Design and Critical Thinking:
A Process Model to Support Critical, Creative and Empathic Learning in Studio-based Design Education

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Abstract

The work that will be done by designers in the future will not be what it is today. In order to respond to new opportunities for creation and innovation, our user-centered methods for learning, creating, and working must be adapted and revitalized. The changes that are taking place in design and in society will have an impact not only on the practice of design but on design education as well. In light of the ever-changing global economy, it is important for students, as future designers and global citizens, to increase and activate their capacity for critical thinking, creativity and empathy.

Interior designers use several skills and ways of thinking in order to develop successful projects for a wide variety of social, physical and functional contexts. In order to understand and to respond to the diverse needs of project stakeholders—clients, end users, consultants, and others—a designer must be able to analyze, synthesize and evaluate a vast amount of complex information. This practice depends on one’s ability to think critically, creatively and empathically. To guide and organize the focus of their work, designers use a multi-phase process. This design process acts iterative cycle, which often requires a designer to toggle between phases in order to fully understand and respond to a problem.

At its core, the design process is one that is fueled by creative problems solving, and is universal to a broad range of design disciplines. In design education, studio-based courses use the design process to support student learning through the creation of concepts and problem solutions for projects in response to specific objectives, criteria
and constraints. As such, it provides the organizational structure for teaching and learning.

This thesis explores the structures and functions of three categories of thought and communication: critical thinking, creativity and empathy. The interrelation and interdependence of these modes form the central focus of this investigation. Building upon the knowledge gained through a review of current literature on critical thinking, creativity and empathy, primary research in the form of classroom observations, a survey and in-depth interviews with design educators. In response to insights and understanding that emerged through this research, a process model for the integration of the cognitive and affective practices into a studio-based curriculum was developed.

The process model has implications for the current and future development of the interior design education. The framework links the essential components of critical thinking to the phases of the interior design process. As a result, a new dimension of the discipline begins to emerge. In the context of the proposed process model, several methods that can be used to support critical, creative and empathic learning by activating cognitive skills and affective mindsets are identified. These learning methods and proposed exercises are supported by examples that show outcomes of student work and professional practice.
Dedication

This thesis is dedicated to my family:

You have always been my greatest teachers.
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Chapter 1: Introduction

1.1 Background and Purpose of Research

The work that will be done by designers in the future will not be what it is today. As design strives to respond to new opportunities for creation and innovation, we must adapt our user-centered methods for learning, creating, and working. Critical inquiry, creative thought and collaboration are required to analyze and solve the wicked problems of our society. As interior designers we must consider, evaluate and respond to the needs of users across a diverse landscape of environments and experiences. In order to fully understand these complex scenarios we must think both critically and creatively. These two modes of processing information are not mutually exclusive. The processes of critical thinking often provide key insights for the generation of creative work.

The discipline of design is not a solitary practice—it is a distinctly human enterprise. Therefore how we interact with and learn from each other is of critical importance. The process through which this human interaction occurs depends upon our capacity for empathy. The awareness and concern for another’s condition, in addition to one’s own has profound impact on several aspects of the design process. As such, consideration must be paid to how empathy is taught in relationship to critical thinking and creativity in studio-based design education.

At the present moment, the role of critical thinking and empathy within the process of studio courses is a relatively unexplored aspect of design education. This thesis explores the structures and functions of three categories of thought and
communication: critical thinking, creativity and empathy. The interrelation and
interdependence of these modes form the central focus of this investigation. The insights
formed through this inquiry provide a framework for the integration of these cognitive
and affective practices into a studio-based curriculum.

The framework, which is presented as part of a proposed process model, has
implications for the current and future development of the discipline of interior design.
Although this investigation, in the context of this study, is being done with a focus on the
realm of interior design, the resulting recommendation for a new framework will be built
upon the foundation of a universal design process. It is the intent of this proposed model
to provide a link to an existing model of the design process in order to facilitate its
adaptation and use by a diverse range of studio-based design disciplines, in both the
academic and professional environments.

1.2 Thesis Structure and Research Methodology

The objective of this study is to clarify the relationship between critical thinking,
creativity, empathy and the design process in the context of studio-based courses at the
undergraduate level. The data and insights gained through primary and secondary
research serve as the basis for the development of a new model for teaching design
studio courses. The proposed model builds upon the synergies that exist between critical
thinking, creativity and empathy.

This study begins with an exploration and discussion of current literature on the
subjects of critical thinking, creativity and empathy in Chapters 2, 3 and 4. The research
that is discussed in these chapters represents a broad overview of the primary structures,
processes and functions of each of these three types of thinking. The information
presented has been developed and formatted to build a framework by which to identify the similarities and differences that exist between these conceptual constructs.

Chapter 5 introduces the first phases of the primary research that were conducted as part of this study. This investigation builds upon the relationships that were identified through secondary research. A series of classroom observations were done to gather qualitative data about student experiences in design studio courses. This information was supplemented by data collected from an online questionnaire that was given to a group of design educators. The purpose of the survey was to gather the educators’ thoughts and perceptions regarding the role of a selected group of cognitive strategies and affective traits in the context of studio-based courses.

Chapter 6 discusses the synthesis of the information gathered from current literature along with the findings that emerged as a result of the analysis of the data collected from the first phase of primary research. The primary outcome of this work is a process model for teaching interior design studio courses. This phase-based model identifies potential design activities and objectives for a prototypical design project along with the cognitive skills and affective mindsets that are necessary to support the kind of work typically done during the specific design phases. It also lists the learning methods to demonstrate how specific exercises can be used to activate the thinking strategies and attitudes while supporting the objectives associated with design activities.

This model was then shared and discussed with the same group of design educators that participated in the online survey. In-depth interviews were conducted to collect feedback but also provided additional information about the factors that influence the experiences of teaching and learning in the context of design studio courses. These insights are discussed in greater detail in Chapter 7.
In response to the information that was collected through the interviews the process model was further refined and expanded to include explanation of learning methods that can be used to support the practice of important thinking skills and affective traits. Chapter 8 identifies several methods that can be used to support critical, creative and empathic learning by activating cognitive skills and affective mindsets. The proposed exercises are supported by examples that show outcomes of student work and professional practice.

In Chapter 9 the salient insights and discoveries that emerged as a result of the study are summarized. Implications for the application of the proposed process model are discussed in terms of future work. Areas for additional exploration are identified including the possibilities for the further development of this model as a potential tool for curriculum development.

1.3 List of Key Terms

In an effort to make the work discussed in this study accessible to readers from a variety of disciplinary backgrounds, definitions for a selected group of terms is provided in this section. Some of these terms are commonly used to talk about the nature of design disciplines. While these words are used frequently, their meaning can be somewhat ambiguous. The explanations provided clarify the meaning of these terms in the context of this study. Detailed definitions associated with the larger constructs of critical thinking, creativity and empathy are presented in the corresponding chapters throughout this thesis.

**Affective mindset:** “a constellation of attitudes, intellectual virtues, and habits of mind” (Facione, 1992).
**Cognitive skills:** individual thinking skills that can be used independently or in concert to support a variety of cognitive strategies and objectives (Paul, 1994).

**Cognitive strategies:** thinking processes for using, examining and evaluating information in support of a cognitive goal or objective (Paul, 1994)

**Convergent thinking:** a method to find the most appropriate solution or answer to a clearly defined problem or question (Cropley, 2006).

**Creativity:** “Imaginative activity fashioned so as to produce outcomes that are both original and of value” (Robinson, 1999).

**Critical thinking:** “the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action” (National Council for Excellence in Critical Thinking, 1987).

**Design activities:** tasks that support project goals and objectives.

**Design studio courses:** Classes within a curriculum that are project-based. Students create concepts and/or problem solutions in response to specific objectives, criteria and constraints.

**Divergent thinking:** a process that involves producing many ideas or alternative answers from available information (Cropley, 2006).

**Exercises:** assignments or tasks that are used to teach and/or demonstrate a design method.

**High-order thinking:** Thinking that uses the complex cognitive processes of evaluation, analysis and synthesis to support critical thinking and problem solving (Bloom, 1956).
**Human-centered design, user-centered design:** a process in which the needs, wants, emotions aspirations and limitations of people as the users of a product, service, environment or experience are considered throughout the design process.

**Method:** Specific tool or technique that is used to support the design activities associated with a larger set of objectives.

**User:** a person who interacts with a product, service, environment or experience in an effort to accomplish a task or to support a goal.

**Stakeholder:** a person who affects or can be affected by decisions made throughout the design process. For example: a client, user, consultant, designer, builder, repair person, etc.

**Wicked Problem:** “a social or cultural problem that is difficult or impossible to solve for as many as four reasons: incomplete or contradictory knowledge, the number of people and opinions involved, the large economic burden, and the interconnected nature of these problems with other problems” (Kolko, 2012).

### 1.4 Introduction to The Design Process

It can be argued that all design disciplines depend upon a process of creative decision-making and problem solving, one that is “a mix of intuitive and deliberate actions” (Lupton, 2011). In *the Universal Traveler*, Koberg and Bagnall (2003) describe the creative problem-solving process as common to all disciplines. The statement, “problem-solving is intertwined with living,” suggests that the process is something that we all use on an everyday basis. In the context of design, Koerg and Bagnall describe creative problem solving as a sequence of stages that lead to a destination.
This is not to suggest that the stages of this exploratory process represent a linear path. On the contrary, the design process is an iterative cycle, which often requires a designer to toggle between stages in order to fully understand and respond to a problem. Koberg and Bagnall discuss this back and forth action as “looping back to check on yourself; where progress only occurs by looking backward before moving forward.” In *Graphic Design Thinking; Beyond Brainstorming* (Lupton, 2011), a similar case for “starting over, going backward and making mistakes” is made. Here a designer’s success is presented as the direct result of one’s ability “to embrace this back-and-forth, knowing that the first idea is rarely the last and that the problem itself can change as a project evolves.”

In its most basic form, the design process can be broken down into two stages, Analysis and Synthesis (Koberg and Bagnall, 2003) as shown in Figure1.1.

![Figure 1.1 Koberg and Bagnall's Basic Creative Process](image)

In this binary model, during the Analysis stage a designer is “breaking the whole into parts for closer examination” while during Synthesis, “resolving the examined parts to form a new whole” is the designer’s primary objective. In order to draw a connection to how the design process will be discussed later in this study, the activities associated with
the Analysis phase depend upon divergent thinking, an expansion of the problem space, while the activities that take place during the Synthesis phase require convergent thinking, a narrowing of the problem that supports a final solution. A visualization of this is model is shown in Figure 1.2.

![Figure 1.2 Koberg and Bagnall's Process Expressing Divergent and Convergent thinking](image)

In Koberg and Bagnall’s extended process models, the two primary phases can be subdivided into additional stages that are determined in part by the type of problem that is being contemplated. In general, a third stage is required to act as a link between Analysis and Synthesis. As shown in Figure 1.3, the Concept stage overlaps and connects the Analysis and Synthesis.
The addition of the Concept stage forms a bridge between these two modes and represents the point at which the learning gained through analysis is transformed in order to support the activities of synthesis.

Individual designers and design disciplines build upon this basic tripartite model to further adapt the process to suit the requirements of specific projects. In the discipline of interior design the design process is broken down into phases that help to organize the flow of the work to be done. (Brokamp, 1993) For example, the retail design consultancy, Chute Gerdeman, breaks their design process into eight phases, as shown in Figure 1.4.
Each phase is defined by its primary objective: Strategic Assessment, Image & Concept Development, Concept Refinement, Design Development, Documentation, Resource Coordination, Implementation and Supplemental Services. Each phase is then further defined through listing the design activities and deliverables that take place during a given phase to support its primary objective. The roles of various stakeholders and design disciplines, such as visual communications and merchandising are also incorporated into this process model through additional task classifications and descriptions. In this configuration the process model is a detailed roadmap for how to approach a retail design project. The comprehensive nature of this model also allows it to be used as a menu of services for both the design team and the client for whom the work is being done.
The two models that have been discussed in this section represent two ends of a spectrum: the general and the specific. The processes that are used to guide the undergraduate studio courses in design can fall at any point on this spectrum depending on both the professor and the project type. At its core, the work that is presented in this thesis was built upon the general three-part design process described by Koberg and Bagnall. The process model that was developed as part of this study became more complex as the nature of the investigation became more detailed. This education-based model is introduced in Chapter 2 and is expanded upon and described in greater detail in Chapters 6 and 8.
Chapter 2: Critical Thinking and Design

The following chapter explores and defines the concept of critical thinking and its relationship to the teaching and practice of interior design. First, an overview of current definitions of critical thinking will be discussed along with the underlying structures and components that support the definitions. These structures will then be compared to those proposed by Bloom’s *Taxonomy of Educational Objectives* (Bloom, 1956). Finally, the relationship between critical thinking and the practice of interior design will be discussed.

2.1 Definitions of Critical Thinking

Several variations and misconceptions about the meaning and purpose of critical thinking exist across academic and professional disciplines. Therefore, it is necessary to provide working definitions for the concept of critical thinking that is the basis of this study. Dictionary.com offers a concise explanation of critical thinking as: “disciplined thinking that is clear, rational, open-minded, and informed by evidence.” In 1987, the National Council for Excellence in Critical Thinking proposed the following definition: “the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action. In its exemplary form, it is based on universal intellectual values that transcend subject matter divisions: clarity, accuracy,
precision, consistency, relevance, sound evidence, good reasons, depth, breadth, and fairness.” This explanation reflects an evolution of the term that has its origins in the educational philosophies of Socrates and Descartes as well as in the theories of John Dewey and Benjamin Bloom (Paul, 1997). ‘Critical thinking’ is often used in conjunction with or as a synonym for the term, “high order thinking.” This phrase has emerged in response to the work of Benjamin Bloom and his colleagues whose *Taxonomies of Educational Objectives*, established a hierarchy of thinking skills that support complex cognitive processing. In this hierarchy, the lower levels provide the foundation for building and entering into higher and more complex levels of learning (Bloom, 1956).

![Bloom's Taxonomy Of Educational Objectives](image)

**Figure 2.1 Model of Bloom’s Taxonomy Of Educational Objectives (1956)**

### 2.2 Critical Thinking and Higher Education

Higher education in the Western world was built upon the classical notions of liberal education that support the development of a person’s mind to be free “from the
bondage of habit and custom” (Nussbaum, 1997). The degree to which a student can become a freethinker depends greatly on his or her ability to think critically. Critical and high order thinking depend on disciplined questioning, reasoning, examination and reflection (Facione, 2007; Paul, 1997). These skills allow students to freely use the knowledge they have gained. Because these thinking strategies are not discipline specific they enable students to confront the complex situations that are often found outside of the classroom. In Cultivating Humanity, Martha Nussbaum speaks to this larger goal of liberal education as the “cultivation of the whole being for the functions of citizenship and life generally” (1997).

2.3 Cognitive Dimensions of Critical Thinking

The broad and holistic definition provided by the National Council for Excellence in Critical Thinking implies that critical thinking not only is a process of questioning assumptions and making decisions according to the evaluation of evidence, but one that requires a degree of generative processing by the thinker. To further clarify the structures and systems that are at its core, Dr. Richard Paul has written extensively on the subject of critical thinking (Paul, 1994, 1997, 2005). Through his work he has developed an expansive collection of insights about the cognitive and affective structures that support critical thought. To support research in critical pedagogy within arts education, Dr. Candace Stout of The Ohio State University has examined Paul’s writing extensively. Through the course of her analysis she has synthesized key themes into a list of thinking skills and traits of mind that are fundamental to the critical thinking process, which are outlined below in Figure 2.2.
• Employing the skills of meticulous observation, looking beyond the surface into the richness of details
• Drawing valid inferences and forming logical interpretations
• Using the vocabulary of the discipline appropriately and precisely
• Transferring learning from one situation to another
• Comparing and contrasting
• Discovering relationships
• Making informed decisions and reasonable choices
• Supporting opinions and waging arguments with credible facts, information, examples, explanation, descriptive details, illustrations, quotations and incidents
• Distinguishing between substantiated and unsubstantiated opinion
• Separating relevant from irrelevant information
• Weighing meanings and evaluating the credibility of sources
• Analyzing information and ideas and understanding their interrelatedness
• Synthesizing ideas to form a new concept
• Recognizing the plausibility of more than one correct answer or solution to a problem
• Identifying fundamental problems and recognizing major issues
• Perceiving the complexity of an issue or concept
• Generating solutions to problems
• Withholding judgment or evaluation until the establishment of valid and adequate evidence
• Making evaluations based on fairly established standards
• Predicting
• Revising and rethinking

Figure 2.2 Cognitive Strategies That Foster Critical Thinking as Identified by Dr. Candace Stout Through the Study of the Work of Dr. Richard Paul (1994, 1997, 2003)

These thinking strategies reflect a fundamental set of intellectual standards, which include Clarity, Relevance, Logicalness, Accuracy, Depth, Significance, Precision, Breadth and Fairness (Paul, 2002). Successful high-order thinking in a particular discipline may require additional intellectual criteria. For example, to address issues of contemporary culture in the practice of interior design additional standards may need to be considered such as: feasibility, novelty, usefulness, and sensitivity.
2.4 Affective Dimensions of Critical Thinking

Like many thought processes, critical thinking is not limited to the cognitive domain. How humans process and interpret information is not a function of the intellect alone. The information and knowledge that is gathered, evaluated and interpreted is influenced by other factors such as emotion, attitude, and motivation. The *Taxonomy of Educational Objectives* proposes that there are three domains of educational activities: Cognitive, Affective and Psychomotor (Bloom, 1956). While cognition is responsible for the majority of critical thinking it must be used in conjunction in the appropriate affective dimension (Facione, 1992, 2007; Paul, 1994, 2003). In the ongoing exploration to better understand and define critical thinking, increased attention is being focused on the importance of thinking dispositions.
The *California Critical Thinking Dispositions Inventory* defines a thinking disposition as “a constellation of attitudes, intellectual virtues, and habits of mind” (Facione, 1992). According to Facione, the degree of one’s success in employing the cognitive skills associated with critical thinking is largely dependent on one’s attitude or motivation. A person may possess strong cognitive skills, yet, if he or she does not have the motivation or a mindset suitable for the situation, the outcomes of a cognitive examination alone will yield little if any meaningful result. The same can be said of a person that possesses the motivation to think in a fair-minded and open way, but who has not yet acquired the cognitive skills to direct their thinking (Facione, 2007).

There is some variation among experts as to the definition and relative importance of critical thinking dispositions. Facione posits that a “disposition to think critically” is of primary importance to successful high-order thinking. This somewhat redundantly named disposition is further defined as an amalgam of the following traits: “Inquisitiveness, Open-mindedness, Systematicity, Analyticity, Truth-seeking, C[ritical] T[hinking] Self-confidence and Maturity” (1995).

Richard Paul offers a different perspective in arguing that fair-mindedness is the single, over-arching disposition that is necessary to engage the cognitive dimension of the critical thinking process (Paul, 1994). Additional dispositions, or categories of traits, can be used in conjunction with cognitive thinking strategies. These types of traits may or may not be discipline specific. Independent of being classified into specific dispositions, Paul identifies several traits, or dimensions of character that are essential to critical thinking. The list of traits shown in Figure 2.3 is the result of the analysis of Paul’s work conducted by Dr. Candace Stout.
• Understanding the importance of metacognition (purposely thinking about thinking in order to monitor the quality of reasoning)
• Being curious, possessing the spirit of wonder
• Having the habit of raising a broad range of significant questions at appropriate times
• Thinking empathically, having the willingness and the ability to enter sympathetically into the thoughts and feelings of others
• Thinking in terms of the relative, accepting contexts of all kinds as determining factors for right/wrong, appropriate/inappropriate, adequate/inadequate
• Possessing the intellectual courage to explore and question the underlying beliefs and basic assumptions guiding personal thinking and actions as well as those of others
• Having the willingness to seek out, examine, and value understanding and insights to be gained through consideration of multiple points of view
• Dealing rationally and fair-mindedly with conflicting points of view
• Having confidence in reason and understanding that reasoning can solve problems and lead to understanding
• Persevering until problems are solved or resolutions or compromises are found
• Having the courage to think independently
• Thinking hypothetically, supposing, assuming, asking “What if…”
• Tolerating uncertainty, ambiguity, and a lack of resolution when no single answer or solution can be found
• Thinking metaphorically, seeing and understanding one thing in terms of another
• Being aware of the relationship between thoughts and feelings
• Valuing personal experience
• Thinking creatively, enjoying and valuing imagination

Figure 2.4 Traits and Mindsets that Foster Critical Thinking as Identified by Dr. Candace Stout Through the Study of the Work of Dr. Richard Paul (1994, 1997, 2003)
2.5 Critical Thinking and the Design Process

At the core of any design process is a loop of generation and evaluation. Ideas and concepts are created and their purpose, meaning, function and form are evaluated which leads to another generative phase of refinements or additional concept creation that is again judged by a set of appropriate heuristics. This iterative sequence can be used at any point in a design process, and it typically occurs throughout the lifecycle of a project's journey to fruition. This cycle of creation and evaluation can be seen as the external manifestation of the designers’ systematic practice of critical thinking during the design process. High-order thinking requires the mind to simultaneously produce and assess, generate and judge the thoughts and connections it fabricates (Paul, 2006). To that end,
critical thinking, like the discipline of design, requires both imagination and intellectual rigor.

To begin the examination of the relationship between critical thinking and the interior design process and to identify which aspects of critical thinking are generative and which are evaluative, the cognitive strategies and affective traits outlined in figures 2.1 and 2.2 were sorted into two corresponding groups. The categorization was based upon how these skills and traits support the generative and evaluative activities of the design process. It should be noted that some skills and traits support both generative and evaluative processes. For the purpose of this study, the primary role of each skill and trait within the design process served as the basis for its classification as either generative or evaluative. The results of this categorization are shown in Figures 2.6 and 2.7. A visualization of the interaction between these skills and traits is shown in Figure 2.8.
Cognitive Strategies that Support Generative Design Activities

- Transferring learning from one situation to another
- Comparing and contrasting
- Discovering relationships
- Supporting opinions and waging arguments with credible facts, information, examples, explanation, descriptive details, illustrations, quotations and incidents
- Drawing valid inferences and forming logical interpretations
- Predicting
- Synthesizing ideas to form a new concept
- Generating solutions to problems
- Revising and rethinking

Cognitive Strategies that Support Evaluative Design Activities

- Employing the skills of meticulous observation, looking beyond the surface into the richness of details
- Perceiving the complexity of an issue or concept
- Analyzing information and ideas and understanding their interrelatedness
- Distinguishing between substantiated and unsubstantiated opinion
- Separating relevant from irrelevant information
- Weighing meanings and evaluating the credibility of sources
- Withholding judgment or evaluation until the establishment of valid and adequate evidence
- Making evaluations based on fairly established standards
- Making informed decisions and reasonable choices
- Using the vocabulary of the discipline appropriately and precisely
- Identifying fundamental problems and recognizing major issues
- Recognizing the plausibility of more than one correct answer or solution to a problem

Figure 2.6 Generative and Evaluative Cognitive Strategies
Affective Traits and Mindsets that Support **Generative** Design Activities

- Thinking hypothetically, supposing, assuming, asking “What if…”
- Possessing the intellectual courage to explore and question the underlying beliefs and basic assumptions guiding personal thinking and actions as well as those of others
- Having the willingness to seek out, examine, and value understanding and insights to be gained through consideration of multiple points of view
- Having the courage to think independently
- Thinking metaphorically, seeing and understanding one thing in terms of another
- Thinking creatively, enjoying and valuing imagination

Affective Traits and Mindsets that Support **Evaluative** Design Activities

- Understanding the importance of metacognition (purposely thinking about thinking in order to monitor the quality of reasoning)
- Having the habit of raising a broad range of significant questions at appropriate times
- Dealing rationally and fair-mindedly with conflicting points of view
- Being curious, possessing the spirit of wonder
- Thinking empathically, having the willingness and the ability to enter sympathetically into the thoughts and feelings of others
- Being aware of the relationship between thoughts and feelings
- Valuing personal experience
- Tolerating uncertainty, ambiguity, and a lack of resolution when no single answer or solution can be found
- Thinking in terms of the relative, accepting contexts of all kinds as determining factors for right/wrong, appropriate/inappropriate, adequate/inadequate
- Having confidence in reason and understanding that reasoning can solve problems and lead to understanding
- Persevering until problems are solved or resolutions or compromises are found

Figure 2.7 Generative and Evaluative Affective Traits
While there is no universal process model for interior design, most share common characteristics, including the iterative cycle of generation and evaluation. The interior design process model shown in Figure 2.9 was therefore used as the preliminary underlying structure for this study. This model reflects phases that are often used in the practice of interior design for retail stores, which is the type of project that was taught in the senior level studios that were observed as part of this study. This observation is discussed in greater detail in Chapter 5.
The phases identified in this model are described as Generative, Evaluative or Balanced/Hybrid to reflect the primary mode of inquiry that is used at that specific point in the process. The process model moves sequentially through time from left to right, with an underlying cyclical path between and within the phases. In addition, the process phases have been further described through the inclusion of typical activities to assist in clarifying the necessary thinking modes.

