

Dubberly: There are different ways to practice design and I think everybody has their own interests and so that affects how they like to practice. There are some people who are interested and who come to design because they're interested in visual things and making things look good. There should be a place for that. It's an important part of design. What we have to be careful about is mistaking that for all of design. Sometimes, people or just an individual designer is not interested in some of the other aspects of it. They also say, well, you know, interest in structure or work on structure or work on planning or some of these things, that's not really design. I think you have to have both. To your question about when to start, I believe that there is value in starting as early as possible in the process.

Edward: Even the sales level, before an actual contract has been signed, when you're discussing the basic preliminaries.

Dubberly: I think one of the places where the designer can be most helpful is in terms of framing what are we going to do or what is the engagement and that's a useful place. For a designer with the right experience, that's a very useful place to be involved. You can't really respond to how long will this take without discussion of scope and that gets into framing, so whether you're actually on the phone or in the meeting, you're still part of the conversation, just in an extended way.

Edward: It is interesting and kind of fun to be involved in that. I think its design-as-more-than-visuals is where we're going. One of the ideas I want to try out is creating class that
would bring all these different people together for collaborative projects. A way finding problem for instance.

Dubberly: A way finding problem is going to be more than, way more than just the appearance.

Edward: Agreed. You said we don’t design for a design, but we design for a conversation. What do you mean by that, as far as designing for a conversation? Sorry to put you on the spot on that. In a recent article, you were talking about today’s designers will become meta designers, creating conditions and with others, can design. You’re designing for … basically, design is a 2-way street. It’s a conversation between the designer and the people who are receiving the design.

Dubberly: Yeah. I think Don [Norman] actually talks about this a little bit himself. Even if you’re designing an object, the object actually makes an argument about it’s need and about how it should be used, so you could say that the person who’s designing an object is trying to convey a message to the person who might buy or use the object, but more than that, I think we start talking about meta design.

Edward: Right.

Dubberly: Yeah. It’s part of a larger change in both design practice and in culture. In the 18th century, a craftsman would make something typically at the request of someone. Someone would come in and say I want a wagon or a saddle or something and someone would make it. In the 19th century, people began to manufacture. Then you would design a sort of 1 size fits all and make a bunch of copies. Increasingly, electronic products offer the opportunity for some kind of customization and there’s a sort of continuum from customization into a thing which is completely personalized, but you can kind of go beyond that in allow users to extend things. If you think about … well, what’s a good example? You could design a toy, which had more or less 1 use, or you could design a kit of parts where kids could make their own toys. Those are things like the Lego or Tinker Toys or Lincoln Logs. They’re construction sets, sort of endlessly fascinating because they’re designed to let other people design.

Edward: I wouldn’t be a designer today if it wasn’t for Legos.

Dubberly: There’s a lot of people in that category. It’s a good thing for the world. It increases choice. They enable people to have conversations with themselves, people have conversations with others.

Edward: I think it’s very poignant, the idea designing to allow others to design. It’s something that I hadn’t really thought of, frankly.

Dubberly: It’s creating situations in which other people can do things. Lou Dorfsman tells a wonderful story about having been head of design at CBS and he got a call from William Paley who was the CEO and Paley said, hey, you know, Jack Benny started with us like, I don’t know, 50 years ago or whatever and contract up for renewal and we need to do something, really, we need to do something great for him so we’re going to have this black tie event for him at the Waldorf and I want you to do an invitation. Lou is a very smart guy. He was riding, going home on the train and was thinking, jeez, another one of these Waldorf things. That’s got to be so boring and that’s so not Jack Benny. I don’t know if you know about Jack Benny at all, but his shtick was being a kind of cheap guy.

Edward: Oh, yeah. My mother and father were gigantic fans of Jack Benny and myself of Lou
Dorfsman.

Dubberly: So, Dorfsman says hey, Jack Benny’s not really a Waldorf kind of guy. He’s more of an automat kind of guy. (Laughing.) I don’t know if you know, New York used to have these cafeterias where there’d be these almost like post office boxes and you’d put a nickel in and you could pull out the food. He said, you know, we really shouldn’t do this at the Waldorf. We should really do this in an automat. So, he had this idea. He thought about it over the weekend. He came back and he goes in to see Paley and he says, you know … Paley’s like oh, you got the invitation done? He said no, but I have an idea for the event, which is that we should hold it in the automat, and we should give everybody a roll of nickels as they go in. Paley thought about it and said, well, I don’t know, but lets talk to Benny and Benny, of course, thought it was a great idea. In the end, Dorfsman still did an invitation, but the kicker is that it got written up in the New York Times and it was an article above the fold on the cover of the New York Times which you sort of can’t pay for, right? Benny loved it, which was part of making the star happy for the network to do that and people had a lot of fun. So, what was the graphic design problem? It was just an invitation, but one of the things which is great about Dorfsman is he thinks about what the idea and not the idea of the invitation, but what’s the idea of the whole thing? What’s the idea of the whole experience? I just think that’s a wonderful example of how design can transform a situation. Take a thing that in the grand scheme of things is not very important, but to take it from being mundane to being a lot of fun.

Edward: That’s cool. I think kind of the root of the thing is that by analyzing the request, he kind of looked at the problem and then redefined the problem completely. The problem wasn’t what was handed to him – let’s make this – but the problem was it’s Jack Benny, how do we honor him.

Dubberly: There’s thinking at a lot of levels on this, but it’s definitely not just at a visual level. There’s some sophisticated brand thinking there at several levels, like what is the CBS brand and what’s the Benny brand and what’s appropriate and even the idea of people being in black ties at an automat, I think, is just very clever. I would see this as design thinking, by the way.

Edward: You would?

Dubberly: Yeah.

Edward: Absolutely. That definitely falls under it. Would you say that this kind of tacit knowledge, he kind of knows this from experience how to do it, would you think that this is teachable, really, to undergraduates?

Dubberly: I think in some ways it is. You can make clear… well I think just telling the story is teaching, part of teaching I think you can say hey, you don’t have to accept the problem that you’re given, you should always question that. There’s always opportunity to make it broader or narrower. There are a lot of ways that you can have people look at that. There aren’t enough courses, which ask people to think about what are the different ways of practicing design and what are the different ways of even approaching design.

Edward: That’s one of my goals is to try to at least address it on a small level.

Dubberly: There are quite a lot of models of the design process, but there are rather fewer models of designing or design itself, design as a space.
Edward: Could you elaborate a little bit on that?

Dubberly: We have a process. We have a collection of more than 100 models of the design process which is fairly easy to find in models of the design process. We have maybe a dozen models of design as a space.

Edward: Yeah. The space as a design model where you have different levels of knowledge

Dubberly: We have one, which suggests that there’s a sort of 3x3 matrix. This grows out of a model from Jay Doblin. Jay Doblin has a famous article. The full title is *A Short Grandiose Theory of Design*. In it, he describes a 2x3 matrix.

Edward: I think I’ve seen that.

Dubberly: And he says there’s form and function and objects and systems and he has a funny word, but essentially systems of systems. Then I said well, form and function … there’s form certainly, but we can think of Charles Morris and model of signs where he talks about the grammar, the structure meaning and then the context or the syntactic, semantic and pragmatic. Then you can take object systems in communities of systems or ecologies and most of the practice is in the lower left corner in the form or grammar of objects, but increasingly, we have to … well, school projects are certainly down there, but if you’re in practice, you have to deal with structure and meaning and if you’re on your own and if you’re doing the business arrangements, you’re dealing with pragmatic issues of who are the users, what’s the context, why are we doing this. You’ve got to move up the ladder and then if you start to move into software, then you’re doing systems stuff and probably at all those levels and then often, the software’s imbedded in other systems and so you really have all 9 engaged. As you move from the lower left to the upper right, in the lower left you can be kind of intuitive and do it yourself, in the upper right, when you’re dealing with the whole thing, you have to use a people dealing with stuff that’s not very tangible and you need to be explicit with that model to process it.

Edward: And this is one of many faults.

Dubberly: Well, this is one of I don’t know, there are a dozen or so models that we’ve found which try to look at just sort of the shape of the design as it were. The design itself.

Edward: Not just the standard design process of finding the problem.

Dubberly: But what are the aspects of design that one needs to consider in designing? It’s basically a solution space for design practice. So, where could you practice? You could practice as an illustrator. You could practice as an urban planner. Arguably, those 2 people are doing … what they’re doing has some relationship of what is space, which includes both of those activities.

Edward: I would say the space is, well, one, I guess very broad, it’s a creation, that they are creating something new out of their knowledge. The other thing would be planning. You can’t just up and do an illustration having some thought…

Dubberly: You have to have some idea.

Edward: You have to have some idea what you’re doing ahead of time. An urban planner has that, too. Then you have constraints of materials.
Dubberly: So, there’s no right answer to it. It’s just they’re different. That’s a thing, which designers don’t examine very often which is what is best for the shape of that space. What are the major dimensions? So, if you ask about how can this be taught to students, I think examining this and foregrounding it, bringing it to the student’s attention can be useful.

Edward: Right at the beginning start … well, maybe not right at the beginning. (Laughs.)

Dubberly: I don’t know … so that they have some sense of how all these pieces fit together.

Edward: Okay.

Dubberly: I think for young students, it can be very difficult to understand what is the difference between illustration and graphic design and somebody who does information architecture or interaction design or experience design or even animation? What are the differences between these activities? What’s a concept artist, you know? How do all these things fit together? To the extent that you could draw a picture at the beginning for them, I think that’s helpful.

Edward: That’s very helpful. Actually, you’ve been quite helpful. I appreciate it.

Edward: How much cross learning do you think there should be or how is that more advantageous for the engineer, the developer to know a little bit more about design on their end, which they don’t usually teach that as much.

Dubberly: Oh yeah, that’s very true.

Edward: Not very true or true?

Dubberly: It’s true that developers don’t know much about design, certainly not about visual things.

Edward: Do you think it’s advantageous to pull developers into design classes?

Dubberly: Yeah. So, that’s several questions.

Edward: It all comes down to the idea of the future.

Dubberly: Yeah. Let me back up. Printing as we’ve known it, that is, large-scale commercial work is as dead as a letter press. There used to be half a dozen great printers in the San Francisco area. There’s maybe 1 now. One of the effects of the web has been that there is less printing. It used to be that every large corporation would print a glossy annual report. It’s just not done anymore. It used to be that every new Macintosh or at least family would have a brochure, you know, glossy 8, 16-page brochure. Not any more. It used to be that every product made had a data sheet. Not any more. To the extent that graphic designers and graphic design emerge out of planning for the manufacturer of printing, it has a problem as a discipline. You could argue that graphic design is about much more than how to reproduce an image, it’s about what the image should be and that in many ways, graphic design can be independent of the medium. I think that’s true, but that’s not the history of practice. The history of practice is that graphic design has been tied to a medium. So, graphic designers need to be very cognizant of this. From a pure business point of view, you have to look around and kind of say, well where’s the work? You’ve already talked about moving into the web, so you went from print graphic design to web-based graphic design.
Edward: I don’t really do much printing at all anymore.

Dubberly: Yeah. If we print 1 thing a year it’s almost always just for ourselves. The reason I think data visualization is important for designers to think about, though, is the amount of information that we have to deal with is just growing at an increasing rate and it’s difficult to make sense of numbers as numbers. It’s much easier to make sense of numbers as pictures. Getting the numbers into pictures is a design problem. It’s a specific kind of design problem. You know, there’s a revolution happening in sensing technology that’s creating lots more data. There’s a huge opportunity for designers there. That’s kind of what was behind that. You asked separate questions about programming.

Edward: Well, yes. The reason I was bringing it up was, 1, the things I was thinking about the class was focusing on an interface challenge and I wanted to make sure computer programmers were involved and see if I can pull them in.

Dubberly: To do what, though?

Edward: To be part of the process from the beginning just like the designers.

Dubberly: Yeah. There’s certainly value in that for designers to learn to work with programmers. The truth is that in practice, we don’t know how to do it.

Edward: Why is that?

Dubberly: It’s part of a large cultural shift, which is happening again. So, we went from craft to manufacturing. Now, we’re going back to craft and think about it for a second. When a designer plans something to be printed, then if you’re the designer and you come to me with an annual report and you say, well all right, Hugh, I want you to print this annual report. You want a thousand or 10-thousand or a hundred-thousand copies of that thing. We might in a very early stage of the project have a discussion about if you make a small change, it could make it a lot easier to print.

Edward: Right.

Dubberly: But, pretty much, you’re telling me take this thing and print it. Make a bunch of copies of it. You want me to be a craftsman to the extent that I will make the photos look really good, but you’re not asking ... the bounds of which I can be creative are relatively small. You’ve defined what you want. You have the photos. The best I can do is make the photos look as good as they are originally. You’re not asking me to re-imagine the photos. The process of making a piece of software is different. You’re not reproducing something. You may be saying, well I want it to look this way and I want it to act this way, but if you’re coming in and presenting somebody with paper, then you haven’t really worked out all the ways literally that it can be. You probably haven’t worked out all the states and you haven’t worked out how it gets from one state to another state in complete detail. So, there’s already invention that has to be done. And then, there’s invention that has to be done to make the whole thing stand up anyway behind it. The whole back end has to be invented. The relationship between the designer and the developer, the software programmer is much less like the relationship between a designer and a printer and more like the relationship between an architect and a structural engineer.

Edward: Is there any way we can take that model and improve the relationship?

Dubberly: It’s interesting to see the discussions that are going. In the building and construction
industry are actually very similar to the discussions that go on in software about how do
you do it. There was within design what's called the design methods movement from say
1960-1970 roughly, give or take.

Edward: Chris Jones is one of them?

Dubberly: Yeah. So, there are 4 people that I think of as being important, maybe even founders of
the movement. So, John Chris Jones is one. Bruce Archer is another. Horst Rittel is a 3rd
and Christopher Alexander is the 4th. It's interesting that Archer and Rittel both taught in
Ulm in Germany. Rittel left Ulm and came here to Berkeley. William Wurster brought him
to teach at the university within the architecture program. The thing here Wurster also
brought Christopher Alexander to teach in the architecture program. So, you've got 2 of
these guys there. What's very interesting is that several people involved in the design
methods movement sort of repudiate it. Jones in many ways repudiates it and Alexander
to a certain extent. One of the reasons is that people mistook the methods which are
useful and very clearly defined problems and tried to apply them to ambiguous or wicked
problems, social problems. So, Rittel invents the term wicked problem to talk about this
issue and essentially says don't throw the baby out with the bath water, just recognize the
difference between these kinds of problems. Where I was going with this is to say that
what's fascinating, at least for me, is that the discussion about design method goes away
within most of design, but it continues today within the world's software and the influence
of these guys – Alexander. Alexander’s known within the world of architecture, but it's a
little bit of a footnote. Within the world of computer science, he's the pattern guy and
patterns are very important. Rittel is also important within computer science. We did
some research on this. There are literally a thousand papers, more than a thousand
papers that have been written about something called design rationale.

Edward: I've never heard of this.

Dubberly: And Rittel is the ... all of the papers, Rittel is kind of the father of this whole area of
inquiry within computer science research. Design rationale is the tracking of decisions in
a complex design problem, recognizing that the problem is going to go on over a couple
of years and more, that the team is going to change and that it's, therefore, very likely
that decisions will be revisited and people will want to know why was this decision made.
If you don't write it down, then you have Groundhog Day all over again and again and
again and again. The question becomes, well how do you write that down? Of course,
computers are helpful. Rittel was very early in looking at, well, how could you use
computers to keep track of this, but it also embodies an important notion of his which is
that the whole process is political, that the whole design process is political. The point
that's interesting, though, is that while most of design thinks of the design process and
design methods as being kind of settled, a settled affair, that within computer science or
computer practice, the coding practice and also within the building trades, how you do
this is actually the subject of intense, even religious debate right now. I think that's a good
thing. I think that's a healthy thing, but it also means that we don't know how to do this
and anybody who claims that they do is not really being honest about it. There are people
who are passionate about certain methods.

Edward: Agile for instance.

Dubberly: Yeah. The guys will say, well, we know how to do it. If you bound the problem and say,
well I’m 37 Signals and we’re 3 guys and we want to make project-tracking software for
ourselves. Okay. Yes. We know how to do that, but if I asked you to make a medical
records system for Kaiser, that's a completely different thing. It would be a mistake to
imagine that what you did as 3 guys making a piece of software for yourself would work in making organizational-scale software that has to be achieved, sort of 9 Sigma results in terms of time and reliability and so that's what I mean when I say we don't really know how to do this.

Edward: Are there applications for design methodology?

Dubberly: Yeah.

Edward: For instance…

Dubberly: And by the way, Agile not a design method.

Edward: All my programmers speak highly of it.

Dubberly: Many people will stipulate that, though. A lot of smart people think that Agile is a design method.

Edward: The idea of the human-centered solution, where you actually go into the field and see how people literally deal with problems, I know that’s really big in design now. That’s one of the whole center points of the design-thinking movement. Is that applicable to software?

Dubberly: Sure. I think anytime you can talk to users it’s extremely useful, no question. Don Norman wrote a famous article a couple of years ago saying hang on a second, that’s not where innovation comes from. And I think he’s actually right about that. Nevertheless, talking to users is always useful. The user’s not going to tell you what… Don’s point was that there’s no example of people going out and carefully studying users and then getting some brilliant insight that translates into a huge hit product.

Edward: There isn’t?

Dubberly: There’s no example of that. On the other hand, every time you talk to users, you get a better idea of the little details which make products good and you can find places where products are not so good and make those better based on talking to the users and Don would stipulate that, too.

Edward: So that basically rules out crowdsourcing.

Dubberly: No. It rules out crowdsourcing for major innovations, as in coming up with the next iPod, but crowdsourcing can still come up with great stuff like Linux or the Oxford English Dictionary. Those are both crowdsourced products and they’re great, just great.

Dubberly: You asked a question earlier about designing and programming. Today, we need designers who know how to program. This has been true for at least 25 years. There are a lot of designers who would like to bury their head in the sand and say, "Well, this is just going to go away soon." The problem has been around for 25 years, since we first began to talk about interactive multimedia in 1987, so. I hope that - I can’t imagine that - we can get to point where there was a more or less universal authoring environment, which had stabilized - which had authoring tools that allowed people to do drag and drop construction without having to know coding.

Edward: So I'd be drawing an example?
Dubberly: Yes - an example of this is Illustrator. I once had an opportunity to talk to John Warnock about the origins of Illustrator, and he told me that his wife Marva is a graphic designer, she did the original Adobe logo. He was kind of tired of going home and coding stuff for her in post scripts. So he said, "Well I thought it'd be cool to design a tool that she could design in post scripts." The truth is, Adobe Illustrator writes a post script display list, and up to Version 3, you could actually open it up and see that the files of post script - it's an abbreviated form of post script.

Edward: Oh, okay.

Dubberly: You can still today save back current versions of Illustrator into Illustrator 3 format. You can open them in Word or in other text editor, you can, you know see the header with it, the original post script commands are converted.

Edward: You can still do that today?

Dubberly: You can still - you can still see L's and N's, which are line 2 and move 2 commands, and C is for curve too, which is - those are the basic perimeters of post script. So - having seen things like that, or like HyperCard - to a lesser extend, director, or even Dreamweaver, it's possible to imagine we will get better tools. But for the time being, the world is changing so fast - it's not possible for the tools to stabilize. I think in the next several years, designers need to know as much as they can - partially, it's good to know about programming so you can talk to programmers anyway.

Edward: Yes.

Dubberly: Partially, designers just need to make interactive stuff

Edward: I tried telling everyone to learn HTML 5, CSS 3, have a good idea of Java-script, and if you have time, get into PHP.

Dubberly: Yes, that's all good advice.

Edward: Hugh, it's been wonderful.

Dubberly: I hope that was marginally useful for you.

Edward: It was extremely useful.

C.2 - Jon Kolko

Edward: Give me your elevator speech on when somebody says, "Design Thinking," what pops in your mind?

Jon: Well, what pops in my mind and what pops in my mouth are two different things really. So, I agree with some of what you prefaced before we started recording that there is something a little thin about design thinking in as popular culture as design circles (as popular culture would get) that typically alludes to designers who want to play a very strategic, high-level conceptual role and maybe never actually learn how to design things.
And it has baggage related to business schools where you teach one or two classes in design thinking to MBAs that go on to maybe run a brand, a brand manager or run a business unit, and so they now think they are now armed with a hammer and everything is a nail. But, what I think of when I think of the ideas behind design thinking are pretty powerful, and that is the notion of taking everything that designers do when they make a chair and applying it to things other than chairs, whether their political system, social problems, or organizational behavior issues – just treating sort of all of the issues in the world as design problems. So the way it manifests due to some really aggressive PR from certain firms, then there also is the way it actually is. It is interesting how it has gotten so much play recently, the last five years or so. When I was a freshman at Carnegie-Mellon, years ago, I took a class with Dick Buchanan called Design Thinking, and he'd been teaching that class for a while. So it's like, it is newish, but not really that new of a perspective.

Edward: Chris Jones and things like that.

Jon: Yeah, sure. And if you really dive into some of the Methods conversations, I think they abandoned that and they were like, 'well no we can't actually solve all these problems through this rigorous design-driven methodical approach,' so, I don't know take this with a grain of salt, but I'm a big proponent of teaching people how to think like designers and I'd love to see you know sort of a conversation around K-12 policy and teaching divergent thinking, user-centered design, empathy at 4-16 year olds, across the board.

Edward: Okay. Obviously it is getting some traction. I was talking to Hugh Dubberly and he was saying, I think Ellen Lupton agreed on this particular one, that is why she wrote her book on design thinking, that visual communications - and it could be social issues too - for example wayfinding systems that help autistic people or things of that nature. That visual communications have not been really served as far as education. There are a lot of things, making things, and business solutions like those you referred to, but do you think that it is a useful tool for such visual problems?

Jon: Yeah. If we break down what one means when we talk about design thinking, for me anyway, I think they mean a process. It is a way of approaching problem solving and I think specifically the process has a couple of attributes. One is a notion of empathy, as opposed to understanding.

Edward: Could you define that?

Jon: Sure. Empathy is about feeling what someone else feels and therefore it is impossible. You can't achieve it, but you can get really damn close. And so I can empathize with you by attempting to feel what you feel. And so there are ways I can gain that. I can ask you lots of questions, spend a lot of time with you, I could dress like you, I could read the books you read, I could become you as much as it is practicable to become you in order to feel what you feel. And again, I can never actually know for sure. But I can get close. Or I could try to understand what you understand. And one is very intellectual and analytical. I can make a list of all the knowledge you have, and therefore I could understand your viewpoint, but to truly feel your viewpoint I think is a different game, and I think much harder, but I think that's core to this idea of design thinking. It is constantly forcing yourself to try to feel what those involved in whatever design issue you are dealing with feel. I think the process is about that. I think it is also about iteration and variation. And that probably plays with a little bit with what you are talking about with visual communication, that you don't just do something once and call it done, you do it many times, do many of them, and it is a divergence, convergence, divergence,
convergence. Lateral thinking is a way this has been described, as provoking the use of these sort of variants, and through that variation you can do more empathy-building though things like traditional usability engineering and testing and stuff like that. But I think the sort of quintessential piece of all of this then is this idea of abductive reasoning, and that is an inferential leap based on my personal experiences and so that assumes that I've had a wealth of personal experiences upon which I can draw and I am constantly looking at the world and inducting things, using inductive logic, but then I am able to use that inductive reasoning and combine two things that are disparate. And two things that are maybe unexpected and shouldn't be combined but when you combine them you get something new. So, to me this idea of what is design thinking, well if we call it a process it is about this idea of empathy, about making that divergence-convergence, and it is about abductive reasoning, I think it applies to visual communications, it applies to physical objects, it applies to systems and designs, it applies to politics. I could scratch my head to try to find something that it doesn't apply to.

Edward: There was an argument from one of the people I interviewed that said there are things that design thinking are not appropriate for, and another one of the interviewees said it was appropriate for everything and I could see somebody needing to knock out a logo or something like that where it might not be appropriate, but I can see situations where it would be where that logo has to appeal to a certain people.

Jon: Isn't that design thinking? Making stuff. I mean my approach would be that design thinking in exclusivity is probably not a good idea ever, and so as an example if we took a designerly approach to what an aircraft would look like, it wouldn't fly, but it would be really comfortable and cater to all of may emotional needs and wants. It wouldn't be very safe. Probably wouldn't be very fuel-efficient, because those are things an engineering, very analytical rigid mindset is going to err toward.

Edward: But those aren't wicked problems necessarily?

Jon: Correct. And I'm not sure there is anything innate about thinking like a designer that relates to wicked problems. Those are two separate conversations.

Edward: Really?

Jon: Yeah sure, because I can take design approaches and drive them into a chair. I can take the same process that I am going to use to address poverty in Austin. The exact same process. Same methods, same tools, same approach, and I'll use it to make a chair. And so it is an external choice on subject matter. When we are talking about a wicked problem, really we are saying what problem am I focused on? Am I focused on chair or am I focused on poverty? But those are external from design itself. Design is about a process, a method, a series of techniques, a way of thinking, but it is not about chairs, it is not about poverty. Dick Buchanan calls it a discipline with no subject matter, and I think that's nice. I agree.

Edward: One of my interviewees was saying something very similar where he was wondered if designers teach design to those who are not designers, what role then is for design? A bit of a conundrum.

Jon: I don't think it is a conundrum at all. If we teach ourselves out of a job so be it. Okay fine so everyone can do what we do, what's the bad part of that other than I can't claim some sort of ivory tower of 'look how great I am." I'm okay with that.
Edward: Tearing down the hierarchies a little bit.

Jon: Yeah. I mean it's extremely idealistic to think it would ever happen, because we live in such a STEM-driven analytical society, but if we did somehow manage to infuse design into everything, and everybody's a designer, first I think there would still be things that someone trained in design in depth would do, like err on the side of craft and find a special focus, and second I don't think it matters. That would be great, then I could deal with some other issue, right?

Edward: Like solving poverty?

Jon: Yeah, or like saying, "okay cool, now everyone has the same language to speak, and I don't have to spend 80% of my time evangelizing what it is I do, I could just go do as I do.

Edward: That's an interesting question as far as language is concerned. That's something Victor Margolin brought up and to a lesser degree Hugh Dubberly brought it up; the idea that when you have non-designers and designers working collaboratively, like using the IDEO methods where you bring these people together, that the weakness of that method (by their estimate) was no common language to start from. Have you run into this problem?

Jon: Yeah. I think I run into it all the time, I bet you do to when you describe what your thesis is to your family, right? You say you are a designer, and they say, "okay cool, can you help me pick the color of drapes for my living room." And you get a little deeper and say, "nah, that isn't what I mean by design and so they struggle to understand it and at some point most of them give up, and if they don't what I've found is they usually equate it to usability, because that makes a lot of sense. And I'm okay with that, but that's where they stop. And they say, "okay cool, so you make things easier to use, like software?" "Yes I do." "Okay great, now I know what you do." And it is like, no now you know a piece of what I do and that's fine because that is an approachable piece. I actually don't think this is an unique problem to design. If you ask somebody what a scientist does, they are going to give you an incredibly superficial shallow answer of what a scientist does. "Well they dress in a lab coat and they look at microbes - with a microscope." Well, okay probably 1% of scientists ever do that, right? That is not what a scientist is but that is what one is taught what a scientist is and does. Ask somebody what a researcher does, an academic researcher, and they are clueless. But clearly once you get to that common language, yeah, then you can have a conversation, a debate, discourse, rhetoric, etc.

Edward: Have you found any real methods to create this communication?

Jon: Yeah, because that is exactly what I have to do with school. In the other room there, there are 11 students who are learning design and one of them has a design background. They are three weeks into the program and the expectation is that we are not going to teach you like the core Bauhaus crafts skills, you'll just have to pick that up along the way because we are going to jump into this higher level discussion. But, in order to jump into the higher-level discussion, you need to have a base set of speaking points. The first 8 weeks are spent learning bootcamp-style approaches and also learning theory and we learn the most aggressive, conceptual theory I can find so that they have a rigorous foundation so they can build an argument. It is not easy. You struggle with what words mean a lot.

Edward: I know a professor at Iowa State who is writing a research paper on how engineers run into this problem communicating engineering techniques and concepts. It seems to be a wide topic.
Jon: I think it's the nature of any discipline that once it gets large enough to call itself a
discipline there is so much academic baggage with it, that you can't possibly know it
unless you focus on it, right so you go to school for four years, plus two years, plus six
years - then you can know it. Then you can say, "yeah I've read the foundational stuff and
I've read the controversial stuff and the experimental stuff."

