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DESIGN AGENCY: REESTABLISHING DESIGN'S IDENTITY IN EDUCATION AND PRACTICE

A PROPOSAL FOR CLARITY IN THE DESIGN CURRICULUM, SUPPORTED BY THEORY AND MASTERED THROUGH STUDIO PRACTICE

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PAPER ABSTRACT: The discipline of design has long struggled to communicate a comprehensive framework outlining its theoretical foundation, primary objectives, and distinct capabilities. As a result, design education has fractured into a wide range of often conflicting approaches, styles, and levels of academic rigor. The design profession, similarly, has suffered from an educational approach increasingly diverging from industry's needs and expectations. This paper explores the historical challenges facing design education and its impact on professional practice, and advocates for an educational framework based on the research and knowledge of creative problem-solving.

Keywords: Design Curriculum, Design Research, Industrial Design, Creativity, Creative Problem-Solving

1. INTRODUCTION

The rapid expansion of the design pluriverse, as evidenced in both academia and industry, is both wildly impressive and startlingly alarming. Impressive because this sudden outgrowth, driven largely by the adoption of design methods in disciplines ranging from business to engineering, offers up the opportunity for new contributors, different ways of solving problems, and alternative prospective solutions. Alarming because it is not quite clear the foundation from which we are expanding so quickly. The absence of a clear theoretical framework in design is not new and has been the topic of much debate for several decades. The absence is, however, decidedly important, for if we cannot clearly articulate the theoretical underpinnings of our discipline, how should we ever hope to effectively communicate design's purpose, value, or unique identity?

The implications are relevant for both academia (how do we distinguish the design field from our peers?) and industry (how do we prove design's practices are worth investing in?). This paper explores the challenges the discipline has faced, the historical lack of a theoretical framework in design, and the impact these phenomena have had on the state of design education and professional practice. A proposal for a design curriculum based on creative problem solving is outlined, including how this framework can be applied to a wide range of design domains and professional practices. The proposal is

supported with an extensive body of academic research in cognitive psychology, human factors engineering, and creative problem solving.

2. BACKGROUND - A DISCIPLINE WITHOUT A FOUNDATION

"Designers, unlike architects and engineers, do not necessarily work with a set of principles and rules that prescribe the scope of their work… Rather, they invent the subject matter of the profession as they go along" (Muratovski, p. 13). This critique is not new, here's a quote from Victor Margolin in 1992: "Designing is an activity that is constantly changing. How then can we establish a body of knowledge about something that has no fixed identity?" (p. 11). Unlike most academic disciplines, fields, and general areas of scholarly inquiry, design has yet to successfully identify and communicate a structured framework of theoretical knowledge that guides the research and practices of the discipline. This is not to suggest that other disciplines have a single 'way of knowing,' but other disciplines build off a body of knowledge grounded within a set of evolving theories that guide how they conduct research to expand knowledge (Cross, 2001). Historically, design's 'way of knowing' has been much looser, often informal, tacit, and guided by practical experience (Archer, 1979).

Much has been written about the evolution of design education in the 19th and 20th Centuries in Western Europe and North America, the heavy influence of the Bauhaus School, and the impact of this history on pedagogical approaches to design (for two examples, see: Giard, 1990 or more recently, Meyers & Norman, 2020). This paper will not attempt to reevaluate this extensive history, because while the criticism has been generally accepted as valid, the recommendations have been largely ignored outside academia. Fortunately, there is a strong historical and increasingly growing body of research and knowledge from which to better define design's theoretical foundation. The framework for design, as will be argued, is distinctly constructed through research into creativity and the extensive experience of creative problem solving in professional practice. Below, I offer an outline for how we might tie theory to practice to better frame our discipline, and discuss how this structure provides ample room for growth in diverse research and practitioner-focused directions. First, this paper explores the challenges the discipline has faced, and must overcome, if we are to expect the discipline to evolve according to the principles, practices, and values that are unique to design.