The parity between critical thinking and the interior design process extends beyond the generative-evaluative loop. The cognitive strategies presented in Figure 2.2 have a strong connection to the methods used throughout the Interior Design Process. In order to further clarify the relationship between these strategies and the design process, a second system for categorization was used to draw connections between critical thinking and the interior design process. This sorting method groups thinking skills into categories of actions that are employed in the interior design process shown in Figure 2.9. These actions, which relate to the sequential order of steps in the design process,
Gathering Information (Evaluative)
- Employing the skills of meticulous observation, looking beyond the surface into the richness of details
- Perceiving the complexity of an issue or concept

Making Connections (Generative)
- Transferring learning from one situation to another
- Comparing and contrasting
- Discovering relationships
- Analyzing information and ideas and understanding their interrelatedness

Evaluation (Evaluative)
- Distinguishing between substantiated and unsubstantiated opinion
- Separating relevant from irrelevant information
- Weighing meanings and evaluating the credibility of sources
- Withholding judgment or evaluation until the establishment of valid and adequate evidence
- Making evaluations based on fairly established standards

Interpretation (Evaluative)
- Making informed decisions and reasonable choices
- Supporting opinions and waging arguments with credible facts, information, examples, explanation, descriptive details, illustrations, quotations and incidents
- Drawing valid inferences and forming logical interpretations
- Using the vocabulary of the discipline appropriately and precisely

Predicting Outcomes (Hybrid)
- Identifying fundamental problems and recognizing major issues
- Predicting cause and effect relationships
- Projecting and Imagining consequences

Forming Concepts (Generative)
- Synthesizing ideas to form a new concept
- Recognizing the plausibility of more than one correct answer or solution to a problem
- Generating solutions to problems
- Revising and rethinking

As part of this research a similar categorization was done for the affect traits and mindsets that were identified in Figure 2.3. For this study, the categories were defined, in no particular order, as follows: ‘Self-reflection,’ ‘Future-mindedness,’ ‘Curiosity,’
‘Empathy,’ ‘Open-mindedness,’ ‘Creativity’ and ‘Tenacity.’ Several of these categories overlap with those identified by both Paul and Facione such as inquisitiveness (curiosity) and open-mindedness, while others traits have been defined differently to allow for a closer association to the discipline of interior design. The resulting classification of these traits is shown below in Figure 2.11.

**Self-Reflection (Evaluative)**
- Understanding the importance of metacognition (purposely thinking about thinking in order to monitor the quality of reasoning)

**Future-minded (Evaluative and Generative)**
- Having the habit of raising a broad range of significant questions at appropriate times
- Thinking hypothetically, supposing, assuming, asking “What if…”
- Dealing rationally and fair-mindedly with conflicting points of view

**Curiosity/Inquisitiveness (Generative)**
- Being curious, possessing the spirit of wonder
- Possessing the intellectual courage to explore and question the underlying beliefs and basic assumptions guiding personal thinking and actions as well as those of others
- Having the willingness to seek out, examine, and value understanding and insights to be gained through consideration of multiple points of view

**Empathy (Evaluative)**
- Thinking empathically, having the willingness and the ability to enter sympathetically into the thoughts and feelings of others
- Being aware of the relationship between thoughts and feelings
- Valuing personal experience

**Open-mindedness (Evaluative)**
- Tolerating uncertainty, ambiguity, and a lack of resolution when no single answer or solution can be found
- Thinking in terms of the relative, accepting contexts of all kinds as determining factors for right/wrong, appropriate/inappropriate, adequate/inadequate

**Creativity (Generative)**
- Having the courage to think independently
- Thinking metaphorically, seeing and understanding one thing in terms of another
- Thinking creatively, enjoying and valuing imagination

**Tenacity (Evaluative)**
- Having confidence in reason and understanding that reasoning can solve problems and lead to understanding
- Persevering until problems are solved or resolutions or compromises are found

Figure 2.11 Traits Grouped into Interior Design Related Categories
Once this series of classifications was completed, the individual strategies and traits were mapped onto each phase in the hypothetical design process. Certain cognitive strategies appeared frequently and were used in several phases while others appeared to a lesser degree. The same was true of affective traits. The individual strategies and traits were then associated with their categories and counted in relation to each phase of the process. The resulting tally generated a picture of the frequency with which categories of Cognitive strategies and traits were used during a given phase in the design process. The model shown in Figure 2.12 is a visual representation of this assessment.

![Figure 2.12 Critical Thinking Strategies and Traits Mapped to the Interior Design Process.](image)

The most frequently used categories of cognitive strategies or traits are shown at the top of their respective lists, in a large type size, with other categories presented in descending
order. For the sake of visual clarity the typical activities shown in the earlier process model (Figure 2.9) have been omitted.

By linking the essential components of critical thinking to the phases of the interior design process a new dimension of the discipline begins to emerge. It is this underlying current of thought that gives meaning and purpose to the creative work of the designer. The prominence of evaluative strategies and traits across the span of the design process reveals that the discipline does not depend on imagination alone. Without the structure offered by the strategies and traits of critical thinking, a designer’s ingenuity has no meaningful content and purposeful trajectory. To be successful, a designer must be adept at gathering information, making connections, interpreting and evaluating information and ideas while simultaneously forming concepts and predicting outcomes. The correlations between these actions are complex and mutable. To a designer the connections between the various intellectual modalities must appear nebulous at best. It is the goal of this study to illuminate the connections between the various modalities of thought used in the design processes in an effort to better prepare students to work as interior designers in the future.

2.6 Summary

Critical thinking has long been a point of focus for higher education, regardless of discipline. While much is implied by the term, which is known by several definitions, an examination of the literature reveals that critical thinking has both a cognitive and an affective dimension. High-order thinking depends on disciplined and well-defined cognitive skills that are supported by specific intellectual dispositions. Together these components promote intellectual curiosity and fair-mindedness. Similarities can be drawn between the processes of critical thinking and design on several levels, most
notably through the cycle of generation and evaluation. Through a process by which the
cognitive strategies and traits of critical thinking were mapped to a hypothetical (typical)
interior design process ideas for how critical thinking might influence and support the
discipline begin to emerge. These insights may provide opportunities for the improved
integration of critical thinking strategies into the studio-based coursework of interior
design classes.
Chapter 3: Creativity

In this chapter the meaning and importance of creativity is discussed with a particular focus on its relationship to education and design. Design related disciplines are often described as ‘creative.’ Depending on the context in which the word is used it can be perceived as positive or negative. Sometimes the term is used to draw a contrast between the work of the arts and the sciences. Creativity has long been associated with a lack of rigor or discipline. This is due in part to the fact that the creative process is not one that can be painstakingly repeated according to scientific methodology in order to produce consistent results. On balance, in recent years there has been a surge in interest and research on the topic of creativity. While creativity remains an enigmatic force in our culture, there is a growing consensus that its importance to many facets of society cannot be underestimated.

3.1 Contemporary Understanding of Creativity

Creativity in the modern day is no longer viewed as a disposition that only artists possess (Lehrer, 2012; Sawyer, 2011; Sternberg, 2000). Quite the contrary—several researchers have reason to believe that creativity is nearly as central to human life as our need for social interaction. There is much yet to be learned about the subject. A review of contemporary definitions will help to clarify its role in relationship to this study.
Creativity research has gone through many waves of study to arrive at its current conceptual manifestation. Because each phase of examination has explored a distinct aspect of creativity there has been difficulty in reaching a clear explanation for a process that is at once ubiquitous and enigmatic. As a result, several definitions for creativity are accompanied by a degree of controversy. Despite a lack of consensus regarding what does and does not constitute creativity, the term can be understood as: “Imaginative activity fashioned so as to produce outcomes that are both original and of value” (Robinson, 1999).

As research has extended beyond the personalities and cognitive aspects of creativity and into its sociocultural dimension, two approaches to creativity have emerged: The individualist approach and the sociocultural approach. The individualist dimension is largely focused on personality and cognition. This perspective on creativity can be defined as “a new mental combination that is expressed in the world” (Sawyer, 2011). This definition makes the assumption that to be considered creative, an action, idea or object must be novel and not previously known. This aspect of the definition is somewhat limiting as it does not account for activities that are commonly used in everyday life, such as those associated with thinking and doing. Secondly, the definition suggests that in order to be deemed creative, an idea or thought must be shared. This notion is troublesome, as much of the creative process is not always expressed in a final outcome. While creativity should be viewed in relationship to affective and cognitive processes, it should also be examined in its larger social context.

A second concept of creativity is that of the sociocultural model. This dimension has emerged from the work of creativity researchers from a variety of disciplines in addition to psychology—sociology, anthropology, history, biology, and political science.
From the sociocultural perspective, creativity is the generation of a product that is judged to be novel as well as appropriate, useful, or valuable by a suitably knowledgeable social group. (Sawyer, 2011) This definition builds upon the foundation of the individualist perspective by acknowledging the role of the community.

3.2 Importance of Creativity to Education

Proponents for creativity in education have been sounding rallying calls for the past several decades. As the world grows evermore connected through advances in technology, the issues we face are increasingly complex. In this era of ‘wicked problems’ creative thought is essential for the interpretation, evaluation and ideation that are necessary to apply knowledge in new situations. “Creative talent [is] one of our greatest national resources . . . every school and college must teach creative problem-solving both in currently established courses and in new courses specifically designed for the purpose” (Parnes & Harding, 1962).

Despite the increasing attention being paid to the importance of creative thinking in education, much work remains to be done to unburden creativity from the weight of the conceptual dichotomies that pervade academia. The arts are often pitted against the sciences. This follows a train of thought that suggests that the intuitive and expressive processes associated with the arts and creativity can only occur in the absence of the analysis and discipline of the sciences and vice versa. Attempts have been made to justify the merits of creativity in education by drawing correlation between arts education and increased verbal, rational and mathematical achievement (Deasy, 2002; Fiske, 1999, Smith, 1991). These efforts have been met with marginal success in the absence of significant data to support these claims. As of the present moment, the case is
being made to recognize the relevance of creativity in education on its own merits as a force to balance and support multiple intelligences.

3.3 Cognitive Processes of Creativity

Regardless of the individual or sociocultural nature of creativity, the role of cognition in the creative process cannot be underestimated. While creativity cannot be understood as an act of cognition alone, it is important to understand the role of thinking processes that are engaged in creative acts. From a neuroscience perspective, creativity depends greatly upon one’s working memory. This neural system is where thinking, problem solving, daydreaming, expert and exceptional performance take place (Vandervert, 2007). These activities are essential to the creative process, yet their expression alone does not constitute creativity. Additional events must occur in conjunction with these activities to produce creativity.

3.3.1 Divergent and Convergent Thinking

Divergent and convergent thinking are two processes that greatly influence creativity. The ways in which these two modes are used together have a significant impact over the creative outcome of a person’s thinking. Divergent thinking is often closely associated with creativity. It is a process that involves producing many ideas or alternative answers from available information (Cropley, 2006). Divergent thinking embraces ambiguity and uses methods of making connections between pieces of seemingly unrelated information in order to produce new ideas. However, divergent thinking alone rarely produces meaningful or resonant creative outcomes. Evaluation and analysis are necessary to make purposeful use of the various ideas borne of the
divergent mode of thinking. As a result, the mind must engage alternate cognitive processes in order to assess the qualities of the ideas it has produced.

Often positioned as the inverse of divergent thinking, convergent thinking is used to find the most appropriate solution or answer to a clearly defined problem or question (Cropley, 2006). Where the divergent thinking is categorized as intuitive, subjective, imaginative and unstructured, convergent thinking is seen as logical, objective, judicious and controlled. The goal of divergent thinking is to produce a single, best option for a given set of parameters. To do this successfully requires precision in the gathering of information, in its critical evaluation, and in its analysis. When used alone, divergent thinking begets orthodoxy and stagnation (Cropley, 2006).

In contrast, when divergent and convergent thinking are used in conjunction, creativity benefits from the structure and rigor of convergent thinking. Analytical processes can provide a much-needed direction to the trajectory of divergent explorations. If distilled to their most basic functions, divergent thinking can be seen as a generative cognitive process whereas convergent thinking can be seen as an evaluative cognitive process.
3.4 Affective Aspects of Creativity

Creativity is often discussed in popular culture as being a personality type or an attitude. The attribution of creativity to the affective domain is perhaps what fuels its enigmatic status in our culture. Significant research on creativity has been done in the disciplines of cognitive and social psychology (Feist, 1999; Sawyer 2011; Sternberg, 2000). The majority of this research focuses on either the cognitive dimension or affective dimension of the subject. Less common is the examination of the relationship between the two. While a clear model for the interaction between cognition and affect in creativity is yet to be determined it is important to consider both influences.
Early research on the role of personality traits and creativity was limited to people working in the visual, performing and literary arts. Over time, additional studies have considered the affective characteristics of creative people in other fields such as science (Feist, 1999; Sternberg, 2000). A comparison of the findings of this vast amount of data reveals that there are several traits that are frequently found in highly creative people. Some of these traits are domain specific; the personality profile of a highly creative musician is different from that of a highly creative scientist. On balance, there are affective attributes that are shared across disciplines that correlate with creativity.

In his paper, The Influence of Personality on Artistic and Scientific Creativity (1999) Feist observes that creative people in both the arts and the sciences tend to be open to new experiences, less conventional, and less conscientious, more self-confident, self-accepting, driven, ambitious, dominant, hostile and impulsive. Additional work by other researchers, including Robert Sternberg (2000) support the correlation between creativity and the traits of openness, independence, self-confidence, attraction to complexity and intrinsic motivation. It is important to note the traits associated with creativity are not universally desirable in all contexts. When considering the social dimension of creativity as experienced in the classroom or in collaborative working environments, the traits of independence, dominance, ambition and hostility might even have a negative impact on the creative outcomes.

While it appears that creativity involves an affective component, it is not the result of personality alone. The relationship between affective dispositions and creativity is somewhat unclear. Do the prevailing traits of creative individuals facilitate creative thought or are they a result of the creative process itself? Of the traits identified by Feist and Sternberg, one could make the case that some affective dispositions fall into the
category of the former and others the latter. Another possibility is that these characteristics belong to both categories. To that end, the argument can be made that creativity could be supported by encouraging the development of traits or the adoption of mindsets that are correlated with creativity such as openness, unconventionality, self-confidence, self-acceptance and intrinsic motivation.

3.5 Relationship Between Critical Thinking and Creativity

The activities of everyday creativity—doing, making, adapting and creating—can be found in even the most rigorous and scientific of disciplines. This leads one to consider that creativity and critical thinking are not always discrete mode of thinking. As
discussed in Chapter 1, there are generative processes that occur throughout the processes of thinking critically, such as the creation of theories, concepts and hypotheses. Creativity is also used in tasks associated with the execution of experiments and analyses. These generative activities might have no innovative outcome in and of themselves, yet they are the part of the connective tissue that supports the development of the work. This notion links to the theories of cognitive psychology that posit “that a cluster of basic cognitive processes are used in creativity: generative processes that produce ideas, filtering processes that select among these ideas, and exploratory processes that expand on the potential of each idea” (Sawyer, 2011).

Figure 3.3 Visualization: Cognitive, Affective and Psychomotor Dimensions of Creativity

Figure 3.3 Visualization: Cognitive, Affective and Psychomotor Dimensions of Creativity
3.6 Creativity and the Interior Design Process

The discipline interior design falls within the realm of the creative industries and as such creativity is deeply embedded in its design process. As an applied art, design seeks to generate solutions that are functional as well as aesthetically desirable. As a result the purposeful dimension of creativity plays a prominent role in interior design. This is not to say that imagination and originality are not essential to an interior designer’s generative exploration. On the contrary—a balance between the two must be achieved. Interior design depends upon a generative process for the development of concepts for a wide variety of environments. The functionality of these concepts depends on context.

The ways in which interior designers use both divergent and convergent thinking to propel themselves through the creative process were identified as part of a discussion with Professor Heike Goeller at The Ohio State University in the April 2012. The interplay between these two modes is highly dynamic and maintains a degree of flux throughout the course of a project. However, many factors influence the ways in which a designer employs these two modes of thinking. Some factors are project specific, such as program requirements, timeline and budgets. Other influences are highly personal and encompass to a designer’s ability, experience, and mind-set, in addition to the interpersonal dynamics of the larger design team.

In general, the design process begins with the gathering of information. Collected information is then evaluated and analyzed to define the scope and focus of the project. This method of narrowing does not fully prescribe the trajectory of the design process. Rather, it provides a baseline of objectives and constraints that give purpose to the creative exploration that is needed to generate possible solutions for the project. At this
point in the interior design process divergent thinking becomes dominant. In the ideation related phases, designers propose multiple concepts and ideas for the problem space of the project. The variety among the concepts is crucial. As the scenarios of a project are often highly complex it is not reasonable to propose and pursue a single solution at the outset.

The factors that define the problem space of a project are rarely fixed or finite. A designer must consider alternate ways of perceiving and interpreting the issues objectives and constraints of the project in order to create concepts that respond to a variety of scenarios. When a group of appropriate ideas and concepts have been generated, a designer must employ skills of convergent thinking to analyze and evaluate their proposals in order to guide the work to be done in subsequent phases.

At times during the creative process additional information is needed to allow a designer to fully address emergent questions. A designer might engage in a localized cycle of divergent and convergent thinking to support and propel the momentum of the larger divergent process. For example, as experienced by the author during the years as a practicing interior designer, once a schematic design has been created, the client could inform the design team that the budget can allow for the design to be implemented in a larger space. While the overall direction concept is suitable, changes may be required to adapt the design to a larger space. Additional investigation and exploration of the impacts of the new configuration will initiate a secondary generative and evaluative sequence.

Testing the appropriateness of a proposed concept or solution can lead to additional cycles of refinement, which then require a new cycle of creative ideation. This step is followed by additional evaluation and analysis. This iterative cycle toggles
between the expansion of divergent thinking and the contraction of convergent thinking. The creativity that takes place throughout the design process depends on the balance and interplay between these two modes. Together, divergent and convergent thinking provide the energy and momentum for the forward progression of the design process.

3.7 Summary

Creativity is an activity that is essential to most aspects of contemporary life. It is not an ability that is unique to a single discipline or type of person. Creativity is a mode of thinking that relies upon several skills—cognitive and non-cognitive—in order to be used to its greatest potential. Creativity depends on cognitive processes and mindsets that are shared with Critical thinking. As creativity is a fundamental part of the interior design process, there is a need for students to increase their capacity for creative thought in order to be able to respond to the dynamic and complex needs of the workplace and society.
CHAPTER 4: Empathy

Empathy is an aspect of human behavior that is nearly omnipresent in our culture yet in many circumstances it is underutilized, eschewed or ignored. In recalling the rapid changes that are occurring across the globe, there is a need to improve our methods for working with and understanding each other, particularly when our communities are becoming increasingly diverse. Activities that encourage the development of empathy can provide a strategy for improved communication and collaboration. This is especially true for human-centered disciplines such as design and specifically, interior design.

The investigation presented in this chapter draws upon the work of Merlijn Kouprie and Froukje Sleeswijk Visser, professors of industrial design engineering at TU Delft, and the work of Jane Fulton Suri, a partner at the design consultancy, IDEO. Their research explores the transitional space between the philosophies and psychological constructs of empathy and its manifestation through the practice of design. Both the educational and applied dimensions of design are represented and reflected in their work, which makes their insights especially relevant in the context of this study.

4.1 Definitions

Like creativity, empathy has an ambiguous and abstract connotation in the minds of most people. Perhaps the difficulty in explanation is a result of the fact that empathy is an innate capacity common to most human beings (Suri, 2001). Our ability to identify
ourselves with the feelings of another person is innate. Because empathy is intimately related to how we relate to and understand each other, it is fundamental part of a well functioning society (Suri, 2003).

In order to understand empathy in relationship to this study, some clarification regarding its meaning is needed. In everyday conversation, the word empathy is often used in conjunction with or as a synonym for the word sympathy. Sympathy is defined as the acknowledgement or feeling of care towards a person in response to his or her emotional state or situation. When one expresses sympathy, one maintains a certain level of detachment from the situation (Grammarist). In contrast, empathy implies a deeper level of feeling than sympathy, something akin to a shared experience. The World English Dictionary defines empathy as ‘the power to understand and imaginatively enter into another person’s feelings.

Building upon the idea that empathy alludes to shared experience, it follows that emotions are not the only means of connection between people. The Oxford English dictionary offers a more abstracted definition of empathy as “the power of projecting one’s personality into (and so fully comprehending) the object of contemplation.” Here, the object of contemplation could be any one of a variety of things that occupy human attention--ideas, thoughts, attitudes, behaviors and beyond.

The field of psychology has expanded upon these basic definitions through a large body of research that has evolved through to the present day. The prevailing view in psychology is that empathy is a multidimensional construct that is the result of cognitive and affective mechanisms (Davis, 1983). Empathy is not simply a character or personality trait. It has also been explained as a process that involves thinking and feeling such as when a person steps into and out of the perspective of another. In an effort to clarify the
process of empathy used in psychotherapy, Rogers (1975) defined the phases of the empathy process as follows:

1. **Entering:**
Entering the world of someone else, becoming at home and being sensitive to what someone is experiencing.

2. **Living:**
Temporarily living someone’s life; sensing the other’s world with fresh eyes, not making any judgments.

3. **Communicating:**
Communicating your senses to the other, checking if your senses are correct, being guided by the other’s responses.

Further expanding the definition, Vreeke and van der Mark (2003) champion a model of empathy that explains its role within the context of communication. When viewed as a means of interaction between people, empathy ceases to be an individual quality of the empathizer alone. Instead, empathy becomes a vehicle for synergy in interpersonal relationships.

In light of the aforementioned research it is clear that empathy is not a static attitude or mindset. While certain individuals might possess varying levels of faculty with engaging empathy, it can be posited that aspects of the process can be learned over time. This has significant implications for how empathy can be learned and used in disciplines beyond psychology.