Edward: Here you are teaching post-graduates. Do you think that undergraduates, who maybe
have just barely got our of the core classes, let's say the Bauhaus model - Iowa State for
instance has an integrated core, and corporate partnerships with Meredith for instance,
but no much design thinking other than an architecture or industrial design class, do you
think that sophomores, not just designers, but the sophomores who are designers just our
of core, or whatever, such as agriculture or marketing - do you think that is an okay time
for them to learn design thinking techniques or should they wait for later or should they
have gotten it earlier such as grade school?

Jon: No, I definitely think that's right. The entire sort of craft foundation model is kind of wrong
at this point. And there are two reasons why it is wrong. One, I think we shouldn't be
teaching the skills like this as much anymore. There are plenty of people that can make
chairs and posters, angled brochures. We don't need that as much anymore. But the
other reason is, I think an 18 or 19 year old has by and large for the most part never been
challenged, especially if they grew up in the United States. And so the idea that somehow
they need to have things progress very gradually in a logical manner I think is wrong. I
think they need to get thrown in well over their ability to tread water and see what
happens. With the exception of those who went to really, really, good public schools or
private schools most of the students I got when I was teaching freshmen and
sophomores they had never felt coarse, had never stretched the limits of their
imagination, had never stretched the limits of their own personal skill set, because when
they found something they weren't good at they simply didn't do it.

Edward: Really?

Jon: Yeah sure. They would get points for trying or the just wouldn't do it. And so an example,
learning history. "Well I'm an artist/designer so I don't need to know that so I'm not going
to take any history classes or I'll get a D and pass the class and that's it." Okay, well can
you possibly think of a reason why history would be a useful thing for you to know as a
designer? "No, not at all." So, the approach then the first thing they would need to do
freshman year would be to do something that's deeply steeped in history. So that they get
beyond this point of "it's not relevant, I'm not good at it, I don't like it" and they find a
reason to integrate it into their sort of world view. I don't like the idea that you have to
learn the simple stuff before you learn the hard stuff. I don't think that's how people learn.
It's not how I learn.

Edward: I find myself agreeing with you. I learned most of my design skills outside of school.
There is a big argument in schools, especially at Iowa State for instance, whether people
want to learn the technical stuff. How to use Photoshop, how to use Illustrator, how to use
InDesign, etc. But the problem is that two years from now all of that is going to be
outdated.

Jon: Yeah, it will. When I was hiring people at Frog, when I was hiring junior designers, D1s at
Frog, the portfolios by and large sucked, and this is not from any individual school, but
across the board and the ones that didn't suck showed a sensibility towards that same
process we spoke of earlier, and they showed a level of curiosity and passion and that's
the type of person I would want to hire. There is a separate type of person I would want to hire that showed an immaculate sense of craft in one skill. "I can make the best icons you have ever seen. I can do visual design for mobile applications like you have never seen. And that person is of huge value at a junior level. They'll never progress to a senior level. So I can have a $45,000 employee who can make the best fucking icons you've ever seen, can't build them on any other project in the studio, but I don't care, and they'll never get promoted, they'll never get a real big raise. On the other hand, somebody who has process, who has passion, who has curiosity, who maybe isn't as good at icons, drawing, whatever, they'll pick that stuff up, but better yet they'll be able to facilitate a client conversation. They'll be able to translate cryptic emails and conference calls into actionable stuff. I can use them over here where I have a narrative problem. I can use them over here where I have a complex system problem. And those are the people who are going to get 80, 90, 100,000 dollar jobs, three years out of school.

Edward: Do you think this relates to the I-shaped, T-shaped person?

Jon: That's so demeaning and annoying (laughter). I don't know what 'shaped' person it is, because I don't hunk about people that way. I think about people. I mean the answer is that you need to be really good, good at all of the things that it takes to be a designer, and if that means knowing how to code, knowing how to think, knowing how to facilitate, knowing how to draw, yeah that's it. You need to know all those things, and it is hard, life is hard. Usually when I have this conversation around the unicorn, "oh you want to hire a unicorn, they don't exist." Well they do exist and I've hired a bunch of them. What usually differentiates them from everybody else is that they just try harder. They go home and they don't watch tv, they continue sketching. And on the weekends, they are not out milling about at the mall - they are sketching and they are getting better.

Edward: I know several people like that, but I know far more that aren't like that.

Jon: Sure, absolutely.

Edward: I'm dong participatory observation with undergraduates, and they are doing poster design.

Jon: Well, and so like start and stop with that. You say, well let's say, how many undergrads do you think there are at Iowa State, in graphic design?

Edward: About a couple hundred.

Jon: A couple hundred. How many Iowa State's are there in the United States? A couple hundred? Fifty? Let's go with 50. So 5000 students are learning (and I think we are being conservative) how to make posters. How many of them are going to make a living making posters? Like none, one, half of one? One every other year? And I think the thought behind poster is it is a skill that should translate to any graphic problem. How many of those students are going to be solving graphic problems? Two? Five? I mean, go look for a job that says graphic design print in it and I guarantee you can't find anything like that in Austin. And so you go fine, what's the digital equivalent of a poster? Well, I don't think that's the right way of thinking about it either, because all of the firms I'm aware of - so call these the mid to upper lever consultancies and agencies - they don't want somebody who can make a pretty looking thing. They want somebody who can think critically, manage a team, deal with technologists and business owners, understand the competencies of the company, understand the strategic imperatives of a business. You don't get that learning how to make a poster.
Edward: On that note, if you were to do a class, let's say you have one class, and perhaps you had different exercises in design thinking. Maybe three five-week sections. If you were to do that, what elements would you include?

Jon: If I had these kids for three five-week sessions?

Edward: Perhaps also with an introductory two weeks where you could see if they sink or swim.

Jon: I think I would do something similar to the bootcamp we do at Austin Center for Design. So we do a one-day bootcamp and then when the students come, they do the entire curriculum of a year, they do in three days. And they do it for a couple reasons, one is to prime the brand and get them ready for it and the other is so they understand the rigor of the process, but so they understand the process entirely. So that is how I would treat those three chunks. I think I would do a chunk around qualitative research and synthesis, a chunk around synthesis and ideations, and a chunk around ideation and presentation. And broadly speaking, that's the stuff I would want a designer, whether they call themselves an interaction designer, visual designer, strategic designer or design thinker, this is what I would want that person to do if I was to hire them. And so I would say, alright here's a problem. Maybe it's a wicked problem, maybe it's a really commoditized problem. Here is a problem. Go solve it. And I want you to use this process. I want you to go out into the world and talk to people. I want you to leave this room and go talk to people, and like that scares the shit out of people. "Well, how do I do it? Is it an interview? I did that in seventh grade." No, not an interview. I want you watch them. I want you to try things and I want you to try to build empathy not just understanding. I think that is sort of the two halves of research is if I try to build understanding, I'm going to note usability flaws. We call those low-hanging fruit, but I can check off boxes. Fixed. Fixed. Fixed.

Edward: You could analyze it.

Jon: Completely. So it I go for empathy, then I'm starting to steer myself toward these deep meaningful perceptions into human behavior, insights. Right? And the ability to identify and build an insight in enormous. And so in this qualitative research phase that is focused on research gathering method and the preliminaries of synthesis. And then this middle phase, then we do more rigorous synthesis, trying to identify insights and then iteration, this variation/iteration idea of building lots and lots of ideas. And then the last phase there is this idea of pruning and refinement, but also presenting/facilitating and saying, "here's what I did, here's why I did it, here's what I learned, in a manner that is persuasive. And at the end of that if they have ability in each one of those, then they will have caught a passion for all three of those.

Edward: Would you think it is one wicked problem throughout the entire semester, though it doesn't have to be a wicked problem?

Jon: The problem with wicked problems as a generalization is that you can't solve them. We will never solve poverty, we'll never solve hunger, we'll never solve sustainability, and so to position an 18 year old, whatever sophomores are, 19 year old, that in 15 weeks we want you to go out there, study everything there is to know about inequality of education and then at the end show me something awesome, like I think it is much more than that. It is setting them up for failure and they will be much more disappointed in themselves. Or setting themselves to have this inflated sense of ego, "look at what I made, I just solved poverty." No you didn't. Instead, I found it much easier at that level to take something

Edward: We thought about wayshowing for busses.

Jon: Yeah wayfinding. Busses are good. Anything that gets you out in the city. But you know 15 weeks from now, they are not going to have solved the problem, no matter what the problem is because they are not good at it. And the whole point is in an introduction, they need to feel that sense of passion, mystery, and amazement about the process at the end of it. So that they then go throw themselves at it to become the unicorn.

Jon: I’ll tell you a really quick story, and you can use his name or not, but Matt Franks who teaches at Austin Center for Design, and I just hired him at a start-up I’m running, that was running the design for. He was previously at Frog and was one of my students at Savannah College of Art and Design, like 10 years ago approximately. And I had him as a freshman, and part of the freshman program there is to weed out people that suck. And he sucked. And my goal was to get rid of him. And I said, like dude - and he asked indeed - man you are terrible, you'll never be a designer. Please go suck somewhere else. And at one point we had a conversation, he said, "look, I wanted to be an industrial designer my entire life." And he is 18 at this point. Really, how did he even know? "I really want to do this, tell me what to do." And told him what I told all of the students, "hey if you really want to do this, go home and study, or draw for 2-3 hours a night, every night for the rest of your life." And usually that was enough for the student to drop the class and go away.

He didn’t. He actually did what I said, which was kind of shocking. And, I still think he still draws a couple hours a day, but he turned around to be one of the best students I’ve ever had and I can take no responsibility for that except for putting a seed in his mind that this is really hard work, that I have to put in the effort. And then from sketching it went on to well I want to learn how to do 3D software modeling, I want to learn how to stand up in front of a Fortune client, well I want to learn assembly/mass production. Whatever it is, there is a sense of, well it’s really hard and will take lots of time, so I’m going to throw myself at it. And I think that’s what you want to try to light a fire for 18-19 year olds. Not this like, go through the motions, move the type around, use Helvetica, because I’ve seen it all before.

Edward: One of the things I want to try to avoid is something similar to what you are warning about, as like making totally a rigorous approach and making a rigorous thing. What I like about the approach is getting them out there and working collaboratively. And I think that is important, and it is one of the ideas I wanted to do for this class, an honors class. Now, do you see any major challenges in that kind of idea?

Jon: Of an interdisciplinary approach? No, I mean yes there are challenges, but it is totally the right approach. It’s difficult to know how differently someone sees the world until you have a derivatives trader, and engineer and an artist all having a conversation about design, and I’ve had that. I had that last year. It is truly bizarre. The derivatives trader sees the world through macro economic strategy, the terms, so when he thinks about behavior, he’s thinking about how to make a million people to do something. The artist is thinking about this deep meaningful message, or spiritual communications they want to have with one person at a time, and the engineer doesn’t give a shit about any of this communication. They want to solve this little problem as efficiently as possible and so then now the task is to design a coffee maker, imagine the conversation that happens as a result of it and the sort of peer teaching that can theoretically occur. The challenge is that I’ve seen in any interdisciplinary or group setting with 18-19 year olds is that it is not about the problem and it’s not about the knowledge, its about who’s a jerk, who’s cute,
who's mean and so like the more you can erase those kind of social dynamics which are
typical of 18 year olds - he's not pulling his weight, I spent three times more time than he
did, he copied my work. The more you can get rid of that kind of conversation the better,
that's a challenge with 18 year olds and not interdisciplinary.

Edward: I've noticed with 18 year old and 19 year olds in lecturing at Iowa State that they are both
hyper-creative and kind of balanced by hyper-lazy.

Jon: Yeah, totally. The US school system has failed them 100% and for the most part most of
our graphic design programs continue to fail them for four more years, so it is like, okay
cool good for you, now you have no skills to speak of and you can make a shitty poster.
But no, you are right, they are lazy and they are lazy because they haven't been pushed
and it's hard to blame them.

Edward: No, I'm not blaming them, though I agree.

Jon: I find myself blaming them, but I think it is the wrong thing to do although, I went to a
public school and not to be too inductive with this reasoning, I don't ever remember being
that lazy. So I don't know where that initiated from.

Edward: I wouldn't say all of them

Jon: Though for the most part, most of the students I've had that are 18 are lazy. And its
incredibly frustrating, but maybe that's the challenge of the educator then. Go with the
assumption that they are, and you then need to ignite the fire across the board to say,
"hey this is worth your time, it is worth getting off the couch, because that's how cool, fun
creative and challenging this discipline is going to be. As an aside, that is a facilitation
rule probably. Whenever I run creative workshops with Fortune clients, with upper
management or whatever, you are the energy source for the room and when you are
done, they've eaten it all, they've depleted it. Right, so you are exhausted, theoretically so
they are full of energy.

Edward: Have you run into that issue, and I believe Doblin brought this up, as the designer as
leader. I don't want to create
hierarchies, but more of a facilitator.

Jon: Totally, absolutely. At Frog that was sort of a core offering of the agency, and I think it is a
core offering of a lot of agencies, this notion that in a big organization, design has little to
do with design and more to do with getting everybody to communicate with each other
and agree with each other and driving consensus. And so, that is a big deal. That is a lot
of what designers do in practice when you are talking about strategy work is how you
have a vision driven by this process, but then how do communicate that, how do you
evangelize it, and how do you get people to breathe it? That is in fact the trajectory that
big companies go. Think about the nature of risk, the - I was reading somewhere - the
retina screens, new retina displays were some weird arcane glass that Corning had and
hadn't done anything with in ages and Steve Jobs called them up and said, "hey we need
this glass, we are getting ready to produce this for our Macs." They said what, what are
you talking about? And if you think about if a designer had had that idea, needing to
rationalize to the CEO why they need to spin up a brand new assembly process,
manufacturing process for this special glass in the middle of America in order to make the
screen so that it is scratch-resistant, scratch-proof, dropable and all that shit. That design
idea is this glass, the design extension or story is look how important it is, it is going to
work, I can see the vision of it, here is how much money it is going to cost, here is how
long it is going to take, the number of employees. That is facilitation, right?
Edward: Definitely. I believe I've gone through my list. This has been really fun.

Jon: Cool man.

Edward: Thank you.

C.3 - Victor Margolin

Edward: Well, as you know from my email, the idea of this, so I'm gathering my information and noting it as I go to create an overall thesis, as opposed to the other way around.

Victor: Okay.

Edward: But the general idea, this is going to be practical. It's not purely just high theory.

Victor: This is a curriculum that you're creating? All right.

Edward: The beginnings of one. What I want to do is come through and, come up with a way of introducing design thinking to undergraduates earlier, maybe as sophomores. After they get their core studies out of the way. And introducing it as sophomores. But not just designers. Pull in engineers and others, so they can get the collaborative stuff early on, and learn how to do it. And I'm trying to find out what the best approach is, how do I frame it. One of the things another interviewee was saying was using anecdotal, basically case studies, to get people to understand it, as opposed to raw theory.

Victor: Yeah. Well I, yeah. I mean, to be honest, I have a problem with the term design thinking myself, because at least in my mode of thought, design thinking is designing. So if it's not designing, what is it? And this term has now become the buzzword everywhere. In fact, I just... One of my colleagues, Richard Buchanan, he's now teaching in a management school in Cleveland, at Case Western Missouri. So he just sent out to our editors yesterday, there's someone from another management business school, has now started a website for design thinking. How to bring design thinking into the business schools. So it's become the buzzword of the year. So that's what he's doing at Case. I don't think he calls it design thinking. His title is Professor of Design and Information Management. And Management. What they're doing there, there's a book called Management by Designing, have you seen that book?

Edward: I've seen it, yeah.

Victor: Yeah. Well I, yeah. I mean, to be honest, I have a problem with the term design thinking myself, because at least in my mode of thought, design thinking is designing. So if it's not designing, what is it? And this term has now become the buzzword everywhere. In fact, I just... One of my colleagues, Richard Buchanan, he's now teaching in a management school in Cleveland, at Case Western Missouri. So he just sent out to our editors yesterday, there's someone from another management business school, has now started a website for design thinking. How to bring design thinking into the business schools. So it's become the buzzword of the year. So that's what he's doing at Case. I don't think he calls it design thinking. His title is Professor of Design and Information Management. And Management. What they're doing there, there's a book called Management by Designing, have you seen that book?

Edward: I've seen it, yeah.

Victor: So it's those guys, Dick Boland and Fred Collopy and now Buchanan. What I think of is, thinking in a designerly way, or designing, is... The question is, what's the difference between design, design thinking, planning... The way I've come to it is that... Well, let me back up and say in our journal, of course now, we've just had a retreat in Cleveland, and we've now decided in our new statement that we're going to put in the journal that we're looking at all aspects of design. So anything from urban planning to, and we're starting to publish fashion articles, and things like that. The argument is that they're all, what cuts across them all, is I'll say it, designing. So what is designing, if it's so different? And could be engineering, too. I think where engineering provides some resistance is;
Edward: Less of a wicked problem.

Victor: Yeah. So it's, I'd argue you're not really creating a product there; you're solving a problem that, the product parameters are fairly tight. In any case, so what I consider to be designing as different from just planning is first of all there's always a product at the end. Design, we want to call design thinking, is geared towards producing something. What drives the process is an outcome, and an outcome that has, I'll say an identity to it. It doesn't have to be a thing. I mean, it could be, this is all now the clichés, but it could be a system or a plan or whatever. But there is an outcome. And the question then is why is it design? Well, what I would argue, and I think I'm the only one who's saying this, is what makes something design is that the outcome has to work. And we know that in planning, I don't know what percentage of planning, yields results that don't work. Or they're poorly conceived. And a design, to be a good, I mean, no, even an ugly product, an ugly coffee maker, if it doesn't work, it's not design. It's just a bunch of material. So I'd say, something has to work in the sense that it has to be useful. And therefore, where I would distinguish designing from just planning as such is the notion of accountability. That in whatever it is you're doing, if your outcome isn't successful, then it's really not good design. I'd say successful in the terms that you define, in terms of it being useful. So let's say you're making a plan for the Social Security Administration for... Or the IRS. There have been some articles, a lot of designers working for the Australian tax system, and fourth order design and all that stuff. So you're making a plan for something, and you plan and it's all out there on paper and then it's just dysfunctional. I would say you haven't really designed anything. You've gone through a process of putting something down, and putting a bunch of parts together, but it hasn't, it's not useful to anybody, really. I would say, you could say designing to be planning a result that's useful. I'd say it's not just planning, I mean, there's got to be something that I would call a product. You know, that has its own parameters and so forth. In that sense what do we mean if we say putting design into the corporate world? It means that you're doing something that has to, that first of all, that's an entity, and second of all that has a clearly defined characteristic of being useful for a particular end. So in a way, the design you might argue is accountable to the success of the end as well, not just to the product, but to-so as I say, if you make a bad coffee maker and you can't get a good cup of coffee out of it you can say it's bad design, but that's equivalent to not being design. You know? I mean, at least in my notion, if you think of design you think of something that's positive and useful and so forth. Forget about good and bad design in terms of shape or form, but rather either something, if it's design it should work or it should be useful.

Edward: I've always considered the highest compliment that I could get from work that I've done is that it works.

Victor: It works. Yeah. Well, that's the point. If it doesn't, all right, you could say bad design, but in a sense it's almost an oxymoron, because, at least in my definition, design should be something that works. All right. So why is everybody interested in it now? Because suddenly we're looking at complex systems, we're looking at huge, you know, settling refugees, we're looking at multinational corporations, and somehow the methods that people have been using to try and make these systems work aren't working. I mean, if you look at the failures of Katrina, you know, and how, you know, the FEMA, how they, messed up they were, and giving people all these toxic trailers, and all this kind of...
mean, they were unable to, I would argue, to actually conceive of a successful resolution to the hurricane as a product. A complex product.

Edward: But a product nonetheless.

Victor: With interlocking components that fit together in terms of cost, in terms of outcomes, in terms of efficiency of delivering all their things. So you could say that they, you know, they were going by the seat of their pants. All right, so, it didn't work. So it's the kind of thing, now you have, someone's reading the paper. Suddenly now there are masses, masses of refugees leaving Syria, going into neighboring countries. Masses of refugees leaving the north of India. So you have these movements, the sudden movements of people who have to be quickly resettled, and you know, it's a complex problem. On and on, the things that we're dealing with, not only at the huge scale, but you've got, you know, problems of how do you create efficient workflow with people that are located all over the- Anyway, all these things. So I think that's why the term design has become kind of a hanger for something. They're kind of grasping for it because so many of the things that people have to deal with outstrip the methods that they have to do it. So somehow design has become the magic word for delivering something. And I would say it's a good word, because what it ... It brings a certain responsibility to the planning process. It means that you don't just sit and draw your plan and then go out. It means if you think about as, you know, as a designer, designing is always like Schon says, you know, kind of a conversation with your project. You're going back and forth between your plan and the final thing. You also have, in the design process you have iterations, you have feedback, you have, there are all sorts of elements that are in a, models, you know, that are in a process for designing a chair that have not been used when you look at how you try to address some of these more complicated things. I think in that sense design becomes interesting, in part, as a kind of a template. Not that designing a coffee pot is anything like settling refugees, but there are methods that designers have devised for doing with simple objects that might work in addressing more complex problems. The question is, is design thinking a single thing? To me it's not. I'd say it's, you know, design thinking is, I'm just trying this out on you, but-

Edward: Oh sure, sure.

Victor: I'm arguing that design thinking is designing. So what you really want to be talking about is how do we bring design to these new situations rather than design- Design thinking to me is sort of a halfway term. It suggests that you're not really going to go all the way but you're going to take some elements from the design process and map them onto whatever you do. As opposed to saying, well, we're going to design. Which means you're into it, and you're committed not only to a process of getting the result but you're committed to a successful result, more so than just bringing yet another method into the mix that you have. I mean, if you're designing that's the totality and everything is subsumed under whatever you need to do to get a successful outcome.

Edward: The historical context is, you brought up a statement, you were saying, and I think that I like where you're going with this. This is very fascinating. Would you say that applying design thinking, those are air quotes. Or design, just designing. Do you think as it's being used and expanding, do you think this might be the fulfillment or continuation of the ideals of the, you know, the arts and crafts movement, or the ideals of possibly, you know, the Bauhaus? Moholy-Nagy in particular?
Victor: Well, I'd go back, not the arts and crafts movement, because I think that's very much about materiality and things, and environment, you know. But yeah, I think Moholy would have been very much at home in the contemporary scene. I mean, he does have a quote in this conference. He says, more or less everything is design, he says, when you're preparing a meal, or just doing ordinary things there's a design element to that. So yeah, I'd say of all of those guys, he would probably be the most comfortable with where we are now. And I think he was a tech guy, at least interested in technology, and I think he would be, he had no problem with that. I think he's always a good person to read, because he pre-stated in a way a lot of things that are going on. Let's see. What do I want to do. Where does all this come from, what are the roots of it? I'd say you want to go back in part to the design methods movement of the 60s. And I don't know, do you have my book, The Politics of the Artificial?

Edward: Yes.

Victor: Okay, well there are a couple of essays in there about design studies, about design studies. And I do write a bit in there about the design methods movement.

Edward: I think I remember that article.

Victor: Okay. Well anyway, the point is that, what they were looking for- And you read John Chris Jones? Have you read-

Edward: Yes.

Victor: Well, he has, probably a number of quotes. But basically he was saying back in the beginning of the 80s that design methods should enable us to build a bridge or do any of these kinds of things. So they were, instead of design thinking, Jones, and just a lot of opinion, Bruce Archer, you know-

Edward: I've heard of Bruce Archer, I've never-

Victor: You ought to look up, there's probably some stuff of his on the web. Archer was really, he was very important. He was an engineer, and he was invited by Sir [inaudible 00:21:37] to teach at the Royal College of Art. He started a design research unit, and some of his ... Some of his MA students actually started working on things that designers had not worked on before. And so I'd say that's probably a good, Archer is probably a good starting point for some of this. Things he was doing at the RCA, and some of his writings are on the web now. And I know there are PDFs of some of Arthur's papers on different websites, and you could just say, you know, you're looking for access to Bruce Archer's work. Or you could look at the early design methods literature, in various books. So yeah, I'd say Archer was really pretty important. And he was, of course, really made central to design methods. And I think the problem, where I think they went aground ... Well, what happened was design methods then sort of eased its way into the journal of Design Studies, and the work of Nigel Cross, and all these things about, you know, designerly ways of knowing-

Edward: I've read that, actually.

Victor: Yeah, okay. Well in a way, I think they got a bit too far from situations in which designers actually work. And they got really preoccupied with the theory independent of what you do with it. And independent of doing it. So it wasn't theory growing out of a new kind of
practice, but they were trying to conceptualize what they were doing in some way that would be transferable, but rather it became a sort of philosophical problem, you know, trying to distinguish what is design, designerly ways of knowing, is design a science.

But before they get to that, you have Jones, and his book is important. And Archer. Those are I think two good sources for that. And I think Jones gives you the basis for talking about collaboration, and the design methods movement actually has a ... You know, there were engineers and designers. And I don't know how well they worked out their differences, but ...

Edward: Well, one of the things I'm trying to do is, basically, from the readings, from interviews, from actually doing some observations of designers, I'm just, collaborative observation. Actually in your latest Design Issues you talk a lot about observation, and...

Victor: Yeah, we've had a few articles like that, yeah.

Edward: So I'm going to watch young designers actually work, who have not been taught anything. So it's kind of, for research purposes it'll be probably have some primary evidence to put with all the readings, and create a curriculum. The theory is, I think, I'll just say I'm focusing on visual communications, working on interface design, but not necessarily. What I'm sensing, in an article, and I can't remember whom you wrote, you interview was writing, offhand. But you had mentioned that when it comes to design thinking or design methods there isn't as much of a shared narrative as there should be.

Victor: Probably not. I mean, well, I think what you still have- I mean, a lot of this stuff comes down to how people are socialized in their professional training. And you know, you look at, it's probably still true in universities that architects see themselves as higher than the designers or the artists. Engineers see themselves as more rigorous than design- So there's a lot of ... What do I want to call it. A lot of posturing I think that gets in the way of collaboration, you know. People are told that what they're doing has a certain meaning and value. So there's this training that, if you're going to be an electrical engineer, well, this is the value of what you do, and therefore... You know, and in the sciences, there's this whole issue about hard and soft. You know, like hard science is better than soft science. Hard data is better than soft data. So what's hard data, what's soft data, and it's all- I'm a social constructivist. So what I see is that basically, people have constructed these systems of value, and that's what really drives their opinion. So you have the notion of hard data, which really comes from centuries of formulations about what is a valid experiment, and all of this. Not that it doesn't work. but there's no reason to think that because you have sort of grown up in a constructed, efficacious system where data has a certain value, that it negates the value of other kinds of data. You understand? That becomes-

Edward: Well, quantitative data overcomes qualitative data.

Victor: Well yeah, or yeah. Hard and soft, whatever people are calling them; it's not necessarily those two. But yeah. It's things like that. So people then become close-minded to things that work for other people that they feel don't have the rigor.

Edward: How do you think we can address that?

Victor: Well, I think the way to deal with that is that you start- I mean, it's not about the knowledge that, you know, if you're an engineer, you're an engineer because you have
technical knowledge. But I think it's about the socializing of engineering students, or of architects, whereby it's really worthwhile ... I think in that sense, there was a good idea with the Bauhaus curriculum. And some people are even bringing engineers into that now, where you have a core where everybody learns something. But engineers, of course, wouldn't find any value in color theory and the Itten stuff, you know. So the question would be, if you were going to have a core course that cut across a number of different design disciplines that you would accept as being that broad, what would be in the core course that would actually provide a shared experience that would then still remain alive as you went off into your specific practices, whereby you could then come back at some point with more, what I call domain knowledge, and share it again because you felt that made sense to do that. I was thinking about, I saw the film of Frank Gehry, The Sketches of Gehry, have you seen that?

Edward: I started it.