3. THE BARRIERS WE CREATE – DESIGN EDUCATION VS. DESIGN PRACTICE

Design Education in (Perennial) Crisis. A review of recent analysis of design education reveals a wide cross-section of criticism, everything from poor academic rigor, a general disregard for scientific discipline (Cross, 2001), and an inability to graduate successful business leaders (Meyer & Norman, 2020; see also: Archer, 1979; Dorst, 2001; Findeli, 2001; Friedman, 2019). In most cases, the conclusion tends to be: less design work, more education in parallel disciplines. The criticism, however, is largely on education itself, and the recommendations are decidedly unproductive: more education is better. Who would argue with this? Almost none of the suggestions serve to develop an educational framework

focused on the unique value proposition of design. Perhaps unsurprisingly, the arguments have had little influence on the manner in which professional practice occurs.

The Domain of Design. According to the research, creativity is the ability to develop solutions that are both 1) novel and 2) valued (Boden, 2004). Richard Florida: "Creativity involves the ability to synthesize. Einstein captured it nicely when he called his own work "combinatory play." It is a matter of sifting through data, perceptions and materials to come up with combinations that are *new and useful*" (2002, p. 31). A third, less discussed aspect of creativity could best be described as 3) impact. To measure impact, the solution must be realized, made tangible, and disseminated *in the world*. This is the domain and the value of design, and the skills necessary to be successful require intense training, practice, even failure, to achieve the level of expertise demanded by professional practice.

Designers identify challenges *and* provide tangible solutions, often in concert with a multitude of domain experts. The distinction is subtle, but important, as it is the creative problem solving, the creation, where the designer distinguishes him or herself from many other disciplines. Simon, pg. 93: "But experts possess skills as well as knowledge. They acquire not only the ability to recognize situations or to provide information about them; they also acquire powerful special skills for dealing with situations as they encounter them. Physicians prescribe and operate as well as diagnose."

A Practical Need. For industrial designers, specifically, the professional need for traditional design skills, including sketching, digital renderings, form development, and CAD surfacing is also driven by resource scarcity: time and money. While principles, including the theoretical framework discussed in this paper, can be learned through traditional educational approaches, *skills* require significant time and practice to acquire the level of expertise required to meet professional expectations. Colin Ware (2008, p. 164), a renowned psychologist focused on visualization, states: "The skill to visually analyze either prototype designs or idea structures is hard won and it is what differentiates the expert from the novice designer. A whole lifetime's experience enriches a scribble and transforms it from a few meaningless marks to a thinking tool." It is far more practical, cost effective, and efficient to hire a recent design graduate with advanced design skills and educate him or her on relevant domain knowledge (e.g., the business model, user groups, environments of use, etc.) than it is to hire a recent graduate with a strong liberal arts education but limited design capabilities.

Impact to Education and Industry. "Design is taught in a variety of educational institutions – from technical institutes and art and design schools to art academies and universities. All of these education providers have different approaches to design education and subsequently different expectations from their students and graduates" (Muratovski, 2016, p. XXIX). The lack of consistency is important, as the design education a student receives will have important implications for the principles and practices they advocate, as well as the professional opportunities that will become available to them. From an industry perspective, the recent trend has led to graduating design students with a poor comprehension

of the theoretical foundation of design and its value to industry. As a result, we often see a tremendous inability from recent graduates to articulate good process, to justify design decisions, to develop appropriate evaluation criteria, to clearly communicate the value of design in business, and to successfully apply the design process to an increasingly disparate range of complex challenges.

4. NONSTRUCTURED CHAOS - CRITICAL CHALLENGES

The Expanding Design Pluriverse. There is general consensus, in both academia and industry, that a designer's role in solving complex challenges is expanding, and with this expansion increasing expectations regarding responsibilities, leadership, and project success (Meyer & Norman, 2020; Muratovski, 2016). The recommendations that have been advocated, however, have been largely misguided, placing too much emphasis on an unrealistic expansion of domain knowledge and an unrelenting focus on new research methodologies. The result is, perhaps unsurprisingly, a field of inquiry that is increasingly diverging from the professional practice of design.

