How designers learn to learn: connecting motivation and cognitive process in practice-based research design

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ABSTRACT: Performing research under the umbrella of design engages various methodological approaches. Scholars such as Christopher Frayling (1993) position dominant modes of art and design research as research-*into*, research-*through*, and research-*for*, while more contemporarily Laurene Vaughan (2017) argues for the value and importance of practice-based design research as an embodied "research-*all*" approach. Through practice-based research, the traditionally distinct role of designer-maker and research-writer often merge for "making," both in engaging theoretical frameworks and in focusing research activities. However, in disciplines such as architecture and industrial design that have traditionally favored investigating the measurable performance of "products" as primarily positivistic, the individual's motivation to initiate directed research activities may be challenged by merging different modes of knowledge acquisition and production. This leads us to question in what ways understanding individual motivation and self-concept can inform the research process under the umbrella of design research. By more closely examining Jacquelynne Eccles (1987) educational model of Expectancy Value Theory, this paper focuses on the rarely acknowledged issue of an individual's motivational beliefs and self-concept in the practice of design research. This exploration begins to conceptually connect these influential factors, especially a designer/researcher's expectancies and values toward certain tasks, to their learning behavior and performance. Specifically, by looking at traditions in institutional pedagogy and their emphasis on visual and textual knowledge and content provides evidence of a separation between "thinking of things" and "writing design." Using Donald Shön's (1984) concept of "reflective practice" in design, research practices and activities can be viewed as successions of representation and conscious learning that are accessible, manipulatable, and flexible. Through practice-based design research — or research-*all* — this paper posits that an individual's motivation, expectancies, values, and experiences are reflected in their "knowledge performances" and research design.

KEYWORDS: research, design, motivation, practice, values

INTRODUCTION

In practice-based design research, not only are we concerned with understanding a variety of 'making processes' and design outcomes, but also with the nature of our learning. *How do designers learn?* We learn from a variety of experiences, including (but not limited to): informed failures as well as successes (praxis); learning from story-telling (case study); systematic investigation and analysis, and post-design evaluation, among other things. We disseminate what we learn through a variety of peer-reviewed and professionally sanctioned venues for publication. In fact, over the course of a career, designers must continue to learn on many levels: technically, organizationally, theoretically, and even personally.

The practice of design requires a "both-and" (Hannula et al. 2014) identity, or approach, in which the-one-who-practices is simultaneously 'reader' and 'writer', perhaps even learner and teacher, communicating through listening and talking, doing and relating, in many forms of discourse with fellow practitioners. The "both-and" perspective consequently places the one who performs in and through acts of doing, as the one who constitutes their own practice, producing self-evident roles of authority. These roles may tend to negate an outsider's

opinions, while developing or consolidating the practice's historical and contemporary criteria and values by performing articulations of those values (Hannula et al. 2014).

As a theory that helps explain how students learn to design, motivation affords deeper understanding of the intrinsic risks and rewards of design education and practice. Better understanding of various motivational systems of the design professions should enable and stimulate designers to improve their capacity to engage self-study. Critical reflection and research activities about how designers learn, should, in turn, deliver fully on the promise of the full self-actualization cycle of learning-by-doing and thus extend our reach and impact on society. This presentation therefore explores and explains some of the benefits of cognitive theories of learning for teaching design, as well as practice, and to suggest directions for further investigation.

1.0. PEDAGOGICAL MODELS and the PRACTICE of DESIGN

In the United States, across many fields, formal or institutional design education typically includes studio- and experience-based approaches to learning. In many design schools, the design studio class is conceived as a simulation of professional environments and relationships. In this educational model, students are prepared for future practice in professional and technical roles by design educators whose backgrounds (traditionally also in design practice) allow them to pass on specialized knowledge, skill, and values from the field. Specialized educators may also operationalize instrumental or extrinsic aims (Oxman 1999); these might include, for example, the advancement of specific theories and values (e.g. critical regionalism or user-centered design) or socio-professional values (e.g. advocacy for licensure or pluralistic design for product design or community engagement).

Design studio classes traditionally employ and/or aspire to distinct learning frameworks, including: strong mentor-student relationships; early initiation and framing of problems; formulated design processes; reliance on graphic (rather than only verbal/textual) representation; demonstration as communication; explicit or conceptual design proposals (proof of concept). While, in the main, learners execute their work independently, they can expect regular guidance and perhaps occasional intervention leading to periodic and/or final evaluation by a ‘jury’ or panel of critics. Here, too, the expected quality of a student’s design and work products, as well as the extrinsic aims of instructors and critics, may shape class rubrics and other methods of evaluation.