Victor: It's really good. Sydney Pollack, it's really good. Anyway, what you see there is Gehry working in conjunction with his, the engineers, and the software engineers in his office. Gehry's office is a good example of collaborative work, whereby he is really an artist in the sense that ... What I mean is that he's not really into, he's highly intuitive, and that's what people want to see in his work, is these intuitive forms, you know, where do they come- And yet they are only possible because of the engineers and the software people who work out the technical means to bend the metal and so forth. So there, I mean, there's a hierarchy there, but certainly engineers understand the value of art. And their job in that office is to make the art work. I think today we're finding that even between art and engineering a lot of artists are working in a more technical way. And one of the interesting things to think about is the relation between art and design. For example, one of my design colleagues, a colleague from the journal, Carl DiSalvo, just wrote a book called Adversarial Design. It's, MIT published it. What he says is that, he writes about technological projects that function as political opposition to various kinds of political situations. Like Natalie Jeremijenko, and there are lots of other people. So the question is to what degree are these simply rhetorical, to what degree do they actually become interventions in social processes that's more than just standing on the sideline and holding up a poster. I think a lot of things are converging. And to me I think the challenge is, if you can understand the idea that domain knowledge sits within a larger frame that we might call shared knowledge, that- I mean, metaphorically, society is kind of the result of, when it works, I know it isn't working very well at the moment. But when it works it works because there's an integration of different skills and techniques. So that the social workers do their job, the psychologists do their job; the architects do their job. So in fact just to take the problem of people who are disadvantaged or need help, they need psychological support, they need social workers to help with various things. They need decent housing to live in. You could argue that there you have a situation usually that's dealt with... Well, let me put it another way. My wife was a retired, she's a retired professor of social work. And the social workers do have these models, these integrative models, where different people performing different functions intervene in the process at different points. And so the reason those models work is because there are no, there are no obstructions such as knowledge that's so exclusive that no one else could figure it out. So if you're an electrical engineer, no designer's going to know exactly what you know about electrical engineering. But a psychologist and a social worker could find a lot of common ground more easily.

Edward: They're talking a lot about, one of the big things they talk about now is the T-shaped person. That whole theory of ... I think that goes to what you're saying. The idea is,
actually I think it goes all the way back to Moholy-Nagy, although he didn't use that term. Just people, a person that knows one thing really really deep is an I-shaped person.

Victor: Okay.

Edward: But a T-shaped person has that broad experience, and interests that allows them to communicate. Such as the psychologist, the social worker has that overlap. The engineer and the designer may overlap.

Victor: Okay.

Edward: Because of interests. And getting people like that together collaboratively, in theory, is ideal.

Victor: Well, yeah. So you have really two issues. And I think these can be overcome in a class, because students don't yet have these attitudes so clearly formed.

Edward: Attitudes?

Victor: Attitudes about whether their profession is hard, or soft.

Edward: Sure.

Victor: I mean, you can actually argue to these students that although they are kind of learning this technical knowledge, it really is always applied in the context in which there have to be other kinds of thinking. That it isn't, that not, the whole world doesn't think that way. That this is a kind of thought. So I think one of the things you can do is really try to develop maybe some typologies of design thought. What it is that different kinds of designers do. And in those typologies, what do they share and what is their domain.

Edward: Okay.

Victor: So in what way is architectural knowledge ... Now, before I go on, if you look at historically, you find even in the arts and crafts movement, designers cutting across everything, from making furniture to crockery to designing buildings. And you've got Henry van de Velde who was never a trained architect who ended up designing lots of buildings. And he had engineering help. Plus he did other things. So that idea of the comprehensive designer actually is not a new notion, it's more than a hundred years old. And you could go back to the 1890s and find people who were actually working that way. Or you look at William Morris who actually mastered a number of different craft skills. I mean, he was a printer, he was a weaver, he did lots, he was just good at- Now, that's just those kind of skills, but you can argue that an engineer can design and that's what they do at Stanford, the engineers get these degrees in design.

Edward: The D school?

Victor: Well, not the D school, but in the mechanical engineering department.

Edward: Sure.
Victor: They actually collaborate with the art department. Not very well. But they have this collaborative degree called a ... Well, it's a Master of Design, but the engineers get a Master in Engineering, and the artists get an MFA. But they take some courses in common. I don't think it works as well as it ought to, and that's a problem that they're dealing with. But anyway, if you develop certain typologies, and then you make clear what ... What is the domain part of somebody's training, and what could be the shared part? And you kind of drive home the idea right from the beginning that in fact, you're always going to be working in collaborative situations. And rather than come into this situation with an exclusive language that prevents you from understanding, respecting, and making use of somebody else's language, it's better to have a, conceive of what you do differently, so that you see it as both a domain and shared aspects.

Edward: So career multiculturalism.

Victor: Well, I think multiculturalism in terms of different ethnic cultures and things. I wouldn't use that term. But multi-something.

Edward: Multi-something.

Victor: Yeah. So that right from the start you understand that in your career it's very likely that you're going to be working with people who are, whose training is different from yours. And I think I would probably bring in the argument of complex projects. We are now, the way in which the world is becoming connected ... On the one hand, we have huge social projects caused by whatever, disasters or ... Or even trying to organize large groups of people for positive ends. And we have ... what did I want to say. But we have also technological interconnectedness, which has its own set of problems. But we talk now about, and I would read Thomas Hughes. You know, on technological systems?

Edward: I haven't yet, no.

Victor: He's a very good historian of technology. He's got a lot of books, and he'd be pretty important. But anyway, we have now, we're dealing with technological systems that have, that involve software engineers, graphic designers, and interaction designers if they're different from a graphic designer, some people want to argue that. Anyway, you might have people from four or five different fields working on a project. So the question is, what is it that they have to share? And I'd say here's where the design thinking comes in, where a big company, you've got to have a methodology that can be adopted by people across the company, if your outcome is of a sufficient magnitude. One of the keys to me would be language; you have to have a way of talking about projects that enables people with domain knowledge to buy in as collaborators. So I think one of the points I could leave you with is that language is really an important part of all this. Because people get socialized into attitudes by virtue of language. And then it's almost as if they're, what, French, and then they're working in a group where some other people speak Spanish. I mean, I think that's a good metaphor. Where, you know, rather than Esperanto.

Edward: Okay.

Victor: It's like, I mean, if you try the metaphor, if you teach engineering as if you were teaching French, and you teach design or art as if you were teaching Spanish, these people get into the same room and they really have no basis for talking together. So the question is,
how do you teach, how do you bring a common language in? So let's say teaching engineering you have to teach French and Esperanto. Or, and Esperanto I use it as a metaphor because it takes from various romance languages. So in a way you're not constructing a completely new language, you're taking a language that was constructed out of elements from various languages. I'd say the idea of language is very important.

In the training, how do you talk about your domain as a domain, and how do you then talk about it as something that you can bring to the table of a collaboration? So I'd say language could be one important thing. And then teaching that language in a course, you have to invent it or devise it, or create the argument for it, and find readings that support it, and so forth. So teaching that language in the course, and if you look, how is language training going? You know, you first, you study the grammar book and then you speak. So in a way you've got to create the new grammar, and then create the situations for, you know, working together, that are the equivalent of the speaking. But then in fact you don't minimize the need to be constantly articulating the points of convergence, because you get into the project. So if you read Donald Schon, I think he would be useful, too, so students get-

Edward: I've read a couple of his books.

Victor: Well, *The Reflective Practitioner*, that's the main book. That's the one that gets cited all the time. And there are some articles of his too, I think. So if part of the ... the practice is the idea that you're going back and forth between the drawing board and the project, I mean, in a way you've got students going to different drawing boards and then coming back with a project. But it's all really about articulation. What exactly are we doing at this moment? What exactly do I need you to go back to the drawing board and find, and bring into the conversation? So I think what we're talking about is an ability, and I don't know that this is pushed very hard, an ability to construct a project language that everybody buys into. So that you can talk together about what you're doing in a way that everybody understands and buys into, and that doesn't negate anybody's domain, and in fact creates the space. This is just hypothetical on my part, but I'm thinking that what always seems to cause trouble for people is they can't communicate. So you get these different, people with the different backgrounds in, they can't, they want to define the project according to French or according to Spanish, and then they want the other people to speak French. And that's where I think it gets into, you get into trouble. Because you can never agree on what the project is.

Edward: I understand. When you give people even a simple problem and they don't use the same language you get confusion. If I say Z-axis to designers, they know what I'm talking about. But for a developer or a programmer, it's Z-index. We're talking about slightly different words, but they have no difference in meaning.

Victor: So that's one thing. That's at one level. At another level I would say ... There are problems when you try to create an interface between different components of something. So let's say you're dealing with a coffee maker…

Edward: Sure.

Victor: Well, or something, a Mixmaster. I'm dealing with the 50s today, so- Okay so there's a motor in there, and then there's a form. Now, historically these big companies like GE, the engineers worked everything out and created the basics. And then a designer was called in to make a cover for it. So there really wasn't any collaboration. The designer's
role was very tightly constrained, and their job was to make the thing look good. Now, people like Henry Dreyfus started, when he worked for Bell, he said you know what, this isn't working. He said, I need to work with the engineers, and we need to really do this together. Because I can't just come in and create a shape of a telephone. It's, you know, and he introduces ergonomics and all sorts of things. So Henry Dreyfus is very important for, you could look at his book, Designing for People. Okay. I mean, it's a popular book, but the issue there is, what Dreyfus is known for, is bringing in all this ergonomic data. So he's the guy of all those consultants how really says, well, I'm sorry, we have to bring the engineers together. We have to ... Or you look at Bell, there's a new look about Bell Labs. So in the project, instead of just saying, well, there's the motor and the casing, you know ... Look, I'm not an industrial designer, but I know that often the way the thing ends up looking has to do with the way the functions determine the kinds of parts you want, and the way then you figure out how those parts fit together. Now it's one thing to talk about that in a relatively simple project. But if you get into some really complex, technological system where you've got lots of different parts, you can't simply say, you know, this person's going to do the parts and I'll make it look good. You really got to start talking about what is the relation between the kinds of knowledge that these people bring? And so I think, even one, of what I would say in a class, one of the first things to do in your, developing your project, is to have the discussion about trying to define the project in terms of what are the components that will make up this end product? And in what way does the design of component A have a bearing on the design of component B? Rather than saying everybody goes off and does something and we come back and they all fit together, which is never the case, you have to say the only way this is going to work is if we're going back and forth, almost like breathing, you know. Breathe in and you're all sitting there together trying to figure out the characteristics of what you're doing and what each contributes. And then you breathe out, where everybody goes off and does something that they then bring back. And so you're going back and forth until you actually can see the final shape. Look, this is just an image. But that's kind of all the best I can contribute.

Edward: Oh, no, you've been wonderful. I am totally fascinated by this entire concept. I've actually been looking even at meta-design, like, the upper levels of, to frame everything.

Victor: Okay, yeah.

Edward: Particularly Jay Doblin-

Victor: Yeah. I'm a big fan of Doblin. He has not been, how did you get onto him?

Edward: Roger Baer, my major professor.

Victor: Oh, I see.

Edward: And Hugh Dubberly.

Victor: Oh, Hugh.

Edward: They both said for what you're doing, you know, you have the process, that's fine. But to think about how it applies, and how you apply it with other people, Doblin is…
Victor: Doblin was good. I knew him, not real well. He was very- He invited me for lunch a few times at the arts club, and ... I mean, there were things I didn't like about him, but he was a really bright guy, and he pushed design education really, forward quite a lot.

Edward: You think this all could work within his theory? As a-

Victor: Well, I'd say-

Edward: At least as a meta-design level.

Victor: Look at Doblin, yeah. I mean, what he's talking about. Because he developed this idea, I heard him give a few talks, but I heard him give one, I think it was a conference at IIT at which he said, "It doesn't matter anymore. If you're just a graphic designer, you're not interesting." He said design is in the integrative, at the integrative level, and that's where he put himself. As somebody who is able ... Now, that's a little different than what, that's not collaborative work. That's hierarchical work, where you can look at what they did for JC Penney, or their ... You might look at the book on Unimark.

Edward: Unimark?

Victor: Unimark was the firm that Doblin worked for. The woman's name, Jan Conradi. C-O-N-R-A-D-I. They tried to put some of Doblin's planning theories into practice. So he and Richard Latham, who was here, they talked about design planning. Other people did. But their notion was planning. And I think at Unimark they did have these big projects where they had the different designers working. Because they did have graphic designers, and they had ... I mean, it was a forerunner of IDEO, actually. I would look at Doblin's stuff. But I think maybe the difference is that Doblin, I would say, Doblin is more hierarchical. You know, Doblin was a, became a kind of, not a manager, but a sort of visionary who saw the big picture and then fit people in to do certain parts of it. But I think you're really talking about something different. By collaborative it means that everybody has a buy-in. And that's a very different process. And that's where I think, see ... Doblin could come up with his own language and then just teach everybody else what it was. But what we're talking about here is some kind of consensual, some agreement, that there will be shared language. I'd say if there's one thing that I would leave you with, I'd say language is the key. Learning, developing ways of talking about what you're doing that really break down the languages that you've been socialized into or rebuke it.

Edward: Yes.

Victor: I'm trying to summarize. One is the way you articulate what you do and can do. That's, to me, the idea of learning, in essence, being bilingual. So learning your domain and learning a shared language. Or learning, having the capacity to talk in your domain, and in a group of people whom ... from other domains. So I'd say that's something that can be taught, both in terms of attitude and experience. Second would be the capacity to come into a situation where you've got a complex project and actually work with people from other domains to invent a common language for that project. That is to say, how are we going to talk together about what we're doing from start to finish? Rather than constantly clashing, you know, with, I keep bringing in ... I keep wanting to talk French and you keep wanting to talk Spanish, and neither of us is getting anywhere, you know. So I think, I mean, this simplifies everything. But the point is that if you get into some huge, complex project, obviously you've got to bring in mind mapping, charting, all sorts of other representational techniques to, create a picture of what it is you're ... You've got to get all
the complex components into some framework. A map. You know, you need a map so you have a sense of what you're doing. But then again, going back to Schon, all of that is always interactive, and that's going to keep changing as you go. But the point is that if you find the right way to, the shared language, there's no reason why you can't integrate these different kinds of knowledge, because that's what the project calls for. And you might even look at some ... Well, my wife and I wrote an article together. You have access to JSTOR I think because you're in a university. So if you look up the article, just look up my name and my wife's name, Sylvia Margolin, and the term social design.

Edward: I think I've seen it.

Victor: What we introduced in that article was the idea of the social work model, and where designers could fit into that. So that'll, and you might look at some of the social work literature on these models. And the model, what the model does is it combines the different components of the client's situation in, it's like a pie chart. So there's the physical dimension, the psychological, the economic, and they think holistically, the social workers, about the client. Now, when they make the intervention they don't necessarily use all the components. And in fact, the one that, as my wife points out in the article, the one that gets the least attention is the physical environment. That is to say, they rarely pay attention the quality of the housing, the lighting, the fact that people like to live in a nice place and if they don't they get... and there have been a few studies, not very many that show, you know, people get depressed when they live in crummy housing.

Edward: Well, why wouldn't they.

Victor: Yeah, that's right. But anyway, what I'm saying is that that part rarely gets the attention. I mean, it's rarely acted on, because there are very few architects or designers who actually are involved with social workers. So mostly gets worked on are these other parts. But the point is that they have found a way to conceptualize the client's situation in a holistic diagram. And that diagram is their road map. So when they're in one part of the pie they know what they're doing, when they're in another part they know. And then they think about the integration of things. So it's not really just about a bunch of different services. You can imagine sending in a bunch of different experts to deal with somebody's problem and each one tells you something different, and you're completely confused. So the problem is, for the social worker, is integrating all these different services into a package for the client, so the client gets better. And I think that's analogous to what we're talking about, because, you know, the project is actually the equivalent of the healthy client. And what you're really trying to do is integrate all these services, IE domain knowledge, into a process whereby you produce a good result. IE help the client.

Edward: Awesome.

Victor: All right. So, okay.

Edward: Victor, it has been wonderful.

Victor: Yeah, Edward, my pleasure.
Edward: So, just about yourself a little bit. How did you end up here at IDEO?

Annette: My degrees are actually in artistry, modern contemporary artistry, so I came from the art world, but I was studying at the School of the Art Institute in Chicago, artistry and then, but I wanted to do art journalism and art criticism. So I had my own art magazine for about six years in art and then art and design magazine Ten by Ten because I wanted to learn how to write and edit and there weren’t any journalists here so that’s kind of how I … I’m kind of a self-taught writer and after that I was doing various editing gigs and working at Crate & Barrel writing catalogue copy and was really bored, and the way I found is my next door neighbor … like I knew about IDEO but I didn’t think that they hired writers, but they were more about design and I was the first writer hired in the Chicago office. That was really interesting. My first week here, people were like, “I don’t know what to do with a writer, can you help me with my crossword puzzle. I could do a lot more than that, but it’s kind of new, because non-visual and it is kind of interesting to kind of mesh those two. They’re a very visual culture. I’m a visual person but I don’t have the build for it in the same way.

Edward: Would you say that without the actual words that go into a lot of communications, visual communications for that matter, not everything can be iconographic.

Annette: Right, and I think what I think a lot of people at IDEO excel at is kind of demonstrating what something looks like, but I look at myself as a translator for a lot of those things. How do you speak emotionally to a client to communicate the value of a particular new to the world idea in a way that doesn’t sound like consulting speak and in a way that doesn’t sound like engineering or anything kind of intimidating, but really gets to the core of communicating what core-user needs this product or service or experience could deliver.

Edward: What do you think the key to that is as far as that type of communication? Because you hear technical writing and educational writing and all these kind of writings and they’re very different; and business writing is just boring in my opinion, but what do you think is the key to that type of communication?

Annette: I think it’s just speaking in human words, like we talk about ourselves in the human – centric design form and then sometimes at the end of a project it sounds very, it doesn’t sound very human at all. It sounds kind of very calculative, and what you always have to do is keep bringing back … like there’s this thing that I’d love to do here and what I did for a good many years was be a researcher. When we didn’t have a human factors researcher, my journalism skills would come into play and I would just go into … do income text interviews in homes and draw people’s stories out and a lot of times big organizations are particularly removed from their consumers. They kind of look at them as like, “You take a survey and tell us what you want.” But they don’t spend time kind of thinking how this product or service or experience would fit into their lives in really meaningful ways and create lasting loyalty and emotional engagement with that company. Part of my job as a writer is to communicate that to them in small, easy to understand ways that … in an elevated pitch, a junior marketing executive can say, “This is what I learned from IDEO’s.” saying to a senior marketing executive and those ideas, you want the ideas to spread virally through an organization, so what I think communication designers and writers at IDEO do is just give and to arm clients with ammunition to push forward with ideas through the organization that we work with,
because sometimes we were five, 10, 15 years out, the ideas we’re working with by the
time the market, and so they need to have lasting value. They need to have some kind of
lasting stickiness within the organization. Sometimes it’s like handing over a rendering or
an object to the client and so that you can be like, “Here, see, feel and touch this.
Sometimes it’s building on a giant prototype and sometimes it’s a deliverable that you
leave behind that has to kind of carry that design intent forward.

Edward:  Awesome, I think that’s pretty awesome as far as any … nothing can be done in a
vacuum.

Annette: Right, and it’s not like I’m … like I said before, we’re working with multi-disciplinary teams.
I’m not getting feedback on my writing from other writers, I’m getting feedback from
engineers and from industrial designers who might not, who don’t have the same maybe
biases or experience about writing, and I’ll take a good idea wherever I can get it. You
also have to also be … even though kind of, I have the most experience, the most
professional experience writing, I realize that sometimes people come up with much
better tag lines, because they are just not encumbered by the same kind rules or the
ways of thinking that I am.

Edward:  I totally grasp that. What was your first impression of design thinking before concept of it
when you first heard about it?

Annette:  Well when it really started kind of gaining more momentum, it wasn’t something that is
taught as such here, it’s just something that’s just kind of ingrained, it’s just part of the
culture. Tim’s book kind of codifies the idea but it’s something that we were just doing and
then he kind of just … it’s a way that we communicate what we’re doing to the outside
world, but it’s just something that has been there from the beginning. Its just now there’s
kind of something … there’s structure around, there’s a framework around an idea,
because we found we had to communicate. I feel that a lot of the stuff that we do,
culturally here or the way that we structure ourselves is we don’t have a handbook. It’s
not like something, when you join IDEO they give you. I think they do maybe now, but
when I joined about six years ago, it was just something that you kind of gathered from
the air and you kind of intuited and you just lived it … so there’s no kind of course on it or
anything like that. They don’t talk to you about it.

Edward:  It just happens?

Annette: It just happens.

Edward:  Now you were talking earlier about other organizations when they try to ingrain something
in someone. Not necessarily design firms, although they may, although I think they’re
fairly unique in their approach. I think there are some that might try to ape it and try to do
something similar but I don’t … and I’m not aware of anyone that’s quite this level myself,
but when you were talking about dealing with other companies that want to have more of
an innovative atmosphere, do you guys teach them how to do that?

Annette:  We used to have a transformation practice and that’s kind of gone away a little bit. Maybe
it might still be out in the bay area. It’s not something that we do here, which is basically
like how do you help an organization restructure itself so it can be innovative? That’s
what the transformation thing is. It’s not just about … the human-centered design tool kit
teaches our process which can be thought of as a … which is design thinking, but it can
be used in really shallow ways.
Edward: Please elaborate.

Annette: In terms of... you can't just tell people to brainstorm and ... or apply things in a segmented way. It has to be kind of from soup to nuts how you do something and if you're staying in an organization, like a Fortune 500 company that is very siloed and departmental and has a strict hierarchy, all of a sudden you're like, "Brainstorm and be creative, blah, blah." There are people from the top that are still going to quash ideas if they come up. There's still going to be that type of behavior because if you don't get rid of that hierarchy and if you don't let people play in an equal playing field or if you don't say that it's okay to fail every once in a while as long as you learn from that, it's a window dressing. Design thinking is window dressing or not implementing the design process, but we found that with a lot of our ... we get out to do kind of like workshops and brainstorm and clients will think, "Well if we do it once it's fine." and it's like, you know why we're good at innovation, is because we do it all the time. It's a daily practice. It's something that you learn, it's not something that ... everyone is inherently creative and you get that kind of stumped out of you in different places but in time if you don't consistently practice it on a daily basis, you have people, really smart people around you who are always questioning why you make that choice? Why are you doing that? You are not defending yourself and you're not always consistently looking for new ways of doing things or all ways of trying new things yourself, it's never going work in the culture, you know what I'm saying?

Edward: I know exactly what you're saying. I've ran into it. In Tim Brown's book he refers to T-shaped people and we just had a conference in San Francisco where now the head of IBM education is talking about T-shaped people, and I know this is a term that has been around for a little while, but in your opinion, what is a T-shaped person?

Annette: Well it's someone who has really the expertise in his or her discipline, so for me, I have really deep expertise in writing and specifically journalism and then also advertising copy. But my chi where I can kind of branch out is I also know how to do marketing events and cultural events and then I can also ... I think the reason why I was hired was because I was just doing a bunch of stuff just because I could just do it, like a do-it-yourself magazine, do you know what I'm saying?

Edward: Yeah.

Annette: The people we tend to hire don't just think about engineering but they're also like, "I really like sailing and I really like knitting." So it's people who are naturally curious, who are always pushing themselves to learn new skills and new techniques and who will take ideas from anyone else and building on them.

Edward: Of course. I think that idea is pretty essential especially from the T-shaped perspective, but it's not necessarily defined as that, the specifics.

Annette: Yeah, it might not be the definition from it but that's why they're T-shaped is because we have a programmer who is also a classical violinist and we also have a business designer who is also a professional ballerina, so people who move and shape themselves in different types of ways, who also look at people who have intrinsically just self-motivated and who can deal with foggy situations, who always don't need to know an answer right away, which is really hard for a lot of people. Some people just want to like, "I just want to know the answer and I want to move on," or "I want someone to tell me how to do something." and here it's like often, throw you in on the deep end because the
challenges that we’re facing are … within six months of my life here, I was helping design healthy dog treats, I was writing a copy for first time tampon users for a new type of tampon applicator. I was working on Ford F150 trucks and then doing athletic shoes. Those are very different voices and very different skills that I was bringing to all those different things and while I might be more comfortable in this area and than this area, than like dude area, you still have to be able to kind of stretch and accommodate those things and be fast. Because the projects are really fast, You have to be able to get yourself up to speed on subject matters very quickly and subject matters you may know absolutely nothing about or would’ve cared to know before-hand but you also look for people who will, because they’re self-motivated and they’re just naturally curious, they will find a hook in anything to keep them interested and keep them going.

Edward: Excellent.

Annette: I think part of the T-shaped person too is that they don’t check-in and check-out. It’s not a nine to five, like it’s a person where they’ll just like, if they have enough fuel and just wanting to solve a problem or wanting to try different routes around it but they’ll just keep going until they satisfy themselves. They know what they’re doing.

Edward: When new employees come into IDEO, do they have any preconceived notions at all?

Annette: Yeah, the shopping cart video and we’re actually, we'll be airing, we’re doing 60 Minutes then coming up in the next couple of months in the Fall. I actually don't know when it's going to air, but the Fall to kind of replace that shopping cart video. I think they think it’s kind of a more of free for all. We have a lot of fun, but then it’s still a lot of work and I think that for... it looks like play and it feels like play sometimes but they don’t realize that its innovation or its design thinking put toward a very specific purpose and sometimes the problems aren’t glamorous, like sometimes their gnarlier. They don’t see the client-facing side of that and sometimes that can be really difficult to navigate if you haven’t been like our client range from non-profits and start ups to Fortune 500s, so being put in front of different clients. It's very different, it is a whole different skill.

Edward: Do you think, obviously you run into Fortune 500 clients and you've obviously had a lot of success. Are there any limitations in your viewpoint to the design making process at all?

Annette: I’ve been surprised at actually how far we’ve been able to take it, because I feel like, I didn’t think that we’d be able to apply it to government problems, honestly, because it's so red-taped and so … there are so many things that are kind of out of your control. Even in a bigger organization say like ConAgra or something like that, like our biggest client. That’s massive impact that I didn’t think that the government would be even interested or willing to kind of go in that direction and we’ve gotten some great traction with the TSA ...

Edward: Really?

Annette: We’re helping them to re-do the checkpoint experience, and then we just really just finishing the project with the Department of Health and Human Services on kind of how to get cutting edge medical research in the hands of those doctors and patients, because sometimes there’s a huge lag time where like doctors just want to do the same thing over and over again. It might not be the most cost-effective way, but they kind of want to do these processes and procedures, and then, you know, like people are swimming in WebMD and that type of medical knowledge but they don’t really know what they’re looking at, they can’t separate the facts, so how do you take really complex information,
simplify it and make it engaging enough to go to those parts? I’ve been surprised that we’ve been able to do that, and then I’ve been also heartened that you know, we’re doing more, it’s such a movement we’re doing social impact work where people were like, “You know, I could design the next razor but I’d really much rather tackle a challenge of how do you get water to distant parts of Africa?”

Edward: I need to read about that one; that would be cool.

Annette: You know the fact that we were able to kind of split off and do that. Now we’re applying the same learning, applying our techniques and trying to run some start-ups. We spun out a couple of startups.

Edward: Okay well, what about digital communications in particular? I know it’s usually they’re part of a system, it’s not necessarily living in isolation, but we’re showing more … you know, we’re showing print media collateral, the different types of starting edge, obviously interaction design, as far as websites and obviously I saw that you did a app or two. How do you handle that any differently? The visual challenges versus more like your industrial challenges?

Annette: It’s the same process that we would use for an industrial design challenge, but it’s just that project would be scoped a little bit differently because they’re just different needs and then, you know the deliverables are different, but then the way that you would approach a problem try to solve it is the same.

Edward: Okay that was my easiest question. Can you tell me a story about something you did that was a visual challenge? I mean obviously the TSA one is, I know it’s in development so… just something that was more of a visual communication challenge or either way showing or interface design?

Annette: Well I’ll use State Farm next door because we built that brand from the bottom up.

Edward: Okay.

Annette: You know, we did the logo mark and brand colors; I did the voice for it. We did the website and app design, so you know … and we worked with State Farm’s third party developers. I was like sitting side by side with them to try to get their website up and that was really eye opening, I think on both ends. Because they’re not there and they were not used to working in the same kind of way we were and they were really uncomfortable. I think being, you know, going back and forth because we really stressed iteration and taking feedback from people who instead aren’t maybe in your core discipline and that was really tough for them, I think. It was a challenge for us because we’re used to moving really fast and they were really slow and, you know?

Edward: Sure.

Annette: It was a culture clash; it was really interesting.

Edward: What did you do to alleviate that at all?
Annette: Well what helped is we insisted that they move into our space; so instead of doing conference, because we were trying to get it out, we were trying to get the app and the website out the door by the time, in like three months, something like that.

Edward: Pretty aggressive.

Annette: Yeah. I mean the project itself, like once we started out, it was less than a year and then by the time the developers were brought in and we were kind of ready to live, we said we can't just do this over the phone, like you have to move in here, and so we had state firm, creative team. We had the developers and we had our team all working together, because we had to hand off the communication at some point to them.