Domain Overload. Herbert. A Simon (1996, p. 111): "Everyone designs who devises courses of action aimed at changing existing situations into preferred ones." This is perhaps one of the most recited quotes in design research publications, and the general sentiment aligns well with historical definitions of design. The question remains: In a world filled with challenges, both simple and immensely complex, what problems do we aim to solve through design? The answer to this question will have important implications for design education. Much of the current research suggests that design students should acquire more relevant domain knowledge, in everything from anthropology to business to computer engineering. The application of design principles and practices to problems situated within such complex contexts, however, is not the issue. It is the specific domain knowledge required, however, that relegates these challenges to advanced levels of education and practice. It is unrealistic, perhaps harmfully so, to expect a student of design to become proficient in so many different domains within an undergraduate curriculum. The obvious harm is that spending too much time in alternative domains will come at the cost of fully understanding design theory and practice. Design education, with its inherent duplicity in both principles (knowledge) and practices (skill sets), requires significant time to achieve the level of expertise required to solve complex issues. There are limits to our cognitive and perceptual capabilities (Wickens, et al., 2004), and these limits must be recognized to achieve meaningful impact. Before we place design students in such challenging environments, let us first determine what it is about design that can prove to be useful in these diverse cases.

Methods… and More Methods. In addition to the domains mentioned above, there is a decidedly increasing number of research publications (for an overview, see: Cross, 2001) focused on creating new design and design research methods. From Chapter 3 of *The Convivial Tool box*, in a section aptly titled *An infinite set of tools and techniques*: "Over the past decades a wide variety of techniques have been employed in learning about people, and in learning from people about their everyday experiences.

These techniques have come from a wide variety of practices, both in industry (marketing) and in academia (psychology, anthropology, and sociology)" (Sanders & Stappers, 2012, p.65). This is perhaps an understatement. There are 100 different approaches outlined in the book *Universal Methods of Design: 100 Ways to research complex problems, develop innovative ideas, and design effective solutions* (Bella & Hanington, 2012), and hundreds more outlined in recent academic journals. Unfortunately, the focus on expanding methods has come at the cost of foundational clarity; a sea of tools but no theory to explain why or how these methods may prove to be useful.

5. A PROPOSAL

Margaret A. Boden, in *The Creative Mind: Myths and Mechanisms* (2004), identifies 4 phases of creative problem solving: 1) preparation; 2) incubation; 3) illumination; and 4) verification. Historically, similar frameworks have been proposed by others, including Graham Wallas in *The Art of Thought* (1926) and Alex Osborn in *Applied Imagination: Principles and Procedures for Creative Problem-Solving* (1963) (see also: Poincaré, 1946; Koestler, 1975). Building off this body of research, more recent design frameworks have been introduced in both academia and industry, including: the UK Design Council's *Double Diamond Model* (Design Council, 2010), design consultancy IDEO's *3 I or Inspiration, Ideation, and Implementation method (Brown & Kātz, 2009*), IDEO's more recent *HCD* or *Hearing, Creating, Delivering* framework (IDEO, 2015) and; the Hasso-Plattner Institute's *The Design Thinking Model Framework* (as outlined in Thoring & Müller, 2011). From an academic perspective, the *SDT* or *Service Design Thinking Model*, developed by Stickdorn, Schneider, and Andrews, and outlined in their publication *This is Service Design Thinking* (2011), provides a highly practical guideline for developing the right process for the project being considered. Tschimmel (2012) provides an extensive overview of existing design frameworks, including their strengths and weaknesses.

As a collective body of knowledge, these design frameworks provide clear, accessible, and easy to understand introductions to the design process. They outline distinct phases of work, most of which align well with the phases of creative problem solving outlined above, utilize memorable acronyms to make them distinct, and employ strong visual graphics to outline the proposed framework. Most also provide an extensive collection of methods, examples, and real-world considerations for designers and non-designers alike. They are effective and concise, and can be distributed seamlessly in a 1- or 2-day workshop, making them approachable, appropriate, and valuable for most practitioners.

Collectively, however, they lack the research-backed theory to support why they may (or may not) work well. The general lack of research makes sense, as these materials are typically intended to provide quick guidance for working professionals. They are a starting point for understanding design, but largely fail to describe why these frameworks, and the methods they advocate, should be considered. Design students must not only understand how to implement a good design process, but also understand why these frameworks, including the principles and practices being advocated, might be appropriate.

Importantly, we must also encourage our students to question the content critically, so they can continue to evolve the practice, the discipline, and the field of design.

Fortunately, the theoretical framework for creativity has been widely researched, disseminated, and discussed through a range of academic disciplines, including cognitive psychology, computer science, and cybernetics. Much of the research aligns on the cognitive steps required to produce ideas that are both novel and valuable.