However, in traditional models of design education based exclusively on the replication of professional performance, some point out that the “cognitive properties of design learning have never been the subject of design education” (Oxman 1999, 105). This oversight is evident in a lack of design-specific educational theories developed for educators in professional design programs. Therefore, in an effort to focus attention on that gap in the literature, we explore a conceptual model for design education based on cognitive theories of design thinking and learning.

One argument holds that, in order to construct a general theoretical foundation for design education, learning tasks in design must be redefined from artifact-oriented to a cognitive approach (Oxman 1999). Fortunately, in identifying design-specific learning increments, (a series of learning exercises or benchmarks with an objective basis for assessment) measurable increments of cognitive strategies can be aligned with design learning’s visual and conceptual content (Oxman 1999). This same approach potentially may be developed as an evaluation tool for use in the traditional design studio format. To that end, we examine the concept of ***motivation*** in design learning constructs. As a theory that explains how students learn to design, it affords greater understanding for the intrinsic risks and rewards of design education: e.g. student time spent on task, risk of failure and criticism, and self-actualization. By extension, motivational theory may also begin to frame related questions as to why design practitioners may engage (or not) in practice-based design research, as a collectivized form of continuous learning.

1.1 Motivation and creative cognition

Motivation affects the initiation and continuation of directed activities for the attainment of a goal (Cook & Artino 2016; Eccles 1987). Motivational theories relate to beliefs of competence (asking "Can I do it?"), as well as the value or anticipated result of a learning task (asking "Do I want to do it?" or "What will happen if I do?"). Motivation is considered 'cognitive,' in that it involves mental processes and individual phenomena that cannot be directly observed or entirely explained without understanding the performances or interactions of an individual within a larger social context. Human cognition is thus influential in the perception and exertion of motivational control (Cook & Artino 2016).

While pervasive in all aspects of our lives, motivation also begins and sustains learning processes. Motivation to learn "is important as …a dependent variable"; that is to say, higher and lower levels of motivation may result from the nature of educational activities (Cook, Thompson & Thomas 2011, 45). In learning processes, motivation can also serve as an important independent variable (Kusurkar, Ten Cate, Aspern & Croiset 2011 33), as it may shape or manipulate individual desire and thus "enhance learning" (Cook & Artino 2016, 998). Practical applications that operationalize motivation theory should thus be able to affect learning outcomes and performance quality across many subjects and fields, in particular design education and design practice.

Cognitive approaches emphasize the process of knowledge construction and the importance of structures in learning. Specifically, the theory of "creative cognition" relates certain principles and knowledge structures to the creative process; it proposes that learning may occur through the structured manipulation of knowledge related to creativity. It is, therefore, assumed that cognitive characteristics assigned to design thinking, practice, and education, should establish techniques for supporting a representation of the student's thinking and creative processes—including both visual and conceptual knowledge (Oxman 1999).

2.0. SCHÖN AND REFLECTIVE PRACTICE

In his influential work, *The Reflective Practitioner: How Professionals Think in Action* (1984), Donald Schön outlines the closely related concept of "reflection in action." Shön posits that, during the design process, visual and conceptual interactions relate to cognitive characteristics associated with dialectic (synthetic) reasoning. In other words, in order for new knowledge to emerge through each successive representation, conscious learning must take place while individuals' access, manipulate, and make existing knowledge more flexible (Shön 1984). Therefore, "reflection-in-action," along with the fluid functions, structures, and patterns of design practice, relies on a process of constant learning and self-awareness.

Reflection-in-action comprises a series of component learning processes: knowing-in-action and reflecting-in-practice, all of which describe various means of building professional knowledge through practical experience, competence, and artistry.

In the first step, knowing-in-action, Shön emphasizes type of tacit or 'common sense' knowledge or practical 'know-how' present in professional activities, evident through skillful action, recognition and judgment. In most skillful professional practices, knowing-in-action may be understood as 'rules of thumb' or implicit intellectual operations and behaviors, rather than a systematic set of rigidly predetermined approaches.[i] Shön's perspective on the performance of innate practical intelligence is supported by philosopher Gilbert Ryles, who writes: "…what distinguishes sensible from silly operations is not their parentage but their procedure, and this holds no less for intellectual than for practical performances..." (Ryles 1949, 32).