### 4.2 The Role of Empathy in Higher Education

It could be argued that empathy is a topic that is often overlooked in higher education, in favor of domain-specific knowledge. While teachers and administrators believe that empathy is an important aspect of social development, it is not always considered to be an ability that is crucial to the acquisition and development of objective skills. This may be due in part to empathy’s affective component. Emotions and attitudes are subjective, mutable and difficult to quantify. These characteristics contrast the
objective focus of many academic disciplines. However, empathy requires a level of fair-mindedness and openness in order for a person to take the perspective of another. Empathy may also lead to tolerance of ‘out-groups’ and reduced bias in judgments (Morrell, 2007). As discussed in Chapter 2, the traits of fair-mindedness and openness are essential for success in critical thinking, which is a key tenet of higher education.

Following the increasing demand for creativity in the workforce, a call is being made for empathy as well (Norman, 2010; Patnaik 2012; Pink, 2007). In A Whole New Mind (2007), Daniel Pink proposes that to respond to the changing demands of the global economy, workers must now focus on developing their capacity for skills that cannot be automated, such as ‘telling stories, demonstrating empathy, and designing innovations.’ At best, higher education guides the development of a student’s intellect while simultaneously supporting the student’s ability to participate as a member of society, both as a designer and as a citizen (Nussbaum, 1995).

4.3 Cognitive Dimensions of Empathy

The process of perspective taking best explains the cognitive aspect of empathy. This occurs when a person, the empathizer, sees or hears about the circumstance of another, the empathee, and imagines the situation from his or her own point of view (Kouprie, 2011). To fully understand the perspective of another requires high-order thinking. Stepping into the role of another depends upon one’s ability to gather information about the person and the situation while simultaneously analyzing, evaluating that information and predicting an appropriate response. This process begins with one’s own metacognition and extends into the interpretation of information and the creation of a conceptual model for the experience of the other person.
In the abstract, the cognitive processes of perspective taking can be explained independently of emotion or affect. In reality, cognition and affect work together symbiotically to help the empathizer to understand the behavior and perspective of the empathee. Research indicates that in social situations, humans depend on many information-processing strategies to guide cognition and behavior. Evidence suggests that ‘the more complex and ambiguous a social situation, the more likely it is that people will need to engage in open, elaborate, and constructive thinking, drawing on their own memory-based ideas to produce an appropriate response’ (Forgas, 2002). The social situations of the knowledge and social economies of the present and near future will be increasingly complex and ambiguous (Kolko, 2012; Norman, 2011; Pink, 2007). As such, the influence of empathy’s cognitive dimension should not be overlooked.
4.4 Affective Dimensions of Empathy

Empathy is often discussed in relationship to emotional response. This is due, in part, to the lasting influence of the large body of research that focuses on empathy’s affective component. The affective dimension of empathy is often explained as the immediate emotional response of a person in response to the emotional state or circumstance of another. This reaction is often congruent with the affective state of the person who is the focus of the attention, the empathee. At times, the response can be automatic, like smiling in response when you are smiled and greeted pleasantly (Vreeke & van der Mark, 2003).

An emotional contagion is what usually initiates an empathic reaction. A person can perceive the emotional state of another through a variety of sensory channels. The human response to this contagion can be motivated by our need for affiliation—the sense of belonging within a social group. (Vreeke & van der Mark, 2003). In part our motivation may also be influenced by recollection of personal experience, curiosity and open-mindedness about the person or situation at hand. Mindsets and attitudes aid our ability to feel and think about others and ourselves. These dispositions reflect another aspect of the empathy’s affective component, one that is similar to that of critical thinking and creativity.

The human capacity to understand and experience emotion influences how we perceive and categorize social information (Niedenthal & Halberstadt, 2000; Zajonc, 2000). While affect might be the impetus to engage feelings of empathy, it also supports how we think about the situation and helps us to respond appropriately. Affect used independently of cognition can result in errors in judgment or behavior and can undermine a successful expression of empathy.
4.5 Empathy in Relationship to Critical Thinking

As described in Chapter 2, empathy is a term that can be used to describe a category of mindsets that are essential for high-order thinking. These include:

- Thinking empathically, having the willingness and the ability to enter sympathetically into the thoughts and feelings of others
- Being aware of the relationship between thoughts and feelings
- Valuing personal experience

As defined in this chapter, empathy has significant ties to critical thinking. Its affective dimension supports cognitive processes that are central to critical thought. Empathy, when understood as an integrated process of thinking and feeling, depends upon the skills of evaluation, analysis and interpretation that are used in critical thinking. In this view, empathy and critical thinking are interrelated, operating in symbiosis to achieve the best result.

Metacognition is the foundation for the development of higher order thinking skills. It is a process that requires a person to think about ones own thinking. In order to begin the metacognitive process a person must engage in self-reflection. This can be a daunting task for anyone, particularly for someone just starting out on the path to becoming a critical thinker. Looking inward and evaluating ones innermost self can be facilitated by self-empathy. Much as empathy towards another person involves an open-minded and objective interpretation of that person’s circumstance, self-empathy occurs when an individual applies these principles to the contemplation of his or her own personal experience. Psychologists point to self-empathy as the genesis of empathy
within people (Hoffman, 1984). As humans continue to develop as social beings, our capacity for empathy is expanded through our development of self-other awareness.

When we are confronted with situations of others and of the self, empathy provides a means by which we can evaluate, analyze and interpret our thinking. In this sense, empathy helps to support the metacognition that is at the core of the critical thinking process. Empathic thinking is also correlated with open-mindedness and consideration for alternative points of view. These dispositions have both been identified as necessary for successful high-order thinking.

Empathy is an important component in the development of our social selves. It influences how we think about, understand and interact with ourselves and with others. Empathy can guide our actions and can act as a filter for how we perceive information.

4.6 Empathy in Relation to Creativity

Imagination is a significant part of the creative process and it plays an equally important role in the perspective-taking processes of empathic thinking. To imagine oneself in the position of another requires conjuring many scenarios. This generation of many alternatives is similar to the divergent thinking phase of the creative process where several possible ideas or concepts are created.

Evidence suggests that the capacity for empathy can be engaged and augmented through the study of the arts (Campbell, 2009; Lopes, 2011; Nussbaum, 1995). Arts education builds the skills of close observation, experimentation, and interpretation through immersive experience. The reflective practice of working in and studying creative media such as the visual and performing arts allows people to imagine the lives and feelings of others (Sternberg, 2008).
4.7 Importance of Empathy in Interior Design

As Interior Design is a human-centered practice, there is a definite need for empathy to be used at various points throughout the design process. In the early phases of defining the project space it is essential for designers to know and understand a variety of people, including users and clients in addition to other stakeholders.

As the central focus of any user-centered project, the end users themselves must be understood. End users are not a uniform group in and of themselves. A user can be anyone who will interact with the environment to be designed. Of course, the needs of some users will be more salient than others. However it is important that a designer consider multiple points of view in order to design a space that is functional, meaningful and appropriate for the context of use.

Interior designers use several tools to learn about and better understand the people for whom and in some cases, with whom they are designing. A selection of these activities is listed in Figure 4.1.

<table>
<thead>
<tr>
<th>Observation</th>
<th>Persona Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interviewing</td>
<td>Scenario Creation</td>
</tr>
<tr>
<td>Focus Groups</td>
<td>Needs matrices</td>
</tr>
<tr>
<td>Contextual Inquiries</td>
<td>Storytelling</td>
</tr>
<tr>
<td>Questionnaires</td>
<td>Visual &amp; verbal narrative creation</td>
</tr>
<tr>
<td>Task Analysis</td>
<td>Perspective taking/ role-play as user</td>
</tr>
<tr>
<td>Competitive Analysis</td>
<td>Bodystorming</td>
</tr>
</tbody>
</table>

Figure 4.1 Design Methods for Learning About People

This list is by no means exhaustive but it represents a spectrum of opportunities through which interior designers can use empathic thinking to support the design process.
Design research methods that involve direct user contact yield deeper levels of understanding (Kouprie, 2008; Suri, 2005). This is due in part to the way the brain works to think empathically. The human brain possesses cortical networks of ‘mirror neurons.’ These neurons are activated when a person performs a task or experiences an event or sensation (Gluck, 2008; Rizzolatti and Craighero 2004;). Activation of these same neurons is also caused “merely by observing another’s actions or behaviors” (Hollan, 2008). This is to say these cortical structures would be activated by either directly performing an action or by simply observing the action as performed by another. This neural system demonstrates the “unintentional capacity of the brain literally to “participate in” or reflect and embody the experience of the other”(Hollan, 2008).

In *Wired to Care*, Dev Patnaik also describes how the brain’s use of mirror neurons supports empathic learning through observation. In particular he cites the power of mirror neurons to allow humans “to pick up on tacit information about other people” (2009). However, he warns that the brain’s intrinsic structure has its limitations in supporting empathy. Mirror neurons “need firsthand sensory input. They still require you to meet another person to understand what he or she is going through” (Patnaik, 2009).

Empathy can make empirical data and information more robust and meaningful, which can provide creative stimulation and insight (McGinley, 2011; Suri, 2005). In this case, sharing data across multiple media can activate empathy. Designers complain about the difficulties of truly getting to know and understand users through data that has already gone through a process of interpretation by another source (Kouprie, 2008). What is salient or relevant from the viewpoint of one person or discipline is not what is salient or relevant for another. To prevent important information from being lost in
translation, research findings should be presented in conjunction with raw data such as live audio, video and imagery of the users and their context. This multi-sensory information can help a designer to make a stronger empathic connection to the users (McGinley, 2011).

Empathy also provides fuel for the creative process. Insights that are the result of learning about and understanding users can provide inspiration and direction for the generation of design concepts. In addition to supporting the information gathering and conceptual creation phases of the design process, empathy can act as a filter for evaluation and analysis. The same needs and perspectives uncovered in the process of learning about users can be used as criteria to evaluate the outcomes of the concept ideation phase. ‘Perspective taking’ can be a powerful method for evaluation at this point. It requires designers to again step into the shoes of the user in order to test and judge possible design solutions.

Kouprie and Sleeswijk Visser, professors at TU Delft, believe that in order for empathy to be used with purpose in the design process requires the integration and balancing of both the affective and cognitive components (2009). The use of one mode without the other is not sufficient to develop a complete understanding. Their model for the interrelationship of these components is shown below (Figure 4.2).
They also posit that the most meaningful impact of empathy on the design process occurs when designers tap into their own feelings in addition to those of the people they are thinking about (2008).

Building upon these sentiments, Kouprie and Sleeswijk Visser have created a four-phase process for empathy for use in the context of design. This framework builds upon the multiphase processes of empathy that have been developed in psychology. This framework is outlined in the following series of descriptions (Figure 4.3).
Step 1 Discovery
- Entering the user’s world
- Achieve willingness

Step 2: Immersion
- Wandering around in the user’s world
- Taking user’s point of reference

Step 3: Connection
- Resonating with the user
- Achieve emotional resonance and find meaning

Step 4: Detachment
- Leaving the user’s world
- Design with user perspective

Figure 4.3 Kouprie and Sleeswijk Visser’s Framework for Empathy in Design (2008)

In the discipline of human factors and ergonomics, a field that relates to design in its focus on human needs, a call for increased awareness and use of empathic thinking is being made. Jane Fulton Suri championed this in a 2001 talk to the National Society of Ergonomists. She makes the case that empathy is an embedded part of the research and analysis used by ergonomists and that by consciously engaging empathic thinking, a deeper and more sophisticated understanding of the users and their needs will emerge as a result.

In more participatory design processes, where users are engaged as members of the design team, empathy further enables communication and understanding. The skills
and attitudes that are activated by empathic support heightened observation, awareness and deep listening. These abilities allow designers to uncover and interpret what users and participants say think and feel. These same skills can be applied to all human interactions throughout the design process and can have a profound impact on collaboration within the design team.

![Figure 4.4 Visualization: Cognitive, Affective and Psychomotor Dimensions of Empathy](image)

Engagement in empathic thinking at any point in the design process requires ability, willingness, curiosity and motivation. While empathy is a capacity that all human beings possess, a designer’s empathic ability can be developed over time through practice, as with any design skill. The framework proposed by Sleeswijk Visser and Kouprie (2008, 2011) offers a process for empathy that can be followed conscientiously.
in the context of design. The goal of using this framework is two-fold; by following this empathic process greater understanding of the user will be gained at the same time a designer expands his or her empathic abilities.

A designer’s ability to be empathetic depends on his or her willingness to do so. A person’s willingness to engage in any task depends on a variety of personal and environmental factors, such as mood, commitment to the project, workload, skill level and experience with methods for research and design. Individual designers must address some of these factors on their own, while others can be supported through external means. The composition of a design team can affect designers’ willingness to think empathically as Kouprie and Sleeswijk Visser express, “One designer in a team can have a large influence on the others, by expressing empathic reactions. To develop empathy is an individual act, but by discussing it in a team, the discussion serves as a trigger for others to make more connections, which will lead to increased understanding.”

Much like creativity and critical thinking, empathy requires curiosity in order to yield its most meaningful results. The need to know more, the need to ask and answer the question, “What if...?” is what drives the generative and evaluative process. Curiosity propels a designer to examine and question deeply. When a designer is curious the investigative process leads to discovery rather than mere searching to find an answer. By assuming a curious disposition, a designer can see empathy as a vehicle for discovery, which can elevate the level of understanding about a user and his or her situation. Increased curiosity about users and their situations in relationship to a design project can have a significant impact on another factor that is necessary for the engagement of empathy: Motivation.
One’s motivation to think empathically is strongly related to ability, willingness and curiosity. If any one of those variables is compromised, so too is a designer’s motivation, and ultimately the understanding of the user. To be motivated a designer must understand and believe in the benefits of using empathy in design. Without this belief the results will fall short of expectations (Sleeswijk-Visser, 2011). As a result it is important to teach designers that empathy can be used to elevate the meaning and purpose of design concepts.

4.8 Summary

Though it is often considered an affective disposition, empathy, like critical thinking and creativity, is a complex process that depends on the balanced interaction of cognitive and affective components. Empathy is an innate feature of human kind that allows us to communicate with and understand each other. Because empathy enables human connection it can be a powerful tool for many disciplines, especially for those that seek to address the multifaceted nature of humanity. As interior design is a human-centered practice it depends on empathic thinking at several points throughout the design process. In order to make better use of empathy in the design process it should be more explicitly taught, employed and discussed through the use of the tools and methods listed earlier in Figure 4.1.
Chapter 5: Primary Research

Similarities exist among the three modes of thinking that have been discussed to this point. Critical thinking, creativity and empathy possess cognitive and affective components that are supported and enabled by a shared group of thinking strategies, attitudes, mindsets and dispositions such as evaluation, interpretation, open-mindedness, and curiosity. These shared attributes lead to an awareness of their interrelation and interdependence, particularly in the context of design and design education. The following chapter describes the primary research that was conducted in order to better understand how the fundamental components of critical thinking, creativity and empathy are used together in the design process. The purpose of this understanding is to identify how studio based design courses can support the development of these skills and attitudes in advanced (junior and senior level) students.

The first part of the research, which is discussed in Section 5.1, focuses on the observation and analysis of the current model of studio-based interior design education. The second phase of the research, discussed in Section 5.2, expands the scope of the research in the form of a survey that was shared with a small group of design educators across the country in order to develop a sense of a larger picture of studio-based interior design education. This questionnaire was developed with particular focus upon the role of critical thinking creativity and empathy.
5.1 Observation of Current Model of Studio Based Design Education

Over the course of a year and a half, three classes of junior and senior level interior design students were observed at various points in their studio-based coursework, such as in-class work sessions and informal critiques in addition to more formal midterm and final concept presentations.

The most focused and thorough observation occurred through participation in teaching a class of nineteen senior-level interior design students at The Ohio State University. The studio course took place over an eleven-week academic term. The focus of the studio project was the design of a department store. The class was structured to follow a design process that is commonly used by retail design firms. Design processes can vary depending on the design firm and the nature and scope of the projects, but in essence these processes are essentially very similar in that they encompass discovery, definition, ideation, evaluation and implementation.

The process model that was used to guide the senior class is shown in Figure 5.1.

![Figure 5.1 Senior Interior Design Studio Process](image)
This model divides the design process into seven distinct phases. Each phase outlines the design activities that were used by the students in the course. This model is nearly identical to the one discussed in Chapter 2 on page 33 in Figure 2.6. The notable differences can be seen in the quantity and types of activities that were used. Some activities and deliverables were adapted to accommodate the structure and schedule of the studio course. In addition, the ‘Implementation’ phase was omitted. In the context of interior design practice, the ‘Implementation’ phase encompasses activities that are undertaken to bring a project to completion as a built environment. As the endpoint of this studio class was a conceptual design presentation, the activities associated with this phase of a typical retail design process were not applicable.

Despite these changes the general purpose and goals of the specific phases remains the same. As such, the cognitive strategies and affective dispositions that were mapped to the design process model as shown in Chapter 2 remain the same. This model, shown in Figure 5.2 provided the baseline criteria for evaluation of the students’ abilities over the course of the quarter.
While there was variation in ability among individual students, the observations that are presented here are generalized to the class as a whole. As students are in the process of learning, they cannot be expected to excel at everything, particularly in a circumstance when new information, methods activities and strategies are being presented. However an educator can expect that students’ prior educational experiences will provide the foundation for the acquisition of new knowledge.

A summary of this group’s cognitive and affective strengths revealed: 1. The group was adept in gathering information throughout the design process. 2. The group demonstrated competency in ‘predicting outcomes’ in earlier phases of the design process when the information gathered was from an external source. Difficulty arose when a phase required students to gather and formulate information that resulted from their own generative work, such as in developing design objectives and forming criteria.
by which to evaluate their own ideas and design concepts. 3. The students were fairly comfortable with ‘forming concepts’, a primary focus of the creative process.

Generalizations about students’ affective traits are more difficult to assess as they are often embedded in actions and behavior and are not always explicit. With that caveat it can be said that the students were generally open-minded as they tolerated and embraced ambiguity. They also participated in self-reflective practices in order to support idea generation, though their mastery of ingenuity was varied throughout the design process. The students clearly valued imagination and creative thinking yet often they were unable to fully engage an ingenious mindset on a consistent basis. Their greatest use of ingenuity could be seen in the final documentation phase of the project. At this point, the bulk of the conceptual design work had been completed, thus reducing their workload. In addition, as seniors, the students were very familiar with the tasks required to create and deliver a presentation.

Though the students possessed and used the aforementioned cognitive skills and affective traits, there were areas in which the students struggled consistently. The cognitive strategies that students struggled with the most were: 1. ‘Evaluation,’ 2. ‘Interpretation,’ and 3. ‘Making Connections.’

1. ‘Evaluation’ proved to be difficult because the students did not consistently engage the following cognitive strategies:

   • Distinguishing between substantiated and unsubstantiated opinion
   • Separating relevant from irrelevant information
   • Weighing meanings and evaluating the credibility of sources
   • Withholding judgment or evaluation until the establishment of valid and adequate evidence.
2. Students also demonstrated a limited ability to employ the thinking skills associated with ‘interpretation’ of information, ideas and concepts for a variety of reasons. This is due, in part to not making sufficient use of the following cognitive strategies:

- Making informed decisions and reasonable choices.
- Supporting opinions and waging arguments with credible facts, information, examples, explanation, descriptive details, illustrations, quotations and incidents.
- Using the vocabulary of the discipline appropriately and precisely.

3. Despite being adept at comparing and contrasting, students also had difficulty with ‘making connections’ throughout the design process. In particular, the students were not equally adept at:

- Discovering relationships.
- Analyzing information and ideas and understanding their interrelatedness.
- Transferring learning from one situation to another.

In addition to the insufficient use of the aforementioned cognitive strategies, students also struggled to engage attitudes or dispositions that support critical thinking and creativity in the design process. The traits that appeared to be the most difficult to engage were that of curiosity and empathy. While students in this class were generally open-minded they were not highly curious. Specifically, the students seemed to lack the following traits of mind:
• Possessing the intellectual courage to explore and question the underlying beliefs and basic assumptions guiding personal thinking and actions as well as those of others.

• Having the willingness to seek out, examine, and value understanding and insights to be gained through consideration of multiple points of view.

The students’ resistance to considering multiple points of view may be based on not actively engaging ‘empathy’ during the design process. Students often struggled with:

• Thinking empathically, having the willingness and the ability to enter sympathetically into the thoughts and feelings of others

• Being aware of the relationship between thoughts and feelings

The students were keen to the value of personal experience, however, which is a component of empathy. In this case, the students had the tendency to limit the valuation to their own personal experience. They had limited success with entering into the point of view, in this case, of a potential shopper, which hindered the development of their design concepts.

The above discussed observations and evaluations of students represent a single class at a specific institution. As such the findings cannot be extrapolated to represent the current state of student abilities and experience of studio-based interior design as a whole. In order to gain a better understanding of the findings of the classroom evaluation, a broader view of studio-based education was needed, leading to the development of a survey that was distributed to a group of design educators. The details of this phase of the primary research are discussed in the following section.
5.2 Survey of Design Educators

In the spring of 2012, a group of interior and industrial design educators were asked to participate in a survey to provide insight regarding their experiences in teaching studio based design courses. The participants were also asked about the aptitude of their students in using the cognitive strategies and affective traits that were explored in the previously discussed classroom observation. The survey that was developed consisted of 15 multiple choice and short answer questions. The questionnaire was conducted online and was designed to allow respondents to remain anonymous. A sample of the blank survey is included in Figure 5.3. The full format of the survey questions and responses can be found in Appendix A. The format and structure of the survey will be discussed in detail in Section 5.2.2.
5.2.1 Participants

A group of ten design educators were invited to participate in the research for this study. Those who were contacted were asked to participate in the online survey discussed in this chapter as well as to participate in follow-up in-depth interviews that are discussed in Chapter 7. The educators were selected based on their experience, educational backgrounds and geographical location. Those invited to participate have taught or are teaching at the following institutions: The University of Cincinnati, The University of Oregon, Pratt, California College of the Arts, Virginia Tech, Harrington College of Art, Iowa State University, The Art Institute of New York and the Columbus College of Art and Design. Eight of those invited responded to the survey.

The respondents represent a broad range of the United States despite a their small sample size as listed below:

- Ohio
- Southwestern Virginia
- New York
- Midwest
- Pacific NW
- Chicago, Illinois
- New York City
- Oregon

The majority of respondents teach at institutions in urban environments, though respondent’s also represented rural and suburban locales. The range of responses is shown below in Figure 5.4.
5.2.2 Survey Structure

The fifteen-question survey was organized into three parts, which are described below:

*Part one* focused on the structure and activities that take place in design studio courses. This line of inquiry included questions regarding project types, user research methods and interdisciplinary collaboration. The latter two topics were included for their relevance in design practice and for their connection to empathic thinking in the design process. The objective of the first section of the survey was to learn about the instructors’ approach to teaching studio courses. The questions and responses of this section were used to identify the degree to which interaction with users and outside disciplines is used in studio classes. These questions also served to introduce the respondents to the overall survey topic.

*Part two* focused on the cognitive strategies and affective traits that are associated with design. This section also focused on the educators’ perception of how adept students are in employing these skills and mindsets. The questions posed in this section were designed to gather information about the importance of specific cognitive strategies and affective traits in the design disciplines. The two-part questions were
formatted using a five point Likert scale. In the first part of each question instructors were asked to rank each cognitive strategy and affective trait on the basis of its importance to the design process. For the second part of each question in this section, the educators were asked to consider the aptitude of their students in regard to these same strategies and traits. The goal of this series of questions was to compare and contrast the viewpoints of the instructors with the aptitude of the students in order to identify any gaps or discrepancies between the two groups.

**Part three** focused on the instructors’ experiences of teaching design studio classes. The short answer questions in this section asked educators to describe both any difficulties and positive outcomes they had experienced in the previous year of teaching studio courses. The purpose of these questions was to gather additional insights about studio teaching that might not have been otherwise revealed through the format of the prior survey questions. Part three was followed by a few demographic questions, which served to conclude the survey.