Edward: The space makes a big difference?

Annette: It does if you set it up and force people to be in the same room and they can't hide in offices and they can't … like can't do the same kind of business as usual; it really helps.

Edward: Sure.

Annette: It really helps. I thought that that's really cool. When you set enough cues, set enough social cues of like, "Oh you can get … you know we have an espresso machine. Do you want an espresso?" Oh! Like they start becoming really accustomed to kind of like the casual atmosphere and in this type of atmosphere you can't do the same kind of power strain, you can't do … you can't, yeah.

Edward: Yeah totally. Well, so what were the elements of State Farm, besides that you have the branding, you have the website, you have the app, you have the actual…

Annette: We have the in-store graphics.

Edward: In-store graphics.

Annette: So the communication inside the store for what, out for the exterior store front.

Edward: Is there a particular part of that you would consider a breakthrough?

Annette: Well I don't know if it's a breakthrough, it was a break neck.

Edward: Okay fair enough.

Annette: Just because it was, I mean, State Farm had never done anything like this before, so for us we kind of felt like it was kind of business as usual, but they … you know, as a company, they don't fail. That's kind of one of the things. They also don't innovate, their last new product they brought up was like 20 years ago. They also don't do retail spaces and they don't… I mean they have franchisees with the State Farm agents and they might do kind of branded communication, but they've never had to work across so many departments to get this thing off the ground and to do it from soup to nuts and to create seamless customer experience that they had never done before.

Edward: Wow!
Annette: For us it was really challenging because we knew it had to go live and we were responsible for it to go live and we had never had to work so closely, like hand-holding basically with clients and these developers. That was really challenging for us because we’re normally just by ourselves and then we hand off like whatever we do and then they kind of go and run with it. Here we were like constantly working and with so many moving parts that we were doing. We did the architecture, like we worked on the interior design of it. I was helping design classes and events, we were doing the brand from the ground up; we were doing all the interface and interaction design so … I mean it was the most holistic vision. We were also helping them hire. We were working with their HR department because we were like, “You can’t use the same HR interview questions for these people because they need to have a specific amount of emotional intelligence.”

Edward: Sure.

Annette: We were kind of helping them hire and all this kind of stuff, it was really like a true partnership and we are doing more and more of those types of things with Forbes for instance, where they’re really asking us to be kind of more … like work directly with them instead of us being here and then being that they really want to kind of learn by doing stuff, so that’s a new way of working with them.

Edward: This is my last set of questions. I hope I’m not taking too long.

Annette: No, that’s okay.

Edward: Okay, so where my focus is training undergraduates and understanding these processes and I know that the d.School does it for industrial design approaches. Basically one of my goals is to get training for undergraduates, right? My rough idea is that the earlier undergraduates get exposed to design thinking - and cross-discipline not just designers but everyone - the better. A class of this kind is something like learning on the job per say, that it might be a good idea for undergraduates to get this experience right away before they get, shall we say, grounded in their ways; that’s a different grounded there. Do you think that is valuable as far as changing the education system a little bit?

Annette: Yeah I mean it’s definitely a more 21st century approach to kind of thinking about how you approach a problem because there is no, I mean the world is changing so fast, technology is changing so fast, so from mores everything and so you really need to be agile about how you can solve the problem, and the traditional way of kind of imparting knowledge of what you’re saying and then like absorbing it, it’s just, it’s not going to work to solve the challenges of today and tomorrow, and you’re going to need to work and think in different ways.

Edward: Okay. Do you think, from your experience and maybe you don’t want to answer this or have an idea about it, but do you think this is something that should be, just a class, you have a class introducing to it, maybe a section like the d.School where it’s kind of a sections, like the section of another degree, or the entire program is that?

Annette: It seems a little disingenuous to just have one class when it seems like it completely applies to every way. That it’s just kind of a way of learning about the world that could be applied. It might seem like a novelty if it’s just a class; I mean you probably have to start that way, but I think it works best if it’s like treated as a whole kind of like start-up on its own; a whole curriculum that might be able to show the breadth of how you might be able to do, solve such different problems… but I’m not an educator.
Edward: When there are people who are educated that way, whether a child in grade school or at university or anything else, is that going to be someone who is going to be more likely to be involved in organizations like this?

Annette: We're just to create innovative solutions wherever they are.

Edward: Right.

Annette: I mean it's not even, this to me always feels like; this is my second graduate degree. A new way of thinking about things that no matter what I do after this, I'll be able to come in, apply the same type of learning, I'm also going to be spoiled a bit. I mean that's kind of the other problem, but I feel like as a thinker and I've grown so much since I've been here. Because you're consistently challenged. You know, like I could see myself before going down a really narrow career path, and now I feel like my career path after IDEO is just enormous because I feel like I've had so many skills that I would never have been able to kind of get in any other place.

Edward: Okay. I think ... do you believe that currently a lot of design schools use the Bauhaus model, which I'm not sure if you're familiar with it, you know, the craft plus learning. You learn technical stuff a lot, less theory; more of how do you do Photoshop, things like that. What I may be inferring and I don't want to lead you on this, is that perhaps it's more of the theory that's important as opposed to the technical.

Annette: Well I mean, I think we have people who are really deep experts in crafts and have amazing technical skills, the thing is that ... and that's great, but you also need to realize that technology is moving so fast that you need to be able to apply those skills more widely and you need to ... you know, you can't just learn kind of a craft and apply it for the rest of your life, like you could in the Bauhaus, this idea of like complete mastery as you go along, like things are just changing so fast and new ways of working are just completely different. Like for instance my boyfriend is an industrial designer and it used to be thought that you like create a product and you kind of give it over and that's all the industrial designer did, was kind of skin something and then create it. Now he thinks about it in terms of a context of experience, like how is it going to be open? Where is it going to be? What's the experience of it? Like the interaction of it, like it's not separate, it's all part of this system and so you can't just be skilled in creating that thing, but you have to be skilled at thinking about all the other things that kind of surround it, because we are no longer thinking about things in isolation from each other.

Edward: I really like that context of experience; I think that's just very ... I think undergraduates could really use that idea. They tried to do that with ... like working on real projects but I don't know, those who are still using traditional methods usually, but in any of that ... 

Annette: I mean if you just think about the different ways of learning, like we always thought that the, that the best way of learning was like someone at the front of a classroom talking and someone receiving knowledge, but like we know now that like their kinesthetic learners, there or people who really are visual learners, oral learners, all these other type of things. You can't just apply one kind of way of imparting information or learning about something, since not everyone learns the same way. It's also the generations who are coming up are like, they're just much more naturally as interested in working in groups and being tangible in working on real problems, they're like, “Well how does this apply to my life?”
Edward: That's cool. Well thank you very much.

Annette: You're welcome.

C.5 - Adam Kallish

Adam: The first question [in a previous email] was a good question to ask in terms of relating different people like Margolin and Dubberly and in how do you create a more fundamental approach for graduate students. This is something that I'm facing. I just got a call from a friend of mine at Northern Illinois University. That program is not doing very well, and they're in a crisis mode. One of the things that they're trying to grapple with is how do you introduce students to methodology versus the focus on what I call mimetic learning, which is really what design education is.

What I mean by mimetic learning is it's an educational term which is very much based on an apprentice/craftsman model, which is I am going to show you an exemplar, and you will imitate that exemplar. If you can imitate it to a certain degree of craftsmanship, that means you understand the exemplar and then you can move on to the next thing and the next thing, etc. It's very much emphasized on the physical manipulation of elements and materiality. There's nothing wrong with that. That is the design education model at the undergraduate level.

I'm not saying it's universal, but it's very hard to change 70, 80, 90, and then if you go into the fine arts, hundreds of years of precedent in terms of how things are taught.

Edward: Right. From the interviews I've had, I've had a lot of people who say that design thinking, just talking at a communications level too as well, doesn't focus enough on making, basically what you're talking about … the concept of making and actually doing something that's a planned exercise or something of that nature.

Adam: Absolutely correct, and if you talk to most craftsmen, like if you talk to craftsmen, people who are craftsmen, they can be stone craftsmen, wood craftsmen, or whatever their material is as far as craftsmanship, they very much will say that there's a methodology behind what they do. There is an ethos, there is a philosophy, behind what they do and how they approach something to shape. It's not just getting to work. There is an intellectual process that they go through, but it's very much intertwined with how they respond to the material.

That, very much, you could extrapolate that model into the way designers have taught design and into the way they practice design. There's nothing wrong with that, however, in terms of design thinking and all the discussion around it, one of them can't be just that there's all these discussions going on about design thinking because for many years, I graduated in '87 from RISD. There was very little discussion about intellectual dimension or the metacognitive dimension of design.

It was just focused on the craftsmanship and the expression of materiality, so in today's day and age where that kind of thinking is around every corner, a lot of people have a problem with that, but I actually don't because I think it's great that everybody is actually talking about it, where, for many years, nobody talked about it. Everybody ran away from
it. I think that design thinking to address small problems, large problems, and even wicked problems which I’ll go into, can create more human-centered solutions.

That’s really I think what we’re all trying to drive for, that goal. If design thinking and it’s protocols can help in that, great. I fully, fully support it, and I don’t think anybody would be against it. That’d be like being against democracy or against breathing or something. I’m going to talk about the missing components that I see in design thinking, and I eluded in some of my answers to by email. I’ll talk about that later because I think there are many missing components to design thinking.

I think undergraduate design education, even though it’s still stuck on the exemplar model, I still think in many ways it’s also variegated at the same time. There are thousands of undergraduate programs in design, from trade school models like the art institutes all the way to Carnegie Mellon.

Edward: Right.

Adam: It’s sort of all over the board, but it’s still a very much, what I call an expression to production model of learning design, which is design is about the new. It’s about being creative. It’s about expressing that creativity through symbology and through physical manifestation, you know, form factors whether you’re a graphic designer, industrial designer, whatever. That model is still very much alive and well in design education at the undergraduate level.

Students are exposed to thinking as a type of creative quotient rather than thinking as a form that feeds into their creativity and then their object making. It’s not like they’re against thinking. They’re not, but the thinking has to support the making in a very direct way, and if it doesn’t, it’s sort of looked upon with suspicion. It’s sort of seen as too much of an intellectualization of design. Most design problems that undergraduate students are given are essentially redesigning existing typologies. That goes without saying.

We’re going to design a poster, and we’re going to design a poster because we study different historical epochs of design. You’re going to design a poster about the Bauhaus. Now, the implication of that is you’re going to try to emulate the style of the Bauhaus in your Bauhaus poster because you’re talking about the Bauhaus. You’re not going to use De Stijl in terms of aesthetic to talk about the Bauhaus. You’re going to use the Bauhaus aesthetic. You’re going to use Futura and all that sort of stuff.

It’s a fairly simple, mimetic redesigning project. That’s what most undergraduate education is, so the emphasis is on styling. I don’t run away from that term. A lot of designers do. I don’t. I don’t think we should run away from it. It’s styling and interpretation. It’s really not dramatically improving a typology. It’s just emulating it to a point where somebody, some teacher, says you’ve mastered or you understand it or something. The emphasis is on composition, on styling, on symbology. That is the goal of the bulk of undergraduate projects.

Now, I am sure if we had all of the faculty in the United States listening to our call, lots of faculty would go, “No, no. You have it wrong, Adam. I could give you an example here at the University of Montana where we’re doing observational or ethnographical techniques looking at this particular issue.” To me, it’s like a bell curve. It’s like an 80/20 rule. The bulk of undergraduate … I was just Northeastern University in Boston, and I sat in on a class, a junior level class, and that’s what the class was. They were essentially
reinterpreting an already-existing artifact and learning the vocabulary of that reinterpretation. Nothing wrong with that.

The other thing is that undergraduate and graduate level courses in design really don’t reach out to subject matter experts from other departments because it’s difficult to do, and it’s not encouraged by design faculty. There’s not enough time to do it. There’s not enough, what I call, human relationship per capita to do it. There’s also many disincentives within university structure to reach out to other departments.

Edward: That’s kind of what I want to do.

Adam: Exactly, and I wish you luck in that, obviously. Designers tend to work by themselves. They tend to use a theory of mind about how other experts may think about it, but they don’t ever bring other subject matter experts in on their projects to collaborate with. It’s just difficult to do. There’s not enough time to do it, and I’ll go into some of the issues around collaboration that are also difficult as well.

I do find it ironic that undergraduate design education emphasizes the centrality of the individual designer as a change agent. We hear that a lot, either formally or informally, that designers are about the new. They’re about using their vision to change the world, but it’s based on individual efforts rather than recognizing that design is very much a social activity with social implications. You’re affecting people’s lives, either one person or many people’s lives, so we’re creating a very schizophrenic series of individuals that can’t bridge the need for individualism on one hand and the needs of a social group on the other and less a social group of designers.

Designers have been very good about talking to each other about design, so as a social group, we have a certain set of principles that we all agree to, so we’re kind of converted already. But when we start collaborating with engineers, people in the medical fields, people in whatever. It becomes a lot more dicey. Also, I do believe that technology has caused design program to use software tools to replace older forms of production technologies as well as new opportunities to manifest out them.

I think that technologies, in a certain way, has brought certain interdisciplinary values into the making plus there’s so much knowledge that goes into the software whether it be Maya if you’re doing 3D modeling or whatever that you have a tendency to have to find people in other areas to help explain how the software could be used effectively.

Edward: Is that so much collaboration as really resourcing?

Adam: No, I would say it’s more resourcing. You actually bring up a good point, Edward. It is more resourcing. It’s what I call the just good enough approach. Just enough to do it and then go away. You’re absolutely correct. I’d probably agree with that. However, I also think that design knowledge, when it comes to rigorous model of thinking when exploring design at the undergraduate level, isn’t there. That’s what missing. We tend to still latch on to creativity as the main context for discussing design’s value.

The more creative you are, the more catalytic you are, the better you are. Creativity is like a black box. There are inputs and outputs, but nobody can really describe what happens in the box because it’s this mystical, intuitive, imaginative, counter-intuitive process.

Edward: I have a stack of books about yea high trying to explain creativity.
Adam:

You've just hit the tip of the iceberg. That's like .0005% of all the books on creativity. That expression of production model that I was talking about is still very much the mantra of undergraduate, and anything that doesn't support that is invisible. If you bring in design thinking which says first just observe the situation. Just choose a situation and observe it and then when you observe, don't make judgments about what you've observed. Document what you've observed. That is very foreign to design students.

Design students, immediately when they get a problem because it's usually pretty well-defined, right? They get right to work and they say, “Okay, what style do I want to use? What type faces do I want to use? What colors do I want to use?” They get into the creativity of the expression of the content, but they don't slow down because they've never been taught to ask the broader questions first.

Edward:

That's one of the things I think it's very important to introduce as early.

Adam:

Well, the short answer is it's a skill. You're absolutely correct, but programs that I've been part of where they've tried to introduce it early ... the problem is if you don't get the faculty comfortable with the concepts ... let's say one faculty is really into this within a program and he teaches a software level, undergraduate level class, and he tries to introduce certain, what I call, exercises around thinking, those students are taking other classes at the same time in the design program, and if those behaviors are not reinforced in the other classes and once that class is over and they move on to let's say their 200-level class or whatever, if that faculty member is not comfortable with what that other faculty member introduced, saying, “Remember when this faculty member talked about this? We're going to continue it here.” or something, it just gets lost. It dies.

It's not the students that are the problem, or it's not the students that are the issue, it's getting the faculty comfortable with it and realizing how do you create a continuum of reinforcement of design thinking from right after foundations, or even during foundations, to all the way to when they graduate the program. That faculty have to reinforce it all the way through. If the faculty don't reinforce it all the way through, then it'll just become a series of isolated experiences that students can't ... it's like they don't know how to leverage it. I think that that's sort of my thinking when you asked me about this undergraduate challenge. Does that make sense?

Edward:

Yes

Adam:

I'm glad because otherwise, I'd be concerned.

Edward:

No, actually, it's kind of reinforced by what a number of people have said that there's an institutional issue not quite in the way you said it because I think you went into more depth than the others have. One thing I know, I was talking to John Kolko, and he ...

Adam:

Oh, John. I respect him a lot.

Edward:

He said, he was saying maybe one of the ways to solve the communication issue and getting to learn it early in the sophomore level ... now this does not address the system-wide, but the idea is to literally put them through, I guess it would be a 2 week design boot camp.

Adam:

Yeah, boot camps are popular, and I participated in boot camps at the Art Institute. It's an interesting way to like have an intense experience, they're just being exposed to it. Exposure for 2 weeks is not enough. It's a start, so unless there's follow-up and going
back to the institutional issue, they’re going to see that as an isolated experience. Some students may demand of their faculty, “Hey, I was really turned on by what I did in boot camp. How come we’re not… how come you’re not referring to what we learned in boot camp? How come you’re not doing this?”

Unless students become more verbal and vocal about holding faculty accountable in terms of being taught early, then faculty will just continue doing what they’re comfortable with. I do believe that there has to be a change at the faculty level because I still think many faculty are not are still into that expression to production model, are still into the let’s talk about creativity as a mystical process that can’t be repeated rather than talking about a more system approach to design thinking, which almost, in many ways, in antithetical to what design is about because they see it as a systemization of design.

Now, you talk about IDEO and the culture and leveling the playing field, but then you talked about cultural hierarchies of collaboration. Let’s say an architect and an engineer collaborate, and the architect says, “I’m the creative one, and I know what I’m doing. Anything that has to do with creativity, I’ll address it. Anything that has to do with the building, you’ll have to address,” which I’ve actually been in discussions where that has happened, so this is from direct experience here.

Then you talked about the Bauhaus and what’s a struggle to level the arts and the crafts. Now, just to let you know, when the Bauhaus started right after World War I, you had Itten and mystical ruling the Bauhaus, so Van Doesberg came from Holland and Moholy Nagy came.

The Itten period was a very powerful period, and the tension at the Bauhaus was very much in transition from a mystical model, a metacognitive, mystical model, to one of industry. That was a huge shift. Your question is really how do you remove hierarchy or how do you reduce hierarchy so that it doesn’t get in the way of collaboration.

Edward: Correct.

Adam: I want to make sure we’re keeping true to what you asked.

Edward: I was giving examples of my question, so …

Adam: Yeah, no which is great. The clearer you are, hopefully the clearer I can be if I’m coming across as clear. I don’t know. I would say the first thing I find incredibly intriguing about human beings is that we’re group creatures that need hierarchy. This has nothing to do with design or anything. This just has to do with human nature that we’re group animals. We work in packs, and packs can’t be egalitarian. Packs are hierarchical. You have the alpha dog. You’ve heard of the alpha. There has to be an alpha for the pack. The pack just can’t be egalitarian and everybody’s doing their thing because the packs wouldn’t work effectively.

Hierarchy and picking order is the nape of the human experience, and you’re not going to just wish it away. You’re looking at 2 million years of conditioning. I’m telling you, it’s alive and well, and it won’t go away. It just won’t. While I think egalitarian groupings on the surface feel the most democratic, based on the study of groups and people play roles within the groups, what I find interesting is that if you work in teams, there are the people who are the leaders who have the titles of the group like I’ll be the leader of this group and I’ll be responsible for this group, whatever.
Then you have what I call the unofficial leaders of the group. These are the people that don't have the title of leader but devotional title of leader, so the leader who has the title may not have the power at all. It's the emotional leader of the group that actually has more weight. What I find interesting in working in groups is that depending on the number of people you have collaborating, the role shift throughout the whole project cycle, depending on where you are throughout the project. Early on, there may be a leader, an official leader. There may be some unofficial leaders. You're going to have people who are bomb throwers. You're going to have people who are the skeptics, the cynics. You're going to have people who are, what I call, the technocrats. These are the personality types essentially.

The interesting thing is, in my experience, is that people tend to shift roles because it's a dynamic within the project depending on how the project moves forward. It's not like people stay in that role throughout the whole project. Some do, but I find interesting how things shift over time. The other thing is it's also natural that some design disciplines will view their knowledge and culture as unique and better than other design disciplines.

I collaborate with architects, and I'm a graphic designer by training, and they immediately treat me like, "Oh, you're the graphics guy. You put the laser beams on things. I'm the one that provides all the intellectual rigor of this thing." It just sort of happens that way. I also think that while it's elementary and important to note that there are partitioning of knowledge and there are sections and divisions that we've discussed that are for our convenience are just a convenience.

For example, I always say ideas don't know what discipline they're in. It's the disciplines that put the ideas in the discipline. Ideas by themselves don't know what discipline they're in. They just don't. They're just ideas … and contextualize the idea within their culture, their discipline. One of my favorite quotes is Joseph Esherick. He was at the actual 1963 conference on design methods. He said, "It's elementary and important to note that the partitioning sectors and divisions that we have discussed are formed by us for our convenience and analysis." He's talking about the analysis portion of thinking. "It's not that we observe that it's a partition," so if you look at direct observation … if you and I observe something, the observation in and of itself is not partitioned. We're both observing the same stimuli.

Now, you may be color blind, and I'm not. There may be some physical issues, but in general, we're both observing the same thing. The manner and the way we report our observations is what is partitioned. It's our mental model that is what does the partitioning. It's what separates Edward from Adam if we both observe the same situation. You can observe the same situation and come up with different conclusions because our mental model has different connections to what is being observed.

That's one of the big challenges of collaborating. It's the same stimuli but has different meaning because of technical competence, values, language, all sorts of stuff. We have to recognize that from the outside versus saying, "Why can't we be egalitarian, and why can't we all just be equal?" That's a very simplistic model that doesn't recognize the complexities of how the brain works in my opinion and other people as well.

I also think it’s difficult to meaningfully collaborate because it’s dependent on who is the main instigator bringing the people together to collaborate in the first place and aside from the specific skills of the collaborators, what is binding the group together other than the subject matter expertise? Because I’ve been in groups where we’ve talked about, you talked earlier … we talked about software, and you said you may just get someone to
help you because you just want to know the technique, and then once they help you, you’re like, “Okay, thank you very much. Go away.”

Edward: Yes.

Adam: Collaboration is not really collaborating. It’s just a convenient tool to get the information and then you’re pushed away. The real issue is who are bringing the people together. That’s a big issue. That sets a certain tone of why the group is there. Then, besides needing the specific skills, what is binding the group together other than their subject matter expertise. What values are binding the group together other than, “We’ve got to solve this problem together, and it’s too complex for us to do it by ourselves if we did it individually. That’s why we’re together in a room.”

Edward: Couldn’t even a project start, couldn’t a value system, in effect, through a leader, possibly, at least the beginning leader, couldn’t a value system be established?

Adam: Well, the short answer is yes. I call that, what I call sunrising. I’ve dealt … I’m a consultant of huge, large internet systems, so there’s huge teams of people that have to build these big, gnarly systems for corporations. One of the huge challenges is how do you onboard people, they call it an onboarding process, how do you onboard a team to get them to work collaboratively together in order to unlock the value of the system?

That onboarding process is a series of conversations about project scope, specific skills that people bring to the project, and what they want to get out of the project. What are their desires other than like delivering the web site? What do they want to learn, what do they want to get out of doing this project? It has nothing to do with their skill set. It just has to deal with their desire, and out of those desires, are there enough overlap of the desire that ties the technical competency together?

I call that sunrising. I have a whole process I use called sunrising. It actually tries to acclimate people to talk to one another to develop some emotional bonds with one another in order to effectively collaborate because if you don’t do that, the people just focus on their technical competency and then that’s where all the fights happen because they’re like, “You don’t have the skills. I do,” or, “I’m doing this component of the project, and I’m going to hand it off to you, and then you’ve got to do something with it because I’m done. I’ve done my part,” but the person who’s getting that component doesn’t understand how to integrate. It’s like lobbing something over the wall, and it becomes a series of disconnect parts, and you end up with a very substandard, mediocre system.

I’ve been involved with a lot of those projects I can tell you. That’s why I developed sunrising because I didn’t want to keep experiencing that, so I developed the sunrising process.

Edward: I actually find this quite fascinating actually.

Adam: Now, how does one abstract knowledge and intention in order to reduce collaboration to the essential act? There’s another guy who was at the 1963 conference. His name was J.K. Page, very interesting person. He says that separate groups are liable to be operating within compatible sets of strategies. They may criticize the other members collaborating for not having solved the problem set by their own strategic frame of reference. What he’s essentially saying is every person who is brought on to collaborate, their methodology is incompatible with the other methodology of the other person.
Edward: Okay.

Adam: They end up criticizing all the other group members for not being aligned to their strategic frame, the way they see the world. You see my point? What they do is they end up saying the problem isn’t me, the problem is you because you don’t have my strategic frame of reference, and that’s a problem. If everybody agreed on my frame of reference and my methodology, we’d be in much better shape than we are now.

I’ve also been in discussions on projects where that has actually come up where everybody ends up saying, “I’m not the problem. You’re the problem. You’re the reason why this thing has not worked out.”

Edward: Is there a way to dispel that kind of chauvinistic attitude?

Adam: Well, you have to do it early on like you said a boot camp. In a way, the sunrising process that I use is a way to deal with the interpersonal wants and needs up front. If you can address the interpersonal wants and needs up front, you have a better chance of getting people to work together versus focusing on the technical competency of people, which is really … only in America could you put a bunch of people in a room and say you’re a team.

Edward: Could you elaborate on that?

Adam: I’ve been involved on lots of projects where I didn’t have any hand in creating the team. I was asked to be part of a team by a person who brought all of these people together, which is great, but then that person just assumes, “Okay, we’re all in a room together. That means we’re a team. Let’s get to work.”

Edward: To use a sports metaphor, you can’t take a bunch of baseball players, throw them together, and expect them to win.

Adam: Exactly. Yeah, actually, let’s plan that. If you remember Michael Jordan was in the Olympics with a team, I think in Barcelona, and I’m not a sports person, okay, but I remember this. I remember when they were practicing, and I think they had some exhibition games or something like that with some college teams, and they were beaten by these college teams, and everybody was like, “Oh my God. How can a college team beat the Pantheon of the MBA?” Michael Jordan said, “It’s because we still aren’t a team. We’re strays of individuals who are very talented, but we have not clicked as a team. We don’t trust one another yet. We have people that are hogging the ball saying ‘I’m the star. You support me.’”

He said, “The reason why we’re not winning is because we’re not gelled as a team yet. We don’t have the interpersonal trust yet to be a team,” and that is what’s very, very important up front. You have to get to the interpersonal wants and needs first, not just focus on the technical competency of people. Now, what I do professionally in terms of internet development is I know that when I’m working on a team, or if I believe I need to put together a team in order to explore or frame or solve a problem or identify an opportunity, I have a sunrise methodology that I use which is we review the goals of the project, we review why each team member is there, we review what’s currently defined as a problem or opportunity and the expectations of the client.

We then begin to define a collaborative approach that will keep in mind these issues. More important, I ask each collaborator on the team what they would like to personally
achieve in being part of a team. What do you personally want to achieve in being part of this team? The sunrise process, and in my opinion is important to develop a rapport because without rapport and developing a language, a shared language, the team won’t work affectively. There will be a lot of missed opportunities in collaboration.

Your question raised a lot of issues to me because I’ve lived these issues for 20-something years. I’ve never … I don’t want to say never because I’ve rarely ever worked alone as a designer. I’ve always worked in teams. When it wasn’t very popular to work in teams, designers did not want to work in teams, or they only wanted to work in teams with other designers, and I’ve never had that luxury. I’ve only worked with other fields, so I’ve always had to try to find a way to develop rapport, reduce stereotypes, you know, all the things you were talking about in your question.

My only belief is that you have to develop a rapport before you can work effectively as a team. It’s down to that’s what I’m talking about.

Edward: Well, I definitely don’t disagree with you. I have found that this is a fundamental thing that just cannot be ignored.

Adam: Right, but unfortunately, designers aren’t good collaborators. In general, they’re not.

Edward: Well, hopefully, we can change that.

Adam: I think designers have to collaborate with other fields and not just with themselves, and that happens at the undergraduate level like you were talking about. How do we get those behaviors early on? I think the way to do it is what I do, what I call multi-disciplinary design, not trans-disciplinary. There’s a difference. There’s inter-disciplinary, which is like within architecture, different types of architecture. That’s inter-disciplinary.

Multi-disciplinary would be like within a discipline like design. Design is a discipline. You have industrial design. You have graphic design. You’ve got many different types of design. That’s what I mean by multi-disciplinary is within a discipline. Now, there’s trans-disciplinary. Trans-disciplinary is you’re collaborating with many, many other disciplines like engineers and people in the social sciences, whatever. I would just be happy if designers could learn how to collaborate with other design disciplines … a graphic designer, an industrial designer, and an architect work together on something.