Another part of the reflective process, reflecting-in-practice regards the practice itself as a consideration for appropriate action. Practice is an ambiguous concept encompassing the performance and repetition of profession-dependent cases, accounts, commissions, or projects that help professionals develop specialized expectations or techniques. As an alternative approach, Shön's reflecting-in-practice requires a corrective measure of criticism conducted in real time during the working process. It assists in recognizing potential divergent

judgments, patterns of behavior, or other affirmations unique to the course of action being taken.

The challenge of reflection-in-action, as a simultaneous "conversation" among practical actions, tacit knowledge, and self-critique, serves to "reframe" both professional knowledge and approaches to solving problems. What is critical is the need for the professional to be intellectually present in his or her practice as a means toward awareness as well as engagement within professional actions. As such, designers and architects will continue to be presented with complex situations related to human needs requiring responsive design processes. Reflection-in-action reflects the dialogic practices of professionals engaging equally and simultaneously with design processes, projects, and various schools of thought. In architecture, for example, a problem might relate materiality in a stylistic vernacular to the implementation of a community design process. An industrial designer might be concerned with sustainability and life cycle economies relevant to on-demand logistics.

In such ways designers strategize, plan a course of action, and develop a 'knowing' relationship to the present phenomena through tacit and reflective practices. The concept of "reflection" can be conceptualized as a rational analytical process that is an "activity in which people recapture their experience, think about it, mull it over and evaluate it" (Boud, Keogh, & Walker 1985, p 33) in order to fast track cognitive problem solving in practice. Jordi (2011) proposes that reflective practice encourages *processes of integration* and dialog between often seemingly disconnected aspects of human experience and consciousness. Further, as a process, reflection is considered influential in the development of an individuals' selfhood, including the individual's self-worth, self-image, identity, and more (Le Cornu 2009). According to Jarvis (2004), that is a lifelong process of understanding the world through meaning making that transforms the "whole person" affecting behavior and thoughts of the individual (Jarvis 2005).

It is through the critical reflective practice that the practice of critique distances and separates the individual from an object of attention. The result is the illumination of significant differences and similarities that further construct the individuals' view of self and the object of attention. What is learned is responsibility for views the individual holds and the construction of a "separate sense of self" through processes of internal and externalization (Le Cornu 2009).

Therefore, as a continuous cognitive awareness, consciousness is the human sense of self and experience of the world that encompasses feelings, tacit knowledge, embodied experiences, and memories that mix internal feelings and meanings with outside stimuli (Gendlin 1993). With Shön's reflective practice acknowledged as a foundation of experienced-based learning and critical reflection (Mezirow 1991), the question to be asked is, what motivation is there for designers to do this more constantly, more profitably, more collectively, and thus more effectively? This is where the theories of motivation become useful.

3.0. MOTIVATION & PROFESSIONAL EDUCATION and PRACTICE

The concept of reflection-in-action is useful for reframing the 'conversational' modality, both of design education and practice. As a powerful pedagogical structure, it also serves to examine the applications and consequences of practice-based design research set within the context of professional projects.[ii] In the next section we draw connections between active reflection in the professional practice of design and theories of motivation for learners, as well as practitioners.

3.1. Expectancy-value theory (EVT)

focuses on expectations of success and the perception of a task's value to the individual participant (Eccles 1987). EVT's theoretical roots stem from a social cognitive perspective that focuses on aspects of personality, social, and developmental psychology (Schunk, Meece, & Pintrich 2014). The key constructs of task value and expectancy of success are influenced by motivational beliefs, which are in turn determined by social influences that are perceived and

interpreted by learner cognitive processes (Cook & Artino 2016). EVT identifies two key independent factors that influence the individual's behavior: 1) the degree of belief in the likely success of trying, and 2) the personal intrinsic interest or perceived degree of importance of the task's value (Cook & Artino 2016).