5.2.3 *Analysis of Survey Results: Part One: Studio Based Design Activities*

Part one of the survey began with questions about the general nature and structure of studio courses and addressed topics such as design research methods and cross-disciplinary collaboration. The majority of educators reported that they incorporate research methods into their studio curriculum. The types and frequency of research methods used are shown in Figure 5.5.
It is important to note that while user research is being conducted in these classes, the method that is used most frequently, direct observation, is also the least immersive. As a result, the impetus for students to engage in empathic thinking might be relatively low.

Collaboration with other disciplines as part of the studio class does not occur with the same frequency as user centered research. The responses indicate that most students might have the opportunity to collaborate with other disciplines at some point during their design education, but it is not a guarantee. One educator describes the nature of collaboration at a Midwestern Institution in this response: “In the foundation years (1 and 2) interior design students and architecture students collaborate. Other than that, it’s more of a hit or miss if students get the opportunity - sometimes it happens in an elective studio.”

When interdisciplinary collaboration occurs it happens most often with other design disciplines, such as architecture, visual communication design, and engineering. Some respondents also report having worked with disciplines that are outside of the immediate design realm. These disciplines include business, medicine, psychology, biology and chemistry.
5.2.4 Survey Analysis: Part Two: Cognitive Strategies

The second part of the survey began with questions that focused on the cognitive strategies and thinking skills that are used in the design process. The respondents rated nearly all six cognitive strategies as very important to the practice of design. These rankings are shown in Table 5.1

<table>
<thead>
<tr>
<th>Thinking Strategy</th>
<th>Importance to Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gathering Information</td>
<td>4.75</td>
</tr>
<tr>
<td>Making Connections</td>
<td>4.38</td>
</tr>
<tr>
<td>Evaluation/Analysis</td>
<td>4.63</td>
</tr>
<tr>
<td>Interpretation</td>
<td>4.57</td>
</tr>
<tr>
<td>Predicting Outcomes</td>
<td>2.88</td>
</tr>
<tr>
<td>Forming Concepts</td>
<td>4.88</td>
</tr>
</tbody>
</table>

Table 5.1 Importance of Thinking Strategies to Design

Five of the six strategies earned average ratings above four on a five point Likert-style scale. The lone exception was the strategy of ‘predicting outcomes.’ An explanation for this could be that because design is a process that requires comfort with ambiguity, predicting an outcome might not be as essential to the overall process. To predict an outcome too early in the design process might impose unnecessary constraint or proscribe certain avenues of exploration. To this end, ‘predicting outcomes’ might even undermine the divergent thinking process at the wrong time, which could have a negative impact on the design outcome especially if the design solution must embody a degree of innovation.
In response to the question, ‘How successful are your students at the design tasks that are associated with these activities,’ discrepancies between the level of importance and student ability emerge. In all cases the educators ranked their students’ abilities with each of the six tasks as at or above average, as shown in Table 5.2.

<table>
<thead>
<tr>
<th>Thinking Strategy</th>
<th>Student Ability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gathering Information</td>
<td>4.5</td>
</tr>
<tr>
<td>Making Connections</td>
<td>3.38</td>
</tr>
<tr>
<td>Evaluation/Analysis</td>
<td>4.13</td>
</tr>
<tr>
<td>Interpretation</td>
<td>3.63</td>
</tr>
<tr>
<td>Predicting Outcomes</td>
<td>3.8</td>
</tr>
<tr>
<td>Forming Concepts</td>
<td>4.25</td>
</tr>
</tbody>
</table>

Table 5.2 Assessment of Student Ability in Using Thinking Strategies

Students were judged to be the strongest in ‘gathering information’ and ‘forming concepts,’ which were ranked high in importance by the educators. These results also parallel the findings of the initial classroom observation. The students were perceived as less successful in ‘predicting outcomes’ and ‘making connections,’ which also correlates to the ranking order of overall importance.

However, the gulf between the ranked importance and perceived student success provides a slightly different picture. The largest differences were associated with the skills of ‘making connections’ and ‘interpretation’ as shown below in Table 5.3
The variation between the educators’ ranking of its importance and their judgment of the level of student ability suggest that there might be a disconnect in how activities are emphasized and even taught as part of the studio class experience.

### 5.2.5 Survey Analysis: Part Two: Affective Traits

A similar series of questions were posed in regard to the importance of affective mindsets in the design process. As was the case with the cognitive strategies, all listed mindsets were ranked as very important with averages above 4.0 on the five-point scale. Here, respondents unequivocally identified ‘curiosity’ and ‘open-mindedness’ as the mindsets that are most important to the design process. These were followed by ‘tenacity,’ ‘ingenuity/creativity’ and ‘empathy.’ The complete ranked order can be seen in Table 5.4.
When asked to consider the point of view of their students, the results reveal a different picture than that which emerged in the evaluation of cognitive strategies and are shown in Table 5.5.

<table>
<thead>
<tr>
<th>Affective Trait or Mindset</th>
<th>Educator’s Perception of Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-Reflection</td>
<td>4.25</td>
</tr>
<tr>
<td>Future-mindedness</td>
<td>4.13</td>
</tr>
<tr>
<td>Curiosity/Inquisitiveness</td>
<td>5.00</td>
</tr>
<tr>
<td>Empathy</td>
<td>4.38</td>
</tr>
<tr>
<td>Open-Mindedness</td>
<td>5.00</td>
</tr>
<tr>
<td>Ingenuity/Creativity</td>
<td>4.63</td>
</tr>
<tr>
<td>Tenacity</td>
<td>4.75</td>
</tr>
</tbody>
</table>

Table 5.4 Importance of Affective Traits and Mindsets to Design

<table>
<thead>
<tr>
<th>Affective Trait or Mindset</th>
<th>Educator’s Assessment of Students’ Perception of Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-Reflection</td>
<td>3.50</td>
</tr>
<tr>
<td>Future-mindedness</td>
<td>3.63</td>
</tr>
<tr>
<td>Curiosity/Inquisitiveness</td>
<td>4.25</td>
</tr>
<tr>
<td>Empathy</td>
<td>3.50</td>
</tr>
<tr>
<td>Open-Mindedness</td>
<td>4.00</td>
</tr>
<tr>
<td>Ingenuity/Creativity</td>
<td>4.25</td>
</tr>
<tr>
<td>Tenacity</td>
<td>3.50</td>
</tr>
</tbody>
</table>

Table 5.5 Student Perception of Importance of Affective Traits and Mindsets to Design
The educators’ rankings considering the perceived student point of view do not align with the educators’ own importance rankings. As shown below in Table 5.6, with the exception of the trait, ‘curiosity/inquisitiveness,’ which was ranked as most important and is common to both evaluative perspectives, there is a clear difference in judgment.

<table>
<thead>
<tr>
<th>Affective Trait or Mindset</th>
<th>Educators’ Perception of Importance</th>
<th>Educator’s Assessment of Student Perception of Importance</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-Reflection</td>
<td>4.25</td>
<td>3.50</td>
<td>-0.75</td>
</tr>
<tr>
<td>Future-mindedness</td>
<td>4.13</td>
<td>3.63</td>
<td>-0.50</td>
</tr>
<tr>
<td>Curiosity/Inquisitiveness</td>
<td>5.00</td>
<td>4.25</td>
<td>-0.75</td>
</tr>
<tr>
<td>Empathy</td>
<td>4.38</td>
<td>3.50</td>
<td>-0.88</td>
</tr>
<tr>
<td>Open-Mindedness</td>
<td>5.00</td>
<td>4.00</td>
<td>-1.00</td>
</tr>
<tr>
<td>Ingenuity/Creativity</td>
<td>4.63</td>
<td>4.25</td>
<td>-0.38</td>
</tr>
<tr>
<td>Tenacity</td>
<td>4.75</td>
<td>3.50</td>
<td>-1.25</td>
</tr>
</tbody>
</table>

Table 5.6 Comparison of Rankings of The Importance of Affective Traits and Mindsets to Design

Comparing the differences between the educators’ point of view and the perception of students helped to identify which traits were associated with the largest gaps. As shown above, the largest differences in perceived importance were seen in the traits of ‘tenacity,’ ‘open-mindedness’ and ‘empathy.’

According to the responses received, the biggest gap exists in the category of ‘tenacity/perseverance.’ As this trait is closely tied to discipline and rigor, it may take time and effort to develop. An educator may expect an advanced student of interior design to be able to rigorously pursue a design solution. To a novice, however, such rigor
and expected discipline can be wrongly interpreted as the antithesis of creative exploration. Therefore, it may be advantageous to teach students how to balance and make use the interrelationship between the different modes of thinking, both divergent and convergent, throughout the design process.

It should be noted that an underlying cause of students’ undervaluation of ‘tenacity/perseverance’ could be related to the sea change in information accessibility that has occurred over the past two decades. Today, searching for an answer is too often reduced to entering words into the Google search bar. One respondent elaborated on this notion when asked about the difficulties in teaching design studios: “attendance, participation, motivation, passion [and] interest in the field are low with some students, they think they already know everything because they can Google it, but what a small world is the Google research...” Technology has made easy the once arduous journey to find the salient stories, images and information. One can only surmise the impact this is having on the habits and expectations of current and future generations. As such it is a topic that demands exploration that is beyond the scope of this study.

In addition to ‘curiosity,’ the surveyed design educators ranked ‘open-mindedness’ as the most important affective trait used in the design process. From the perspective of their students, a difference in value was noticeable as well. Though it appears that students understand that open-mindedness is important to the design process, they may not realize how essential the mindset is in supporting several components of the discipline, including critical thinking and creativity. This gap in valuation suggests there is an opportunity for design education to clarify the role of open-mindedness throughout the varied phases and activities of the process.

Looking at the affective trait of ‘empathy,’ it not only ranks low in importance to the design process from the students’ point of view, but it also ranks significantly lower
when compared to how it is viewed by design educators. As discussed in Chapter 4, empathy is a trait that requires both open-mindedness and curiosity. While in the context of the survey, these two traits are ranked highly by professors and students alike; the survey results suggest that empathy is not appreciated to the same degree. The factors that underlie this discrepancy in valuation are somewhat unclear. Reflecting upon the research discussed in Chapter 4, a few possibilities for why this may be the case come to mind.

First, in both meaning and function, ‘empathy’ suffers from the lack of a universal definition. The same can be said of ‘creativity,’ which students consider to be significantly more important than ‘empathy.’ Second, in contrast to ‘creativity,’ ‘empathy’ rarely yields a distinct outcome, such as a drawing, observed performance, musical score or manuscript. This lack of a tangible or easy to perceive result could inhibit a student’s appreciation for what empathy can bring to the design process. Third, because empathy is an innate part of the human condition it is often engaged unknowingly and thus not subject to the same examination and contemplation as the other processes used to reach a design outcome. These three explanations begin to suggest ways in which empathy might be discussed, used and taught in a studio course.

5.2.5 Survey Analysis: Part Two: Additional Skills and Mindsets

Beyond the provided types of cognitive strategies and mindsets that were provided as part of the survey, respondents were asked to provide any additional strategies or mindsets they felt were essential to being a designer. One respondent identified the “Ability to take risks, learn from mistakes” as important, and rightfully so, as this is a key piece in the iterative design process. Another respondent included skills and traits that support metacognition, self-reflection and awareness: “innovation,
imagination, dreams, learn how to see the world we are living in...You have to do this to find out what you like and dislike. Discover yourself!”

5.2.6 Survey Analysis: Part Three: Difficulties and Successes in Teaching Studio Courses

In Part three, respondents provided short descriptions of both the difficulties and positive outcomes of teaching studio classes. Their responses reveal that difficulties and successes depend largely on the diverse nature of the students. In a single class there are both motivated and unmotivated students. The disengagement of some is difficult but at the same time, the passion of others is a triumph. Though it is dangerous to generalize difficulties or successes as universal, several respondents indicated that the lack of motivation in students could be an issue. "There are always a couple/few students who you can't seem to get motivated and can't figure out why they’re in design - it was a struggle for them to get in, they went through a selective process - yet they still don't seem to be engaged, interested in, curious about design. But they don’t want to change majors."

Other respondents express frustration with the lack of exploration by the students for several reasons, including procrastination and the dependence on technology. "Exploration isn’t as strong or extensive as I would have liked. While their final outcomes are strong and well presented, it can sometimes be a surprise as to what I see! Meaning the work develops at the end too much. Students use the computer too much - at the expense of drawing and ideating."

For each tale of frustration there appears to be an equal, if not greater story of success. Several of these achievements are expressed as the counter points to the frustrations listed above. One educator elaborates: “attendance, participation,
motivation, passion, interest in the field, creativity are high with some students, they create amazing projects, connect with the industry and are successful in the field, that makes me very happy.” Above all, the awareness that the students are learning and developing is a great source of pride among the respondents. “Positive outcome is the feeling they have learned and accomplished something significant on its work.” Another respondent extends this to the changes in the students’ own self awareness in observing the “Surprise in the students that they could do/accomplish/learn so much.”

No matter the cause or manifestation, it is clear that failures and successes can be found in any teaching experience and that their interplay is part of what spurs the growth and advancement of a curriculum.

5.3 Summary

The primary research that is discussed and analyzed in this chapter reveals that there is an opportunity for cognitive thinking skills and affective mindsets to be better integrated into design studio courses. The findings gathered through classroom observations identified areas in the design process where students were unable to successfully employ important thinking skills and mindsets. The insights that emerged from classroom observation lead to the creation of an online survey that was distributed to a group of design educators.

Once analyzed, the results of the survey suggest that the issues that were identified in the classroom observation were not an isolated case. The findings collected through the questionnaire provides additional information about how design educators perceive students’ awareness and abilities in using thinking skills and affective traits to support their learning. These insights, together with the understanding of the
interrelationship between critical thinking, creativity and empathy, coalesce to form the basis of the proposed process model that will be discussed in the following chapter.
CHAPTER 6: Synthesis

The results of the classroom observations and the survey of design educators reveal that there are indeed opportunities for students to increase their ability and understanding of specific cognitive skills and affective traits that are considered essential to the design process. Specifically, in light of the ever-changing global economy, it is important for students to increase and activate their capacity for critical thinking, creativity and empathy. Dan Formosa of Smart Design alludes to the changing role of design in his 2009 talk, *Six Real People*, “The future of design rests on understanding people.” He goes on to add, “Design...needs to address diversity.” Engaging in thinking strategies and mindsets that support design and are also native to countless other disciplines create pathways for improved communication and understanding across diverse groups of people: practicing designer, stakeholders, users, clients and beyond.

As design educators, we should identify ways in which these skills can be taught to prepare and empower students for the future. The following chapter discusses a proposed framework for a purposeful integration of these skills and mindsets in design studio courses.

6.1 Proposed Model for Improved integration

The model to be discussed was created in response to the insights gained from the classroom observations and survey of design educators. The interior design process described in Chapter 2 provided the foundation of the proposed model. Serving as a
framework, this basic structure was expanded and refined in response to additional literature reviews along with reflection upon the results of the first phases of the primary research. This new, refined model was based on the process used in commercial design studios and is similar to the process that was used during the Senior Interior Design Studio course observed in Chapter 5.

6.1.1 Framework Structure

The overall structure of the framework is a matrix of interrelated elements as shown in figure 6.1. The horizontal axis delineates the sequence of the phases for a given project. Reading from left to right it represents the temporal dimension of the design process. For the sake of clarity, the vertical columns along this axis are equally spaced.
The vertical axis of the framework represents the layering of the components essential to each phase of the process. From top to bottom these layers are defined as:

Activities: This category identifies the tasks listed correspond to the goals and objectives that are typically associated with that particular phase of the design process.

Strategies: This category represents the fundamental cognitive skills that are associated with each phase. The vertical order and size of the type used for each strategy denotes its relative importance for a given phase.

Traits: This category is used to map significant affective attitudes and mindsets to the phases of the design process. As with the Strategies category, vertical order and type size are used to express the hierarchy of these traits during a specific phase.

Learning Methods: The items included in this category represent the vast array of methods that can be used within the studio curriculum to support and achieve the objectives that are defined by the Activities categories.

The “Activities” and “Learning Methods” categories act as bookends to contain and support the thinking strategies and mind-sets for each phase. A second level of phase-specific explanation is provided for the “Strategies” and “Traits” categories. Figure 6.2 shows the detailed explanation of the specific cognitive skills that are associated with each strategy in a particular phase.
Some skills are constant across the phases while others emerge and disappear and reappear in other phases. Figure 6.3 shows the same detailed explanation of the affective mindsets that are associated with the traits used in each phase.
Using the data that was collected in the primary research discussed in Chapter 5, three categories of cognitive skills and two categories of affective traits were selected for analysis within the framework. The cognitive skills selected were: Making Connections, Evaluation and Interpretation. These skills were chosen because of the frequency with which they are used throughout the design process as well as for the size of the gap between ranked importance and the assessment of students’ ability in relationship to each.

The traits that were chosen for analysis within the framework were Open-mindedness and Empathy. The former was chosen for several reasons. First, open-mindedness has been identified as an essential mindset for achievement in critical thinking and creativity. Second, the educators who took part in the survey ranked this...
mindset as the most important, along with curiosity. Third, the size of the discrepancy between how educators and students perceive its importance to design was substantial, revealing a potential gap in awareness and understanding from a student perspective. Lastly, open-mindedness was selected because of its interrelationship with several other mindsets, including empathy and curiosity.

Empathy, as an affective disposition, was selected for analysis because of its somewhat ambiguous definition in the context of design. Survey respondents indicated that their students consider empathy to be relatively unimportant among the traits that are essential for a designer to possess. In addition the margin of difference in its importance between educators and students was considerable.

Once the skills and traits were selected, they were highlighted at each point where they occurred during the design process, as shown in figures 6.4 and 6.5.
Each item then was individually analyzed in relationship to the learning methods that can be used in the course of a design studio process. Links were made between the cognitive strategies and traits and the learning methods that could be used to support the development of that particular thinking skill or mindset. In figures 6.6 through 6.10, these connections are shown as dashed lines between the highlighted strategy or trait and the corresponding learning method. In cases where the connection was unclear, the dashed line leads to a question mark located at the beginning of the list of learning methods.
### Design Process Analysis - Methods to teach and activate Making Connections.

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- **Photographs**
- **User profile development**
- **Lifestyle/Brand review**
- **Preliminary Problem Identification**
- **Pre-project feedback**
- **Pre-project feedback**

- **User observation**
- **Observation videos**
- **Interviews**
- **Market review & analysis**
- **Photography**
- **Diagrams**

- **Sketching**
- **Storyboarding**
- **Brainstorming**
- **Concept assessment**
- **Pre-project feedback**

- **Sketching**
- **Storyboarding**
- **Brainstorming**
- **Concept assessment**
- **Pre-project feedback**

- **Drafting**
- **Pre-project feedback**
- **Technical communication**
- **Materials**
- **Photography**

- **Presentation**
- **Process/Report**
- **Reflection**
- **Large scale models & full scale prototypes**

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**Figure 6.8** Links Between Making Connections and Learning Methods

### Design Process Analysis - Methods to teach and activate Empathy.

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**Figure 6.9** Links Between Empathy and Learning Methods
The cognitive strategy that appeared to have the greatest number of unresolved connections with the learning methods was that of ‘making connections.’ It is interesting to note that this is also the trait that was associated with the largest difference between importance to the process and level of student ability in the survey results. The cause for this disparity could lie in the ill-defined relationship between ‘making connections’ as a way of thinking and how, as a skill, it is activated as a way of working and learning in the design process.

A similar pattern can be seen in regards to the role of open-mindedness in the design process. In the earlier phases of a project, methods to activate or engage open-mindedness are somewhat clear. However, the links between open-mindedness and distinct learning methods become unresolved during the ‘Design Concept Refinement’ and ‘Design Development’ phases. This disconnect could be related to the shift into
convergent thinking that occurs at these points in the design process. However, these phases also require a localized loop of generative and evaluative thought that relies on open-mindedness.

In an effort to further clarify the relationships between the categories of the proposed framework, feedback was sought from the group of design educators who participated in the survey. The components of the framework that were discussed in this chapter were assembled along with an introduction into an electronic document that was sent to the participants for review with a request for comments and feedback that would be shared and discussed as part of an online interview. The feedback and responses are discussed in the following chapter.

6.3 Summary

The creation of the proposed framework represents a synthesis of a review of the literature related to critical thinking, creativity and empathy along with the findings of primary research. Secondary research on these topics identified the cognitive strategies and associative traits that support critical and creative thinking and these elements were mapped onto the design process model. The importance of these elements was determined through class observations and the results of a survey of design educators.
CHAPTER 7: Interviews: Responses to the Proposed Model

In order to evaluate the relevance of the process model discussed in Chapter 5 it was sent to the same eight design educators who participated in the online survey for review. The model was accompanied by an introduction and brief explanation of how it was developed in response to a review of current literature, classroom observations and the results of the survey. In addition, a short explanation was given for how to read the process model including explanations for each part of the framework structure. Participants were asked to participate in an in-depth interview and conversation with the researcher to discuss the framework and its potential application within studio-based design courses.

Of the eight educators who participated in the survey, six agreed to be interviewed. The conversations were conducted by telephone or by Skype, an internet based audio and videoconferencing application. With approval of the participants, the conversations were audio recorded for later review and analysis. The interviews typically lasted between 40 – 60 minutes.

The interviews began with a brief explanation of how and why the process model was developed. This introduction was followed by series of questions about the process model. The first questions addressed the clarity of the model and its similarities or differences to the design processes that are used in studio classes. Examples of these initial questions are below:
• My first question is to ask if the framework was clear. Can I provide any clarification or explanation you think is missing?

• The design process that was used to develop the framework is based on a model that is commonly used in retail design projects. How is this process model similar or different to what you use to guide your students’ studio projects?

• If response indicates difference: In what ways does it differ?

After these initial questions were asked the interviews became more open-ended as the educators elaborated on their answers by discussing their teaching experiences. Further unscripted questions were asked based upon these responses and past examples. Over the course of the discussion additional questions were asked to relate the topics of the open-ended portion of the conversation to the issues presented by the process model. Questions that were used to guide the discussion are as follows:

• How do you think the framework could be adapted to your style/method of teaching or adapted to the types of projects you teach?

• What modules do you feel could be most useful/have the greatest impact?

• Have you used any of these types of assignments or activities in your studio classes in the past?

• Are there activities you currently use or have used that could be included in this framework? If so, could you briefly describe them?

• The research that guided the development of this model revealed that empathy is an important part of learning how to work with and for others—as clients, users, co-workers, employers and beyond. Do you have any insights or thoughts you would like to share about the role of empathy in studio-based learning?
What comments, feedback or ideas do you have about this approach?

The insights and feedback that were generated during the interviews were reviewed and analyzed in order to identify common themes and to identify the strengths, weaknesses and opportunities for the proposed process model. This analysis is discussed in the following section.

7.2 Analysis of Interview Responses

The qualitative data that was gathered through the interview conversations produced meaningful feedback about the structure and usefulness of the process model. In addition, the open-ended discussions revealed several insights about teaching studio courses and issues that are influencing the future of design education.

7.2.1 The Process Model: Similarities and Differences

For the most part, participants felt the process model was similar to the design processes they use and teach in their studio courses. Participant 3, an educator who has taught studio courses in both interior and product design responded, “it [the model] resembles it dramatically. There is not really a lot of difference... in the process I used when I taught interior design and the process I use when I teach product design.”

Participant 6 also confirmed that the structure of process model was familiar by stating that it “definitely follows the same steps.”