Creative Problem Solving and Design. For practical purposes, the following terminology has been selected for the proposed framework: preparation, immersion, ideation, implementation, and validation. The 'illumination' phase, as defined by Boden (2004), has been purposefully divided into 2 phases to distinguish between the initial idea development and the idea implementation, which constitutes a large portion of the value of design in practice – the realization of ideas *in the world*. Preparation includes understanding the problem and problem space, while immersion includes advancing knowledge regarding the domain, including existing solutions and related challenges. Ideation is defined as the act (both cognitive and physical) of creating a wide range of possible solutions, and implementation includes realizing these ideas, whether through physical, digital, or systems focused manifestations. Finally, validation is the step of evaluating the proposed solution based on criteria identified through preparation and immersion. The process is rarely sequential, of course, and may include several rounds of divergent and convergent thinking (idea expansion and down-selection).

Importantly, each phase of creative problem solving can be further considered through the lens of 1) principles and 2) practices. Principles outline the historical, theoretical, and research-based inquiry that help define the fundamental knowledge for each phase of creative problem solving. Principles describe why each phase is important for developing new and valued ideas, and help students understand the logic that supports the process being followed. Practices outline the behaviors, tools, and methodologies that have evolved over time to contribute to our collective understanding of creative problem solving. Practices describe how each phase might occur.

Course Outline. See figure 1 below for an outline of the proposed framework, a visual diagram of the five phases of creative problem solving, including introductory content regarding the Principles and Practices required for each phase. The categories outlined are, of course, a starting point based on the author's professional and educational experience. Carver and Scheier's (1981) astute observations regarding schema ring true here: "Category membership is not an all-or-none phenomenon." It is fully expected that the course instructor will modify as necessary, and select appropriate texts using his or her own judgement to complement lecture materials and context specific design challenges.

	PRINCIPLES	INTRODUCTORY PRACTICES
PREPARATION	Fundamentals of design research, Framing the design problem, Developing research questions	Qualitative research, Observational research, Writing interview questions, Data collection
IMMERSION	Applied human factors, Cognition and perception, Anthropometrics	Moderating observational research, Data collection, Qualitative data analysis, Insights
IDEATION	Spreading activation theory, Bisociation, Metaphor in design, Communication theory	Individual and group ideation methods, Sketching, Planning and moderating ideation
IMPLEMENTATION	Formal aspects of 2D and 3D space, DFx principles, Spatial reasoning	Model making, Materials and manufacturing methods, 3D CAD, Renderings, Storytelling
VALIDATION	Satisficing, Decision making theory, Criteria development, Evaluative research methods	User testing and feedback, Decision matrices, Communicating decision and down-selection

Figure 1. Proposed Design Framework: Introduction to Design

Shared Values. The proposed framework provides three important contributions to design education: 1) The framework provides a clear, concise, and explicit foundation for understanding the principles of creative problem solving and how these align with and drive design practice; 2) The framework provides a theoretical body of knowledge, based on both academic research and professional experience, from which to understand, evaluate, and practice subsequent design coursework and activities (an educational scaffold); and, 3) The framework aligns well with current professional practice, providing students with a strong educational background to support professional success.

A Common Construct. The proposed framework follows the structure of creative problem solving, supported by research and professional practice. Look at any design consulting website today, and you will find a similar structural outline being prescribed. What is new, perhaps remarkably to some, is the application of this framework to the foundation of a design curriculum. The content of this framework would be introduced through a foundational studio course in design. This type of introductory course is common in most academic disciplines, including engineering, anthropology, and applied psychology, providing a lens through which to study more advanced material. Unfortunately, this is not common in design programs today, where students are generally introduced to design through a series of disparate skills-based coursework, ranging from 2D and 3D form development, sketching, and model making, with no common thread to provide meaningful connections. The novelty of this framework is tying practices to principles, action to theory, and using this as a springboard to increasingly advanced levels of inquiry. See an example of how the five phases of creative problem-solving lead to advanced design coursework and design research opportunities in figure 2 below.