They’re trying to do that at the Art Institute. They’re trying to expose graduate students to working with, what I call adjacent, disciplines to solve problems, and let me tell you. It is very hard. You think it’d be easy, “Oh, they’re all designers, right?” An architect comes in and says, “I have 500 years of history for profession. You don’t, and I’m the leader. Just do what I say,” without saying it that way, but that’s their behavior. The graphic designer and the industrial designer are saying, “I’m not going to do that.” They subvert the process sort of like the Senate.

Now, you talk about IDEO and their model for design thinking, and it’s well defined. You talk about other like Martin and Nigel Cross is also defining a certain intellectual model of design, and they ask you about the weaknesses of the ideal model, and I had to really think about this one because Nigel Cross … his writings have been around since the mid-’60s, late ’60s.

It seems like the design community seems dedicated to reinventing other people’s models using their language to make it unique, which is natural. Sharon Poggenpohl has
always lamented that design has no original knowledge in it. It's essentially just bound from many other disciplines. We have not created any … that's extreme, okay. You could poke holes in that, but says such that most of the knowledge in design is borrowed from other disciplines. It just is, and we tend to create in our own language to make it unique because we have to own it.

Instead of using this term, they're going to substitute it with this term. It's the same thing, but they don't want to use the borrowed language from the discipline that they borrowed from. The other thing is that design, and Victor and I have talked about this a lot, is in the ’60s and ’70s there was a movement to try to align design to science and actually even Cross wrote this thing about design science. He played with design science, design as science, designed science.

Edward: Buck Fuller was involved in some of that? Buck E. Fuller?

Adam: Buck E. Fuller, yes because obviously his exposure to science, and Victor said something very interesting to me. He said design is always going to be an extension of culture first and foremost. You can try to make it aligned to science, but it's always going to be an extension of culture because it is a culture act, design. It's not a scientific act. It's a cultural act. Therefore, you have to accept all the diversity that that culture holds as a cultural act. It's like a big tent. It's all about diversity, the good, the bad, and the ugly of a culture, and I agree with him because if we were, if we really were aligned with science, we would have specific terminologies that are understood. We would have specific protocols that are understood. We don't. We don't have any of that. We don't.

There is no overarching philosophy and values that bind all forms of design together. You can say it's human-centered.

Edward: It's a little vague.

Adam: Nobody would disagree with that. That'd be like being against apple pie and Chevrolet. You can't. It's sustainable because you're hearing that now. Design is sustainable, so you can't be against that. It just can't, so but there's really no overarching philosophy binding all the design disciplines together because it's an extension of culture. There are too many frameworks and models and too many design sub-cultures out there.

Edward: I think Hugh Dubberly found like 150 different models for design or something psychotic like that.

Adam: That just a scratch on the surface. I don't know his methodology, but if you do an estimating and say he got 20%, a factor of 5. There's a lack of clear core methods that could be used to activate frameworks and make them practicable. There are a lot of designers that have been at the bandwagon. For example, I was in school when design management was all the rage. Peter Gorb, I don't know if you've heard of him, he was one of the leaders of the design management movement of the late ’70s and early ’80s.

Edward: Only tangentially

Adam: But the method tries to emulate design as business or design and business together, which I'm not against, but they were trying to … it was kind of like science. We have to be more like science and be more like business. We have to feel, we have to sound like business people for us to be effective in business, but the problem is his models of
design methods were too much at the abstract level. He didn’t get granular enough in the
everyday of doing it. That’s the problem that I see with a lot of people in design thinking
area. They say they have great frameworks. They can draw on a white board, put
bubbles and arrows and all sorts of things. That’s great. I’m all for models, but a model is
not an end in itself. A model is a way to talk about what you can’t say as much directly at
one time. That’s why you develop a model.

IDEO, they set it out as an engineering culture. IDEO came from an engineering chasse,
and then they integrated design as a rigorous generator and creator of responses, their
responses. I think their model of what they call … this is their language, not my language.
This is their language, discovery, interpretation, ideation, experimentation, and then
evolution. Those are the phases. Those are my terms. I think it’s a fairly good, common
sense model built for them and not to be constrained by pragmatic constraints in order to
address fixing problems that face business, so their model is fine.

I have no problem with their model. I don’t think that it’s like a yolk on me or a yolk on
somebody because it’s a fairly flexible model. I think that the criteria of the model is
based on 4 attributes like IDEO has identified 4 attributes for designed thinking is that it
has to be human-centered, it’s collaborative, it’s experimental. I found the 4th one actually
interesting, it’s optimistic. You know, cynics need not apply or collaborate.

Now I’m a skeptic. I’m asking the questions that nobody wants to answer like the
elephant in the room. Skeptics aren’t cynics. Skeptics just ask the questions that nobody
wants to answer, so I’ve always been a skeptic, and skeptics have pushed society
forward, believe it or not in my opinion. That’s a whole another discussion, but those are
the 4 attributes of design thinking built on this chase of exploration. I think those are 4
excellent attributes, focus on people, realize that you have to work with others, try to push
past precedent. Don’t just look backwards and say, “Well, it’s always been done this way,
so therefore, we’ve just got to keep doing it that way,” and be optimistic. We’re trying to
build a better tomorrow. We’re not trying to build a mediocre tomorrow. We’re trying to
build a better tomorrow, so I think it’s great.

The problem isn’t necessarily IDEO’s process, but it’s in others co-opting the process for
their own ends without being IDEO, so again, they’re borrowing the terminology and the
model without really understanding how to do it. They think they’re doing IDEO’s work,
and they’re not. They can talk all day about what they do, and you’ll never be able to do
it. They don’t have the reputation of the culture of IDEO. Even if they borrow the
methodology, they don’t understand the ethos behind it. If you don’t have the ethos, you
won’t be able to do it.

Edward: Well, it seems to be a very positive ethos. I was there.

Adam: It’s a positive ethos, but I hate to tell you that thinking positive, in and of itself, it not
enough. Bad thoughts happen because people are positive. That’s not going to save you
from doing a bad job, but keeping a positive outlook on things as a part of something else
is important. Now Cross and Martin and IDEO are all drawn to see design something
different than it is in the bell curve where we talked about expression and the production
model.

They were saying that model doesn’t work. Now, they didn’t tell me that. I’m interpreting
it. There’s such a saying as that model, designed as something different in order to
unlock new value. The only way we’re going to unlock new value is we have to push the
expression to production model. We have to rebuild it. Not throw it away but rebuild it,
retextualize it, and this new value is what’s being hashed out in all the cacophony that you’re hearing in the design thinking community. That is what, this new value is being hashed out, and it’s here we see significant variations of frameworks because each is using specific languages to address different contexts for design.

I’m on all the design thinking threaded discussions, and I sometimes think of it as an insane asylum.

Edward: I’m on the same boards and like LinkedIn.

Adam: It’s interesting. It’s phenomenal the diversity of language and the diversity of concepts. I mean, it’s amazing, but people don’t have a shared language to talk to each other about it, so the communications are fractured especially when you’re using text. You’re typing. It’s not like we’re talking like you and I. We’re essentially using a keyboard to hash these things out. I spent much of my career in exploring design methods as a way to channel the attributes of design thinking before design thinking was even called design thinking through what John Chris Jones calls divergent, transformative, and convergent methods.

I try to go back to the wellspring not to be tied to it like a bowling ball or something, but I think it’s a wonderful elegant model. Divergent means you expand. Transformative means you’ve found the box and unlocked some value and convergent means you compress. You bring together. That’s a fairly simple, elegant model. I don’t think I have to reinvent the terminology for it. I don’t want to use the term divergent. I want to use the term expansive or innovative. I don’t want to use the term convergent. I want to use the term continuous improvement. That book was written in 1970.

Design methods also provides the high level philosophy and technical methods for methodology. That was the real shift in the 1970 book, the recognition that the expression to production method wasn’t working. It had to be human-centered. It had to be collaborative. He didn’t necessarily say it had to be positive or optimistic. I think it was a fairly optimistic book to write, actually. In the end, what is design thinking? If you take away all the psycho babble of design thinking, what is it? What are you left with?

For 3 weeks, I actually copied and pasted all the responses on the discussion board. That shows you how crazy I actually am. Every single posting, every single response, I read every one of them, and then I created a matrix of words. I wanted to figure out is there anything holding this jumble together, and really what I came up with after doing that is that design thinking is a process of intellectual scaffolding. That’s all design thinking is. It’s intellectual scaffolding where a group explores, discovers, finds patterns, and defines a problem space with positive options to consider in response. That’s all design thinking is, to me.

That’s what I came up with. Out of hundreds of pages of passionate opinions, and I don’t know, whoever, all this circus. That simple statement, it’s a process of intellectual scaffolding where a group explores, discovers, finds patterns, and defines a problem space with positive options to consider as a response. That, to me, is what design thinking is. If you want to get it down to an elevator pitch. I can elaborate on all that stuff for days, but that’s what it is.

Now, design thinking uses 3 modes of thinking, inductive, which is a bottom up approach and it is usually related to scientific method. Deductive, which is top down. That was a few statements and axioms and you build upon them, and the most controversial is
abductive guessing. Abductive guessing is about the way how logical inference that goes from data description to hypothesis.

Those 3 modes of thinking, inductive, deductive, and abductive are essentially modes of thinking that activate not so much design thinking but any form of thinking.

The other thing is how do you manage ambiguity and the built in resistance to struggle in relation of the unknown because we don’t like the unknown. Most people don’t because it’s the unknown. It’s scary. It’s like a boogey man, so how do you manage ambiguity by using design thinking as an arbiter of exploration. I really think this is where harnessing the role of imagination and creativity, especially with teams that aren’t comfortable breaking precedent. It’s like I don’t run away from the term creativity. I don’t run away from the term imagination, and I don’t run away from the term intuition. There’s nothing wrong with those terms. They mean very specific things to me, and they have specific value to me.

One of the things that’s missing in design thinking are the protocols of design thinking. Nobody can agree on the protocols, so once we agree on the elevator pitch. If you took my elevator pitch and you asked a bunch of people and you read it out loud, and you asked if they agreed with that statement, hopefully people would say, “Eh, well, I would use this word or that word,” but yeah, that’s probably what design thinking is.

You say, “Okay, well what are the protocols of doing it?” How do you do it? How do you activate it? That’s where you would be in the same boat all over again because they can’t even agree on the protocols of design thinking.

I’m from the Midwest. I’m corn fed. It could be a good thing. It could be a bad thing. I don’t know, but I tend to think the protocol is rigorous. Now the question is how do you be rigorous? Rigorous is a protocol. Rigorous is a type of protocol. Okay, how do you be rigorous? Well, being thorough, being exhaustive, and striving for accuracy, being comprehensive. Leaving no stone unturned even though you will have many unturned stones.

Trying to create an authentic experience for exploration versus just going through the motions or check list. We did that… we did that… We haven’t done any of it. That you connect concepts you’re exploring with the skills your team has, saying that people actually have experience in dealing with that issue. Let’s just use our imagination. Let’s use our imagination. That should be elaborated and curatorial, and that should be exacting and demonstrable, what you do with design thinking.

Those aren’t necessarily the pure protocols. They’re not. I’d be the first to admit that, but those are sort of adjectives moving to protocol. How does one be thorough, exhaustive, and strive for accuracy? How does one do that? How does one create an authentic intellectual experience? How does one connect concepts with skills? How does one be exacting and demonstrate that exactness in your methodology? That is, to me, what needs to be answered.

The problem is that in design thinking, there’s no shared language, there’s no core agreement on what it is, and there’s no protocols, and there’s no … processes are sort of agreed upon if you look at the IDEO process. People use different terms, analysis, synthesis, whatever, so there’s sort of an agreement in a way, in a very cloud-like way, of it, but even there, there are some issues.
Then, we have a laundry list of methods, but they’re out of context. We have tons. We have tons of ingredients, but that doesn’t necessarily mean they taste well together.

Edward: Yes, I understand that.

Adam: Now, you talk about other models and also about how I do design or design exploration. Since I dedicated my career to understanding design models because I found it interesting, I continually refer to models that help me practice design, so I never write off a model. I just sort of explore or try to understand these models. I’m also wired to continually distill many inputs in terms of methodology and process, and I try to distill the diversity into some basic strains.

It’s here that I develop my modality of practice, and [inaudible 01:03:31] was an extreme distillation with a key emphasis on listening. If you look at my diagram on my site, the middle is listening, and I did that intentionally because designers are horrible listeners. They don’t listen. They just immediately jump to getting creative and jump to making things. I want to listen to what people say to me, and I want to take some time and say, “I heard you say this. Did you say that?” and the speaker says, “Yeah,” or, “I think you misunderstood what I said,” and then I say, “Okay, what did I misunderstand?”

Listening, to me, is central to understanding needs, desires, and challenges, and then and only then do I then think about what was said, how I could show empathy as well as claim focus, and so they feel that I’m listening to them, that I’m not just negating what they want. That’s not to be confused with pandering bill clients.

Edward: No, of course not.

Adam: But clients are providing the resources for me to do my work.

Edward: I completely understand.

Adam: From listening, if you look at my process and these are my terms, but I did the same thing. From listening comes what I call unpacking, so I call it unpacking. I didn’t want to call it exploration or discovery. I just called it unpacking. You unpack what you’re given and you sort this unpacking. Then, you propose based on what you unpacked, and you provide options, which is interpretation, “This is what I think we can do,” which option would be best to go forward with.

Then, you’re reconfiguring a response. You’re reconfiguring, and then you’re refining what you’ve reconfigured based on proof of concept like releasing it out, all this work in Peoria. That’s my process. I tend to really try to get it down to not simplistic, but simple. I like simple because simple it’s like, for example, have you heard of Dieter Rams?

Edward: Yes.

Adam: If you look at Dieter Rams and the work he did at Braun, the reason why it’s so powerful is because it’s simple, and it’s so simple, not simplistic, it’s simple, that you can't hide anything. There’s no gingerbread. There’s nothing to like throw you a curve ball, and the stuff that’s he done is timeless. The stuff that he did in the 1960s you could put on a table, and it would look like it would be at Design Within Reach, which it is, or it would look contemporary, and it’s 50 years old.
I believe in getting things down to simple. That's very hard to do. It's necessary, and you get it down to the essentials. That's what we're missing in all this discussion about design thinking and design methods. We don't have a simple distillation that we can then build upon. It's like you have to strip the complexity down to something simple and then build it back up again. That's what we need to do. Boy, we haven't even got it down to a simple model.

Edward: I'm hoping to try.

Adam: Well, otherwise we might as well jump ourselves off cliffs and stuff and just give up. You talked about your next question like do you believe challenges envision communications, you know, and you talked about Hugh and I talking about the vast number of methodologies. Do you believe that a meta-design model such as the Jay Doblin design theory which I have? I have that article, and I give it to my students as a starting point. Is it still relevant in the teaching of collaborative design or design thinking? Well one, Jay Doblin had never, in all of his writings that I could find, never talked about collaboration. It was implied. He never used the term collaboration in his writings. Never. He talked about systems and about inference. He talked about unisystems and multisystems, and in multisystems, implicitly in that is you have to work with a lot of professions. You can’t do it all on your own, but he never talked about collaboration at all, not that I could find.

I’m not necessarily talking about meta-design. I think I’m talking about design … the concern I have is that design is being reduced to a metacognitive activity about thinking, about thinking about design. When it becomes a metacognitive activity of people who don’t have a shared language or a shared culture, it’s like Lord of the Flies if you’ve ever read Lord of the Flies.

Edward: William Golding.

Adam: Yeah, everybody is hunting for Piggy, and they end up slaughtering each other in the process. I think there’s a real danger of design being reduced to a real metacognitive activity where we’re thinking about thinking about design. It’s too abstract. It’s too fraught with risk, and I don’t think it’s doing anybody any good. That’s what we’re doing now is we’re doing that, and it’s just causing too much heartache now, in my opinion.

I think when design becomes this metacognitive discussion, that’s when it becomes so abstract that it has very little utility factor. It just doesn’t have any utility. It’s like I’m trying to listen, but I don’t understand what you’re saying. How do you put it into use? Nobody can tell you. Now visual communications, which is a term I believe came in the 1950s, but I don’t know the providence of who came up with it or whatever.

It was an area that focused on communication theory, sender and receiver. That’s what I was brought up with when I was in design. They said, “Well here’s the sender and here’s the receiver. Here’s the signal.” This is from the 1950s. Unfortunately, visual communications never understood the basics of cognition and the dynamics of media to be really innovative. If you don’t understand how the brain works, and you don’t really understand the dynamics of media and their interplay. I’m talking like Marshall McLuhan approach versus I don’t know if you’ve ever heard of Dietmar Winkler?

Edward: No, I’m afraid not.
Adam: Dietmar was a very talented German designer. He was head of the visual communications program at Urbana-Champaign. I still think he's there. No, he may have gone back to Massachusetts. I met him when I was at RISD and one of the things he talked about was the seven deadly sins of visual communications. He says that you can have a solution, you can have any solution in visual communications so long as it’s a poster, a brochure, a letterhead, a logo. There were like 10 typologies he talked about that were repeatable in visual communications that any solution had to fit those 10 outputs.

Anything that didn't fall within those 10 outputs, you couldn't have because there was no output, so he was trying to tell us why does everything have to be in a poster? Why does everything have to be in a brochure? Why does everything have to be in a logo? Why does everything have to be in a letterhead? Why does everything have to be in a book? He was trying to say why couldn’t it be something else? Visual communications deal with that. Visual communications, or graphic design, which I don’t really hear much anymore. I don’t really hear the term graphic design much.

Edward: There are some people, especially at my school, they love graphic design as a term, but they see people who just have a copy of Microsoft Publisher, throws something together and calls themselves a graphic designer.

Adam: Lots of people who have drafting programs and call themselves architects, so well architects are actually … that’s a controlled profession, but that discussion, Edward, has been going on ever since the PC came out. It's been a discussion ever since 1985. Now, visual communications and graphic design in 2012 has been co-opted by other design disciplines as well as other fields making a unique role for communications or graphics designers even more challenging.

There are a lot of people who would never even work with a graphic designer because they’re like, “I don't need you. I don't need your outputs. I can do those 10 outputs. There are wizards and templates in Microsoft Word that can do those outputs. I don’t need you for that, so why are you even here?” I think that graphic design and visual communications has totally been co-opted by other design disciplines and other fields because they have not moved the field, controlled the discussion, or even added to the discussion. That's my empirical evidence, what I see out there.

Now, Jay Doblin. Let's go back to Jay Doblin for a minute.

Edward: Sure.

Adam: He used, he didn't even want to use the word … he tried to keep away from all the boogey man words, so he says, “You have state one. You have some type of process, and then you have state two.” He called that direct design. It means you inherit something, something happens, and then something is different. That’s the direct design process.

Then he says, “Okay, you have state two. You analyze it. You create some sort of genesis and synthesis, and then you have state two.” That's a more elongated process. He categorized the process in both direct and indirect models that nourished problem definition depending on the complexity of the problem. For large, complex problems, it would be impossible to tempt them without the analytical methods. This is his terminology and rallied against an adolescent reliance on overtly intuitive practices.
He was essentially saying this isn’t about expression or production activity. He didn’t even want to use those terms. He didn’t. He says as problems get complex, we have to embrace analytical methods. It just can’t be all about intuition and creativity and imagination. That’s not enough. He contrasted direct design in which the craftsman works on the artifact to indirect design in which a design first creates a representation of the artifact, separating design from production into something more complex.

Now, John Chris Jones in his book design methods, early in his book, he talks about 4 epochs in design. He says, “There was design by craftsmanship which lasted hundreds and hundreds of years.” It’s the oldest model. Then, he said that scale drawing liberated design because you didn’t have to make things in reality first. You could actually draw something to scale and say, “This is what I’m thinking about designing,” so he says that was like the next epoch in design. Scale drawing liberated the design from being a pure craftsman because you weren’t constrained by being a wheelwright.

If you didn’t have drawing, you’d have to work on an actual wheel all of the time in order to get your concept across. You’d have to actually be fashioning a wheel to do all the permutations to then take it to your person and say, “This is an improvement to the wheel that I’m talking about.” You actually have to create a wheel.

Edward: It seems like a lot of work.

Adam: It’s just a drawing, not even to make it work just to say here is a proof of concept. Here it is. It’s mature. It’s done. You can just pop it onto a wagon and just go. Scale drawing busted that model because it allowed the designer to actually draw to scale and do exploded views and all that stuff before it was even built. That was the next innovation in design was scale drawing. The 3rd epoch was technology, different types of technology that weren’t just about the craftsman. They were industrial production, etc. That was the 3rd epoch in design.

The 4th epoch, which he was writing about in the ‘60s, was systems design, and that was like a whole new world. It was new. There was a post war phenomenon that science, technology, and systems were going to solve all the world’s problems because we had just come out of World War II, a very destructive war. Those are the 4 epochs that he articulated in his book, and I think that Jay was indirectly sort of talking about this notion that we can’t just rely solely on the craftsmanship model alone, thinking is making. We have to rely on other modes of thinking to enhance our making skills in order to become better designers.

Edward: This goes kind of full circle through the education model that you were talking about earlier.

Adam: Well, yeah I’ll delve more into that because I do believe, and I’ve been talking to Victor about critical thinking, which obviously is another everyone is talking about what is it versus the distraction. You talked about Don Norman and Margolin and Dubberly and you talked about design thinking as a marketing term. Don Norman says that design thinking is a lie. He said that design thinking is a lie, but it’s a convenient lie. He says that. He says that it’s a convenient lie. It’s like, what did Picasso say, that art has to lie in order to tell a greater truth?

Edward: Yes
Adam: Art essentially is a lie to tell a greater truth, and I think Norman, even though I don’t think he’d agree with that, that’s what Don Norman is saying. Design thinking is a lie. There is no such thing as design thinking. It’s a lie in order to tell a greater truth.

Edward: Victor was saying design thinking is just designing.

Adam: Yeah, and you’re absolutely correct. I had that discussion with Victor over a good glass of wine many times. You’re absolutely correct. Now, I do agree with Margolin’s statement that design thinking is just another form of design. It’s just designing. That’s what it is. Now Sharon, when I talk with her, and also in her previous writing, she goes there’s little agreement about what is fundamental knowledge and design and how to scaffold learning experiences around it. This goes back to what you and I talked about at the beginning.

If you want to understand the fundamental knowledge, how do you scaffold the learning experience around it? Design thinking, in my opinion, is analogous to a gold rush. Everyone is running around mining and showing their gold nuggets, but the value of these nuggets aren’t the same. Some are fool’s gold, pyrite. Some are gold, but everybody’s digging, everybody’s digging, and they’re totally wrecking the landscape. They’re like picking everything, so it’s a mess.

Design thinking is like a contagion. Contagions are what affect the mind, like illusions. That’s that contagions are, and I think, I forgot who said this … hold on here. Contagions, the definition of a contagion, is the spread of a behavior pattern added to our emotion from person to person or group to group through suggestion, propaganda, rumor, or imitation. That’s one definition of a contagion. That’s the definition I’m latching onto. That’s what’s happening in design thinking.

As such, there are many people that are taught, they sort of think that they’re the one like, for example, GK VanPatter of NextD. I respect him. I totally dig what they’re talking about. The problem that I have is that GK, in all the discussion boards that I’ve had with him, he comes across as being the master. He is the one, no matter how much you think you know, he is the one that knows everything about what he calls design 2.0 and design 3.0, actually now it’s design 3.0.

There’s a clique around NextD. Fine. Great. There are lots of premises, but few tangible outcomes that tie back to the ordinary life that we experience every day. You read the rhetoric, get up in the morning, and have a “this is my life” type of thing. Now, thinking is usually associated with reasoning that has an implied judgment. That’s what thinking is in this most abstract, elementary form. That’s what thinking is. Now if you put the word design before it, it modifies the term thinking, so a few ideas, another that was at the 1963 conference. His name was DJ Christofferson.

He says, “New ideas come from new juxtapositions, from the associations of objects and functions not associated in ordinary life.” I think this is, design thinking is, it doesn’t really equate to ordinary life yet. It’s like this extra judicial, not in an assassin sort of way, but this extra process, this magical thinking that’s out there that does not relate to our pragmatic everyday life. There’s a huge rift between the rhetoric and the utility value of design thinking.

Edward: Which is so weird because that’s the entire point of design thinking.
Adam: Absolutely correct. Bravo. You're absolutely correct. I agree with you. Now Cross, who was an important instigator of design methods, he believed that design's ability is a fundamental form of human intelligence, that it's a fundamental form of human intelligence, and that design is confronted with ill defined problems, also Chris Jones said that, design is always confronted with ill defined problems, and then you constantly have to adapt solution focused cognitive strategies, employ abductive, abductive means guessing, versus inductive or deductive, and non-verbal modeling.

Now, Cross says the non-verbal design is what makes designers unique is our non-verbal skills. That's our power. That is our power, and you have the arts and you have the sciences. These are the academic spheres of knowledge. You have the arts, and you have the sciences. Nigel made a case of design is a 3rd culture. It's not art, and it's not science. It's a 3rd culture. It's a distinct culture from the other 2. Instead of run towards the arts, or instead of running towards the sciences, and instead of being more like them, Nigel was saying, “No, we don't have to be more like them. We have to become ourselves. What is ourselves, and how are we different, and then what are the connections to art, and what are the connections to science?”

That's what Nigel has been trying to talk about in terms of ill-defined problems and that sort of thing. Actually Sharon, in this interview that I had with her, she says we have too easily tried to emulate other fields as a way to save ourselves like design should be more like the sciences, design should be more like the arts. She said we never really talked about the 3rd culture. We haven't had the skills to define that 3rd culture. She saw that as a missing opportunity because she says if we try to become too much like another field, then we're giving up our value. We have to trade off and become more like them, but we're not them. She talked about that as well.

Now, both Cross and others in design have said that we've too much tried too much to become like scientists or scholar, like scholar enquiry, versus trying to define what designerly enquiry is. That's a Cross term, designerly enquiry. What is designerly enquiry? He says that design has to have its own inner coherence. He uses the term inner coherence, in ways that the science and humanities do.

He's saying we don't have to emulate them, we don't have to be like them, but they have an inner coherence in what they do. We don't. Design does not have an inner coherence in what design does. That's what's missing, and if you don't have that inner coherence, then everything is trial and error. Everything is just reduced to belief. Everything is reduced just to individualism. That's what he felt was hurting design, and Sharon agrees with that.

Edward: That's parallel to the lack of original knowledge that Victor was talking about.

Adam: Yep. You're right. We’ve borrowed too much versus really trying to generate things from us. Design thinking, as I said, is a protocol, and as a protocol, it means that design is a modifier to thinking. The problem is, like I said, there are too many strains of what design is, either as a plan or as a material manifestation because those are the two basic definitions of design. If you looked design up in the dictionary, it says it's either a plan or it's a way of modifying a material. That's what design is.

There's not enough understanding of what thinking or what design is modifying in terms of thinking, so we've put design before thinking, but we're not clear what it's modifying. You see what I'm saying?
Edward: To a degree. I think ... the thinking is very arbitrary.

Adam: Thinking is associated with reasoning. Let's go back to what thinking is. Let's go back to the root. Thinking is associated with reasoning and judgment that has an implied process. That's what thinking is. That's the definition of thinking, so accept it. Let's just say that we accept it. Then, if we put the word design in front of it, which means a plan, design is. How is it modifying reason and judgment that has an implied process?

Edward: I think it's implying an overall ... the best way of putting it is applying the naturalistic methods that designers would use outside the box, designers are just going to do it, what would they do ... applying that naturalistic method as a constraint to your thinking process.

Adam: I'd have to parse the term naturalistic. I have a tendency to think that the question really is what is design do differently, or what does it bring to thinking that thinking alone doesn't do?

Edward: Good point.

Adam: It's kind of basic, but that's what isn't clear. That's why on the discussion boards that you or I are on and all these design thinking consortiums and all whatever, it's a cacophony of ideas, wonderful ideas. I mean I dig going in there because it's literally like a bizarre. It's like people are shouting and harking, and they've got like their version of the truth, but it doesn't add up to anything coherent. It's just a series of disconnected things. I believe in the end that design thinking has raised many important issues about the intent process and outcomes by creating a series of value systems because that's what we have right now is a series of value systems.

We've got the JK VanPatter value system. We've got the IDEO value system. We've got the Dubberly value system. We've got the Adam Kallish value system. You've got all these value systems, but it hasn't made anything clear because, depending on who you ask, design thinking's well spring incorporates the struggle, knowledge, and techniques that are so varied it's cacophonous. There's no agreement on the components and the protocols of design thinking, so it's a philosophy that then goes back to your naturalistic term is that it's an intuitive, imaginative, creative ethos. It's a black box.