Participant 5, a professor who teaches on the west coast but who was trained in Germany offered a contrasting point of view. Though she felt the process model was “pretty clear” she also expressed that it was different from the process she uses with her students. She remarked, “I don’t know if I could split it like that... I think my page would look differently.”
7.2.2 The Process Model: Relevance to the Discipline of Design

There appeared to be consensus among the participants that there is a need to teach the cognitive strategies and affective traits common to critical thinking and creativity in studio courses. As such, the purpose of the proposed process model is valid. Through the discussions it became apparent that these educators are thinking about how their teaching methods can support these components. As Participant 5 stated, “When you are teaching, the most important thing ... is to teach people how to think; how to approach a problem, how to find out information, how to handle it, how to question it, just question it, and how to come up with a solution.” Despite the agreed upon importance of teaching thinking in design studios, in most cases the relationship between classroom activities and how thinking skills and attitudes are used is not considered explicitly.

In general, the way in which most instructors seek to teach students to think critically and creatively is intuitive. Participant 1 elaborated on the responsive aspect of this intuition by explaining how the needs of students dictate the flow and pace of a course. “Sometimes you don’t leave enough time for things they are struggling with and you can’t just move them on until you work through that.”

For many educators the interrelationship and interdependence of some thinking strategies makes it difficult to teach or think about them separately. This is particularly true of the evaluative process used in design. Participant 4 elaborated, “For me, evaluating goes together with making-testing-evaluating.” From her point of view, evaluation cannot be taught independently as she views it to be intrinsically connected to other steps in a larger process.
7.2.3 Experiential Learning

Experiential learning or ‘learning by doing’ was a common theme that emerged through the analysis of the conversations with the design educators. This is not entirely unexpected as the design process is one that requires generative making, not only in the cognitive sense but in the physical sense as well. Here it is of interest because several of the methods that are used by professors to support critical and creative thinking require kinesthetic engagement such as sketching and model building. Participant 5 spoke of this in a general sense by saying “when you are educated and you have to work with your own hands you find out that ...what you know...makes you very successful.” In describing her experience teaching studio courses, she further noted that students “have to feel it so they can understand it.”

As presented in the proposed model, the learning methods that incorporated the psychomotor dimension of high-order thinking were central to many of the participant conversations. These methods are seen as essential to teaching thinking the design process. Several educators described the benefits of making models and prototypes to support the processes of interpretation and making connections. Participant 3, who currently teaches product design, said, “we do a lot of prototyping.” The benefits of building physical models are also apparent in interior design classes as expressed by participant 1, an interior design educator in the Midwest. “[Experimental] model making ... helps because some of them [the students] use it in their final design.”

7.2.4 Sketching

In addition to making models, the design educators that were interviewed felt that sketching is an essential part of the development of critical and creative thinking in the design process. Participant 4 explains, “They need to find a way to express their
thoughts in sketches. For the pure experience of doing something with your hands.”
Participant 2, a design educator in New York City describes the conversation that occurs between the hands and the eyes that takes place while sketching: “Your mind is always running around and [you must] control your hands, the way your eyes are seeing your hands doing and responding back and forth...getting a sense of control over that and [the] confidence to move to the next step and ... to go backward, too.”

However, most educators suggested that students struggle with sketching. It is an activity that many resist, particularly in interior design studios. Participant 4 explains, “There is such a big discrepancy...the drawing ... is minimal. You hardly find anyone sketching anymore, and that’s a big problem.” In response to the researcher’s explanation of her own sketching process Participant 4 asked rhetorically, “but isn’t that dialogue your critical thinking?”

While sketching is an important method for building a student's capacity for evaluation, interpretation and making connections, Participant 3 suggests that there might be differences between design disciplines in how sketching is used and understood. He explains, “I tend to think the idea of sketching is a different kind of thing in product design than it is in interior design because... a sketch of an interior is a much more comprehensive thing...and there might be a difference in the way people think about sketching.”

7.2.5 Immersive Research Activities

Another manifestation of learning by doing in the design process was discussed in the relationship to immersive research experiences that can take place as part of a design studio project. The depth of this immersion can take many forms. At the most basic level these activities promote direct contact with a site, user or client. Students’
ability to interpret and analyze the factors, which will impact a project, is greatly improved by getting out of the classroom and into a real environment. In discussing the advantages of working with a real site for a studio project Participant 1 said, “...if you go see it [the project site] first and then you’ll understand it better.”

Several educators offered examples of how immersive research had been used to learn more about users and their lives. Some of these activities focused on need finding while others promoted taking the perspective of the user, a key component of empathy. These examples were often special cases and not a routine component of the design studio coursework, however their impact on the students’ learning was striking.

Participant 6 described an interior design studio project that involved collaboration with an organization that supports the aging population. As part of the process, students participated in various simulations of aging such as “experiencing what it’s like to have had a stroke and then trying to put on a shirt and a tie.” Participant 6 indicated that the students were not very open-minded at the outset of the project but observed, “the simulation exercise opened a lot of eyes.” In the course of this project, the students also interviewed seniors who were served by the aging advocacy organization. Participant 6 indicated these interviews provided inspiration for some projects: “A couple of them [the students] used the issues of those they interviewed as the subject of their projects. They had no personal connection but definitely a bond had formed.”

Participant 3 described a similar experience in reflecting upon taking a studio class to Nicaragua. The goal of the studio was to design something that would benefit the lives of coffee plantation workers. After weeks of living with and observing the lives of the plantation workers the students had a startling realization. As the educator described the situation the students came to realize that the community of plantation workers were “a group of people that have less than anybody they’ve ever seen and ...they’re all very
happy and very resourceful ... they live with very little and it kind of works... It was a shocking thing ... and they [the students] learned an immense life lesson that’s way beyond anything we could have done as a product.”

These examples of immersive research demonstrate the profound impact that this level of experience can have on a student’s attitudes and thought processes. Participant 3 explains that the immersive, learning by doing experience is an important part of the design curriculum at his university. “We have a long tradition here of making stuff and we’ve ... expanded that into the research area as well.” He goes on to express that the program challenges students to “get your hands dirty, get out there and actually find the people you think you are going to be using this.”

7.2.5 Empathy in Design Studio Classes

During the course of the interview, educators were asked to reflect upon the role of empathy in design as it relates to teaching studio courses. Most agreed that it is important yet were not as definitive about how it can best be taught. Participant 1 expressed that there is a need for empathy to be engaged in studio coursework. “I think that’s a hole in education because we don’t have real clients to talk to. You can’t have empathy if your teacher is your only client.” She also expressed that while research can help to activate empathy, without real people the possibilities for teaching students to think empathically are limited.

Participant 5 also makes the case for building students capacity for empathy through direct contact with users. “User participation and knowing ... the final user has been one of the things I always go to with my students.”

Participant 3 acknowledges a change in the understanding of empathy in the context of design education. “Think it’s different from what we’ve talked about with
students before this with needs assessment. To me, it’s getting at a more emotional level ...and really trying to understand what that means as you walk through a space.”

7.2.6 Suggestion for Additional Learning Methods

Throughout the interviews educators elaborated upon the proposed learning methods presented in the process model through sharing their own experiences. In most cases the proposed learning methods were familiar and are already a part of the participants teaching repertoire. When asked explicitly if any module was missing, few participants vocalized an addition. However in reviewing the discussions a few of the educators described using a method that was not included in the framework—a self-expression assignment. This exercise was used at the beginning of a course as a method of introduction. Students were asked to prepare a presentation about themselves. This activity serves many purposes. Participant 1 explained it as a means by which an instructor can learn about the student and how the students can learn about each other. “How they [the students] get here is really fascinating...[the assignment] is about people’s stories in a way to know how to teach them.” Participant 4 also described using a similar assignment at the beginning of studio courses. “They start with a personal introduction pre-assignment as a point of departure and from there they go into basic architectural education which is plan, section and elevation.”

The immersive research experiences discussed in the previous sections represent another dimension to the learning methods that were included in the process model. Although the model lists several distinct research activities, the ways in which they can be used has not been clarified. The educational impact of these research methods can vary greatly depending on the context and degree of use.
7.2.7 Suggestions for Improvement

As part of the interview participants were asked to offer any suggestions for improvement to the proposed framework. Several commented on the legibility of the process model. The word-centric nature of the framework components was seen as a negative factor. Participant 3 called the model “daunting” and offered suggestions to highlight new segments of verbal information to improve their salience. Participant 4 was more direct, confessing her immediate reaction to seeing the comprehensive view of the process model: “I was like, damn! Do I want to go through all these words?” She followed up that statement with a valuable insight: “it doesn’t mean that a word needs to be made out of letters only.” This suggests non-text information might be appropriate as part of the model.

A second common suggestion focused on how the model could be used to as part of a course. The proposed model is comprehensive, displaying all possible methods and activities that can be used for a given project. However, a few participants were curious to see hypothetical examples of what the process module would look like for a specific studio project. Participant 3 explains, “What would have helped me is that if at the end there were a couple of pages with a hypothetical walk-through of the process in one instance and how I might use this.”

Participant 4 asked for further clarification for some of the proposed learning methods as she felt the words alone were not sufficient to explain how the techniques would be implemented. “For me, I ask how does it relate? For me, it’s pretty theoretical...[what] do the assignments look like?”

Another common suggestion was that the model should reflect the flexibility that is often necessary in a design studio. This comment related primarily to the temporal
dimension of the process. Participant 5 explained, “Sometimes the students don’t follow
the steps one by one. It’s not so step-by-step.

Over the course of the interviews the personal dimension of teaching emerged as
another factor that should be addressed by the model in some way. Participant 1
described the personal connection that must be made between teacher and student in
order to create a positive learning environment, “I think the instructor has to understand
the students early on to know about the open-minded and future-minded. You [need to]
see where they’ve come from.”

This personal dimension also relates to an educator’s own individual style of
teaching. Participant 4 felt that this component of the educational process should be
addressed more directly by the process model. “I think one important factor is missing.
What’s the identification between the person who asked the assignment or teaches the
studio and what’s on the paper? What is good for you might not be good for [another
teacher] might not be good for me...How does this show your personality?”

7.3 Additional Data

Although the majority of the data gathered through the interviews related directly
to the proposed process model and the larger experience of teaching design studio
courses, some educators discussed issues that have a broader impact on design
education. It is important to include these insights as they could have implications on the
future of studio based design education.

7.3.1 Technology and Cognition

The use of technology in education is not a new topic for discussion. However, its
use is changing the way in which students think and work in design. These changes are
not necessarily negative but should be considered. Participant 2 talked about the
working and thinking habits of students who have grown up in a technologically advanced age, “I realize I’m working with kids that really played differently when they were little. They played with buttons and gadgets ... and their experiences are very different...There’s a huge gap.”

The influence of technology is having an impact at a smaller scale as well, within the student experiences of individual learning methods of the design studio. Participant 6 describes how students use images in concept generation, “Definitely they begin to rely on the computer more and more...I find they have access to images and sophisticated imagery yet when they do their projects, their projects often don’t have a tenth of that sophistication...they’re not understanding how to translate that...they don’t seem to apply that to their own work.”

7.3.2 Online Design Courses

Online education is a newer topic within the discussions of technology in education. Participant 5, who was hired to create an online course for interior design spoke about its potential impact on design education. She does not believe online courses are appropriate to teach design. “Design and critical thinking are not something you teach online...there is no contact with the student.” She explains the disconnect with an analogy, “How can you teach someone to dance by reading a book about it? You cannot become a ballerina just by reading about it.” Here she is also referring to the experiential dimension of learning that is so prevalent and essential to the coursework of a design studio. Online classes can make education more accessible to more people. However, the medium presents some serious difficulties for the successful teaching of key aspects of the design disciplines.
7.4 Summary

The interviews detailed in this chapter provided valuable insights for the potential use and future development of the process model that was developed and discussed in Chapter 5. The strength of the proposed model comes from its familiarity. Many educators expressed that its structure was similar to design processes they currently use in studio classes. In addition, the participants expressed having used many of the learning methods before. Their detailed descriptions of how they use these methods in practice revealed several insights, which are outlined below.

1. Experiential learning is essential to inculcate cognitive strategies and affective traits during design studio coursework. Use of kinesthetic and psychomotor learning practices increases students’ ability to use and develop high-order thinking skills and mindsets necessary to create design solutions.

2. Direct contact with key factors that influence the project space, such as the site, the context of use and the users increases student awareness. Tangible experiences encourage students to actively engage thinking strategies that support evaluation, interpretation, and making connections. In addition, such experiences encourage open-mindedness and curiosity.

3. Immersive research activities play a significant role in students’ development and use of empathy. The more immersive the experience, the greater the awareness that is demonstrated by the student.

4. Encouraging student reflection and rumination after using a particular method is an important part of the process that allows students to make the connection between thinking skills, mindset and the activities of the design process.
5. The degree to which the thinking skills and mindsets are interrelated has implications on can be taught through the activities of the design process.

While the proposed model was seen as relevant to the practice of design studio education, it is far from perfect. The design educators offered suggestions for how the model could be revised to improve its legibility and ease of use. Refinements to the visual communication of the model could be made to address many of these issues.

In addition, the participants expressed the process model could be improved by the incorporation of sample assignments or modules. The inclusion of examples could more clearly demonstrate how the learning methods would be used to facilitate the use of cognitive strategies and affective mindsets.

The proposed model has the potential to be used to support and guide the development of studio-based coursework. However to do so it must be seen as a supporting structure of options and methods that can be adapted to the specific needs of a particular project, teacher or class. As Participant 3 observed, “It would really open the door for people to see that any one of these is an option, none of them is a mandate and you pick and choose as you go through it at various times and say, ok, this is where my students need more of this at this moment.”

Despite the opportunities that the proposed model and the suggested learning methods afford it is subject to the limitations imposed by external influences. It is clear that encouraging students to explore beyond their comfort zone by moving them into the larger world is important; it is not always possible throughout the studio course. Time, location, and access to users along with the willingness of students are all factors that can constrain the use of the proposed learning methods.
CHAPTER 8: Revisions to the Proposed Model

This chapter will discuss the refinement and expansion of the process model. The changes that were made are due in part to the feedback that was gathered during the in depth interviews that were detailed in the previous chapter.

8.1 Overview of Changes

Preliminary alterations have been made to the graphic communication of the process model in order to improve issues of readability. Including visuals to improve usability, however, requires deeper examination that is beyond the scope of this thesis. Due to its importance several examples offering potential opportunities to address this issue will be outlined in Chapter 9.

In an effort to address both the usability and usefulness of the structure and content of the process model an additional level of detail has been added to the learning methods. This preliminary attempt at expanding this segment of the model lead to the addition of examples for how several learning methods could be implemented in a studio course. Each of the proposed examples are described in detail in the following section.

8.2 Example Methods and Assignments

The learning methods presented in the proposed process model can be implemented in a variety of ways. This variation is useful in adapting a chosen method or assignment to encourage the use and learning of a specific thinking strategy or mindset. As figures 6.x.x show, some learning methods can be used to engage multiple thinking
strategies and mindsets. In the following section example assignments and learning methods will be discussed in relationship to how they support the cognitive strategies of ‘evaluation’, ‘making connections’ and ‘interpretation’ as well as the affective mindsets of ‘open-mindedness’ and ‘empathy.’

8.2.1 Learning Methods to Support Evaluation

Skills of evaluation are often developed in concert with other cognitive activities such as analysis and interpretation. However there are ways in which evaluative processes can be emphasized through specific methods that are used throughout the design process.

In the preliminary phases of a design project, when information is being gathered is important for students to evaluate the data they have collected. Equally important is how the information itself is gathered. Project-based activities that encourage direct contact with a site and or user group offer many opportunities to gather and evaluate data. Site visits can be supplemented with client and user shadowing. In this process students accompany a stakeholder over the course of their day in order to observe and understand the individual's activities and interactions in context. This experiential process adds a layer of richness to the passive information that might have been collected as part of a site visit, such as photographs and field measurements.

Through the use of matrices, diagrams and maps, information can be organized to facilitate the evaluative process. An example of a client shadowing evaluation process as demonstrated by a student of Professor Heike Goeller at The Ohio State University is shown in the following Figures, 8.1 -8.3.
Figure 8.1 Evaluation of Client Shadowing Part 1: Matrix.
Student Work Under the Instruction of Prof. Heike Goeller

Figure 8.2 Evaluation of Client Shadowing Part 2: Diagram.
Student Work Under the Instruction of Prof. Heike Goeller
This series of three figures illustrates the evaluative process that took place over a client shadowing exercise. A first shadowing experience lead to insights and objectives that were identified and grouped into the loose matrix shown in Figure 8.1. A second shadowing exercise, shown in Figure 8.2 built upon the data collected in the first phase and used the new information to evaluate key components that could be addressed through the design process. In the third example shown in Figure 8.3, the evaluations from the first two exercises provide direction for the further analysis of the physical space. Additional evaluative observations and opportunities are identified through annotation of the site photos.

As the design process progresses into the ideation phases, evaluation can be further supported through informal and formal group critique sessions. The pin-up
presentation and critique process is commonly used in design studios but it is important to acknowledge its importance in building students’ evaluative skills. This common practice can become more diverse and dynamic through a variety of means such as inviting professional designers to participate in informal desk critiques, or by breaking the students into small groups to present, discuss and evaluate each other’s work.

As the focus of the design process shifts from divergent to convergent thinking, there is a significant need for students to activate their evaluative skills in order to review and refine their concepts. At this point, there is an opportunity to involve potential users in the evaluative process. The methods for such evaluation are plentiful and range from surveys and interviews to hands-on prototype testing. An example of a questionnaire based on a semantic differential scale is shown in Figure 8.4. Here, interior design students of Professor Heike Goeller at the Ohio State University used the survey to assist in the evaluation of different design directions for a project.
In the final phases of the design process, as a project is implemented or documented, students can be encouraged to again hone their evaluative skills. Assignments that require students to document their process in retrospect offer students an opportunity to reflect upon their work and to further evaluate the impact and outcomes of their creative decision-making.

8.2.2 Learning Methods to Support Making Connections

The cognitive strategies that support ‘making connections’ throughout the design process influence a student’s ability to use several other thinking skills such as evaluation and interpretation. Assignments that require students to compare and contrast information, to identify patterns and uncover relationships between ideas and information help to strengthen their skills in ‘making connections.’
At the outset of a user-centered project, a designer must find ways to connect user behaviors to the scope of the design space. By studying the relationship between users and their environment opportunities and needs can be identified, thus guiding the development of design solutions. User activity and user need matrices are methods that teach students how to identify the relationships between humans and their spaces for living. Both types of matrices are created in response to what is known about a user—real or hypothetical.

An activity matrix chronicles a day in the life of a user or users. The day is broken down primarily by time. From there additional criteria are mapped to a time period such as activities and experiences, the equipment or artifacts that are needed to support that activity and perhaps information about the environment where the activity takes place. An example of an activities matrix that was created by the author while a third-year design student is shown in Figure 8.5
Figure 8.5 User Activities Matrix

A second matrix can be used to identify the hierarchy of a user's needs and how these needs might impact the environment to be designed. In a **needs matrix** categories of basic needs are ranked in priority from the viewpoint of the user. These needs are then described in greater detail with consideration to how the needs might influence a design concept. Figure 8.6 illustrates a needs matrix that was created by the author as part of a junior interior design project to be used in conjunction with the activities matrix shown in Figure 8.5.
Together these matrices organize the information gathered from users in a way that facilitates making connections between behaviors and artifacts, and between needs and the environmental attributes.

Additional methods can be used throughout the design process to encourage students to further develop their skills in making connections. These exercises can take place at a localized scale in support of a specific aspect of a project, such as in material use and selection. The book, *Materials and Design: The Art and Science of Material Selection in Product Design* (Ashby, 2009) offers an example of one such method. In this example, designers gather a group of materials and then engage ten or more participants
to respond to the question, “What is this material’s character?” After the responses have been collected the designers can then use the following three steps as listed in the book to identify the semantic associations for each material.

1. Examine the responses, judging the degree to which participants agree on associations
2. Use statistical methods to identify association-choices with a significant degree of common meaning.
3. Use cluster analysis to group materials with similar associations.

A less data-driven variation of this **semantic association exercise** can be used to support other activities of the design process. For example, the creation of **experience maps** and **customer journey diagrams** can make the connection between physical space and intended experience. Figure 8.7 shows an example of diagrams that were created by a senior interior design student of Professor Heike Goeller at The Ohio State University.
The connections and associations that are identified through the creation of user experience maps can be used to guide concept generation in the ideation phases. By connecting sensory experiences to physical space, a designer can begin to address these relationships more directly. In addition, these same experience maps can be used as an evaluative tool in the later phases of the design process as a way to compare and contrast the strengths of initial explorations with later, more refined solutions.

8.2.3 Learning Methods to Support Interpretation

The thinking skills that fall under the category of interpretation focus on description, explanation, and meaning making. By building interpretive skills, a design student can gain a deeper understanding of the issues and influences that need to be considered for a given project.

The use of design narratives can encourage students to develop their interpretive abilities. In a narrative exercise, students are asked to write a story from a users point of view that describes his or her experience interacting with the space that is to be designed. Danko (2006) discusses the use of narratives in a senior level interior design studio course. She posits, “Well-crafted stories, selected with deliberate intent, bolster skills in listening, enhance interpretive abilities, and motivate people to action.” In this study students were required to create written descriptions at the beginning of the conceptualization phase, prior to using other, more familiar visual methods. The goal of the exercise was to encourage students to approach design conceptualization in a holistic manner. The outcomes described in the study indicate that students perceived that the narrative exercise strengthened their conceptual ability while allowing them to think more empathically.
**Visual storytelling** methods also allow students to develop an understanding of semantic factors that influence design outcomes. The process of defining experience, emotion and feelings with carefully selected imagery enables a student to deepen his or her sensitivity and awareness to the meaning communicated through visual language. Several formats can be used to tell visual stories and the focus of the exploration will influence the outcome. For example, Figure 8.8 is a matrix that was created by a junior interior design student of Professor Goeller at The Ohio State University. Here a distinct structure was used to define a series of attributes both verbally and visually.

![Figure 8.8 Matrix of Visual and Verbal Semantic Definitions](image)

*Figure 8.8 Matrix of Visual and Verbal Semantic Definitions
Student Work Under the Instruction of Prof. Heike Goeller*
On balance a visual narrative that is created to capture the essence of a user experience or a space may be best represented in a less structured format such as in a video or mixed media collage. Figure 8.9 shows a spatial collage that was used to guide the conceptual development of a retail space. Figure 8.10 is a visual experience board that was created to express the essence of a design concept that emphasized contrast in a retail environment. Senior-level interior design students of the author at The Ohio State University created both examples.

Women’s Department: Well-Selected, Open, Airy, Art Gallery

Figure 8.9 Interpretation Collage
Student Work Under the Instruction of the Author
The aforementioned exercises to stimulate the growth of interpretive skills are typically created in the preliminary phases of the design process. As a project progresses, the outcomes of the initial exercises can be revisited and refined as part of the project evaluation and implementation.

Multi-level questioning, or the “Five Whys” is an additional method that can be used at any point throughout the design process to strengthen students’ interpretive abilities. This method, which originated as part of the Toyota Production System, is used to uncover root causes for problems. The method, which has been adopted by many disciplines including design, can broaden or narrow the influences of an issue. Figure 8.11 depicts how the design firm, IDEO, describes this technique as a part of their series of Ideo Method Cards: 51 Ways to Inspire Design (2003).
By employing this method to examine and explain the meaning, function and intent, a student is pushed to think beyond the superficial in order develop his or her understanding.