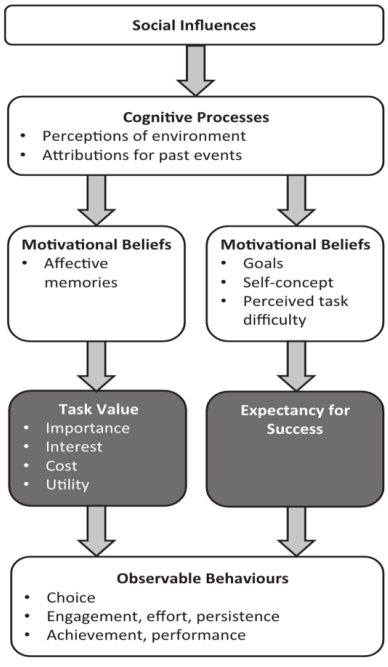

Figure 1. Expectancy-value theory. This is a simplified version of Wigfield and Eccles's theory (Cook & Artino 2016 1003).

An individual's expectation of success in the accomplishment of future-oriented tasks represent convictions that are both general and specific. These expectancies and values are assumed to be task-specific (Eccles 1983), with tasks is valued as an individual's interest (intrinsic value), utility (extrinsic), attainment value (personal importance), and cost (the negative consequences (Cook & Artino 2016).

Ability Belief, the belief in one's own ability is defined by an individual's perception of current competence for an activity (Wigfield & Eccles 2000). Further, expectancies of success are shaped by three motivational beliefs: that goals are short- and long-term learning objectives; the self-concept is the self-impression of an individual's capacity within a task domain; and task difficulty, the perception of the difficulty of a task. In empirical studies, where an individual has a belief of success predictions can be made for learning engagement and achievement, it can also be postulated that expectancy of success may be a stronger predictor than past successful performances (Cook & Artino 2016). EVT theorists posit that motivation requires more than expectations of success to succeed at certain tasks; it requires a personal gain or value, whether immediate or in the foreseeable future. Expectancy-value theorist post that motivation connects expectations of success with a task's four values, which contribute to and affect the learner's motivation (See Figure 1). First, the task value must be interesting or enjoyable (intrinsic value), and second, learning a topic or skill must be perceived as useful and propelling the learner toward a goal (utility or extrinsic value). Third, the self-concept or personal importance of the learner must be affirmed (attainment value or importance), and the focusing of time and energy on one task over another means other tasks will be neglected (opportunity costs). Affective memories and emotions inform these tasks based on the learner's association with prior experiences, social influences, and the environment, which has either favored or diminished the perceived value of a task. Ultimately, motivational beliefs

include goal-setting, self-concept and task difficulty, which in turn determine the expectancy of success; these beliefs are shaped by affective memories and emotions associated with prior experience, the environment, social influence and life events. The individual's motivational beliefs are the personal perspective and cognitive processes that interpret and form perceptions, not necessarily reality. These motivational attributions shape the beliefs and future actions of learners through conscious or unconscious links to events, outcomes, and personal factors, which led to those outcomes (Cook & Artino 2016).

3.2. Practice-based research and the design disciplines

According to Linda Candy (2006) practice-based research is “an original investigation undertaken in order to gain new knowledge partly by means of practice and the outcomes of that practice” (1). In practice-based cases, the embedded nature of research principles, critical engagement, and debates of theory and practice are focused on the issues of originality and knowledge production (Scrivener 2004). That said, new knowledge, claims of originality, and contributions to the many forms of art and design in practice-based research, need strong contextual support. Even when presented in the form of written word, a full understanding of the significance of this type of research must make some “direct reference” to creative outcomes (Candy 2006).

Practice-based research is thus relevant to various fields of hands-on cultural production, including design, social sciences and universities of art, where teaching, community facilitation, and reflexive and open-ended research might take place. Practice-based research takes a context-aware ‘insider’ approach to open-ended practical questions using discipline-specific internal logic. Research activities may focus on practice-specific actions and decisions, while consciously connecting to and through the past, present, and future histories of production. In this way, practice-based research can be very useful for exploring, expanding, and/or reshaping the limits of practice. This type of articulation requires both a performative element and participatory nature, positioning who articulates and how by alternations and changes the practice, ultimately guiding views, approaches, and the possibilities of the research practiced” (Hannula, Suoranta & Vadén 2014 In other words, within the “contested territory” of practice-based research we may find not the centrality of artifacts, but the accompanying methodological framework and methods created and tested as part of the evolving or emerging discipline.

As explained above, disciplinary frameworks are constructed through professional practice, reflection, research, and discourse, including processes of articulation and discussion that form, normalize, maintain, and renew expectations. Professional practices have routine performances and traditions that constitute, situate, anchor, and are imbedded in its internal structure. These routine practices or traditions illustrate the responsibilities and freedoms to be enacted through professional interpretations and decisions.