Edward: Which we want to explain the black box, but we keep coming back to it.

Adam: I couldn't have said it any better than what you've just said. I agree with that wholeheartedly. Am I angry with that? No because I'm just happy designers are talking about thinking. I'll be honest because I was in a desert for many of years where I was seen as a leper because I kept talking about cognition, methodology, and rigor, and they were all like, "Oh god, no. What does that have to do with design? I just want to go make a poster."

Edward: I'm very surprised at that that yourself, and having the desert metaphor as you said because right now, this level of "Whoa, design thinking is the rage," what does it take to kick it into gear? Why did it kick into gear? Why do people care now when they didn't before?

Adam: Because they can't ignore it. They can't ignore it. It's like an elephant that you can see. You can't pretend that it's not there. It's there.
The good thing is that suddenly everybody realizes, “Oh, there’s this thing called thinking, and it’s not related to the making.” It’s not directly related just to the making portion of it. It’s an activity that can inform the making, so that’s great. I’m just glad we’re at this point. The problem is that it’s a very, very messy, non-linear, upside down, Alice in Wonderland discussion.

Edward: I think I should definitely acknowledge that within my thesis. I mean, acknowledge that any approach right now is coming from multiple different factors.

Adam: Well, let’s get back, and you had a very big question that scared me.

Edward: Oh, which one?

Adam: You said it in your article that thinking about design thinking that design thinking needs to move past cacophonous diversity towards progress. This is what we’ve been talking about. Can you expand on it? Can they impact of the 6 skills you noted later on in the piece? Now the 6 skills that I noted are the critical thinking skills.

Edward: Right.

Adam: I’m first going to say that we’re hardwired as humans to find meaning or creating meaning no matter what. I could put something down on a table, on a white table, and people are going to put meaning into whatever I put down there, and the meaning is separate from the artifact. It could be related to the artifact, but it could also be separate.

Edward: Kind of like sign signifier.

Adam: That’s what I’m saying. We’re hardwired to put meaning into things as human beings. We can’t turn it off. We do it all the time. Designers are very talented at divergent thinking. We’re wonderful at divergent thinking. Designers are incredible at divergent thinking. We’re masters at it. We’re not good at convergent thinking. We don’t want to converge. We don’t want to go like this. We want to keep widening it.

When I was at North Carolina State, I was trying to start an honors course in design, so I went to the honors college to figure out what’s the process of making an honors level design course.

Edward: I’m doing that now.

Adam: Okay. I met a provost who was on the committee. I think she was in biology. She was in the sciences. She said, “Adam, I always know when I have a designer in the class,” and I’m like, “Well, how do you know? Is it like his hair long and his skin is bleached white, and he’s wearing combat boots? How do you know?” He goes, “Because designers will always raise their hand and make connections between the concepts that we’re talking about and other concepts, and they keep widening the connections of concepts.”

Sort of like a universe, a cognitive universe. They just keep creating connections outward, outward, and outward. She said, “It’s almost like poetry. There’s an aesthetic appeal to it, but I couldn’t do that. I don’t have it in me to do that because scientific method is … I could never keep making arbitrary connections between things, but designers make incredibly arbitrary connections to things where most people don’t do that.” Designers are phenomenal at divergent thinking, masters at it. Ninjas at it, but we’re not good at
convergent thinking. We’re not good at after we create that universe to still it down into something coherent. We’re not good at that. I’ve seen it over and over again.

What’s lacking are clear exemplars of design thinking that can be agreed upon by the diverse communities that purport to know about design thinking. There’s no agreed upon exemplars. Exemplars are an example, and everybody … well, not everybody because that’s unanimity. You’re not going to get unanimity, but a big part of the community would agree upon. I don’t think we have clear exemplars, so I’ve looked at the ingredients of critical thinking, that’s in my article, as sort of as ingredients to create a framework that guides purposeful people to purposeful results because that’s what I want.

I want purposeful people that do purposeful things that have some value to society. That’s what I want when I work with, when I’m a designer, when I collaborate with designers, or when I educate designers. That’s what I want are purposeful people that do purposeful things for good. Now, Victor and I discussed the role of critical thinking, and he’s like, “Critical thinking doesn’t necessarily mean you’re going to get a better design.” He said that to me many times. Critical thinking is not enough.

Edward: I think he said that in my interview as well.

Adam: Yeah, and that came probably from the discussions I’ve had with him. We’ve talked about that for a while. I agree with him on one hand that if you look at the attributes of critical thinking, which I did not invent. I’ve read a lot about critical thinking, and I’ve distilled it down to those 6. In and of itself, it doesn’t necessarily mean you’re going to get a better result. I agree with Victor on that, but I think you can have a better chance at getting a better result.

I think that critical thinking is a foundation for actively engaging with subject matter and creating new knowledge. That’s what I think critical thinking does, and then critical thinking is a platform that creates a dial-up between what is, like what is right now, what’s in front of me, what’s around me, what’s in your dorm room or whatever … that is what is, with what could become. That critical thinking could be the bridge between what is and what could become. That’s what I like about it.

Observing without judgment. Not observing with judgment although I don’t think you could ever observe without judgment because we’re constantly judging. You can’t turn it off, but let’s just say you can do that … observing without judgment, asking questions about what you’ve observed because you ask questions. If I have you observe something, you’re going to ask, “Well, why is that person doing it in that order,” or “why are they treating each other …” whatever the questions are, but you’ll have questions, gathering information based on those questions because you ask questions [inaudible 01:41:00] find out. I’ve got to get enlightened about it, sorting the answers based on what you’ve found out. You’re sorting them into a collage, hopefully not like a brick collage, but you’re sorting them into this thing.

After you’ve sorted it, you’re generating insights. You’re going back to your original observation because you’re a different person now. You go back to your original observation and say, “Now I understand why those people did that. Well, I have a better understanding. I don’t understand everything about it, but I have a better appreciation as to why that is.”

Edward: Right. Understanding but not quite empathy.
Adam: Right, so the 6 skills I identified is good formal skills. I’m just talking about designers now. I’m not talking about everybody. I’m just talking about designers. Good formal skills, it means you can be a good graphic designer, a good industrial designer, a good architect, fashion designer. Formal skills are your craft of what defines you as a graphic designer, whatever. You have to have that. That's to express.

You have to have good collaboration skills, which we don’t have, but you’ve got to have that. What that means is you’ve got to be able to work with people that are not like yourself. That's to share. You have to have some basic research skills. That means you have to go out and verify what you’ve observed. You just can't accept on face value what you’ve observed.

Edward: Most designers I know just want to dive into things, and it’s not so much the research.

Adam: Yeah, I’ve observed it, and I can just get right to work. Having critical thinking skills – which is making connections. Facilitation skills, which designers don’t have as well. We don’t know how to help people get off the ledge before they jump because they’re afraid of our ideas, and that a facilitator is someone who bridges things. That's what facilitators do. That’s different from negotiating. Negotiating is I have a position, and I’m going to move you to my position. I’m talking about facilitating, which is you’re an honest intermediary between 2 opposing ideas. That's facilitating, not negotiating.

Then, you have to have good innovation skills, bridging what is desired with what’s possible, with what’s viable. That's what innovation is. That's why innovation is damn difficult to do because you’ve got to bridge what’s desirable with what’s viable, and that’s through what’s possible. To me, what’s possible is what is the hard part of innovation. What’s desirable isn’t hard. That’s easy, right?

Edward: Yes.

Adam: What if we had a world without constraints? Great. Do it. Then what’s viable is what other people are willing to accept. That’s easy. Just give people what they want. Just give them it. That’s easy. You don’t have to think about it. Just do it. Just make it pink versus red or whatever, but what’s hard is what’s possible. It means taking aspects of what’s desirable and taking aspects of emerging behaviors, putting them together, and then facilitating with those people, and say, “Hey, don’t run away from this. I know you’re going to reject it, but don’t run away from it yet. Let me talk you through it.”

Those are facilitation skills, and designers are horrible facilitators because they think everything is self evident. Here’s my artifact, and the people are like why is it red? Or I don’t like its form factor, or it’s too heavy, or some very arbitrary comment, and you’re like, “That’s a stupid comment.”

Edward: I’ve actually learned … I’ve been an art director and a creative director for like 10 years, and I’ve dealt with having to explain things to clients. I decided to use their terminology instead of fighting it. If they say it pops, it pops. I’m okay with that.

Adam: Right, exactly. Well, you could also explore what it means to pop. Let’s talk about that. Now, I believe that problem solving that everyone is confronted with it is very task and utility oriented. Problem solving is you’re given a problem to solve. Somebody has to find the parameters of the problem. You just have to go out and solve it. Problem seeking is a higher order of exploration, which is designers actually go in and they ask questions.
They’re like, “Why are you doing it that way? There's a better way to do it,” and people are like, “A better way to do what?”

Designers have a tendency to seek out things that aren’t defined as problems initially. Problem seeking is a higher order approach using observation and experience to identify something to be turned into a problem to be solved. That's what problem seeking is. Unfortunately, in design education and most designers, they're never given that chance to develop those skills. Even though I think they'd be good at it. They, essentially, are good problem solvers, but not necessarily good problem seekers that can then go and find the parameters of the problem themselves.

Edward: That’s one of the points I want to do with this class in the first place is for them to find the problem.

Adam: Exactly. You’ve got something, obviously. Now, the problem with design thinking is that it confuses problem seeking as a way of addressing problem solving, which then causes a high degree of frustration because the problem solving is more of a direct line than problem seeking. It’s like you’re using a linear process to try and address a non-linear process because problem solving is a more linear process. Problem seeking is not linear. Problem seeking is not linear. It’s all over the place because you’re observing, and you’re asking questions.

Nobody has told you what the problem is. You’re essentially going out, and you’re saying, “There’s got to be a better way to do this,” not that someone has told you that. It’s just you told yourself that, so then you’ve got to turn it into a problem solve, which has parameters. That’s what you need to do. In design thinking, there should be an agreement of several types of design methodologies. There’s no one methodology to design thinking. It’s not a one-to-one process. It’s not.

There are many different design methodologies to address problem solving and problem seeking and a few scales. Now, go back to John Chris Jones. He had the craft scale. He had the drawing or prototype scale. Drawing is a type of prototyping. That's why you draw a scale. It’s a type of prototype. At a system level, or at a societal level. These are all levels that have different methodologies. I think once we can agree on what design thinking is and the protocols for it, we can then have a series of design methodologies that we can use, we can deploy to do both problem solving and problem seeking.

There should be corresponding processes that support those methodologies. There should be specific protocols that can be granulized, refined, and repeated. It’s not intuitive, purely intuitive. There should be a large variety of methods to be used to put the things into action, to have activities and outcomes that build on one another to manifest a solution, a response. There should be specific tools to make the methods repeatable and practicable so you don’t have to repeat. You don’t have to like reinvent the wheel all over again, every step.

I go back to my premise. Since there’s little that goes into design thinking, and there’s no supporting protocols, methods, or tools and no methodology to document design thinking and action that can create a body of knowledge based on empirical and qualitative results, how can design show larger communities and collaborators that investing the time, effort, and resources and using design thinking and documents as beneficial? That’s why Bruce Nussbaum, he said design thinking, we need to move on.
Everybody in the design thinking consortium went nuts in *Business Week*, in that article in *Business Week*. He said, “We’ve got to call it something else now, or we’ve got to move onto something else because design thinking just really doesn’t work.” It has no pragmatic, we have not experienced design thinking in a way that has utility value. We hear the rhetoric, the promise, but there’s no product that you can map back to design thinking. That’s why he wrote that article that got everybody pissed off.

That last thing I just said is the crux. It's a very long crux, but that last thing I just said is the crux of the problem, which then affects the way you create educational experiences, to your point, the way you create purposeful collaborators as designers with other fields, and giving them the cognitive and skill tools in order for them to become purposeful when they get out of school. That’s the problem. It’s a huge problem.

You said if we designers teach design thinking to those outside design, what is the role of the designer? That’s what I have been struggling with. Can non-designers do design thinking? If you didn’t have a designer in the room, no designers, add you had engineers and different people that’s like, “Let’s use design thinking. Let’s use it.” Would that really be considered still design thinking if you don’t have one designer in the room?

I go back to John Chris Jones. He says, “The act of designing is difficult because designers are given problems to solve by using current information to predict the future state that will not come about unless the predictions are correct.” That’s why design is difficult. We’re given a problem using current information, which may not even be the right information to have, to predict the future state that we want to have that will not come about unless the predictions are correct in the first place, and they’re usually not.

Edward: Hence reexamining the problem.

Adam: Yep, and so designers alone cannot work alone in a studio model and then expect the world to immediately see the value of what they’re proposing. That’s one of the big problems, and designers are just like, “If I’m creative, I’m the only creative one in the group, and I’m going to birth this, and everyone should just see this as a self-evident response and should accept it wholeheartedly,” but that’s not how the world works.

The thing is that innovation and creativity is not a domain of design. It’s a domain of being human, not of a particular discipline. Particular disciplines have their spin on innovation and have their spins on creativity, sure, of course, but in and of itself, creativity and innovation is not owned by any particular field. It just isn’t. One of the things that I, this is my word jazz. I’m going to call it word jazz is I say that there’s a different between the role of the design mind versus the role of the designer mind.

You’re saying what’s the difference? It sounds like word jazz, like what do you mean by design mind, and what do you mean by designer mind?

Edward: I like where you’re going with this.

Adam: Well, because I’m struggling with this. I don’t have the answer, Edward. I’m struggling like you are. Is that … the designer mind is a specific mind shaped by a designer, culturally, skill wise, etc. graphic designer, industrial designer, architect, fashion designer. That’s a designer mind. A design mind, on the other hand, is much broader. It’s a framework of understanding. A design mind… I’m going back to the biggest definition of design, the big D-definition that design is a plan.
Edward: It’s planning, ultimately … just like Doblin said.

Adam: Yeah, it was Doblin, but there probably are others. To me, everybody has a design mind. Everybody on this planet has a design mind. I’m still testing out this concept. It’s a concept, so bare with me, but there’s only a small group that are designer minds, so how do you get design minds and designer minds to work together? Even though we’re using the same term. Do you see my point?

Edward: Yeah, you’re saying that we all, to a degree, want to take the information that’s presented to us and try to predict the future.

Adam: Yeah.

Edward: But the designer, the trained designer, yourself, myself, and what have you, have had the tools to do that, and others, their tools are … I know many, many, many programmers, right? Their tools are very much, unless you’re using Agile, which is different, but they tend to be very linear in this is how we solve the problem.

Adam: Yeah, and but again, they have a design mind that means they have a plan, they have an approach, you have to, and I’m using the term design to mean that. We’re having a subjective discussion here, okay? That’s how I’m getting around this conundrum is that you have the design mind and then you have the designer’s mind. The question is how do you get them to work together, those two minds?

Sharon stated that if we have protocols of design thinking, if articulated clearly, could be of value to just about anybody that non-designers and designers could easily benefit from design thinking in the sense of the protocols. The problem is we’re missing so many pieces of the puzzle and have so many jumbled puzzle pieces that they don’t fit properly, and we can’t clearly see a compositional picture of design thinking. We’ve jumbled all the … let’s say we have 30 puzzle boxes. We’ve essentially jumbled all the puzzle pieces together, and we’re trying to force fit them together, but they don’t fit and then the composite picture isn’t from one box. It’s from many puzzles, so we’re not getting the clear picture because we’re creating all these composite pictures that weren’t even on the cover of the box.

Edward: Is there a route to this though?

Adam: There may be. Maybe the pictures that we are coming up with are better than what is on the box, but I’m just saying. I think designers need to learn not just how to collaborate with others but how to facilitate change and the attitudes and beliefs and manifest the behaviors and also address the powerful role of precedence. Precedence is so powerful, which is what was and what is. That’s what precedent is. Precedent is typologies that have become tried and true and just accepted, sort of like air. We don’t question them because we inherit them, and that’s the way it always was. That’s why precedence is so damn hard to break, but designers are constantly trying to break precedence. We do, and then we’re upset that people are upset at what we’re proposing.

We don’t have the skills to address the hurt that other people have other than, “Hey, I’m the designer, and you’re not. Accept what I’ve given you,” and people are like, “That’s not what I wanted, essentially.” Non-designers have an important role to play as subject matter collaborators who have skills that are needed to create a more robust and sustainable response. I’m just a firm believer in it because I experience it every time I
work in a trans-disciplinary team. They have things that totally help me understand the problem that I alone could not understand.

Designers have to realize that. What do non-designers bring to collaboration? The design minds versus the designer minds. Well, they bring their expertise on specific subjects. They have experiences that we don’t have. They bring specific methodologies, models and methods that could be of use when addressing an issue. They have that. The dynamics of collaboration is where you compare and contrast perspectives on a specific issue. Half of collaboration is comparing and contrasting those experiences, those skills, and those methodologies, those belief systems.

Edward: You bring something new to the table.

Adam: Yeah, you’re talking with one another about these issues. You’re talking it out. That is the art of collaboration is that give and take, that layering and morphing that I believe in. The challenge to collaboration, as I said, is that domain knowledge degrades shared knowledge which exacerbates a cascading of communication problems reinforced by a style of decision making that rewards the appearance of certainty. That’s why somebody says, “I’m the expert in this room. Have you ever done that before?,” and you’re like, “No,” and they’re like, “Well okay. Shut up.” They might not say it that way, but their body language says that. “Well if you haven’t done it, I’ve done it. Who votes somebody who’s done it, or somebody who hasn’t done it?” Everybody votes for the person who’s done it because they have the experience in doing it.

Domain knowledge degrades shared knowledge. That’s why it’s hard to collaborate because everybody thinks they have the answer, and if everybody just conforms to their mental model, everything will be fine. I think that this is where I think that design methods recognizes these issues, and I’ve talked about these disconnects, and tries to put it in a more positive way. It’s more positive going back even though we didn’t use the term positive. Given what IDEO said, is you have to be optimistic.

It says that design methods is a methodology that allows the space to explore with people that are different from yourself and to develop futures that nobody has considered but collectively you’ve developed. There’s no one owner to the response. It becomes a group response. That’s what design methods, I think, can bring. Design thinking, I support it. I think it’s great, but it does not have the mechanics to make it utilitarian. It just doesn’t, and the problem is that there’s a huge industry in the status quo, which means there’s a lot of stakeholder groups that want it that way.

Edward: Well, that’s extremely illogical to, for me, if we’re looking at design thinking or anything to be designed that they would want to maintain a status in the first place.

Adam: Well, let’s put it this way. I’m not a conspiracy theorist. It’s not like I’ve gone out to everybody. I don’t know what their intention is. I don’t know, but either they’re incapable of it, they’re more comfortable with design thinking as a metacognitive discussion in a metacognitive way, never in a cognitive, keeping it abstract and not connecting it to the everyday.

Edward: Going back to your point a little bit ago. I think by connecting it to the everyday, design thinking can have palpable good results. This is an artifact, either a system or a better toaster, using design thinking to improve these things collaboratively and having these verifiable results I think is going to make design thinking more accepted.
Adam: The IDEO handbook on design thinking … it was done for the Riverdale School …

Edward: Yes.

Adam: I think it's great. It's clear. It's cogent. It has the philosophy. It has the ethos. It has the frameworks. It has the protocols. It has the methods, and it has the tools. Now, you can take issue with IDEO and say, "Oh, it's only IDEO. There's got to be another way to do it." Guess what, I look at what they have, and it's a utilitarian value that makes sense, and then I've got yours, which is just a metacognitive cloud but has issues. If my life depended on it, I'm going to go with that, so I think that that reference is fantastic, and I think it shows why IDEO is so successful and has really defined a space because they get it and understand it, and they're able to put a utility value around it.

Do I agree with everything they're saying? No, of course not, but I'm not going to get unanimity in their ideas, but if I can use 85% of their ideas, I'll take the 85% because otherwise, I've got 0.

Edward: Do you an anecdote of something that you ran into as far as applying a design thinking or design process that created a palpable result?

Adam: I'll give you my initial response to that which is even before the term design thinking was around, because the term design thinking is a tangible thing, before design thinking was even around, I was very committed to developing a human-center collaborative, back to IDEO's attributes.

I've always been those 4. I've always had those 4, and so because I came from the sciences, I was originally trained as a geology major, and I went into design. I've always plasticly taken things from the sciences and the arts and the humanities because I have a strong liberal arts education. I have made like my own stew, and a lot of people would look at my work and say, "Well that's not the 7 deadly sins or the 10," you know, Dietmar Winkler. I've done enough posters, but I wasn't going to do another poster because it wasn't even an appropriate response to the problem.

I was designing things that were totally different typologies, and I was doing it in a collaborative way which means ownership wasn't by one person. There wasn't a genus of one owner. There were many owners to the solution, and I've always worked that way since I left grad school. I sort of have lived it or lived parts of design thinking or parts of design methods, and I subscribed to them before all this cacophony, so to me, this cacophony is sort of like 20 years later. It's almost like now everybody's there where I was 20 years ago when nobody was there because there was no language for it.

Nobody was even … for example, when John Chris Jones wrote Design Methods in 1970, the design community would not embrace it. For one, it's a very difficult book to read. It's a horrendously difficult book to read.

Edward: Still working on it.

Adam: Yeah, it is. It's not an easy book. You have to read it like 4 or 5 times, but it was too early. The trends weren't there yet in the '60s and '70s. Design was still very much a expression and production model. It worked. It was an apprenticeship model. They were not going to trade for what John Chris Jones was selling. No way, but guess what community embraced his design methods. Totally out of the field where you wouldn't
even think were computer engineers. If you typed design methods in and looked at the first time pages of web sites or so because obviously there’s been more.

When a good friend of mine and I we collaborate on design methods, 7 or 8 years ago, I typed in design methods because I wanted to know what was out there. The first 10 pages, I’d say 80%, were from engineering schools, computer engineering school, who were using the text of the book in their computer engineering courses. If you look at most of the methods, most of the methods that John Chris Jones has in Design Methods, come from engineering. They are engineering exemplars. They come from engineering, mechanical engineering. Most of them come from mechanical engineering.

The engineering community were the ones that embraced Design Methods, and software engineers, computer engineers, systems makers, embraced it because it fit perfectly within the development of software systems.

Edward: I didn’t actually know that. I knew that they were saying that a lot.

Adam: No, that is indeed the case. I'm just happy now, in 2012 that the design community is grappling with something they can't ignore anymore. It's there. the problem, unfortunately, is that design is a field. It's a series of disciplines. It has not matured at all, it's been usurped. It's territories have been fractured, and it doesn't have I think the rigor or discipline to take advantage of this insight because society has changed.

John Chris Jones, all these people in the 1960s that talked about this, were 40 years too early in their thinking. They were defining behaviors and protocols and methods that were 40 years too early, but they, in an uncanny way and unbeknownst to them, they were able to see trends that were happening due to the internet revolution due to the rise of the internet, that you can have shared knowledge, stored repositories, textual queries, search. They knew there was going to be this thing called the internet, but they didn’t know what to call it because there was no term for it.

They knew there was going to be some type of electronic repository of information that you could do research on. They just didn’t know what it was. They knew the concept. They had sort of the feel, the concept, the adductive reasoning that there would be a thing called the internet, but they didn't know what it was.

Edward: They took the evidence of now and predicted a future outcome.

Adam: Oh, yeah they said if we keep going, it's going to happen. For example, it's like the singularity and we’re going to have intelligent machines that machines will have consciousness. That’s what the singularity is all about. Well, they were talking about the singularity for 50-60 years. We’re not at the singularity yet. They’re not running around yet, but they know that will happen or some form of that will happen. They can only describe the pieces of the singularity but not the singularity in total in terms of what actually will happen because they don’t know what the singularity will be.

They just know that machines will have some type of consciousness at some point and that consciousness will be able to change the software, the code, and here’s the computer. The computer will regulate itself. It will learn how to adapt based on external factors. I don’t know if I’ve answered your questions.

Edward: Actually, you’ve helped a great deal.
Adam: I'll put you on the spot. Name 3 things that you think will help you or could help you in your work.

Edward: Well, right back toward the beginning the idea of your sunrise methodology where you’re establishing early collaborative work. I think that is something that … I've been struggling trying to find a quick way of creating some time of collaboration, and most of the time it’s … I have a friend of mine who’s an engineer trying to do the same thing from the other angle.

Adam: Yeah, sure. Of course.

Edward: And they’re running into the same kinds of problems.

Adam: You know what? That is fantastic. I'm very happy you said that because you know what universities are now doing? They’re now doing what they call dual appointments, and even at your university they’re doing dual appointments, which means that you have an appointment in the school of engineering, and let’s say the school of architecture. They’re doing it both to defray costs because faculty are very expensive, so they want to have faculty that their skills can be interpreted different ways.

Engineering and architecture are obviously perfect, civil engineering, mechanical engineering. They’re doing more and more dual appointment because you’re right. Other fields are grappling with a lot of the same issues that we as designers are, which is great, which means there’s more of a space to want to collaborate because they’re feeling the same things that we’re feeling, so good, I'm glad to hear that.

Edward: I also feel like a lot of the major ideas of design thinking in and of itself. Even though we may have these theories and we may have these concepts, methodologies, what have you, that ultimately, in the end analysis if you’re doing it for your class or using it for your business, that design method has to have an end product. It has to help making. It can’t just be theoretical.

Adam: Well, I want to refine that because I don’t think that design thinking always has to be in the end because we have to define end product. The end product has to have some type of utility value. I think that’s what we mean, so it doesn’t necessarily have to be something tangible like a dimensional x, y, z axis type of thing. It can be a plan. It can be a process, but the process of utility value that enhances the performance versus if you didn’t do it. I think design thinking should have some type of, I’m going to use the term utility value versus product or service, whatever. I think it has to have some type of utility value that benefits versus if you didn’t use it, like if you used something else.

I think if we say that design thinking always has to have a product, the term product has a lot of baggage.

Edward: Good point. I think utility value is more accurate to what I was thinking.

Adam: Utility value is because utility value has an economic meaning, you know, in economics utility value, but the whole notion of utility, of use, that’s the critical thing that is needs to have, but the process, Edward, should not be utilitarian. The process of getting to utility may be very non-linear and non-utilitarian.

Edward: Of course.
Adam: The process of exploration is very much dealing with the unknown. I agree with you that the end result of application of design thinking should have some type of utility value that people can experience versus being told, “It’s better because we used design thinking.” “No, it isn’t.”

Edward: To improve that per se.

Adam: Right.

Edward: One thing that I really liked a lot, and you talked about this probably at the mid-point of our discussion is, and I don’t know how to address this. It’s a challenge is the idea of reinforcement that you can teach people, give them examples of design thinking methodology or design methods or whatever you want to call it, but unless it’s reinforced over a term, unless you go from … if you just have one class, it’s here to here with no parallels in the other classes they have. When they get done, it’s an isolated experience.

Adam: Right.

Edward: And purely from the education point of view.

Adam: And that doesn’t mean that you have to create a regimented educational experience with all the faculty saying, “You will do this, and you will build on this, and you will do that,” but what you essentially say is, “Here are concepts and principles that we want to reinforce in your subject matter of your courses, and that you constantly want to make connections to other courses.” That’s reinforcement. It’s building and creating a more sophisticated series of experiences for those concepts the higher you go in the educational model, from the 100-level courses to the 400-level courses. You hear what I’m saying?

Edward: Yeah, I do. Just from an isolated point of view, just like let’s say 1 class, and you had a dozen kids in that class, and you learn what their curriculum looks like, what else they’re taking. Do you think that referencing those items early on might be a useful technique?

Adam: Well sure, and I think students … once you heighten the awareness of students about something, and they have a pleasant or useful experience with it, and then they go to another course and it isn’t reinforced, they begin to wonder why it’s not there. I think students can sometimes be good ambassadors to faculty about what was learned, but they still may be too early in their journey to be able to clearly share and articulate it well to somebody else. It’s still too new.

This is where I think you need to look at it in an undergraduate program from 100-level to 400-level and map the concepts and theories and terminologies and how they apply to the subject of the course and what needs to be reinforced every year. You sort of have to come up with a conceptual framework for the educational experience in total, and in faculty they need to recognize those as goals, like rubrics … I don’t want to use the term rubric because the term rubric has gotten a bad rap, but some type of rubric so they can then contextualize their subject matter and educational experience to addressing those things, building more and more sophistication on it, so by the end, you have purposeful graduates.