8.2.4 Learning Methods to Support Open-mindedness

As identified in the research presented in Chapter 5, open-mindedness is a trait and mindset that is considered to be of great importance to the practice of design. The literature reviewed in the beginning chapters of this thesis also indicates that open-mindedness is necessary for the development of several critical cognitive skills. The format of the design studio environment allows for the use of several learning methods that can encourage students to become more open-minded. Many of these methods stimulate an open-minded attitude by focusing on experimentation that defers criticism and judgment to a later time.
**Free drawing** is an exercise that can help students clear their minds of preconceived ideas while also documenting them for future consideration. In some ways the process works like **free writing**, a method where a person writes continuously without the burden of paying attention to spelling and other rules. The goal of this process is to overcome creative blocks and performance anxiety. In *Graphic Design Thinking: Beyond Brainstorming* (Lupton, 2011), a book that outlines several methods for generating ideas, the term, “Visual Brain Dump” is used to describe a free-drawing process. A visual brain dump is comprised of the following 3 steps:

1. Start sketching. After defining the basic purpose and parameters of your project, get some paper and a pencil [or pen] and start making quick small drawings.
2. Set a time limit. In a twenty-minute period, shoot for at least twenty sketches. Put many small drawings on each page so that you can compare them.
3. Keep moving. Rather than erasing and refining one sketch, make alternative views of the same idea. Review your ideas and choose some to pursue further.

The use of **unconventional tools and materials** is a second method that can be used to support open-mindedness during the design process. For example, instead of sketching with traditional media such as pen and paper, students could be required to draw on paper towels with markers as part of an ideation session. Similarly, a model making assignment could impose constraints that compel students to use materials they would not otherwise consider. For example, a model must be built without glue, using only wire and string with a foam board base. To accomplish such a task students are forced to experiment with methods of fabrication to achieve a suitable result. The outcome of a similar process is shown in Figure 8.12.
In this example from *Graphic Design Thinking: Beyond Brainstorming*, a designer used pushpins and string to create letterforms. The experimentation and exploration that is necessary for these exercises encourages open-minded thinking by challenging students’ assumptions and expectations.

**Consciousness studies** are another category of methods that can be used to promote open-mindedness in students. Loosely defined as methods for first-person investigation, awareness and reflection (Sarath, 2006), conscious studies such as formal and informal meditation can guide a student to explore a dimension of creativity and contemplation that does not often occur as a part of subject or process focused learning. Professor Ed Sarath of The University of Michigan teaches a series of courses in creativity and consciousness in the Jazz Department. The courses introduce students to consciousness studies through the use of “guided meditation, drumming, movement, and a variety of other methods.” (Sarath, 2006) These activities allow students to achieve
greater clarity, presence and focus by accessing deeper levels of consciousness. Sarath posits this process enhances the subject-focused third-person inquiry that is emphasized in most academic coursework. Formal meditation practices are prevalent in the examples Professor Sarath describes.

Despite the possibilities for the use of formal meditation to support design studio activities, such resources might not be available, as design educators are not necessarily qualified to guide formal meditation sessions. However, there are examples of less formal meditative design exercises that can be used to encourage students to enter a deeper level of consciousness. Professor Heike Goeller of The Ohio State University describes two such exercises in her research, *Balancing Hemispheres* (2002). Both exercises begin with guiding students to enter a meditative state through the following steps:

1. Arrange the workspace in such a manner as to easily reach the favorite tools, to sit comfortably in a favorite location within hearing distance of the guide [instructor].

2. Slowly move different muscles of the body to relax.

3. Concentrate on breathing outwards, and to separate from the existing environment by allowing eyes to lose focus or to close, thus interrupting the continuous scanning of the external world.

The first exercise encourages students to focus on specific aspects of the project on which they are working. A few minutes after students have settled into the meditative state, the instructor verbally guides the students to move through the envisioned space in a multi-sensory exploration. The guide prompts students to visualize in their minds eye what they see, hear, taste, smell and feel as they move through the environment. After a
period of time, the instructor gradually prepares the students leave the guided tour and to re-enter the present moment. Upon the return to the physical present, students are asked to remain silent while they are then guided to visually express what they have seen during the meditative journey. The resulting imagery is then analyzed, shared and discussed with the group and can provide insights and opportunities that can be explored in the development of the design concept.

The second exercise uses a similar method to encourage students to explore their personal associations with the semantic attributes that are desirable for the project environment. Once students have entered the meditative state by following the aforementioned steps, the instructor guides them to internally conjure images that are triggered by a key word or attribute. Following this imagination period, upon a calm return to the present in period of silence, students are then asked to visually articulate what they have envisioned through sketches, drawings, diagrams and words. These visuals are then shared and analyzed with attention being paid to similarities and differences, options for development and possibilities for application. An example of student work created during this type of exercise is shown in Figure 8.13.
Figure 8.13 Meditative Drawing Exercise.
Student Work Under the Instruction of Prof. Heike Goeller at The Ohio State University.
8.2.5 Learning Methods to Support Empathy

As discussed in Chapter 5, there are several methods that can be used to activate empathic thinking as part of the design process. Many, if not all, of these methods also simultaneously support open-mindedness, as this mindset is akin to a prerequisite for meaningful empathic understanding. In the educational environment learning methods to support empathy occupy a broad spectrum of scale and scope. Some exercises might take place to support the larger objectives of a design process while others make empathy the primary theme of a studio project.

The creation of user scenarios is an exercise that can strengthen students’ capacity for empathic thinking. User scenarios are also known as user profiles or use cases in the vocabulary of other disciplines involve a process of identifying the key attributes of a user as well as their needs and expectations. The profile of the user is then supplemented by a description of key tasks or experiences and the context in which these user actions take place. User scenarios can be either real or hypothetical. However, evidence suggests that scenarios that are created in response to information gathered through direct contact with users such as observation and interviews have greater resonance and impact on the development of empathy. Photographs of the user, either real or representational are presented alongside imagery that describes the key facets of their identity and situation. Often the visual information is supplemented by verbal details and explanation. The result is a concise yet rich representation of the user and their world. Examples of student created user scenarios are shown in figures 8.14 and 8.15.
George finally retired.

George worked for the past 37 years as a school teacher. He taught high school Biology. All of his many years around teenagers have kept him young.

He is widowed, but has three grown daughters to keep him busy. His oldest is married and has two small children, with her third on the way. His younger daughters are not married, but are both in serious relationships.

His family is everything to him.

George loves to take his "boys" golfing. He is making up for lost time since his daughters never took an interest in it.

If George isn’t on the golf course, he is tending around in his garage. Since retiring, George has more time to spend tinkering with his projects.

He is a self-taught craftsman.

He likes simple, clean lines but crafts all of his projects with a high level of quality. He recently built a wooden rocking horse for his granddaughter to be.

Figure 8.14 User Scenario Example.
Created by a Student of the Author at The Ohio State University

MEET

Jason

Jason is a 53 year old design professor who teaches at The Columbus College of Art and Design in downtown Columbus. He has a background in engineering and architecture and teaches fourth year interior design undergrads.

Before working as a professor, Jason was employed by numerous well known design companies for over 16 years. He worked mainly on restaurant and retail design in large cities all over America such as LA, Chicago, Atlanta, and many more. Not only are the hotels excellent within the states Jason took his love for design and decided to travel with it, working on projects in Tahiti, Hong Kong, Milan, Paris, and even Dubai. His creative skills and attention to detail are one of the things his family and friends love most about him.

Alongside that he has a wonderful sense of humor and a caring attitude that make him one of the easiest people to make friends with.

Jason is married and has three children with his wife. Their family are avid sports fans and players especially when it comes to soccer. Jason plays on a adult men’s soccer team with his eldest son Brandon who just graduated college and moved back home while studying architecture in graduate school.

Jason and his wife and two sons take an exotic vacation to celebrate their milestones. Jason and his wife love to travel, but with three children it has been hard in the past to go anywhere for long periods of time. Now that their youngest son, Evan, is a freshman in high school they feel that they can live life as they once did when they were in college.

Figure 8.15 User Scenario Example.
Created by a Student of the Author at The Ohio State University
In the design studio classroom, **scenarios** can be used as tools to support needs assessment, opportunity identification and concept generation. These scenarios can also be used to guide the creation of written narratives as discussed in section 8.2.3. In addition, these same profiles can be revisited as evaluative tools. In this capacity, students step into the perspective of the user described in the scenario and proceed to assess the strengths and weaknesses of a proposed concept from that point of view.

In Chapter 7, immersive experiences were identified as being especially powerful tools for teaching students to think empathically. Given the time and funding constraints of the typical design studio course it is not always possible to live among and work with users for a prolonged period of time. Exercises that draw upon performative pedagogy provide a potential alternative method for tapping into an immersive experience. Two such methods, **role-playing** and **bodystorming**, are described in *Ideo Method Cards: 51 Ways to Inspire Design* (2003). Images of these method cards are shown in Figures 8.16 and 8.17.
Both methods involve physical activity as a way to enter into the perspective of the user. **Bodystorming** focuses upon a specific scenario and encourages students to respond intuitively to the situation as a way to better understand important issues. In
contrast, role-playing emphasizes the innate characteristics of a user. In this way, role-playing is akin to acting out a user scenario, where the images and words become real-time experiences. By tapping into psychomotor learning, these exercises encourage empathic thinking that transcends cognition and emotion through the simultaneous engagement of multiple senses.

While empathy can be activated throughout the design process in a series of separate or interrelated exercises, it can also be taught holistically through carefully coordinated studio projects. Laurel H. Campbell and Deana McDonagh, professors at the University of Illinois, Urbana-Champaign, describe an example of this method in their 2009 research. In this example, a five-week shrine-building project was used to teach empathic thinking to industrial design students. A variety of methods were used to support the studio project.

Classroom discussions about the student’s inner beliefs about designing items for people different from themselves were used as a way to develop “an understanding of the spiritual aspects of caring, compassion, empathy, and social change” (Campbell, 2009). Students were encouraged to investigate their environment and to share their thoughts and perspectives with each other, acknowledging and discussing differences and similarities. Additional contextual research and creative exploration resulted in the creation of “shrine/altar/shadowboxes” that represented a dimension of the students’ identities, perspectives and experiences. The project discussed in this case study focused on cultivating empathy through self-reflective and performative practices. Similar techniques could be used to incorporate, expand and adapt this method for use with other genres of interior design projects, such as health care or office environments.
8.3 Summary

The learning methods detailed in this chapter represent a small sample of those that can be used to activate the learning and use of a selected group of cognitive strategies and affective traits. These examples were used to provide an additional level of detail and clarification for a few of the methods that were presented as part of the proposed process model discussed in Chapter 6. As presented in the context of this study, these learning methods and exercises offer a tangible picture for their use as part of the design studio coursework. Together these methods are starting points for further expansion and definition. The potential opportunities for the development and implementation of this process will be outlined in the following chapter.
CHAPTER 9: Conclusion

9.1 Project Summary

The goal of this thesis has been to clarify the relationship between critical thinking, creativity, empathy, and the design process in order to identify the interactions through which they are linked. Illuminating the connections between these complex ways of thinking, working and knowing, and the design process, allows studio-based courses to benefit from their shared synergies. By becoming consciously aware of how and when cognitive skills and mindsets are used during the design process, educators will be better prepared to integrate these elements into their design curricula.

The following series of figures illustrate how the cognitive strategies of ‘evaluation,’ ‘making connections’ and ‘interpretation’ as well as the affective traits and mindsets of ‘open-mindedness’ and ‘empathy’ can be activated through the use of specific learning methods. In these diagrams, the individual strategy or trait is shown in the context of the design process. The methods that can be used to support its learning and activation are listed corresponding to the appropriate phase. Phases where a given strategy or trait is not heavily used have been left empty.
### Methods to teach and activate Evaluation

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**Figure 9.1 Methods to Teach and Activate Evaluation**

- **Photographs**
  - Literature/brand review
  - Preliminary problem identification: Five Why's (multilevel, deep questioning)

- **User Observation**
  - Field notes, photographs
  - Site visits
  - Client and user shadowing
  - User interviews & surveys
  - Market review & analysis
  - Photographs

- **Group Critiques**
  - Concept Assessment: Five Why’s (multilevel, deep questioning)
  - Perspective taking: evaluate from the user point of view
  - User testing: surveys, semantic differential scales, focus groups

- **Group Critiques**
  - Project Presentations: Visual, Verbal
  - Concept Assessment: Five Why’s (multilevel, deep questioning)
  - Perspective taking: evaluate from the user point of view
  - User testing: surveys, semantic differential scales, focus groups

- **Group Critiques**
  - Project Presentations: Visual, Verbal
  - Concept Assessment: Five Why’s (multilevel, deep questioning)
  - Perspective taking: evaluate from the user point of view
  - User testing: surveys, semantic differential scales, focus groups

- **Group Critiques**
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  - Perspective taking: evaluate from the user point of view
  - User testing: surveys, semantic differential scales, focus groups

- **Group Critiques**
  - Project Presentations: Visual, Verbal
  - Concept Assessment: Five Why’s (multilevel, deep questioning)
  - Perspective taking: evaluate from the user point of view
  - User testing: surveys, semantic differential scales, focus groups

- **Project Presentations**
  - Visual, Verbal
  - Process Books
  - Reflective Writing

### Methods to teach and activate Making Connections

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**Figure 9.2 Methods to Teach and Activate Making Connections**

- **User profile development**
  - Scenario Creation
  - Needs analysis
  - Visual-verbal narrative
  - Perspective role play as user
  - Diagrams: mind maps, circulation, user experience, customer journey

- **Diagrams**
  - Mind maps: circulation, user experience, customer journey
  - Semantic association: spatial cognitive models, visual experience boards
  - Materials and meaning

- **Sketching**
  - Concept Assessment: Five Why’s (multilevel, deep questioning)
  - General exploration, discovery, internal communication

- **Drafting**
  - Concept Assessment: Five Why’s (multilevel, deep questioning)
  - Precision and clarity

- **Drafting**
  - Concept Assessment: Five Why’s (multilevel, deep questioning)
  - Precision and clarity

- **Drafting**
  - Concept Assessment: Five Why’s (multilevel, deep questioning)
  - Precision and clarity

- **Drafting**
  - Concept Assessment: Five Why’s (multilevel, deep questioning)
  - Precision and clarity

- **Drafting**
  - Concept Assessment: Five Why’s (multilevel, deep questioning)
  - Precision and clarity

- **Drafting**
  - Concept Assessment: Five Why’s (multilevel, deep questioning)
  - Precision and clarity

- **Drafting**
  - Concept Assessment: Five Why’s (multilevel, deep questioning)
  - Precision and clarity

- **Drafting**
  - Concept Assessment: Five Why’s (multilevel, deep questioning)
  - Precision and clarity
### Methods to Teach and Activate Interpretation

<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>Evaluative</td>
<td>Evaluative</td>
<td>Primarily Generative</td>
<td>Primarily Generative</td>
<td>Balanced</td>
<td>Balanced</td>
<td>Primarily Evaluative</td>
</tr>
</tbody>
</table>

#### User Profile Development
- User Observation: Field notes, photographs
- User profile development: Scenario Creation, Needs matrix, visual-visual narrative, perspective taking, role play as user
- Diagrams: mind maps, circulation, user experience, customer journey
- Visual Storytelling: spatial collage, visual experience boards
- Sketching: exploration, discovery, internal conversation, concept assessment: five why’s (multi-level, deep questioning)

#### Design Concept Development
- Visual Storytelling: external communication, perspective, evaluation, details
- Drafting: precision, clarity, technical communication, notes, dimensions, symbols, material representation
- Concept Assessment: five why’s (multi-level, deep questioning)

#### Implementation
- Visual Storytelling: spatial collage, visual experience boards
- Project presentations: visual, verbal, process, books, reflective writing

---

### Methods to Teach and Activate Open-mindedness

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</thead>
<tbody>
<tr>
<td>Evaluative</td>
<td>Evaluative</td>
<td>Primarily Generative</td>
<td>Primarily Generative</td>
<td>Balanced</td>
<td>Balanced</td>
<td>Primarily Evaluative</td>
</tr>
</tbody>
</table>

#### User Profile Development
- User Observation: Field notes, photographs
- User profile development: Scenario Creation, Needs matrix, creative, free writing, visual-verbal narrative, perspective taking, role play as user
- Literature review: concept assessment: five why’s (multi-level, deep questioning)

#### Design Concept Development
- Free Drawing: use of unconventional tools and materials, creative writing, narratives, story telling
- Concept Assessment: five why’s (multi-level, deep questioning)

#### Implementation
- Free Drawing: use of unconventional tools and materials, creative writing, narratives, story telling
- Concept Assessment: five why’s (multi-level, deep questioning)

---

Figure 9.3 Methods to Teach and Activate Interpretation

Figure 9.4 Methods to Teach and Activate Open-mindedness
9.2 Topics for Future Work

The proposed design process model is only that, a proposal. Significant additional research, development and testing are necessary to refine the model to be useful and usable by those who teach studio-based design courses. The methodology that has been developed over the course of this study offers a new way to consider how essential cognitive skills and affective mindsets can be taught consciously through the use of exercises that support the larger goals of a design studio project. The sample collection of learning methods discussed in Chapter 8 represent both the familiar and the foreign. Several of the exercises are common to the practice of design in educational and professional environments, while others are less common and borrow from the perspectives of other disciplines. These alternative perspectives suggest there are several
yet to be discovered learning methods that can be used to teach and engage high-order thinking skills and mindsets in the context of the design studio. Additional research into the teaching practices of other disciplines could support the further expansion and development of the proposed process model.

9.2.1 Development of the Model as an Interactive Application

The proposed process model is somewhat static in its current text-centric form, and as a result it does not effectively reflect the dynamic, collaborative and organic nature of the design studio experience. Future development of the process model could include its implementation as an interactive application. Through the use of interaction design principles several of the model’s usability issues could be addressed. For example, the overwhelming amount of information that is contained within the model framework could be accessed on demand. The program could be designed to allow the phases to expand and contract, revealing information in measured chunks rather than all at once.

Whether web-based, or standalone, such an application could also encourage educators to use the process model as a starting point from which to create a framework for a specific studio project. This experience could encourage educators to adapt exercises and to add their own learning methods to a personal database. As an interactive application, the model could expand to become a responsive resource for design educators.

9.2.2 Expansion to Other Course Formats

As discussed in this thesis, the format of a studio course is process driven. The proposed model for the integration of cognitive strategies and affective traits presented in this study was built to respond to this context. However, the advantages of directly linking the components of high-order thinking should not be limited to the learning
environment of the design studio alone. The undergraduate design curricula are composed of courses that vary in content and in format. Studio courses are but one facet of this educational structure.

There is potential for the work that has been initiated as part of this study to be explored in relationship to other course types. For example, how could skills of interpretation and evaluation be activated in a technical course that teaches construction details? Or, in what ways could empathy and open-mindedness be used to support the learning experience of design history? These questions are catalysts for future consideration. If expanded further, the nascent ideas presented as part of this thesis could be used as the underpinning for the development for a comprehensive design curriculum.

9.2.3 Potential for Use in Other Design Disciplines

The research that was conducted for this study focused on the experiences and activities that are common to studio-based courses in interior design. As discussed in Chapter 1, the discipline of interior design is guided by a design process that when abstracted to its key functional components, is similar if not identical to the process that supports several other creative disciplines such as industrial design, visual communication design, interaction design and architecture. The underlying similarities that exist between these processes could allow the process model created in this thesis to be adapted to support the specific activities and objectives of a given discipline.

The adaptation of the process model to additional design disciplines could provide useful insights, which could support cross-disciplinary collaboration. While the activities, tools and outcomes of each design discipline might differ greatly, the ways in which cognitive strategies and affective mindsets are engaged might be similar. The
similarities might offer a means for improved dialogue and understanding. On balance, distinct differences between the disciplines could exist in these areas. By identifying points of incongruence, more can be learned about the inherent nature of a discipline. Through improved understanding of how various design disciplines use and teach high order thinking skills and attitudes, a foundation for meaningful collaboration can be built.
Bibliography


Ideo Method Cards: 51 ways to inspire design. (2003). San Francisco [u.a.: IDEO.


Kesner, L. (March 01, 2006). The role of cognitive competence in the art museum experience. Museum Management and Curatorship, 21, 1, 4-19.


Sternberg, R. J. (September 06, 2004). Teaching College Students that Creativity Is a Decision. *Guidance & Counselling, 19,* 4, 196-200.


Appendix A: Survey Questions and Responses
A Survey About Studio-Based Design Education

Studio Based Design Activities

1. How many projects do you assign in a typical studio class?
Approximate number per term. Please specify quarter or semester.

2. What types of projects do you present / use as teaching subjects in your studio courses?
Select all that apply:
☐ Consumer Products
☐ Retail Interiors
☐ Hospitality/Restaurant
☐ Health Care/Medical
☐ Working Environments: e.g. offices
☐ Exhibitions
☐ Civic projects/Government
☐ Educational
☐ Institutional
☐ Social/Community
☐ Other: __________

User Research

3. Do students participate in any of the following activities with users and stakeholders as part of the design studio project requirement?
Select all that apply:
☐ direct observation
☐ interviews
☐ surveys/questionnaires
☐ focus groups
☐ co-design/participatory activities
☐ Other: __________
4. If applicable: How often does this participation/user research take place?
For example: As a part of every project, For most projects, etc.

Interdisciplinary Collaboration

5. How often do students collaborate with other disciplines—within the broader realm of design or beyond—as part of the design studio project requirement?
For example: Number of times per term or per academic year?

6. If applicable: What disciplines have your classes collaborated with in the past?
- Visual communication/graphic design
- Architecture
- Industrial/Product Design
- Fashion
- Business
- Mechanical Engineering
- Engineering: Other (Please specify below)
- Psychology
- Medicine
- Education
- Biology
- Chemistry
- Other: 

[Continue »]
**Students: Activities and Attitudes**

The following questions concern the activities and attitudes of upper level students—juniors and seniors—in studio courses. Understanding that each class represents a range of students, please consider how the following questions apply to your students on average or to a class as a whole.

7. **How important are the following activities in the design process?**

<table>
<thead>
<tr>
<th>Activity</th>
<th>1 - Not Important</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5 - Extremely Important</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gathering Information</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Making Connections</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evaluation/Analysis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interpretation</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Predicting Outcomes</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Forming Concepts</td>
<td></td>
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</tr>
</tbody>
</table>

8. **How successful are your students at the design tasks that are associated with these activities?**

<table>
<thead>
<tr>
<th>Activity</th>
<th>1 - Students Not Successful</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5 - Students Very Successful</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gathering Information</td>
<td></td>
<td></td>
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<tr>
<td>Making Connections</td>
<td></td>
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<tr>
<td>Evaluation/Analysis</td>
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<tr>
<td>Interpretation</td>
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<tr>
<td>Predicting Outcomes</td>
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<tr>
<td>Forming Concepts</td>
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</tbody>
</table>
9. How important is it for a designer to possess the following traits/mindsets?

<table>
<thead>
<tr>
<th>Trait</th>
<th>1 - Not Important</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5 - Very Important</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-Reflection</td>
<td></td>
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<tr>
<td>Open-mindedness</td>
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<tr>
<td>Curiosity/Inquisitiveness</td>
<td></td>
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<tr>
<td>Future-mindedness</td>
<td></td>
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<tr>
<td>Empathy/Emotional Intelligence</td>
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<tr>
<td>Ingenuity/Creativity</td>
<td></td>
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<tr>
<td>Tenacity/Perseverance</td>
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</tr>
</tbody>
</table>

10. If possible, consider these traits from the perspective of your students. How much value do your students place on the following traits/mindsets?