It seems increasingly evident that professional ‘traditions’ are being challenged by other contemporary practice cultures (Susskind and Susskind 2017) and thus questioned, perhaps even doubted, within historical/cultural and practical contexts simultaneously. This new challenge to the professions demands practice-based design research activities that are “context-serious and committed” (MacIntyre 2006), [iii] conducted (at least in part) by practitioner-researchers with a commitment to professional perspectives and debate. Questioning and investigating the frameworks of process-based and practice-driven research also re-contextualizes the conditions of designing itself (Hannula et al. 2014), where the needs and acts located within the structure or site to be contested thus marshal both knowing-in-practice and reflection-in-action.

Practice-based or context-specific research allows for a type of internal production that offers the duality of freedom and responsibility through an open-ended approach that is continually anchored to itself (Hannula et al. 2014). The researcher must choose and interpret existing materials and conditions from which they will 'write' and produce cultural products that are

contested, actualized, and reinterpreted from each project, site or situation (Hannula et al., 2014). These arguments and conditions, however, are under the constant challenge and changing conditions of choice and interpretation, which do not produce a priori or hierarchical structure within the same site or situation but provide conditions for the pluralities of reality including various values and traditions pushing forward the practice's conditions (Hannula et al. 2014).

Philosophically, Feyerabend (2010) posits that "being able to 'read' a certain style also includes knowledge of what features are irrelevant" (178). If we extend this to practical learning, we may infer that acts of practice that may once have "take[n] place within a certain specified and historically well-entrenched framework" (Feyerabend 178), must today be considered within active, innovative, or shifting disciplinary boundaries and norms, in which outlier practices may function in shifting the mainstream of the profession.

CONCLUSION

Whenever key insights for the professional design practitioner and the practice-based episteme foreground "soft" or "intuitive" knowledge, it can seem to contradict or even threaten formal programs in other disciplines (for example engineering or structural physics), that rely extensively on "hard" knowledge or objectivist perspectives. Shön argues, however, that if all "research" may be considered transactional, an activity of "exchange" through the implementation of a concept, then *all* professionals use reflection in research leading to technical competence, and to develop priorities and themes for specialized disciplinary knowledge over time.

The general methodology and application of Schon's concept of reflection-in-action exposes just how much tacit knowledge actually hides in the exploration, expectations, recognition, and judgments of professional practices. In fact, Shön describes many activities associated with practical competencies as reliant upon divergent, uncertain, and intuitive processes. Shön's descriptions of reflective processes as applied to professional reasoning are exemplified in context for various professions.

In fact, without specific formulas or methods for uncovering, understanding and making visible tacit knowledge across design practices, there remains great potential as well as complexity in how design practitioners conduct reflective research. However, Shön believes this type of professional knowledge is essential to the social progress, indeed to the way our society functions, which is indicated by society's traditional reliance upon professionals to define and solve problems. It remains to be seen whether continued trust will be sustained however. For example, the book *The Future of the Professions* (Susskind and Susskind, 2017), presents a radically different picture of professions in which traditional expertise gives way to a more democratized approach to knowledge construction, consulting, and information-sharing.

By understanding our individual motivations as practitioners and learners for both praxis and scholarly dissemination the initiation of goals and goal attainment can become more focused. With reflections on practice uncovering motivations behind decisions, realizing the values we place on tasks, and practicing our base knowledge with personal motivations we can increase learning and expertise.

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ENDNOTES

[i] Chester Barnard, a business and management theorist, distinguished “think processes” from “non-logical processes” that are not capable of being expressed in words or as reasoning, and which are only made known as a judgment, decision, or action” (Barnard 1949, 302).

ii Shön coins the term “intermediate reflection,” which is often followed by next steps in the design process as a reflective conversation, the “what if” with the medium and the design problem in order to produce and alternate solution. This “what if” is one reflective question that is often at the core of the design conversation, as a generative pedagogical tool, that is generic in its approach but specific to the vernacular and practices of design. This reflective conversational modality moves the design process forward through alternate potentials and differences of “what if” as consideration of explorative and potential commitments to the practice.

iii MacIntyre (2006) connects the interpretation of freedom and responsibility to aspects of tradition by stating that tradition is conflicted by the interpretation of a long-term activity