Edward: Do you think now is the time where, obviously 20 years ago people were design thinking or design methods having more human-centered design and listening to people was kind of rejected by the majority, not all, but by the majority? Teachers, 20 years later, who are hearing all this stuff, they are ground in whatever methods they did when they came in,
do you think they would, and I can’t speak for any individual, obviously, but do you think because there is kind of way almost on the word design thing at the very least, the convenient lie as Norman says, that they would be open to this idea? In other words saying, “Hey, this is the future. Can you jump on board?”

Adam: You would have to show specific exemplars and then map it back to their areas of interest.

Edward: Okay.

Adam: You’d have to know what really turns them on as faculty, whatever it is, and then map, show exemplars, and then map it back to their area of interest and saying that this thing could have different interpretations depending on the subject matter, but you’re still interpreting the same thing. It’s just as different let’s say in a typography course … I’m making all this up, versus in this type of course, that type of course, whatever. I think that you have to seduce faculty and give them something pleasant to grab onto, almost elementary like, “Of course, that makes perfect sense,” because unfortunately, those faculty that were in school 20-30 years ago are bringing all their bad habits with them, and you only know what you know.

The other problem is academia is sometimes very deliberative. Change comes very slow in academia because it is a deliberative culture. You don’t just say, “This is the way it is,” and everybody fall in line. You can do that, but you’ll have a bunch of disgruntled faculty on your hands. I think it needs to be taken in stages, but I think that you can do some baby steps in trying to lay the groundwork for reinforcements between freshman year and senior year in school.

Edward: Well, you’re the only one so far who’s brought this up, this reinforcement point, and I don’t think anyone else I’ve talked to has brought it up. I think it’s extremely saleable.

Adam: Well, good. Another question is how do you deepen that understanding, and then how do you apply it with some utilitarian value to the educational construct? There is no going back, and I think that faculty are looking, are desperate for relevancy because I think that design faculty are under a lot of stress to the budget cuts and increased class sizes and the questioning of the value of the design program in and of itself. There’s all sorts of huge problems going on because I have people I know, so I think from uncertainty, change can happen more.

Edward: In other words, it may be an ideal time.

Adam: Right, exactly because there’s more uncertainty, so people are looking for certainty, people are looking for something to fill the uncertainty with, and I think, depending on how you package it, they could be open to your ideas.

Edward: Okay.

Adam: I would be very empathetic when you do it, and put yourselves in their shoes so they don’t feel threatened. That’s critical because if it comes across as hubris, which is … I use the term hubris …

Edward: I’m familiar with it as well. My father was a classics teacher.
Adam: That's how most design thinkers come across as just full of hubris, unfortunately, and that may not even be their intention, but they come across that way like, “I am the right one. You are the wrong one. I am the all-knowing. You are the vessel that I need to fill.” Who wants that? I think you have to be empathetic and seduce them. If you want to know how I teach, I'm empathetic, and I seduce people. That's how I teach.

Edward: Okay, well it seems completely logical. I run into similar situations with clients.

Adam: Sure.

Edward: You have to seduce them with your ideas. You can’t just say, “I have done this for x-number of years.”

Adam: Yeah, I mean. You’re getting it.

Adam: I appreciate your time.

Edward: I appreciate yours very much so. Thank you.

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C.6 - Seda Yılmaz

Edward: Some people say that design thinking is kind of a marketing term as opposed to the defined methodology. It doesn’t necessarily have an original knowledge set. Through your experience, what’s your opinion on that?

Seda: I think in relation in design thinking, those are buzz words right? There’s not much you can do about changing it. They had become marketing strategy tools for them to sort of distinguish themselves from the rest of the world. I think design thinking is a methodology. There is a base, established base underneath.

Edward: Okay.

Seda: Design thinking is thinking for designers. So for us it’s the way we maneuver our lives, the way we live our professions. So the way we approach any problems and yes I mean some people do understand what it means. Some people tend to underestimate it. I don’t know. My opinion is that there is a methodology that is underneath and it’s been practiced in many design schools already that are called design thinking or creativity or studio-based projects or collaborative interdisciplinary. Whatever they want to call it. The essence is the same.

Edward: Some people say it’s from a model to design teaching. As opposed to the Bauhaus model or the more corporate-focused model. If you are going to the Bauhaus model more of the craft. You learn the craft part and you learn the other side of the design/planning part. So you understand parts of it and there are those who see it as maybe a new model.

Seda: For teaching?

Edward: For teaching. What are your thoughts on them?
Seda: They’re talking about not teaching design thinking but using design thinking methods for teaching?

Edward: Of both. Either one is reasonable. I’ve heard both points of view.

Seda: Either thing. The way I teach design thinking is... well it’s part of the design thinking for industrial designers and now it’s called design thinking because we have students from Industrial Design, from Architecture who are interested in learning more about creativity techniques and design thinking knowledge. So they’re taking the same course and the way I run the course is not so much about using the method itself as the essence of the structure of the course but teaching the methods. So in many cases the students always struggle with generating viable solutions. So their approaches are always the same and it’s becomes more and more evident especially the designers and engineers too, any designers. That they just get fixated on ideas and design thinking makes you go beyond your initial ideas, make you explore new possibilities. So it really forces you to think differently, to approach differently, to just live differently. So that’s the kind of culture I’m trying to create in my classes.

Edward: Now your classes are undergraduates right? Most of the classes of design thinking I’ve ran into, again this is changing, are for grad students, like a d.School.

Seda: The structure is very different though. It’s not ... they’re not even giving a degree ... some of the degree program by itself. I don’t know if they are giving certification. So their goal is different. Their goal is to teach design thinking to people who are not involved in design. So it’s like teaching how to cook Chinese food to Americans. It's a different category and the way we teach here is already called is design. Professionals are designers. Students are designers. So it’s a very different structure than these schools. And I understand why their approach in graduate students is different versus their approach in undergraduate students.

Edward: Now when it comes to undergraduates who are not necessarily designers, there are some who say that having a designer in the room as part of the design thinking thing is a good idea? Somebody who knows something about design? When it comes to undergraduates, do you think in that collaborative environment having at least one or two people who are in design as part of a group? Do you think that’s very … that’s very useful? Do you think that adds to the inspiration or creativity of the others?

Seda: So you’re saying if you are within this setup of undergraduate students who are design students.

Seda: Absolutely. Yes. There’s no question about that. I think when ever the designers are enrolled in any kind of process, they will make it different because the way they think is different, is very different than many other professionals.

Edward: Mm-hmm.

Seda: So yes. I agree entirely. I don’t care if it’s undergraduate or graduate. They will make a difference in the dynamics. They will me a difference in the solutions that are going to come out of the team. So they will yes, no questions.

Edward: There are two things that have been posited as possible problems with... I mean there are lots of possible problems obviously. But one that really comes up with especially and
this are even multi-disciplinary within the same general school of design. I mean architects talking to industrial designers that communication becomes a major issue.

Seda: That's true.

Edward: How have you dealt with that problem?

Seda: It's always a battle. In industrial designer's case, it's always a struggle between mechanical engineers because they worked very closely with them and the common language is not there yet. And in many cases, we never end up, we do not end up getting to a collaboration. Meaning engineers are not so much involved in concept generation and industrial designers are not so much in detailing the design for manufacturing processes. So everybody sort of define their boundaries they play in their boundaries. So we're trying to break that by bringing engineering students to our studio projects more often so that they can feel more integrated in the way they approach to the problems. In many cases from my experience engineers look into the problem from only one way. As if there's only one way to solve it and once they solve it, they don't look for additional, they don't look for alternative.

Edward: Done.

Seda: It's done. We've done the job. Why are you wasting the time? And in some cases I kind of agree with that. Why are we wasting the time? Money equals time so why are wasting it? But today, there is a solution. There's always a better solution. We just have to search for it and for them it doesn't come naturally. By bringing them into our classroom, see sort of try to break it but it's not easy. So coming to your question how are we doing it, we're doing our best by bringing them to our studio projects.

Edward: Mm-hmm.

Seda: That's it.

Edward: Ken Robinson always said that all children draw. All children draw and that we are through our educational system…

Seda: They kill creativity right?

Edward: Right and one of the ideas of this research and maybe even design thinking itself is can we get creativity out of everyone? And what are your thoughts on that?

Seda: No I think everybody is creative. They just... they either do not know the ways to get that creativity out of them or they are just so biased by the profession that they are in that creativity should not play a role. Now I think everybody is creative and in the design thinking class, I make sure that I should start the first lecture by asking a question who is creative and who’s not. So for example, I had a small lecture in one of the interdisciplinary design classes and most of the class was engineering students. And then I asked them who thinks that he or she is not creative? There are so many hands in there which is very surprising to me because as a designer I always think well, people should know that they are creative. They may not know the techniques to apply creativity to certain domains but they must know that intrinsically they are creative. Well designers are not there just for the initial thinking part of it either They are there for the entire process. Designers are the one who understand the entire process who can contribute to
every single phase of an entire project. So they are supposed to be more project leaders than marketing people or engineers or managers. They are supposed to really know the entire process. So our contribution is not just in solving, approaching a problem. There will always be a need for designers in life. In any kind of company.

Edward: Looking at design thinking, in teaching specifically and maybe you ran into this. I don’t know. But when you’re teaching as an individual class, do encounter any problems that can best be described as institutional inertia in which your class is a singular experience. When they learn design thinking, it’s done. It never applied to anything else.

Seda: Right.

Edward: And use it. For instance, you’re taking a… if you take an English class learning basic English, English literature or what have you. It’s obvious that the second English class is going to assume you know this stuff and going to add to it.

Seda: Right.

Edward: And I assume that the design studios do to a degree.

Seda: Mm-hmm.

Edward: But there’s been some observations that if design thinking was just a class. If it isn’t carried through the rest of their schooling, whether you’re a designer or an advertising student or an engineer that it’s a singular experience and may fade. What are your thoughts on that?

Seda: My experience is more on the industrial design students so the techniques that they are learning in my class they are actually applying it for industrial design project that they are told to apply it and make sure that those two courses studio and design thinking are sort of going hand in hand.

Edward: Oh cool.

Seda: Even bringing their own projects into my class so that they can practice the techniques that I’m teaching with their ongoing project. So I don’t say that being an issue for industrial design students but I can see it being an issue for example architecture students who took my class and I don’t know how they should carry it over to solve their problems in their architectural courses. I don’t know. I think once they learn the basic understanding of design thinking, it’s hard to not use it. It’s like in everyday life you know you approach to even research from a design thinking perspective, exactly right? All the decorations, you’re looking at the problem from this perspective, this perspective and then you’re talking to somebody else and then the perspective suddenly changes. So they’re learning, teaching them how to be adaptable and how to adjust from one thing to another. So I don’t know if this is something that can be accomplished by one class but I think it can be an issue.

Edward: One of the things that you mentioned I think it actually leads back to Jay Doblin as well is that in this, the designers, you kind of touched on this a little bit. That designers may be in the understanding process the natural leaders or facilitators of the process. There’s some argument …
Edward: That natural leadership does … I mean natural leadership happens in any group. But one of the problems that does run into and this leads into communication issues as well as hierarchies. That for instance, if there are different people together and you have that graphic designer. You have an industrial designer. You have an architect, right? The assumption from any outsider and possibly from the architect is that architecture is the superior form of design. This is something that leads back the 19th century or such. It’s changing obviously with the Bauhaus and evening things out of it, raising people up. But how do you, sometimes how do you break down these hierarchies in a group of people from different disciplines? And is it easier with undergraduates?

Seda: Interesting. How do you break that hierarchy? I was reading an article about that.

Edward: Sure

Seda: One lesson that I kind of got out of that article was they were saying whenever you put different disciplinary teams together to work on a project, then make sure that there’s a leader from each discipline. So for example there are marketers and designers and engineers. So instead of selecting one leader that will represent the entire group. You select one leader that will represent each team and sort of make those leaders be the decision makers in a more discussion way. Do not put the entire load of responsibility to one person. How can you break that hierarchy? Designers are the ones who have high egos.

Edward: Some engineers do too.

Seda: Yes. The perception is they are different. So we think that engineers cannot think visually. They are very biased about their own ideas. They think they know everything but then they don’t understand the user and they design product for users. How can you possibly design product for user without understanding users? In their case if you put yourself in their shoes, they’re probably saying that designers are all about drawing pretty fancy pictures. Pretty fancy concepts that can never be manufactured. That can never come to life. So they are there to make sure that there are functional products in the world. So what we do is for example in industrial design department here, the students are required to take two engineering courses. They are not courses that faculty for engineering but their courses taught by industrial faculty for engineering but they are courses taught by engineering department faculties. So that’s one thing that we are going to create this. Well, kill this boundary in terms of the language difference. And then they are also required to take one marketing class. I had the same experience when I was in college too. I had to take two Psych classes required because we have to understand Psychology of people, how they pursue things et cetera and then two Physics classes, two Engineering. So it’s more interdisciplinary than just design. I think that’s one way of creating that common language. I really don’t think it’s a good idea. I keep going back to the question just make sure that I’m answering the right question. For you to break the hierarchy is probably to show what you know and to show that your contribution is valuable to the whole team. Doesn’t matter what your label is. What matters is what you can bring into the table.

Edward: Okay. I think there is as far as teaching a course, everyone has their own way of doing it and I understand that. One of the divisions I suppose that kind of comes up is once you get past any boot camp or get to know each other’s session and practices and what have
you. There's some discussion about whether one should do a single project together or maybe each group maybe two or three groups each doing the same project right from different angles or something of that nature and they do it together from beginning to end. Maybe you don't have a final product at the end but at least you did the work. And there's some arguments saying no, no, no. You should just do three ... two or three times of the entire process and kind of rush in through it as if they are in a real world situation.

Seda: Mm-hmm.

Edward: Obviously the real world situation is working 8 to 10 hours a day, much different.

Seda: Right.

Edward: Do you have a critique of either of these approaches? Or do you have a different approach or something that may be better from your point of view?

Seda: So the two approaches that you described one is you go through the entire process step by step as a team versus the second approach is you go through it and then you go through it twice or …

Edward: Two or three.

Seda: Three times more. We always say that the design process is an interactive process. So there is no end even though the product hits the market, as a designer you’re still trying to improve it because you can’t stop thinking about it. In more common way is actually doing the whole thing just once because of the time constraint. And I know example Stanford is looking at it as you start defining the problem and then you jump to concept generation and then you jump into prospecting process and then you get some user test results, which will affect your solution. You have to go back to problem definition and then go back to, it’s very common than you think about. It seems to be common enough the way they have to be approaching to problems. It’s not possible because everything has a certain deadline and you just can’t afford going back and forth that much. Even though our teaching hour never sets the ideal scenario. So coming back to your question, the ideal scenario would always be very flexible in juggling among those steps back and forth back and for. Until you actually are satisfied with the final results.

Edward: Okay. Now …

Seda: So it's not so much about starting from the beginning going all the way to the end. Starting from the beginning going to the end. It's about jumping among the steps after you get feedback from users or from the team itself.

Edward: What kind of problem do you believe is appropriate for students? And we’re not talking about wicked problems like poverty. But maybe a small slice life like better signage for a soup kitchen or something of that nature.

Seda: Yes and I've been teaching to graduate students to sophomores - such a variety. I say honor students, so they have to be freshmen or sophomores. For you to able to teach design thinking is an expert manner, I think your main challenge is going to be defining those constraints in your problems. I think the looser the constraints are the better you will be because you will be giving a lot more flexibility to the students to juggle through the entire process. Versus if your problem is very well defined, they will not feel like they
can actually approach from various perspectives. So there's a higher chance that they will get fixated faster earlier which is going to kill your idea of design thinking which is exactly the fact that you want to teach. One thing that I have experienced a lot with engineers that the more vagueness you include in the design problem, the less secure they are about solving it and about their knowledge. So they want all the constraints, all the variables to be very precise so that they can rely on their own knowledge to solve them. In designers, it's the other way around. The more vague the problem gets, the more confident these designers become. So we tend to make things really loose. We tend to make not even include variables. We ask them to find the problem. We ask them to observe people and try to identify the problem. We define the context. We sometimes define the product user but we do not define the problem for example.

Edward: Okay.

Seda: So that vagueness creates lots of questions in their minds, which help them a lot in finding their own way in the design so.

Edward: Do you think you can give like a class ... a week of class where you say okay today we’re going to discover the problem and they said okay we’re done with class, go. Use this class period, explore the campus, find the problem. And then I'll talk to you on Thursday.

Seda: That's very common. That's something that I do a lot. Even in my introduction to industrial design class I gave them so there are three to four people teams and each team got only one activity. One of them got eating. The others got sleeping. The others got swimming for example. Just basic activities and I said while it's you job to try to design problems relating to those activities. Go. So they did ethnographic research. They identify some users. They asked questions. They observe people and then they came up with wonderful problems that are ready for them to solve. So they are the ones who initialize those problems and we want them to be flexible thinkers.

Edward: Well how do you handle it if they find a problem that requires shall we say intervention that said let’s say okay Cy-Ride’s way-finding / mapping systems needs improvement.

Seda: Right.

Edward: Let’s say they have a hard problem? Or any kind of transportation and they want to solve that problem. Okay, now you're bringing in the need for permissions... so that kind of things possibly, for observation. Do you steer away from it or you just go for it and see if you can do it?

Seda: I just go for it. Just go for it because they really have to understand that they can push the boundaries that are already there. And this way, they learn how to ask the right questions. They always feel about the voice of customers. How do you possibly get that voice of customers if you do not know how to find the right customer, how to ask the right questions? So it's very related to the whole process.

Edward: One of the things Tim Brown talks about as far as T-shaped people who are good design thinkers. I don't think anyone in theory can be. But he was talking about T-shaped people. Some people say that's a great thing. I've also heard people say that doesn't exist in reality. It's kind of, that everyone in theory can be the magic unicorn who can do whatever within his or her discipline. Where do you fall on that?
Seda: That a really good question. So T-shaped people are, it's about the depth and the breadth right? And industrial designers are more generalists.

Edward: Mm-hmm.

Seda: Meaning they understand a piece of everything. That's the kind of culture we have and they do get that than they spend years in one company designing for example footwear. They don't get to that level in education though.

Edward: No.

Seda: So that lifestyle, I think I believe in that T-shaped people. I think they are very viable and I think there are people like that but again you need to come from education, which teaches you how to be generalized. How to be generalist and then who ... and then you can take that education into an industry and a practice and then get that there.

Edward: Okay.

Seda: So it's a combination of both and I think they do exist.

Edward: When you're dealing with the ideation sessions with the students, you have your own pitch, you do affinity diagrams, you do whatever you need to do. Sprinting, whatever techniques you need to do. How do you deal with the more practical aspects of the devil's advocate? Especially from those who are not necessarily industrial designers?

Seda: Can you give more elaboration on that question?

Edward: Oh people who are doubters right away as opposed to an idea ...

Seda: If this is going to work out or not kind of question?

Edward: Yes. Because ideally you get all your ideas first before even begin pairing them down.

Seda: Yes.

Edward: And there are lots of people really and good-hearted people frankly. Maybe they're engineers, you're talking about this is the solution it's not anything else.

Seda: Yes.

Edward: Right? How do you facilitate that not happening?

Seda: I think the easiest way to convince those people would be to bring users, to bring users into the session and in many cases that doesn’t have until actually you do designing for them. You’re in the final stage where you have the prototype. I think bringing the user into even early stage of design like ideation will really help to convince the people who are going to be rejecting the ideas at the early stage. So that’s I think that’s a great way to approach it. If you do not have that possibility, if you can’t bring users into the picture, how can you possibly convince those people to set it all for you? It’s always a battle. It’s always a battle. I don’t have a better idea.
Edward: Last question I want to … I may follow-up one question if it's okay with you.

Seda: Sure.

Edward: Last question, as far as design thinking and education itself, do you believe that design thinking as it's evolving whether it's called design thinking or design innovation or whatever you want to call it, is the way of the future? Or is it just a fact?

Seda: I think it's the way for future. I really think so. I think people will learn and adapt this thinking into whatever profession they are at and that this school is spreading so much their ideas are spreading so much and I only hope that there will be more of these schools in the world who can actually convince people about how important these design thinking methods are. I think it's great in approaching to anything in life because it's not teaching you to something that is incredibly difficult to get. It's teaching you life skills. That's how you look at it. So you take it and you adopt it your own personal life and you actually start living better. You look at differently and I think it's going to become the future. If not already and I think it's sort of.

Edward: Well thank you very much.

Seda: You're welcome.

Edward: Appreciate your time.

C.7 - Patience Lueth

Patience: The first thing that I think about how designers think and mainly I think about the design studio. I think about … because that's the area that I teach mostly and that's the area that my research lies as well. I think of the design studio and the method of learning and the method of teaching in the design studio. How students get from a process to a product. How to make your thoughts tangible. That's what I think of. To make a long story short, I guess.

Edward: Since 2009 design thinking has been very popular, but it's been somewhat controversial as well. Some people had some issues with it. Every one has their own take on it. Each says no this is the design thinking, but there is no design thinking standard. What is your take on the popularity of design thinking? Why do people turn to it when before these ideas of collaboration, working together, were kind of rejected?

Patience: You know what I don't think they were necessarily rejected but that's just my thought. I think that this happened for eons. I think design thinking is not anything new. I think that it's just been verbalized. If we want to understand design thinking a little bit more, I would go back to Donald Schon. I don't know if you've read any of his work.

Edward: I have.
Patience: Right. I'd go back to him because he begins to explain pretty much how designers, in my eyes, how architects think or how they go about problem solving. Really, it's not about architect, but let's think back to Michelangelo. Think about the clients, think about versions of work, think about the cross study he had to take to get to a final product, and to me, that's what design thinking is about. It's about the consumer; it's about having pretty much satisfying your customer or your consumer or clientele with options. Michelangelo did that, I'm pretty sure that people before Michelangelo did that as well. There's always been innovations, we're talking about Leonardo da Vinci, we're talking about the Wright brothers, you know, and so on and so forth. They didn't get to the point that they were by themselves. Even though it looks like they might have. In terms of being my thoughts on design thinking, I think the term might be hype. It could be called anything.

Edward: You and Donald Norman.

Patience: Yeah, because, again, it's nothing new. It's nothing new. It's been happening. It's just that some business guy who was smart decided that he was going to name it and use it and capitalize on it and I think that's what happened. For me, the sad thing is that since designers have been doing it for a long time, it's sad to me that they have not verbalized it. In terms of being the nature of design ... nature of design meaning our production, like what we produce. We produce things in our head, visually. We're not necessarily beings that deal with text or words and so in terms of information, when we explain something, it's through a model. All right so in terms of designs again I really think it's sort of a fad if you know what I mean. The term might come and go.

Edward: Donald Norman was saying, “the design thing is a useful fiction.” I mean in the end its design, but its design that is explainable to non-designers because they necessarily don't get how we think. We have a challenge especially when the work is cross-domains. Is this something you have encountered?

Patience: So the class that I'm teaching there is actually a group of students, actually not a group, I divide them into teams. So one team is dealing with a systems organization design, where they are focusing on collaboration within the colleges design. They're saying that collaboration can be enhanced through the change of the physical properties of the environment. So environmental change you know as what would aid with collaboration. That's their theory, they found out of that it's a little bit too broad, and then they decided to focus more on architecture. On the architecture program on how we have first years somewhere else, like here then you have second year, third year, third years in the Armory, fourth years somewhere else. Everyone is spread out and it's not necessarily encouraging. Now in collaborative teams and teams that are similar. We've had this issue, let alone that issues being an issue that for example across campus. Because I mainly, what I would love to do is to have transdisciplinary collaboration across campus. But if we can't collaborate as majors then I think it has to do with different philosophy and also different ways of thinking. For example; three dimensional designs or two dimensional designs when you look at three dimensional designs which is what most architectural designers deal with. Then they have different terms for principles of three-dimensional design and principles of two-dimensional designs, whereas; they could all be the same. They don't have to be different and we experienced this. I also teach an introductory course called design collaborative in the summer with Deb.

Edward: I've heard of that.
Patience: Okay, so design collaborative it kind of introduces design to high-schoolers who are interested in designing. So we have instructors in architecture and graphic design, so everyone has a different technique, a different style, a different language. Now here we are trying to put a list of terms of just design principles. So I had my list and she had her list and they looked completely different. So the same word, for example would be used differently in two different majors.

Edward: Okay, but they’re all still design.

Patience: They’re all still design, so it’s an issue and I don’t … I think again it’s an issue of philosophy, it’s an issue of our way of doing things. Now how do we go about collaborating? I have my own philosophy. It all has to do with not being so pompous, right. As designers we just think we know it all, sometimes. I think this is the reason why no-one has come out with the term design thinking. If we believe that, let me give you another example. The core; the foundation…were you here when we were going through that change? From being architect, for example or landscape architecture and so on and so forth, and then we’re all now design studies.

Edward: I was not here at the time but I’m aware of the transition.

Patience: Okay, so during that time it was very difficult for a lot of people too not be selfish and say, “well what has this got to do with us? What has it got to do with architecture? What has it got to do with interior? What has it got to do with graphic? What has it got to do with CRP? - rather than thinking about design in general. What are the general things that we do together? It’s not necessarily about fulfilling or teaching students about graphic design or architecture or whatever. We’re trying to teach them the foundations of design. If we cannot even agree on foundation how then are we even going to collaborate on work? So the first thing is we need to not necessarily let our guard down, but to just stop being so pompous.

Edward: We should talk about; there is the question of hierarchy. This has come up before, given different takes on it, but it is a question of apparent perceived hierarchies and how to get rid of perceived hierarchy.

Patience: Yes, okay it’s obvious.

Edward: A designer saying they are better than the engineer, who is better than the marketing person, etc.

Patience: I think it’s through the education again. Everything that students are taught, because everyone who is an engineer, whoever is an architect, a construction engineer and so on, all those people were once students. A lot of times we students, including myself, apply the philosophies that we learnt in school to wherever we go. So for learning in school that there is a hierarchy and that someone whoever is better than this other person, that’s what we’re going to know and that’s what we’re going to hold true too.

Edward: So you’re saying where this weakness is in design thinking is communication channels, right?

Patience: Well communications but also educational strategies.

Edward: Go ahead I want to hear.
Patience: Right, so for example the way we, I love design studio. I mean we can get to a point
where we have a big head about design studio because when I look at all the other forms
of education, I feel like design studio has hit it on the head. This is how students should
be educated. Now you have schools, like high schools and what not, doing design
thinking classes which look like design studio. IDEO for instance. Yeah, so there are
people who have talked about this, right, they've talked about really beginning to integrate
the studio type learning into just like high schools and what not. But the problem is that
again is that thing where; I don’t what to either share information, or, I don’t want to
change; or I don’t want to … So people and I’m talking about individuals, not even as a
group because I think change comes individually first. There has to be one person that
says; I’m rebelling against the norm. The norm would be that architecture is seen as the
best, not as the best … In the college of design, right...

Edward: Going back to the Bauhaus trying to even the playing field …

Patience: Think about what’s happening right now, industrial design has come into the College of
Design. Then all the people who thought, “I want to do architecture,” are now apply into
industrial design. So then what are architecture program going to do? Leave them in a
spotlight, oh, my gosh, right. So normally you would get the A-student, most of the A-
students who go through the core, would register for architecture would apply to the
architecture program. Some students who get A-s and have bad portfolios are not
accepted. But now you have a lot of the A students, in fact I have some students here I
taught in design studies 102 who I know got C-s. I’m wonder wait, wait; how did they get
into the program, because normally it’s a B-plus to get into the program. I always tell
students you’ve got to get a 3.33. So now its like tables are turning on that. But what did
that take to get to the point where just because you know for the population to be almost
spread. The reason why I think architecture is seen as; I think it is because they have big
numbers, right. Numbers mean, but now industrial design has pretty big numbers as well.
Now let’s go back to educational strategy. In terms of the design studio, I think it’s an
awesome way of educating, but even in the design studio I don’t think are open to other
forms of learning or teaching. When I went to education I was completely shocked,
literally it was culture shock because they have all these methods. I go into design studio
and I used to teach how I was taught how to teach. Or, I used to teach how I was taught,
not taught how to teach, but taught. Which means whichever professor I had that was the
professor I copied. Was that the right way, I don’t know, I just knew that my professor did
it, so therefore I do it. I remember my first and I got hired right out of college. So, my first
year reviews were awful. That’s when I decided to apply for the teaching program, in fact
I had already started applying but it confirmed for me that I needed another outlet for
teaching, how to teach and so on. Even though it’s a design studio and I’m a designer I
still need to learn about the student population. I need to learn about how to teach, how to
understand students and that’s what it’s about. We think about design thinking, design
thinking being about clientele, design thinking being about consumers. To me my
students are my consumers.