<table>
<thead>
<tr>
<th>Trait</th>
<th>1 - Not Valued by Students</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5 - Highly Valued by Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-Reflection</td>
<td></td>
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<tr>
<td>Open-mindedness</td>
<td></td>
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</tr>
<tr>
<td>Curiosity/Inquisitiveness</td>
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<tr>
<td>Future-mindedness</td>
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<tr>
<td>Empathy/Emotional Intelligence</td>
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<tr>
<td>Ingenuity/Creativity</td>
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<tr>
<td>Tenacity/Perseverance</td>
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</tbody>
</table>

11. Please list any additional traits or mindsets you consider important for designers to possess:

[Blank space for input]
Teaching Experiences

The school year has just ended or will be ending soon. As you reflect over this academic year I would like you to consider the positive teaching and learning outcomes of your studio courses as well as the frustrations or difficulties you may have experienced.

12. Please briefly describe any frustrations or difficulties you experienced in teaching your studio courses.

13. Please briefly describe any positive outcomes you experienced in teaching your studio courses.

Regional Demographics

The following questions are for classification and contextual purposes:

14. In what region/state do you teach?

15. How would you classify the area/community in which you teach?
   - Urban
   - Suburban
   - Rural
   - Other: ____________

Thank you for participating in this survey. If you have any additional thoughts or comments to share feel free to do so below.

Survey Completed!

Click below to submit your responses. Thank you for your time.
Teaching Experiences

The school year has just ended or will be ending soon. As you reflect over this academic year I would like you to consider the positive teaching and learning outcomes of your studio courses as well as the frustrations or difficulties you may have experienced.

12. Please briefly describe any frustrations or difficulties you experienced in teaching your studio courses.

Since students are from different cultures and languages must think through content and language that may not translate well. There are always a couple of students who you can’t seem to get motivated and can’t figure out why they’re in design - it was a struggle for them to get in. They went through a selective process - yet they still don’t seem to be engaged, interested in, curious about design. But they don’t want to change majors. Students’ limited experience with various materials for making models. Exploration isn’t as strong or extensive as I would have liked. While their final output...

13. Please briefly describe any positive outcomes you experienced in teaching your studio courses.

The progress students make after the initial application - the 2nd or 3rd iteration. Then there are the rest of the kids - hardworking, smart, fun to be around, inquisitive, talented; dedicated to doing something good and important. It’s always a kick to see what they decide to work on and what they come up with. Students are open to discovery, they can push an idea and strengthen it throughout the design process. Students are good at verbally presenting their projects. Final outcomes/renderings are strong - communicate the spaces well. As usual, the more students dive into a problem the wider...

Regional Demographics

The following questions are for classification and contextual purposes:

14. In what region/state do you teach?

Ohio  Southwestern Virginia New York Midwest Pacific NW Chicago Illinois New York City Oregon

15. How would you classify the area/community in which you teach?

Urban  5  58%
Suburban  1  11%
Rural  1  11%
Other  2  22%

Thank you for participating in this survey. If you have any additional thoughts or comments to share feel free to do so below.

Question 10 was difficult to answer from students’ points of view - hard to know what they think. Would be better to actually survey them directly. Good luck! Design is visions, dreams, feelings and emotions, good luck! Thank you. Peter

Survey Completed!

Click below to submit your responses. Thank you for your time.
Appendix B: The Complete Process Model and Framework
Design Process Analysis - Introduction

The following pages present a proposed framework for studio-based design education. The process, phases and activities are built upon an Interior Design directed course. This model is similar to processes used in commercial design studios and closely matches the process model I used with senior-level students for an 11 week retail design project in the winter of 2011.

As my research is examining the role of cognitive strategies and traits (mind-sets) associated with critical and creative thinking, these elements have been mapped onto the design process model. These cognitive strategies and traits are based upon the work of Dr. Richard Paul and Dr. Lisa Elder in addition to Dr. Benjamin Bloom's Taxonomy of Educational Objectives.

The importance of these elements was determined through class observations and the results of the survey that you participated in earlier this spring.

The review of data from the survey and classroom observations revealed that students understand and use value certain thinking strategies and mind-sets that are essential to working as a designer.

The horizontal axis represents the sequence of the phases for a given project.

The vertical axis of the framework represents the layering of the components essential to each phase of the process. The "activities" and "learning methods" categories act as book-ends to contain and support the thinking strategies and mind-sets for each phase.

The following document begins with a view of the overall framework. Subsequent pages dive into greater detail for each category along the vertical axis. A second level of phase-specific explanation is provided for the "strategies" and "traits" categories.

The final pages of the framework begin to explore the possible links between learning methods and the strategies and/or traits they could activate.

With your feedback I hope to identify additional ways in which studio-based design activities can engage students to become stronger critical and creative thinkers.
# Design Process Analysis - Overview

Where are the strategies and traits of critical thinking used in the interior design process?

<table>
<thead>
<tr>
<th>Phase</th>
<th>Activities</th>
<th>Strategies</th>
<th>Traits</th>
<th>Learning Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Investigation:</strong> Internal</td>
<td>Evaluative</td>
<td>Review Project Brief: Identity Goals, Project Objectives</td>
<td>Curiosity</td>
<td>Photographs, User profile development, Preliminary Problem Identification</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ingenuity</td>
<td>User Observation, Diagrams, Sketching, Prototyping</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Open-Minded</td>
<td>User profile development, Concept Assessment: User versatility, Deep questioning</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Self-Reflection</td>
<td>User profile development, Concept Assessment: User versatility, Deep questioning</td>
</tr>
<tr>
<td><strong>Investigation:</strong> External</td>
<td>Evaluative</td>
<td>Research: Market, Competitors, Competitive Store Audits, Benchmarking</td>
<td>Curiosity</td>
<td>User Observation, Diagrams, Sketching, Prototyping</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ingenuity</td>
<td>User profile development, Concept Assessment: User versatility, Deep questioning</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>Open-Minded</td>
<td>User profile development, Concept Assessment: User versatility, Deep questioning</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Self-Reflection</td>
<td>User profile development, Concept Assessment: User versatility, Deep questioning</td>
</tr>
<tr>
<td><strong>Schematic Design</strong></td>
<td>Primarily Generative</td>
<td>Brand, style, image, experience creation: User experience mapping, Customer journey mapping, competition</td>
<td>Curiosity</td>
<td>User Observation, Diagrams, Sketching, Prototyping</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ingenuity</td>
<td>User profile development, Concept Assessment: User versatility, Deep questioning</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>Open-Minded</td>
<td>User profile development, Concept Assessment: User versatility, Deep questioning</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Self-Reflection</td>
<td>User profile development, Concept Assessment: User versatility, Deep questioning</td>
</tr>
<tr>
<td><strong>Design Concept Refinement</strong></td>
<td>Primarily Generative</td>
<td>Interpretation of attributes into dimensional space: Floor Plans, Adjacencies, Visual Concept Design: Elevation, Interior</td>
<td>Ingenuity</td>
<td>User Observation, Diagrams, Sketching, Prototyping</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Tenacity</td>
<td>User Profile Development, Concept Assessment: User versatility, Deep questioning</td>
</tr>
<tr>
<td><strong>Design Development</strong></td>
<td>Balanced</td>
<td>Detailed execution of spatial, environmental and experiential elements: Interior elevations &amp; visuals, Exterior elevations &amp; visuals, Material &amp; finishes, Specifications, Graphical communication</td>
<td>Ingenuity</td>
<td>User Observation, Diagrams, Sketching, Prototyping</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Tenacity</td>
<td>User Profile Development, Concept Assessment: User versatility, Deep questioning</td>
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<tr>
<td></td>
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<td></td>
<td>Open-Minded</td>
<td>User profile development, Concept Assessment: User versatility, Deep questioning</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Self-Reflection</td>
<td>User profile development, Concept Assessment: User versatility, Deep questioning</td>
</tr>
<tr>
<td><strong>Documentation</strong></td>
<td>Balanced</td>
<td>Interior Construction Drawings: Details, Sections, Material &amp; Finishes, Specifications, Background information, Final Image &amp; Graphics, Bid Documents, Cost Estimates</td>
<td>Tenacity</td>
<td>User Observation, Diagrams, Sketching, Prototyping</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ingenuity</td>
<td>User Profile Development, Concept Assessment: User versatility, Deep questioning</td>
</tr>
<tr>
<td><strong>Implementation</strong></td>
<td>Primarily Evaluative</td>
<td>Project Summary: Presentations, Case Studies, Post-completion assessments, Installation: Construction Administration, Trouble-shooting, Team coordination</td>
<td>Tenacity</td>
<td>User Observation, Diagrams, Sketching, Prototyping</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ingenuity</td>
<td>User Profile Development, Concept Assessment: User versatility, Deep questioning</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Self-Reflection</td>
<td>User profile development, Concept Assessment: User versatility, Deep questioning</td>
</tr>
</tbody>
</table>

*Note: The table above outlines various phases of the design process with related activities, strategies, traits, and learning methods.*
### Design Process Analysis - Typical Project Activities

**Fundamental components of a project**

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PILOT</strong></td>
<td><strong>PHASE</strong></td>
<td><strong>Evaluative</strong></td>
<td><strong>Evaluative</strong></td>
<td><strong>Primarily Generative</strong></td>
<td><strong>Primarily Generative</strong></td>
<td><strong>Balanced</strong></td>
<td><strong>Balanced</strong></td>
<td><strong>Primarily Evaluative</strong></td>
</tr>
<tr>
<td><strong>ACTIVITIES</strong></td>
<td><strong>STRATEGIES</strong></td>
<td><strong>Curiosity</strong></td>
<td><strong>Empathy</strong></td>
<td><strong>Ingenuity</strong></td>
<td><strong>Ingenuity</strong></td>
<td><strong>Ingenuity</strong></td>
<td><strong>Ingenuity</strong></td>
<td><strong>Ingenuity</strong></td>
</tr>
<tr>
<td><strong>TENTATIVE</strong></td>
<td><strong>LEARNING METHODS</strong></td>
<td><strong>Photography</strong></td>
<td><strong>User Observation</strong></td>
<td><strong>Sketching</strong></td>
<td><strong>Sketching</strong></td>
<td><strong>Sketching</strong></td>
<td><strong>Sketching</strong></td>
<td><strong>Sketching</strong></td>
</tr>
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Design Process Analysis - Hierarchy of Critical Thinking Strategies

What are the most important thinking strategies in each phase of the design process?

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<tr>
<td>Documentation</td>
<td>Balanced</td>
<td>Writing, Forming Concepts, Making Connections, Interpretation</td>
</tr>
<tr>
<td>Implementation</td>
<td>Primarily Evaluative</td>
<td>Evaluation, Gathering Information, Predecting Outcomes, Interpretation</td>
</tr>
</tbody>
</table>
### Critical Thinking Strategies in Detail

**Descriptions of the cognitive strategies used in the phases of the design process.**

**Investigation:**

**Internal**

<table>
<thead>
<tr>
<th>Evaluative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Evaluation</strong></td>
</tr>
<tr>
<td>Distinguishing between substantiated and unsubstantiated opinion</td>
</tr>
<tr>
<td>Separating relevant from irrelevant information</td>
</tr>
<tr>
<td>Weighing meanings and evaluating the credibility of sources</td>
</tr>
<tr>
<td>Withholding judgment or evaluation until the establishment of valid and adequate evidence</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Predicting Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identifying fundamental problems and recognizing major issues</td>
</tr>
<tr>
<td>Predicting cause and effect relationships</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drawing valid inferences and forming logical interpretations</td>
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**External**

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<table>
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<tr>
<th>Making Connections</th>
</tr>
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<tbody>
<tr>
<td>Comparing and contrasting</td>
</tr>
<tr>
<td>Discovering relationships</td>
</tr>
<tr>
<td>Analyzing information and ideas and understanding their interrelatedness</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gathering Information</th>
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</thead>
<tbody>
<tr>
<td>Employing the skills of meticulous observation, looking beyond the surface into the richness of details</td>
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<tr>
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<th>Schematic Design</th>
<th>Design Concept Refinement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primarily Generative</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Forming Concepts</strong></td>
<td>Synthesizing ideas to form a new concept.</td>
<td>Recognizing the plausibility of more than one correct answer or solution to a problem.</td>
</tr>
<tr>
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<td>Generating solutions to problems.</td>
</tr>
<tr>
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<td>Generating solutions to problems.</td>
<td>Revising and rethinking.</td>
</tr>
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<td>Revising and rethinking.</td>
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<td>Drawing valid inferences and forming logical interpretations.</td>
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<tr>
<td></td>
<td>Predicting cause and effect relationships.</td>
<td>Using the vocabulary of the discipline appropriately and precisely.</td>
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</tr>
<tr>
<td></td>
<td>Making evaluations based on fairly established standards.</td>
<td>Making evaluations based on fairly established standards.</td>
</tr>
<tr>
<td><strong>Predicting Outcomes</strong></td>
<td>Identifying fundamental problems and recognizing major issues.</td>
<td>Predicting cause and effect relationships.</td>
</tr>
<tr>
<td></td>
<td>Predicting cause and effect relationships.</td>
<td>Projecting and imagining consequences.</td>
</tr>
<tr>
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Critical Thinking Strategies in Detail
Descriptions of the cognitive strategies used in the phases of the design process.

**Design Development**

**Interpretation**
Making informed decisions and reasonable choices.
Supporting opinions and waging arguments with credible facts, information, examples, explanation, descriptive details, illustrations, quotations and incidents.
Drawing valid inferences and forming logical interpretations.
Using the vocabulary of the discipline appropriately and precisely.

**Forming Concepts**
Synthesizing ideas to form a new concept.
Recognizing the plausibility of more than one correct answer or solution to a problem.
Generating solutions to problems.
Revising and rethinking.

**Making Connections**
Comparing and contrasting.
Discovering relationships.
Analyzing information and ideas and understanding their interrelatedness.

**Gathering Information**
Employing the skills of meticulous observation, looking beyond the surface into the richness of details.
Perceiving the complexity of an issue or concept.

**Predicting Outcomes**
Identifying fundamental problems and recognizing major issues.
Predicting cause and effect relationships.
Projecting and imagining consequences.

**Documentation**

**Interpretation**
Making informed decisions and reasonable choices.
Supporting opinions and waging arguments with credible facts, information, examples, explanation, descriptive details, illustrations, quotations and incidents.
Drawing valid inferences and forming logical interpretations.
Using the vocabulary of the discipline appropriately and precisely.

**Forming Concepts**
Recognizing the plausibility of more than one correct answer or solution to a problem.
Generating solutions to problems.
Revising and rethinking.

**Making Connections**
Comparing and contrasting.
Discovering relationships.
Analyzing information and ideas and understanding their interrelatedness.

**Predicting Outcomes**
Identifying fundamental problems and recognizing major issues.
Critical Thinking Strategies in Detail
Descriptions of the cognitive strategies used in the phases of the design process.

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<tr>
<th>MODE</th>
<th>PHASE</th>
<th>Balanced: Generative and Evaluative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Evaluation</strong></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Interpretation</td>
</tr>
</tbody>
</table>
Design Process Analysis - Hierarchy of critical thinking strategies
What thinking strategies do students struggle with or overlook?
### Design Process Analysis - Hierarchy of Critical Thinking Traits

**What are the most important thinking traits (mind-sets) in each phase of the design process?**

<table>
<thead>
<tr>
<th>Mode</th>
<th>Phase</th>
<th>STRATEGIES</th>
<th>ACTIVITIES</th>
<th>LEARNING METHODS</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

**Categories:**
- **Curiosity**
- **Empathy**
- **Open-Mindedness**
- **Ingenuity**
- **Tenacity**

**Sub-Categories:**
- **Ingenuity**
- **Empathy**
- **Open-Mindedness**
- **Ingenuity**
- **Tenacity**

**Key Terms:**
- **Photographs**
- **User Observation**
- **Data Collection**
- **Conceptual Framework**
- **Collaborative Environment**
- **Workshop**
- **Workshop Design**
- **Presentation**
- **Simulation**
- **Model Making**
- **Prototyping**
- **Final Presentation**

**Examples of Activities:**
- **Photographs**
- **User Observation**
- **Data Collection**
- **Conceptual Framework**
- **Collaborative Environment**
- **Workshop**
- **Workshop Design**
- **Presentation**
- **Simulation**
- **Model Making**
- **Prototyping**
- **Final Presentation**
Critical Thinking Traits and Mind-sets in Detail

Descriptions of beneficial traits and mind-sets in the phases of the design process.

### Investigation:

**Internal**

<table>
<thead>
<tr>
<th>Mode</th>
<th>Phase</th>
<th>Evaluative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Curiosity</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Possessing the intellectual courage to explore and question the underlying beliefs and basic assumptions guiding personal thinking and actions as well as those of others.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Having the willingness to seek out, examine, and value understanding and insights to be gained through consideration of multiple points of view.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Ingenuity</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thinking metaphorically, seeing and understanding one thing in terms of another.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Open-Minded</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thinking in terms of the relative, accepting contexts of all kinds as determining factors for right/wrong, appropriate/inappropriate, adequate/inadequate.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Empathy</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Valuing personal experience.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Self-Reflection</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Understanding the importance of metacognition (purposely thinking about thinking in order to monitor the quality of reasoning).</td>
</tr>
</tbody>
</table>

### Investigation:

**External**

<table>
<thead>
<tr>
<th>Mode</th>
<th>Phase</th>
<th>Evaluative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Curiosity</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Being curious, possessing the spirit of wonder.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Possessing the intellectual courage to explore and question the underlying beliefs and basic assumptions guiding personal thinking and actions as well as those of others.</td>
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<td><strong>Ingenuity</strong></td>
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<td></td>
<td></td>
<td><strong>Empathy</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thinking empathically, having the willingness and the ability to enter sympathetically into the thoughts and feelings of others.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Being aware of the relationship between thoughts and feelings.</td>
</tr>
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<td></td>
<td>Valuing personal experience.</td>
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<tr>
<td></td>
<td></td>
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</table>
Critical Thinking Traits and Mind-sets in Detail
Descriptions of beneficial traits and mind-sets in the phases of the design process.

Schematic Design

Primarily Generative

Open-Minded
Thinking in terms of the relative, accepting contexts of all kinds as determining factors for right/wrong, appropriate/inappropriate, adequate/inadequate.
Tolerating uncertainty, ambiguity, and a lack of resolution when no single answer or solution can be found.

Ingenuity
Thinking metaphorically, seeing and understanding one thing in terms of another.
Thinking creatively, enjoying and valuing imagination.
Having the courage to think independently.

Future-Minded
Having the habit of raising a broad range of significant questions at appropriate times.
Thinking hypothetically, supposing, assuming, asking “What if...”
Dealing rationally and fairly minded with conflicting points of view.

Empathy
Thinking empathically, having the willingness and the ability to enter sympathetically into the thoughts and feelings of others.
Being aware of the relationship between thoughts and feelings.

Design Concept Refinement

Primarily Generative

Open-Minded
Thinking in terms of the relative, accepting contexts of all kinds as determining factors for right/wrong, appropriate/inappropriate, adequate/inadequate.
Tolerating uncertainty, ambiguity, and a lack of resolution when no single answer or solution can be found.

Ingenuity
Thinking metaphorically, seeing and understanding one thing in terms of another.
Thinking creatively, enjoying and valuing imagination.
Having the courage to think independently.

Tenacity
Having confidence in reason and understanding that reasoning can solve problems and lead to understanding.
Persevering until problems are solved or resolutions or compromises are found.

Future-Minded
Thinking hypothetically, supposing, assuming, asking “What if...”
Dealing rationally and fairly minded with conflicting points of view.
Critical Thinking Traits and Mind-sets in Detail
Descriptions of beneficial traits and mind-sets in the phases of the design process.

### Design Development

**Balanced: Generative and Evaluative**

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<tr>
<th>Trait</th>
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<tbody>
<tr>
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<td></td>
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### Documentation

**Balanced: Generative and Evaluative**

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Critical Thinking Traits and Mind-sets in Detail
Descriptions of beneficial traits and mind-sets in the phases of the design process.

Implementation

Balanced: Generative and Evaluative

Tenacity
- Having confidence in reason and understanding that reasoning can solve problems and
  lead to understanding.
- Persevering until problems are solved or resolutions or compromises are found.

Self-Reflection
- Understanding the importance of metacognition (purposely thinking about thinking in
  order to monitor the quality of thinking).

Ingenuity
- Thinking metaphorically, seeing and understanding one thing in terms of another.
- Having the courage to think independently.
### Design Process Analysis - Hierarchy of Critical Thinking Traits

What traits or mind-sets do students struggle with or undervalue?

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<table>
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<td>Evaluative</td>
<td>Investigation: Internal</td>
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<tr>
<td>Ingenuity</td>
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### Design Process Analysis - Hierarchy of Critical Thinking Traits

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<td>Implementation</td>
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### Design Process Analysis - Learning Methods

What tools and learning methods are typically used throughout the design process?

<table>
<thead>
<tr>
<th>LEARNING METHODS</th>
<th>PHASE</th>
<th>ACTIVITIES</th>
<th>STRATEGIES</th>
<th>TRAITS</th>
</tr>
</thead>
</table>

**LEARNING METHODS**
- Photographic: User profile development, Literature/brand review, Preliminary Problem Identification
- Five Why's (Intricate, Deep Questioning)
- User Observation: Field notes, Photographs
- User profile development: Scenario Creation, Needs matrix
- Creative Writing: Narratives, Storytelling
- Brainstorming
- Concept Assessment: Five Why's (Intricate, Deep Questioning)
- Mind-maps, Circulation, User experience, Customer Journey
- Sketching: Exploration, Discovery, Internal Communication
- Image Collages
- Creative Writing: Narratives, Storytelling
- Brainstorming
- Concept Assessment: Five Why's (Intricate, Deep Questioning)
- Perspective (taking into account the user's point of view)
- Sketching: Discovery, External Communication, Perspective, Elevation, Details
- Drafting: Precision and Clarity, Technical Communication Notes, Dimensions, Tolerance
- Materials Collages
- Prototyping: Model making, 3D Wireframes, Rendering and color studies, Scale graphics
- Drafting: DD drawings, Notes, Dimensions (Technical), Symbol Making: Legends, Material representation
- Final renderings: Color studies, Scale graphics
- User Experience: Customer Journey

**PROJECT ACTIVITIES**
- Review Project Brief, Identify Goals, Project Outline, Design and Visualization
- Research: Client Meeting, Stakeholder Analysis, Market, Competition
- User Experience: Customer Journey
- Sketching: Exploration, Discovery, Internal Communication, Perspective, Elevation, Details
- Drafting: Precision and Clarity, Technical Communication Notes, Dimensions, Tolerance
- Materials Collages
- Prototyping: Model making, 3D Wireframes, Rendering and color studies, Scale graphics
- Drafting: DD drawings, Notes, Dimensions (Technical), Symbol Making: Legends, Material representation
- Final Renderings: Color studies, Scale graphics
- Informational Diagrams
- User Experience: Customer Journey

**PROJECT DOCUMENTATION**
- Interior Construction Drawings
- Details & Sections
- Pipe Schedules
- Material Specifications
- Email Images & Graphics
- Bill of Materials
- Cost Estimation
- Project Summary: Presentation, Case Study, Final Reports, Post-completion assessments, Implementation: Construction Administration, Trouble Shooting, Team Coordination

**PROJECT IMPLEMENTATION**
- Project Summary: Presentation, Case Study, Final Reports, Post-completion assessments, Implementation: Construction Administration, Trouble Shooting, Team Coordination
# Design Process Analysis - Methods to teach and activate Evaluation.