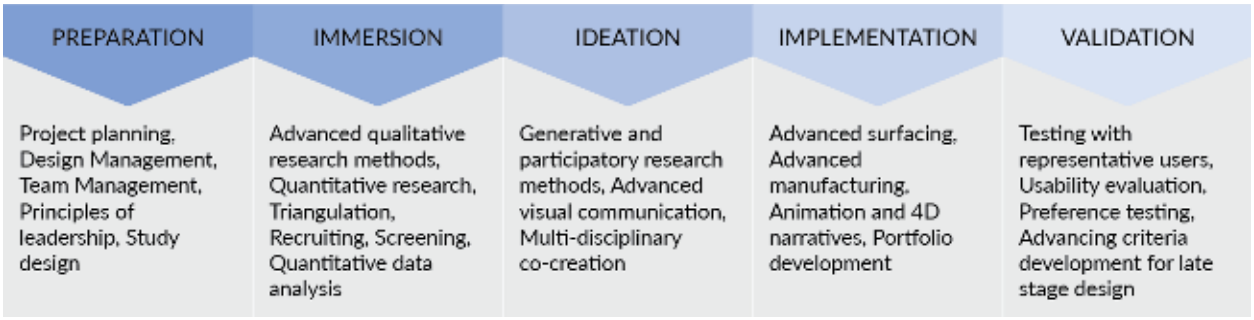

Figure 2. Advancing the Field: Phases of Creative Problem Solving Provide Advanced Coursework and Research Direction

Umbrella Skills. Creative problem solving as a framework for design is not intended to suggest every possible content area for a design curriculum. There are important principles and practices that are important throughout the phases of problem solving, 'umbrella' topics such as storytelling, negotiation, leadership, team work, collaboration, and resource allocation, amongst others. Similarly, there are critical parallel disciplines that any designer would greatly benefit from, especially coursework in business, anthropology, applied psychology, management, and statistics. These content areas should be in addition to, and not in place of, the content areas outlined above.

Successful creative problem solving requires practice in the art of immersion, exploration, understanding and creating alternatives, and evaluation. Invariably, some designers will specialize or attain higher level of expertise in some areas at the expense of others. This heterogeneity is expected, and welcome, to create a diverse cohort of designers that can fulfill various roles in solving different types of challenges. The key, however, is that that they all build off a common foundation. The framework can be applied to any design discipline, from industrial design to fashion, but is perhaps most appropriate for a human-centered design curriculum.

6. DISCUSSION

The framework outlined above can be expanded on through increasing levels of studio-based coursework. The framework remains constant, with advancing knowledge and skillsets provided by application to new problem spaces, domains, cultures, and increasingly challenging problems with fewer constraints. A design curriculum based on creative problem solving would, of course, start by introducing relatively simple problems with appropriate constraints. This approach would eliminate studio projects that focus purely on abstract visual or physical attributes alone, such as form, proportion, etc. Instead, these elements become one set of criteria for evaluating the success or failure of proposed solutions.

Advanced studio courses would scaffold new knowledge and skillsets across the five phases of the framework. In the preparation phase, for example, students would be challenged by working in multiple member teams and then, after practice, with cross-disciplinary teams. Similarly, problem spaces would

be expected to grow increasingly complex, integrating information rich contexts with conflicting goals and, later, social environments with multiple stakeholders and diverse cultural considerations. Similar advances, with growing expectations regarding rigor and quality, would occur in the subsequent phases of ideation, implementation, and validation.

On Simplicity. The simplicity of the framework might suggest that critical content has been eliminated, but it should be noted that each phase can be expanded to immense volumes of knowledge, content, and expertise, both theoretical and practical. Unfortunately, the foundation of design, as a discipline, has been taken out of focus, blurred by often conflicting objectives, and shifted too far by recommendations from scholars outside the discipline. It is time to reestablish design's identity as a discipline focused on both deep understanding *and* creating, and a related profession focused on adding real value through divergent ideation and idea implementation. Novelty, value, *and* impact.

7. CONCLUDING THOUGHTS

The framework proposed in this paper is inherently flexible. The theory should be modified as the science and evidence advance, and the practices along with it. Fortunately, a framework for the discipline of design can be clearly aligned with the research into creativity and creative problem solving, where each phase introduces a 'bounded' set of domain knowledge and practical skills that can be applied across a wide array of human challenges. For the sake of establishing a robust design future, let us build a wide, structurally sound bridge to these important challenges. Let's start by creating a clear foundation, supported by evidence, from which we can establish our values, our distinct areas of academic inquiry, and our professional identity. Let us acknowledge what we believe to be true - we are creative beings capable of solving big problems. Finally, let's not lose sight of the value we bring to these challenges through our unique set of principles, practices, and creative skillsets.

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