Edward: By consumers do you mean in the literal capital consumer, or are you thinking more
human centered?

Patience: Yes, human centered, being human centered and what I think design studio does not do
very well, is being human centered even though the method of teaching is awesome
because it’s the idea of learner-centered. It’s being this idea of active learning and all
these other educational terms that we just throw out, this happens in design studio. There
is just that disconnect between the teacher and students. How to relay that information if
we are relaying information, which I don’t think we necessarily always do, or, are we
really teaching them how to think. Which is what I think we’re really doing, and no we can’t say; you think this way, you’d better think that way, no, but we are teaching them how to use their own minds to help in the problem solving, in solving a problem. That’s what I believe design studio is about now. What helped me when I went into education; it helped me understand again the student population. It’s very important to understand your clientele. It’s very important to understand what they like, what they don’t like. I’m not saying that that’s what I do; just cater to the students, no. I understand that this is a different generation. There are studies out there on how students learn, learning styles. There are studies out there on different teaching styles, it’s not like we should we put ourselves in a box, but who am I in terms of a teacher? Who are they in terms of students? Just yesterday I had a conversation with my students on how to begin to pull out their learning style at this particular moment in time. So when they are in studio and we’re doing this particular project; you are learning in a certain way. You are thinking in a certain way. How do you know what you are learning? How do you relay that? That’s what your project is about, really. It’s getting you guys to understand how you learn and also getting us to understand what learning process you went through and having evidence of that; which is the artifact or the product; whatever they produce.

Edward: When you teach the class, do the other professors within that program, who take these students after you, provide opportunities for them to continue this learning experience?

Patience: No and in fact we just had a conversation, we had another meeting on last week Friday about the same situation. There is fourth year who was like, wait a minute; I thought students knew how to make posters? You know like fill something basic. How come their posters look like this? Evidence, look at these posters, all right. Why can’t they design a poster that analysis sum angles or whatever. How come they cannot explain that into the picture, it was an issue because these are fourth year students. Apparently they should have learnt this in first year, so the core. Plus; they should have learnt it in second year, now they’re in fourth year and; oh my gosh, someone is noticing that they don’t know what they’re doing or how to do what they are doing. So in terms of opportunity to learn; we talk about learning outcomes, learning objectives. So learning outcomes I don’t think are consistent or I don’t think they tie together from year-to-year, if you know what I mean. So design studies 102, whatever program that students go into; are we taking the learning outcomes and the objectives in design studies 102 and beginning to help students to make connections, between for example their first year of graphics? Their first year of architecture, their first year of interior, are we helping them make that connection and the answer is no.

Edward: It seems to be common that these classes tend to be isolated experiences. For instance design studio class or any methodology class, anything whereupon this is your one experience and then none of the classes that come after it, follow it up or build on it. Why is that?

Patience: Again it goes back to the person involved, as an instructor. In fact in design we pride on us being very different. Every individual is different, we have our own method of teaching; therefore respect that. I can’t tell you; okay what about if in your course I have these objectives and you’re coming after me; can you go … I’m like no, no, no … or you’re like, ah, I’m interested in the this topic and that’s what we’re doing. That is the issue, the underlying issue. So we talk about wicked problems, but with every wicked problem there is some underlying problems, there are underlying issues. So one of the underlying issues is that us as people, we think that our stuff is good enough.

Edward: Kind of academic inertia, people.
Patience: This happens everywhere. There are articles out there in education about sciences, so it's not only in design. It happens everywhere and I'm yet to see a school, in fact actually I shouldn't say that, because I know that there are some.

Edward: But at least some schools try.

Patience: That's right. I've been thinking about this for a while, because you begin to think; man I should just make my own design school. Then you have to take a step back and almost humble yourself and wait am I saying that because I think that I am better. Or because I think what I am doing is better? Or take a step back and say; how can I learn from these guys? Can I then maybe do something here in terms of collaboration that will help? Right? Everybody understands what is going on. Which might be more fruitful, which is what design thinking is about. Rather than just separating yourself and do you know what I mean?

Edward: Actually I do. Now your design thinking classes are they for undergraduates or graduate students?

Patience: It's undergraduate, so they're in their first year BS, so they have gone through the core, they did not get into the program. I've heard some people, like themselves, calling themselves rejects. So they didn't get into the designated programs and decided we want to do BS. That's the nature of multiple students in my course. There are maybe just one or two who decided at the beginning, I just want to do a BS track, but most of them came from the core, which is design studies 102, 131 and all that. Then they didn't get into whatever they wanted and said it would be better for me to be in Design. It's not a required course. It's elective and they can pick any other course they wanted.

Edward: Everyone I've talked to have said that most design thinking courses are in graduate school. Having a design studio in class for undergrads class; I think it's more effective than having it for grad students. What do you say to that?

Patience: I agree, somewhat agree it just depends, right. So for example if my undergraduates I believe, you know when students come into 102 or design studies 102 for example. It's like we almost have the mindset that we have -- or okay you can several mindsets. One is that the tabula rasa where you can just erase all the memory that they had from their high school years and then begin to plan all the new. That's not the bet I normally take. But to a certain extent you're almost having to teach fresh things; things that they may never have thought about. Some of them have never necessarily even been in a design studio. So when you talk about design thinking, teaching undergrads with I feel like it helps shape them a little bit. Whereas if you're a graduate student, it's a little bit more difficult because again we come in with out own mind set. We come in with our own agenda. When you're a graduate student you're a little more focused. You're like I'm coming in is what I want to study; and this is what I want to write about. When I was a grad student I knew exactly what my thesis was going to be. Then you have to hand in your purpose statement. Statement of purpose and all that, so it's like you have to be focused, you have to know what ... So for someone to come in and begin to teach you design thinking it's like I already know how to do that. So there might be; people might not be as open. I'd like the challenge though; it would be interesting to teach graduate students in a different way. Do the design thing in a different way, so not necessarily try to teach them new information but try draw from their experiences to teach them from other principals or some of the depth or some of the methods, of design thinking.
Edward: Let me throw a wrench, what about bringing engineers into design thinking classes.

Patience: Awesome, I love it. In fact this is what I thought, this is my goal when I first signed up for this course. But still experimental courses, so when I first signed up I was I hope; or in fact I do have one engineer, I have two engineers. I would love some business people to be in it. I would love some; I had this list going about whom I'd like. But I just it’s my bad that I did not advertise, I should have advertised everywhere. But it would be awesome, I would love it because then we'd get different ... we’d get collaboration going. We’d get different ideals and begin to mesh them into methodology and I think that's really cool. That I think is also the basis of ... geez I’ve thought about several different things about design thinking but that is one of the basics of design thinking, is that collaboration; getting a team together if you think of ideal. How they do their stuff, they just don’t get a designer. They have a ton of different people, using different, actually who have different thought processes, coming together and coming to an agreement on how to go about doing what they’re doing. Or how to get this system organization solved.

Edward: One question was right up, was; if we designers do design thinking teach non-designers how to think like designers. What role then is there for the designer?

Patience: I’ve thought about this because the more I read articles, the more I’m like; oh my gosh we will have no place. But I don’t think it’s really about teaching people how to think like non-designers, I don’t think that’s the goal. Teaching people how to think like designers, that's not the goal or it shouldn’t be the goal of design thinking. I think teaching people their own thought process and how to begin to collaborate with others to get a god product out – that's the goal. It’s not about changing... it’s not about teaching somebody to think like a designer who is not a designer. Why would you do that? For example, would I teach a medical doctor how to think like a designer, why would I want a medical doctor to think a designer?

Edward: Probably not.

Patience: Probably not. My dad was an orthopedic surgeon... that’s what I’m saying and if he got really creative with those bones or if he got like; I don’t really like the way this bone is padding out, hey someone give me scalpel, let me shave this off a little bit, that looks a little more beautiful. The consumer or the person or the client might like this a little better, let’s try it, let’s be a little risky here. That just doesn’t work. So it’s not about thinking like a designer. But it’s about using the method that a designer uses because they’re so successful to get things done. To get products out, to get systems organized and so on and so forth. I think that’s what it’s about.

Edward: There have been some designers who have said that design thinking, the meta-process of design thinking looking through this lens is not necessarily useful for that single little project.

Patience: Do you mean it’s more useful for the system itself?

Edward: Yes, well the larger projects, it’s not useful necessarily for making a logo. But there are others who argue totally the opposite. Where do you come down on this?

Patience: I think I kind of go in-between.

Edward: Fair enough.
Patience: Right, in fact the lecture today was about, there's an article called “We're in this together…” wait we're in this together, it's in the book, it's in the writing design…

Edward: Writing design, yeah I know which one you're talking about. We're better together…

Patience: There's' one called we're better together then there's another one right after it well two chapters after it…

Edward: Social design.

Patience: Yes about social design. They talk about how one in terms of the product production, there are some firms or there are some areas that focus on the product. There are some people that focus on the client and there are some people who do both. I like this idea of doing both. But there are sometimes when we just need the product. If we say; or for example I would say; I need... don't get me wrong. For example if I were to design this bottle, and I need it by Thursday, we have deadline by Thursday. We need to design this and we've got to get it done because we need a new bottle by Thursday and blah, blah... We have to get that out, we can still use the design thinking process to get that out. On the other hand if you have more... if they always had to hire somebody to help them design a bottle they might actually want to think about their system and a way of cranking out new designs every so often so that they don't have to necessarily hire someone when it's crunch time. But setting it into their whole organization, to do that and that is completely different for me, so you can do both. I've fallen between because when a product needs to get done or when a product needs to be designed, it needs to be designed. But also if a system needs to be designed but I think of IDEO and their TSA thing…

Edward: They're still working on it.

Patience: Yes but at least they have thinking you really can't get a whole organization designed fully or perfectly in any amount of time.

Edward: That's a wicked problem.

Patience: It's a wicked problem, so with one problem comes another. So now they're telling people to take off shoes, whatever people are getting mad because they have holes in their socks and stuff like that, it may not seem like much to people but it becomes a wicked problem. Now they have those crazy big machines where you have to stand like this. It's kind of embarrassing for some people. Then I wonder what are they seeing on the other end? What can they see? Are they just seeing my bones or are they seeing... they haven't shown me an image of what they can see. Do you know what they see?

Edward: You're pretty much naked.

Patience: That's awful, so then it can be embarrassing. Then what's the ideal solution to that?

Edward: I don't yet, I'm sure they can come up with …

Patience: Yeah I'm pretty sure. But the wicked problem was 9/11, that was the wicked problem. But within that wicked, I don't think that said; let's think about this whole; they need a solution now. Like with 9/11 it wasn't about let's think for years, no. It was; we need it now, like in
the next two weeks before we get these planes running again we need to have a system in place. Which means they had to have some sort of product design to help them, so I’m talking about software and all that sort of stuff to help them initially start the process and then long term thinking about okay this organization? I’m sure they started the organizational thing from the beginning, but they had to crank out some products and within the changing of the organization then also came the cranking out of more products. I think it’s a back and forth thing, I don’t think I would go to either extreme.

Edward: Thank you very much

Patience: You are welcome.

C.8 - Mark Chidister

Edward: I am just going to ask you a very ... Starting out, just kind of a basic question as far as design thinking to terminology. You've obviously heard about it, read about it. What do you think about when you hear design thinking, what comes to mind?

Mark: I think design thinking is a way of approaching any kind of opportunity that presents itself or challenge or problem that you might be faced with and how to deal with that and I think that design thinking is a very synthetic and cyclical way of approaching a problem. Synthetic in the sense that I think designers drew out on a pretty broad range of material, experiences, things that they're familiar with and that the way they approach a problem like that is sometimes not a linear process in terms of starting with kind of point A where you gather information and then you draw a conclusions and then you start to work into what a solution might be, but many times, designers I think start right, jump right into the middle of it and start thinking about ways of approaching their problem and that jumping in then can many times prompt questions or queries that require more detailed information to inform the process that they're going through. I guess when I think of design thinking, I think of it as a kind of very flexible fluid synthetic way of approaching whatever situation you find yourself and are trying to reach solutions in many times to a very non-linear fashion.

Edward: Okay. Do you think design thinking can be applied beyond designers?

Mark: Absolutely. I think it's a way of thinking that while we use the word "design" to it, we use the word "design" with it, I think it can be applied in many different settings where there are problems to solve or kind of innovations that need to be made and its a way that ... I think many times, it also tends to be more visual in the way that either solutions are generated or the way that ideas are communicated with other individuals and it's a way of marshaling information always with the intent of trying to do something, I think as opposed to more research thinking which the aim is much more about generating new information. Without necessarily sense of that that information is going to be immediately pressed in the service I think when you come out things from the stand point of a designer, there's always this urge to make something, do something, change something to martial that information or that experience into some kind of a result that is going to end up into action.
Edward: Okay. Have you had any personal experience with dealing with having a design thinking being bolder with design thinking addition at research?

Mark: Well, I use it all the time and every day. Also in my graduate work, I was very familiar with more of an empirical method of doing research where I did a very extensive set of survey, data, gathering the data and collecting, summarizing the data, interpreting it for results. There, the aim is very much of the result was trying to understand the phenomena and it was not tied in directly with trying to necessarily change something. But in terms of design thinking, it's my mode of operation no matter whether I'm working on some kind of analytical report or whether I'm designing a piece of furniture or whether I'm thinking about how to construct the syllabus for a course and how a course should run. It is the way I like to think about things.

Edward: Okay. Now, do you believe that the design thinking as methodology, whether it's design methods or whatever you want to call it, designer new ways of knowing, if that's the different terminology. Do you think it's always appropriate for all designer problems or can be appropriate for all designer problems?

Mark: I don't know.

Edward: Well, to give you context on this, there have been some that have said that certain design problems such as making a logo or deciding what type it is to use with a particular situation. It is more of an intuitive process, singular person kind of process, not that design thinking can't be use for singular people but there are times, if you're looking at Doblin's simple theory, if you're looking at that, there are singular basic problems that design thinking is kind of overkill. Do you think that is true or maybe there's more to that?

Mark: I guess, maybe you and I are using the term design thinking a little bit differently in terms of as design thinking overkill. I guess in my way, I am not thinking about a specific methodology or specific set of steps that one goes through and I'm sure that there are others who maybe have pursed it out into a more elaborate construct. I think of design thinking is the intuition is a part of design thinking but it's not intuition based on nothing. It's intuition based on experience and based on your own exposure to the world in which you live and that you're drawing upon those things in a way that sometimes you can explain or rationalize, but sometimes you can't. That intuitive response, I think many times is your own mind's way of synthesizing a great complexity of information down to a gut response based on all that you know. Now, the quality of a decision in terms of what you end up with is I think very much based on the individual's knowledge and experience and the number of times they've done this and certainly, the more knowledge and the more exposure and experience the one has, the more that you got to work with in making the responses whether they'd be very rationalize responses or intuitive responses.

Edward: Okay. You're an educator and you teach creativity among certain things, when it comes to teaching ... I am going to start just with designers. When it came to teaching in designers, how early do you think you really need to get them involved in trying to harness their ability to think about the designer as opposed to like for instance, for this school, teaches a grad school level that take whomever and then they start thinking about methodologies a little bit after you graduated, you have the basics already. There's a common argument whether this should be done teaching this level of creativity with thinking early or like, what is your thought?

Mark: Early.
Edward: How early?

Mark: Probably not prior after somebody is born. I mean, it's ...

Edward: Kind of a Ken Robinson approach?

Mark: Yeah. I think it also is a matter of ... There's motivation involved. If somebody wants to learn and think and work and operate this way, I don't want to see that there's any magic behind waiting until they're in graduate school, certainly if he has somebody walk in the graduate school, what you got is you get somebody with a few more years of knowledge and experience to draw from and maybe they can ... If they haven't been exposed to this way of approaching things before they can probably pick it up or apply it more rapidly, but I don't know that there's any reason to wait.

Edward: One of the things I was thinking about was setting up from a sophomore level class, your course and one of the ideas I had is ... This has been done before. This has talked about by a number of layers but was planned this way, not just in the design discipline. It was like having class with architects and engineers and have some graphic designer, but designers and I know undergraduate level, they don't even know their own fields yet, but designers, advertising, marketing students, business students, engineers, ethnographers or what seem to be ethnographers getting them in together across university and colleges and having a class together. What do you think of the strengths or the possible challenges of such an idea?

Mark: Are you talking about having this group of students collectively work on a problem or a project together?

Edward: Yes. For instance, they perhaps would look at Cy-Ride and say, "Can we make a better wayfinding system for Cy-Ride?"

Mark: I think one of the challenges of teaching an interdisciplinary course is that you have students that not only have different perspectives or basis of knowledge but they also have many times, a different vocabulary in figuring out how to create a situation where they share something. A course like that for somebody who is relatively new like in their sophomore year, I think the project needs to be very, very well defined. The packet of information, the background information needs to be laid out and not ... The focus is going to need to be on the interdisciplinary interaction in how to role play and how to create a structure in which they can converse with one another and reach some kind of a solution or some kind of a response rather than turning them lose on the project and I think if it's fairly open ended, the thing I think is going to implode having taught interdisciplinary design studios before at the senior level that there needs to be a lot of forethought into how. I think first of, what you're trying to accomplish in the course. If what you're trying to accomplish in the course?

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Edward: More of define your goals? I mean, very tight goals?

Mark: Yeah.

Edward: One of the ideas that has been bouncing around was teaching them, not only they all think like designers is the goal, think like designers so you can have this out of the box thinking, evolutionary and revolutionary idea in generalization, but not only that but getting back to your point, appreciating the contributions, all disciplines can make to this when they work together using designer lead techniques. If that is a general goal, do you think that goal is achievable as long as we set a measured project? If so, if we don't know who is going to come to class ahead of time, how do we set that project?

Mark: I am not sure, but there's something I want to come back to design thinking and design methodology that I didn't say before that I think is important.

Edward: Sure.

Mark: As a designer, I think one of the things that we are very attune to is that most of the circumstances we respond to in the world are fairly complex and that no one discipline has the market cornered on how to approach it. I think one of the things personally, as a designer in the landscape architecture program that was impressed upon me as the importance of bringing many different voices to the table to contribute information and expertise that will help to solve the problem or generate new ideas and that there's a strong respect for the process that you go through even though sometimes it's certainly a lot messier than having it all happen in one person's head. The process of bringing a lot of different voices to the table to speak into a project is a critical part of the process. For me, whether I'm teaching or whether I'm working in my own studio or whether I'm over working in administrative position, understanding the collection of people who need to be involved in anything is an important part of design thinking in my view. Again, back to this class situation, I don't know that necessarily understanding the players before they walk in the room is as important for a sophomore level course of this kind as it is to be very clear about what the learning outcomes are that you want and articulating those very clearly to the students who walk in the room so they know what they're about and giving them enough core information that they can getting on that right away and not have to spin their wheels gathering base information to work from.

Edward: You spoke about communication. Every discipline has its own methods and language, terminology that may mean exactly the same thing but it's totally different. In your experience, how do you bridge that gap?

Mark: Multi-Modal communication. Certain things are communicated in more than one way. For me, I think there's a strong power of communicating complex information in visual means that respect the data or the quantitative aspects of that information but also put it on the form that people can get added and understand it. I think about Edward Tufte's work in the visual display of quantitative information as being a masterful example of how to take dense information and put it in a way that people can understand and get their heads around it, but also communicating it verbally in written form and making sure that ... Then, also testing it to see if people are understanding the information as it's being presented and if it's not, do change it. I don't know if that is getting into question answered. Sure it has, whatever.
Edward: Well, it is question when you have different students, how do you get them to communicate earlier? I think Multi-Modal is a perfect and a legitimate methods doing that. There have been some people who suggested that boot camp where people learned to communicate with each other.

Mark: Are you talking about an institution where you got an interdiscipline or came together and you're trying to get them to work together on a project?

Edward: Right.

Mark: I think one of the things, if the different people at the table are actually familiar with the kind of work that the other person at the table does, then it seems like at a very base level, people need to understand what kind of work they do? What are the kind of goals and objectives that each person sets out to try to achieve and the work that they accomplished? What are the things that they are particularly attended to or keen on in the work that they do and just to have almost having each person give a kind of briefing about their job and what they do and how they see themselves as a part of the particular project that is hitting the center of them right then and to gain a level of both understanding but also, I think a level of trust because I think unless you feel like the other person has something genuine to contribute and that they care about the project you're working on, then you're probably going to be less inclined to spin the extra effort it's going to take to communicate and to bridge that gap.

Edward: Speaking of gap, there has been some discussion about hierarchies that you get an architect and a graphic designer and engineer in the room, there's a natural hierarchy or implied hierarchy that occurs. With design thinking, the idea of this is every one is equal and everyone contributes. How do you deal with mitigating hierarchies? I know it's less of a problem with a sophomores

Mark: Well, many times, I think there's a disciplinary bias that is a culture of each of these disciplines and there's the individual person who's personal attitude may align with disciplinary biases or they may recognize when they have a greater self awareness of that and a greater appreciation for the fact that other people in the world can think as well. I think one of the ways that I have found maybe most effective is that when you do group work that you don't try to all sit around the same table and push a pencil together and then it's an alternation between an individual work and group work and that by taking each person of the table and they work individually and they bring their contribution and they're able to explain their contribution. Everybody has the same amount of air time to put their ideas on the table or their perspective that hopefully through that, there will be a gain, a better understanding of what each person can contribute, but also not have one person dominate as if you were sitting around the table and trying to do it all together but there needs to be this back and forth between the individual work and group work.

Edward: This kind of segues into question of introvert versus extrovert, those type of thinking. In your class, you presented a wonderful TED talk that I can't remember the name of the person.

Mark: Susan Cane.

Edward: Cane. Susan Cane talking about not unlike you just said, except let the introvert go and do theirs. Is it really a good solution for what you are saying this also addresses that
problem simultaneously? Not that it's a problem but you address everyone's needs simultaneously.

Mark: I think it addresses the difference in personality spells but I also think that it's hard for ... There has been in a number of situations where groups have had to produce something, design solution, a document or whatever and in variably, when you have a number of people sitting around the table and all of a sudden, they started try to launch into it collectively and do it, it becomes not only a fairly confused process but a very inefficient way of trying to go about it. If you were to give people the opportunity to go back and spend some time to formulate their own thinking, drew up on their own knowledge, do their own work for a little bit and then bring it back together again and then put it together around the table, you actually have a much richer range of possibilities because sometimes if you sit around the table and one person starts talking, it has the potential of shutting down other possible strains of thought that if you send people the way I let them do individual work and bring in to the table again, I think you get a much broader range of possibilities to work from and a greater possibility of hitting up with some interesting ideas. I think it's not individual work or group work, it's in the alternation back and forth between those things that is important. Part of it is I am thinking about something else with this course and I think that other thing that would be useful and I have not done this personally in the courses that I've taught, but I think it would be very helpful and that is to help the students in that situation to understand the difference between active and passive learning and group dynamics. Also to ... Possibly, one person's role in the group is just simply to manage the conversation as a way of making sure that everybody is getting air time in the group that making sure that nobody is dominating. I think that certain amount of understanding of helping people to check their own kind of response to make sure they either aren't sitting there passively and letting everybody else do the talking or that they are dominating the conversation. The importance and the power of this is that everybody has a chance to contribute even though their personality might be more quiet and introverted that if you don't hear any body's voice, then you lose something in the conversation. I think in that course that you have kind of positive, it would be important to give them some understanding about how groups work together effectively or ineffectively to understand that as well.

Edward: One question, can this be a onetime experience or should it carry forward with the other classes that they take? For some disciplines or instructors might consider going out and getting your friends together and collaborating to put their ideas together as cheating. Right? Well in reality, it reflects how the real world looks.

Mark: It's an interesting question. I think one of the people is going to call it academic inertia, because that was the fine line between what role does with the person sitting as the student who is submitting work. How much authorship is there in that work because you are trying to evaluate whether that individual has the ability to do certain things or generate certain ideas and if they are simply pulling together a three of their most talented friends and say, " I need some help to generate some ideas," and somebody who has no stake in it, spins out five great ideas and the student runs with one of them, then you question at least what's the authorship with that piece. I think the burden is maybe on the faculty to make it clear about the work that's being done whether it's the individual work or whether it's be done in the group context because it was to open up two different kinds of issues there. Not a real great answer but that's a challenging situation.

Edward: Creativity is pretty much the center of one of your courses. It's really as far as the idea of building on creativity and obviously design thinking is to harness that. Your course in
many ways is reflective of the kinds of the ideas of many of the others that I have interviewed. It is very open in context. How do you keep them on-track?

Mark: Part of what I did in the iteration of the class that you're familiar with is to ask each student to develop a work plan at the beginning of each five week period of time within the semester, so they at least have something to focus their energies to get off the starting block. When I first taught this course, I didn't do that and I found that students wondered a little bit too long before they got out their things and this gave them a little bit of a focus and then to be able to meet with them at the end of that five week period to talk about the work they've done and make suggestions on how to proceed during the next five weeks based on what they've done. I think my basic premises that there has to be an internal motivation to do work that's interesting if you are motivated to it. My hope is that by giving each student the freedom to identify the particular topics, individuals, projects that resonate with them that that will be an internal motivator to get them to move forward. I am going to add a couple of students who just... they don't want to engage in this type of course and they ended up not getting a tremendous amount out of it, although I think that's been a small percentage, I guess my hope is that more people have come out with something in hand and with some ideas that they can use in the future than have not.

Edward: You think the three sections versus having one giant project you do the entire semester, in your experience, which is stronger?

Mark: I think it would be unfair for me to have them go an entire semester and only get evaluated once at the end of the semester because it puts them off a lot of risk. It puts them in the great deal of risk because they don't really know what the rules of the game are and I also think that having only two points of grading in the course of the semester also creates some difficulties and if at the beginning, they don't understand it, if that is at the midterm, they don't have much time to recover. By doing it in three different modules, it gives everybody enough of a safety net that after five weeks, I can figure out, are you getting it? Are you moving along? If you aren't, then we can make some corrections early enough in the semester that they still got two thirds of the semester in front of them to move in that direction, it is going to be helpful to them. The other part is that have them evaluate themselves because at the end of the day, 24 months from now, nobody is going to be handing them a grade. They will get evaluations in their work place and stuff like that but they have to start to have a sense within themselves on how their work is progressing whether where they need to redirect their efforts because I think it's important for them to start playing a role in evaluating your own work as the way that they think about.

Edward: Yes.

Mark: The course that you shout through with me, The 310 Course, because my primary audience there are students in the visual arts, the [design thinking] method would be very different that are probably sitting in a room where the primary audience would be a group of designers.

Edward: Sure.

Mark: As I was going through design school, I was reading a book called "The Universal Traveler." I don't know if you've ever come across that book, but it had a very linear ... Well, actually they had a series of steps that start problem definition, problem adaption,
analysis, synthesis, start to generate a series of ideas and then there would be these feedback loops that certain points and time and there was this very kind of elaborate process and while all of those steps happened in what I think of is design thinking, each problem and each group of people that you put together for that set of circumstances are going to suggest a slightly different unique approach to that based on who's sitting in the room and what they know and the nature of the project itself and the kind of time line, circumstances, context, all of those things. Sometimes, you really do need to start with a whole bunch of really serious information collection before you can really get off of the starting blocks, but sometimes it's more productive to jump right in at the middle of things and start drawing and let that be the thing that generates a series of questions that then guides with the information you collect. In landscape architecture, I went through a number of years where people try to follow this in a very linear fashion. We run up over and over again with what we termed as analysis paralysis. We get all this information with the blind thought that the analysis was going to lead to physical form and never did. I mean, it would get you about 15% of the way there in terms of determining what things were really, what the parameters were? But within even with respecting the parameters of the physical circumstances of a natural systems and things like that, there's still an off a lot of range to move in in terms of generating ideas that would be all sensitive to the environmental factors and stuff. Analysis is important but it's not necessarily going to be the thing that leads to physical form and forms it. I think each situation you find yourself in depending on again the nature of who's in the room and what the project is in the middle of the table that the way you design the process is going to vary. When you're dealing with the designer physical environments, there are certain pieces of information. There are certain phenomena that operate in the world that you have to respect or the design is whatever solution come up with is going to fail in some way or another. There are hard pieces of information that designers need to respond to in different kind of circumstances. Again, you need to know all of those but then also understand that that's only part of what is going to lead to some kind of an end design solution.

Edward: Thank you very much.

Mark: Sure. I hope it's somewhat useful to you when you get everything done.
BIBLIOGRAPHY