<table>
<thead>
<tr>
<th>LEARNING METHODS</th>
<th>STRATEGIES</th>
<th>INVESTIGATION: INTERNAL</th>
<th>INVESTIGATION: EXTERNAL</th>
<th>SCHEMATIC DESIGN</th>
<th>DESIGN CONCEPT REFINEMENT</th>
<th>DESIGN DEVELOPMENT</th>
<th>DOCUMENTATION</th>
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</table>

- **Investigation:**
  - **Internal:** Evaluative
  - **External:** Evaluative

- **Schematic Design:**
  - Primarily Generative

- **Design Concept Refinement:**
  - Primarily Generative

- **Design Development:**
  - Balanced

- **Documentation:**
  - Balanced

- **Implementation:**
  - Primarily Evaluative

### STRATEGIES
- **Photographs**
  - User profile development
  - Literature/brand review
  - Preliminary problem identification
  - Five Whys (multilevel, deep questioning)

- **User Observation:**
  - Field notes, photographs
  - User profile development: Scenario creation, needs matrix, creative free writing, visual verbal narrative, perspective taking, role play as user
  - User interviews & surveys
  - Market review & analysis
  - Conceptual sketches & wireframes

- **Collaborative Design:**
  - Brainstorming & collaborative design
  - Mind maps, user journey
  - User experience, customer journey

### LEARNING METHODS
- **Photographs**
  - Mind maps, circulations
  - User experience, customer journey

- **Sketching:**
  - General exploration, discovery, internal communication, external communication, perspective, elevation, details
  - Drafting: precision and clarity, technical communication, notes, dimensions, details
  - Rendering and color studies: 3D wireframes, rendering, scale graphics
  - Informational diagrams: user experience, customer journey

- **Process Books**
  - Reflective writing
  - Large scale models, full scale prototypes
## Design Process Analysis - Methods to teach and activate Interpretation

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<tr>
<td><strong>Learning Methods</strong></td>
<td>Photographs: User profile development, literature review, preliminary problem identification</td>
<td>User Observation: Field notes, photographs, user profile development</td>
<td>Sketching: Exploration, discovery, creative writing, storyboarding, brainstorming, concept assessment</td>
<td>Sketching: General exploration, discovery, internal communication</td>
<td>Drafting: Drafting, technical communication, models, color studies</td>
<td>Evaluation: Gathering Information, projecting outcomes</td>
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- **Interpretation**: Forming Concepts, Making Connections, Gathering Information, Predicting Outcomes.
### Design Process Analysis - Methods to teach and activate Making Connections.

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#### Strategies

- **Photographs**
  - User Observation: Field notes, Photographs
  - User profile development: Scene Creation, Needs matrix, Creative/Free writing, Visual(oral/narrative)
  - User interviews & surveys
  - Market review & analysis
  - Diagrams: mind maps, circulation, user experience, customer journey

- **Sketching:**
  - General exploration, discovery, internal conversation
  - External communication, perspective, elevation, detail
  - Brainstorming, concept
  - Assessment: 5 Whys (multilevel, deep questioning)
  - Perspective taking: evaluate the user point of view

- **Drafting:**
  - 3D drawings, models, models (technical)
  - Material and materials: collages, prototyping
  - Rendering, color studies, scale graphics
  - Informational diagrams, user experience, customer journey

#### Learning Methods

- **Project Presentations:**
  - Visual
  - Verbal
  - Process Books
  - Reflective Writing
  - Large scale models
  - Full scale prototypes
# Design Process Analysis - Methods to teach and activate Empathy

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**Documentation:**
- Drafting: 3D drawings, notes, dimensions (technical)
- Symbolic making: legends, material representation
- Final renderings: Color studies, Informational diagrams

**Implementation:**
- Project presentations: Visual, verbal
- Process books
- Reflective writing
- Large scale models
- Full scale prototypes

**Learning Methods:**
- Sketching: exploration, discovery, internal conversation
- External communication: perspective, elevation, details
- Drafting: precision and clarity, technical communication notes, dimensions (technical)
- Materials: Collages, Prototyping: Model making 3D Wireframes, Rendering and color studies, Scale graphics
# Design Process Analysis - Methods to teach and activate Open-mindedness

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<th>Schematic Design</th>
<th>Design Concept Refinement</th>
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- Photographs
- User profile development
- Literature/brand review
- Preliminary Problem Identification
- Five Whys (multi-level, deep questioning)

- User Observation: Field notes, Photographs
- User profile development: Scene Creation, Neds matrix, Creative/Five writing, Visual/verbal narrative, Perspective taking, role play as user
- User interviews & surveys
- Market review & analysis
- Prototyping: Mind-mapping, 3D Wireframes, Rendering and color studies

- Sketching: exploration, discovery, internal conversation, Image Collages, Creative writing, narratives, story telling, Brainstorming Concept Assessment: Five Whys (multi-level, deep questioning), Perspective taking: evaluate from the user point of view
- Sketching: general exploration, discovery, internal conversation, External communication, Perspective, elevation, details, Drafting: precision and clarity, Technical communication, notes, dimensions (technical)
- Materials Collage: Prototyping: Model making, 3D Wireframes, Rendering and color studies

- Sketching: discovery, external communication, perspective, elevation, details, Drafting: precision and clarity, Technical communication, notes, dimensions (technical)
- Materials Collage: Prototyping: Model making, 3D Wireframes, Rendering and color studies

- Project Presentations: Visual, Verbal, Process Books, Reflective Writing, Large scale models, Full scale prototypes

- Ingenuity
- Tenacity
## Appendix C: Interview Quotes

### Participant 1

<table>
<thead>
<tr>
<th>Time Stamp</th>
<th>Participant Quotes</th>
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<tbody>
<tr>
<td>2:55</td>
<td>“As for creativity, when you have multicultural students it’s a little different. Creativity isn’t a word they understand necessarily, you know. It’s developing ideas, yes and its how to look at at things, but they are not like a US student.”</td>
</tr>
<tr>
<td>7:08</td>
<td>“Sometimes you don’t leave enough time for things they are struggling with and you can’t just move them on until you work through that.”</td>
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<tr>
<td>17:04</td>
<td>“Making models is a good one. Think that helps because some of them even use it in their final design and by using little exercises leads you into the design. I think hands-on is a good thing besides the computer. You get to work with some materials and you provide them some materials so they don’t have to find them. So you take some materials and you take some exercises and you take some ideas and they brainstorm some ideas.”</td>
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<tr>
<td>22:08</td>
<td>“I think if you go see it first and then you’ll understand it better.”</td>
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<tr>
<td>25:14</td>
<td>“I Think that’s a hole in education because we don’t have real clients to talk to. You can’t have empathy if your teacher is your only client.”</td>
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<td>26:10</td>
<td>If you’re going to do a preschool and have no experience with a preschool—and I’ve worked on two—you gotta go and talk to the people and find out what their needs are. But in school you mostly get, ‘here is the program.’”</td>
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<tr>
<td>27:50</td>
<td>“You can have some empathy from research but without real people, that’s where the empathy comes in.”</td>
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### Participant 1 - Continued

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<tr>
<th>Time Stamp</th>
<th>Participant Quotes</th>
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<tr>
<td>32:30</td>
<td>“I think the instructor has to understand the students early on to know about the open-minded and the future minded. You gotta see where they’ve come from.”</td>
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<tr>
<td>34:20</td>
<td>“I think early exercises where the students tell about themselves would be really good. How they get here is really fascinating.”</td>
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<tr>
<td>35:42</td>
<td>“Teaching someone who’s 18, just out of school and teaching someone who’s 32 is different, too.”</td>
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<tr>
<td>36:01</td>
<td>“It’s a lot about story. It’s about peoples stories in a way to know how to teach them.”</td>
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<tr>
<td>39:00</td>
<td>“Practicing drawing in any studio is good.”</td>
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### Participant 2

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<tr>
<th>Time Stamp</th>
<th>Participant Quotes</th>
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<tr>
<td>6:15</td>
<td>“The best of what we can do is give them the time to get it out. Mush it, smash it, step on it, get angry with it.”</td>
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<tr>
<td>12:53</td>
<td>“I love that you added this ‘reflective writing’ and process books. Absolutely. Because I think that’s where you really, um, I don’t; know, that brings me to when you are selling an idea, when someone understands where the idea comes from. For students to learn that is they key to successful and well done work.”</td>
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<tr>
<td>27:43</td>
<td>“This whole digital thing, you know. I realize I’m working with kids that really played differently when they were little. They played with buttons and gadgets that give them digital whatever, you know. And their experiences are very different, you know, and so there’s a bunch of us old folk that are introducing, trying to make the connection. There’s a huge gap.”</td>
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<tr>
<td>29:21</td>
<td>“I think as designers we are social, we are responsible. Can you imagine art students, sophomores on Monday morning where I work when I say, ‘you realize this has to do with people. You are all going to be involved with improving something. You re responsible. You are not just going to be wanting to be famous. Or it’s note about money.’ They look at me like, ‘Where did she come from?’”</td>
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<td>35:00</td>
<td>“The world is getting smaller and I think recently, especially politically we’ve been sort of, um, been told to isolate ourselves more. I’m reacting in the opposite way and I think we should be sharing more.”</td>
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<tr>
<td>36:42</td>
<td>“We stayed at a Nicaragua coffee farm to observe and to improve living areas and kitchen cooking. It was so different, just by observing and watching and considering what we were seeing we realized the students learned themselves that here’s a group of people that have less than anybody they’ve ever seen before and guess what? They’re all happy and resourceful and they live with very little and it kind f works. So they were like, “my god, they’ve got this solved. We don’t have anything to contribute.’ It was kind of a shocking thing that way and they learned an immense life lesson and that’s way beyond anything we could have done as a product or whatever.”</td>
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<tr>
<td>38:10</td>
<td>“And actually the students learned how to pick coffee and spent all afternoon picking beans and they added to their baskets and they had their beans weighed and found out how, like the value of their accomplishments were and they compared it with each other. It was fun but it was labor and they got involved.”</td>
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<tr>
<td>42:43</td>
<td>“It’s important at an early part of the process to reach beyond what their expectations are. That’s why I mention this breaking down is so critical. It’s huh, uh, you don’t’ know what you’re doing. You have not idea what you’re doing. You don’t even want to know because if you’re not open—yeah, go ahead. Make a mistake, an accident, do something, take a risk, um, because really what you’ve got to learn is that’s the key to your success is when you are aware of those possibilities. When you make a mistake and something comes up that is unexpected you go, like, ‘ohh, that could be interesting’ and that’s usually when the little spark and that’s once they grab hold of an idea and take it and run with it. And then they own it.”</td>
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<tr>
<td>44:10</td>
<td>“I tell my students the hardes part is sketching. Even at work for me, if I’m not in the right mood, it’s just not going to happen.”</td>
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Participant 2 - Continued

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<tbody>
<tr>
<td>44:49</td>
<td>“when you do spend time, your head is always, your mind is always running around and but you gotta control your hands; the way your eyes are seeing your hands do and responding back and forth, how eye, hand, back and forth, and getting a sense of control over that and confidence to move to the next step and being not afraid to go backward, too. It’s fascinating to watch the variety of how that works”</td>
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Participant 3

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<tr>
<td>1:49</td>
<td>“It struck me as a legitimate and very well documented outline/matrix/framework whatever we are going to call it. It seems a little bit daunting. When I looked at it to try and figure out how I would implement this.”</td>
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<tr>
<td>3:17</td>
<td>“I didn’t disagree with anything I was reading. I just wasn’t sure. Maybe I need a slightly better road map through it.”</td>
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<tr>
<td>6:44</td>
<td>“What would have helped me is that if at the end there were a couple of pages with a hypothetical walk through of the process in one instance and how I might use this.”</td>
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<tr>
<td>7:20</td>
<td>“At some point I throw up my hands and give up when I have too many options. If you laid out a hypothetical situation and then walked through it and highlighted on each page where you go might work and give some examples of that might be a way to move forward.”</td>
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<tr>
<td>10:18</td>
<td>“It would really open the door for people to see that any one of these is an option, none of them is a mandate and you pick and choose as you go through it a various times and say, ‘ok. This is where my students need more of this at the moment.’”</td>
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<td>14:10</td>
<td>“It resembles it dramatically. There’s not really a lot of difference, I don’t think, in the process I sued when I taught interior design and the process I use when I teach product design.”</td>
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### Participant 3 - Continued

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<tr>
<td>14:52</td>
<td>“I tend to think the idea of sketching because it’s a different kind of thing in product design than it is in interior design. Because it’s just a sketch of an interior is a much more comprehensive thing, even if it’s the same level of sketching. It may take half an hour or 40 minutes to really be able to fill it in whereas if I’ve got somebody working essentially on the form of something or even on the level of detail on it we can even kind of extract that and do 5 sketches in 40 minutes. And there might be a difference in the way people thing about sketching.”</td>
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<tr>
<td>17:00</td>
<td>“Yes, yes, you’ve done all this in plan but you will never see the space this way. Quit making a plan do everything.”</td>
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<tr>
<td>23:35</td>
<td>“Think storytelling is really important. I make a big deal of it with my students but I try to make sure that they don’t tell lies. You know, um, uh, so the storytelling part needs to be, it’s almost as if, Have you had your students do personas? (answer: yes). Ok, so personas I think are extremely valuable but not if they are generated out of thin air. And students tend to do that. They tend to make up all these essentially projections they have of their, they things they are interested in and that’s what may persona’s like. And I go, ‘where’d you get that?’ you know, a persona that’s just generated out of thin air tells you a lot about the person who created it and nothing else. So I think it’s kind of the same thing with this making sure that when I tell a story about a product or I tell a story about a space, which I believe is incredibly important especially in this day and age. That I tell an accurate story of it that’s not be fooling myself.”</td>
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<tr>
<td>26:52</td>
<td>“I’ve been thinking a lot about the term empathy for the last 3 weeks or so because I was at the IDSA conference in Boston and there was a discussion about, there’s always a discussion about the future of design education and like the guaranteed panel discussion. And do you know who Craig Vogel is? He’s associate dean a the department at the University of Cincinnati in their design program. And he said two things that I think were really kind of really well put. I think the guy’s really smart. He talked about the fact that ID is a empathic profession. And while that’s you know whether you say empathic or empathetic or however you want to put it, I think that really marks one of the most important things we do. We try to get into the needs and the desires of the user. And the only way we can do that is by empathy, by empathizing with them.”</td>
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<tr>
<td>29:04</td>
<td>“Comprehensive visualization of future alternatives. (ID Definition per Craig Vogel) and you put it through a kind of empathetic mindset and you get some really good stuff.”</td>
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“I think it’s different from what we’ve talked about with our students before this with needs assessment. To me, it’s getting at a more emotional level and really trying to understand not just the needs assessment of that elderly have reduced vision and that thing but really trying to understand what that means as you walk through a space. What do you need to be able to walk through a space and see left. And I don’t have any great ways at this point of employing that. I mean, we try to do some of those walk a mile in my shoes kind of events but they can sometimes be fairly rote.”

“We try to make a big point out of not just doing something right but doing the right thing. I don’t mean it to sound that every student is doing a life saving project. We are trying to get away rom the traditional—I shouldn’t say traditional—the kind of weaker side of product design: making salad shooters.”

“We have a long tradition here of making stuff and we’ve kind of expanded that into the research area as well with like get your hands dirty, get out there and actually find the people you think are going to be using this or you know its not uncommon for us to say ok, here’s your user group and go find out what they need.”

“We don’t do this too early with them. I do this in the 3rd year. You know, in the 2nd year they’re just trying to learn how to make a sphere look like a sphere. But in the 3rd year it’s time for them to start doing, discovering, like the need matrix, narratives, explorations and that kind of stuff. They need to be finding things that are important.

“We do a lot of prototyping but we don’t necessarily get the same amount of them getting out there and testing their prototypes with their users. It’s both a time aspect and it’s really hard when your average project lasts 10-13 weeks."
### Participant 4

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<tr>
<th>Time Stamp</th>
<th>Participant Quotes</th>
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<tr>
<td>5:05</td>
<td>“It was pretty clear to me. It was for me, I ask how does it relate? For me, it’s pretty theoretical. I thought how do the assignments look like? And it’s so based on talking about design rather than doing it. That is for me very difficult and for me with my cultural background, coming from Germany.”</td>
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<tr>
<td>8:01</td>
<td>“I was like ‘oh, damn! Do I want to go through all those words?’”</td>
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<tr>
<td>9:29</td>
<td>“It doesn’t meet that a word needs to be made out of letters only.”</td>
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<tr>
<td>11:01</td>
<td>“For me studio teaching is trying to take students over a big mountain but rather than taking them over the big mountain I try to split it into several mountains. So they start with a personal introduction pre-assignment as a point of departure and from there they go into basic architectural education, which is plan section and elevation. Maybe they do a case study, not necessarily, but they definitely have to relate it to the context of similar assignments and the history of architecture or interior architecture, mid century and contemporary. So everything they do they have to express in drawings and models. Actually they are not allowed to write. Maybe a sentence, maybe three sentences, but definitely their form of expression needs to be a visual. The visual splits into the first 4 weeks. We have a 10 weeks program. The first 4 weeks they have to do it all in hand drawings and then they may start taking the computer but they have to work in hybrid thinking. So for me it’s all about the hybrid and its not so much that I look at the differences between what you do and what I do, but lets say there’s a common path and a step by step approach as everybody does but the form is a different one. So they need to find a away to express their thoughts in sketches, for the pure experience of doing something with your hands in the most decent form.”</td>
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<tr>
<td>18:48</td>
<td>“For me, evaluating goes together with making, testing, evaluating. I would not leave the word evaluating alone. To break it down in aspects of critical thinking is important especially because the word is so inflationarily used. So maybe you can even find a replacement for it.”</td>
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<tr>
<td>20:19</td>
<td>“There is such a big discrepancy. I don’t know if it is in Ohio, but Heike went through it in Stuttgart, too. The pure drawing, the drawing by themselves is minimal. You hardly find anyone sketching anymore and that’s a big problem. I do think it’s a problem.”</td>
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<tr>
<td>21:31</td>
<td>“But isn’t that dialogue your critical thinking?”</td>
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<tr>
<td>24:11</td>
<td>“I don’t know if I can split it like that. It’s for me not, I rather want to break it into thought #1 broken into this and this form influenced by this and this, which will lead to the next point. Like for example, I’d rather say what is this building. Or what is this department? How does this relate to the site? What is it doing on the site? What does the user get out of the site? You know, for me, it’s, I really try to go from not even a bubble diagram but a scaled massing model into going deeper and deeper and deeper into the design process so that I can arrive at the end with a set of points that are important for me relating to the building type, related to the site, relating to program, to the materials used in the drawings. I really think my page would look differently if I would do it like that.”</td>
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<tr>
<td>40:00</td>
<td>“And I think one important factor is missing: What’s the identification between the person who asked the assignment or teaches the studio and what’s on the paper? You know, what is good for you might not be good for Heike, might not be good for me. Not even how it is adapted but how is this good for you? How does this show your personality or your work, even? How is all. It’s a very personal experience, at the end of the day. It is for all of us, isn’t it?”</td>
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<tr>
<td>40:37</td>
<td>“And I think the is also the beauty of teaching, that as a teacher and also as a student, that you go through different people you are dealing with and they say pretty contradictory things.”</td>
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Participant 4- continued

47:41 “I have no teaching method at this point and I do not want one at this point in terms that I have not asked myself to get one. But I started at the beginning teaching like we did in Germany and then I looked how they did it in America and out of that it’s like a fusion at this point and I really do not want to stop that fusion with a theory at this point in my life. I am teaching since 8 years and one year sabbatical, so 6 years is not enough for me to say. There is this beautiful analogy by Issey Miyake, so he says, he’s in his 60’s or 70’s at this point and he’s pretty surprised about all those young designers who say they call themselves designers because he says he vaguely starts understanding the profession. And he said it’s not about the body and it’s not about the fabric. It’s about the space between them. And that’s how I feel. I’m, you know, sometimes I have this kind of body in front of me and sometimes I have this kind of fabric to do something, but I’m interested in what the students come up with to make both of them shine in each other’s company.”

Participant 5

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<th>Time Stamp</th>
<th>Participant Quotes</th>
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<tr>
<td>11:20</td>
<td>“When you are educated and you have to work with your hands you find out that what you know makes you very successful.”</td>
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<tr>
<td>18:27</td>
<td>“It’s so much easier to understand building systems by seeing it. They have to feel it so that they can understand it.”</td>
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<tr>
<td>23:11</td>
<td>“I see that doing it into the computer makes you lose completely the feeling of it.”</td>
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<tr>
<td>31:00</td>
<td>“User participation and knowing who is the final user has been one of the things I always go to with my students.”</td>
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<tr>
<td>35:20</td>
<td>“With life experience you become more critical. You have to ask questions. Why are you doing this? It builds up to where you never do something without questioning about it.”</td>
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### Participant 5 - continued

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<tr>
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<tr>
<td>40:33</td>
<td>“Have you considered online teaching of interior design that is going on in the US?”</td>
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<tr>
<td>42:00</td>
<td>“How can you teach someone to dance by reading a book about it? You cannot become a ballerina just by reading about it. It’s a joke. It’s so time consuming for a teacher. Design and critical thinking is not something that you teach online. How do you implement critical thinking in online teaching? There is no contact with the student.”</td>
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<tr>
<td>49:55</td>
<td>“When you are teaching, the most important thing you have to teach is to teach people how to think; How to approach a problem, how to find out information, how to handle it, how to question it, just question it and how to come up with a conclusion.”</td>
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<tr>
<td>51:00</td>
<td>“What I see in this framework, I see things I would have done.”</td>
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<tr>
<td>53:58</td>
<td>“Sometimes the students don’t follow the steps one by one. It’s not so step-by-step. You have to be more flexible.”</td>
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### Participant 6

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<th>Time Stamp</th>
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<tr>
<td>6:04</td>
<td>“It definitely follows the same steps.”</td>
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<tr>
<td>10:00</td>
<td>“They have trouble with making connections and interpretation.”</td>
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<tr>
<td>13:39</td>
<td>Aging in place studio with the Live-well Collaborative at UC. I think the students did not come into the studio with much open mindedness or empathy because</td>
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<tr>
<td>15:30</td>
<td>“The students were basically experiencing what it’s like to have had a stroke and then trying to put on a shirt and a tie.”</td>
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<tr>
<td>17:11</td>
<td>“I know the simulation exercise opened a lot of eyes. The difference between your range of experience might require more immersive techniques.”</td>
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**Participant 6 - continued**

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<tr>
<td>18:22</td>
<td>“A couple of them actually used the issues of those they interviewed as the subject of their project. They had no personal connection but definitely a bond had formed.”</td>
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<td>30:00</td>
<td>“I think graphically it’s [the proposed framework] all laid out well, it’s just a matter of sifting through it.”</td>
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<tr>
<td>31:47</td>
<td>“I use peer evaluations and small group discussions. There is a lot of connection between the students which is nice.”</td>
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<td>35:08</td>
<td>“When it comes to something like that, they feel like there’s a prestige that goes along with being in a sponsored studio.”</td>
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<tr>
<td>36:00</td>
<td>“I think you covered a lot of them [learning methods]. I feel like you’ve covered most everything.”</td>
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<tr>
<td>38:50</td>
<td>“Definitely they begin to rely more and more on the computer. And I find that they want to talk more versus show me something on a piece of paper. And I don’t know if its they haven’t translated what’s in their mind into the computer yet or that their sketching certainly has been on the decline, I have to say. And then just the other thing about a lot of talking versus showing seems to be happening.”</td>
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<tr>
<td>39:33</td>
<td>“And the other thing, I guess, has become part of that interpretation, but I find that they have access to images and sophisticated imagery yet when they do their projects, their projects often don’t have, you know, a tenth of that sophistication. So why are they not you know, they’re finding images but they’re not understanding how to translate that into, they’re, not the image that they see translate but take that, those issues about whether it’s details or continuity or flow between forms, whatever it might be, they don’t seem to apply that to their own work.”</td>
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