

Design Studios in Instructional Design and Technology: What Are the Possibilities?

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Abstract Design studios are an innovative way to educate Instructional Design and Technology (IDT) students. This article begins by addressing literature about IDT design studios. One conclusion from this literature is that IDT studios have been theoretically conceptualized. However, much of this conceptualization is insular to the field of IDT and only narrowly considers studio pedagogy. This insularity and narrowness is odd, given both that design studios inherently are borrowed from other disciplines and pedagogy is a focus within IDT. Thus, this article identifies and analyzes the purposes of design studios as considered in other disciplines and through disparate lenses. These purposes can serve as the basis of prescriptive pedagogy.

Keywords Instructional design · Design studio · Instructional design studio

University Instructional Design and Technology (IDT) programs are rethinking the ways that they educate their students. The evolution of education for aspiring IDT professionals seems to be based upon the premise that it is no longer appropriate simply to teach students to formulaically follow prescriptive design models (Boling 2004; Tracey et al. 2014). Instead, IDT professionals of the future must develop a skill-based acumen toward problem solving and contextualized design thinking (Nelson 2003; Tracey and Boling 2013). Pointing to a wide variety of literature about the training of

instructional designers, Yanchar and Hawkley (2014) come to a similar conclusion. They noted “that more practical, immersive experiences would better prepare students for real-world instructional design work” (p. 272). The challenge of educating IDT students toward contextualized thinking through immersion might necessitate a reconsideration of the traditional, teacher-centered classroom as an ideal learning environment. The perspective of these authors within the field of IDT certainly seems reasonable when definitions of “design” beyond IDT are considered. After all, as Nelson and Stolterman (2014) noted, design is a systematic and complex act of compositional “meaning making” (p. 73) that requires multiple approaches, including the “scientific,” “spiritual,” and “intuitive” (p. 33). Such complexity cannot be addressed by following decontextualized algorithmic models.

Design studios might provide one meaningful alternative that can promote IDT students’ design skills and design-thinking acumen (Campbell 2015). In general, design studios can be defined as follows:

The studio, as commonly used in design-related curricula such as architecture, landscape architecture, interior design, and industrial design, consists of a space where students are assigned individual desks that are, in most cases, available to them at all times. Studio classes typically meet multiple times a week for three to four-hour sessions with students encouraged to work in the studio rather than at home during off-hours. (Cennamo et al. 2011, p. 13)

Others, beyond the field of IDT, support the above description. For instance, design studios on average are “creative,” “collaborative,” and “dominated by material objects—surfaces for sharing ideas and inspiration and Post-it Notes, sketches, magazine scraps, models, and physical prototypes to make ideas visible and tangible” (Bleviss et al. 2008, p. 77). While these

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descriptions focus on the surface features of studios as a point of introduction, it will be clear later in this article that studios are substantive in their capabilities as spaces—both virtual and physical—to develop students' design acumen.

An assertion of this article is that design studios have the potential to transform IDT education. Yet, studio-based education presents conundrums that must be addressed if design studios are to thrive in university IDT programs. This article begins by considering literature about the use of design studios within IDT programs. The second section of this article draws on literature from other disciplines—primarily architecture—that use design studios. The purpose of this second section is to examine some of the intended goals of design studios. Only through this broader consideration of studio goals can IDT professionals bring design studios to full fruition within an IDT curriculum.

Design Studios in IDT

Much of the existing literature that addresses the use of design studios within IDT is based upon the studio experience at the University of Georgia (see, for example, Clinton and Rieber 2010; Orey et al. 2000; Rieber 2000; Song and Hill 2004; West and Hannafin 2011), though other literature also exists. This section describes IDT design studios and discusses their theoretical and methodological underpinnings.

The Scope and Characteristics of the IDT Studio Experience

The above-cited literature about the IDT studios at the University of Georgia (UGA) describes the large studio experience that is distributed across a program of studies. However, within IDT, smaller-scale studio experiences can span across two or three classes. For example, one IDT professor merged an instructional design class, a software development class, and a project management class to create an integrated studio experience for IDT majors (Nelson 2003; Nelson and Palumbo 2014). In other cases, single courses within IDT programs were operated and taught in studio formats. For instance, in one case, a “Principles of Instructional Technology” course was operated as a studio (Knowlton 2004). In another case, a graphic design course for IDT majors was offered in a studio format (Boling and Smith 2014). In all of these cases, there seemed to be a clear experiential-based purpose of the studio approach—IDT students become designers and engage in design cycles as a means of acquiring design knowledge and skills. Since the learning is contextualized and comes *through* the act of designing, studio courses emphasize problem-solving (Nelson 2003; Nelson and Thomeczek 2007) and reflection (Hong and Choi 2011;

Knowlton 2004). To note that design studios are contextualized simply implies the creation of a design motive other than the requirements of a syllabus and the desire to earn a high grade. Such motives might include “passion,” “entertainment,” or “personal importance” (West and Hannafin 2011, p. 830); in other cases, the motive might include meeting the needs of a client (Nelson and Palumbo 2014).

Theory and Methodology of IDT Studios

Clinton and Rieber (2010) provide an excellent overview of the studio experience for Master's students at UGA. In so doing, they theorize design studios and assert that the “effectiveness of the Studio curriculum should be as robust as the theories themselves, given the assumption that the theories have been implemented with reasonably high fidelity” (Clinton and Rieber 2010, p. 770). The authors carefully explicated numerous theories that frame the studio, including constructionism, situated cognition, and self-directed learning. When compared to Rieber's (2000) 10-year-prior description of the UGA studio experience, it becomes evident that there has been consistency of theoretical frame over time. Others who write about the IDT studio experience commonly follow suit in focusing on the theoretical frame for studios. For instance, West and Hannafin (2011) considered the degree to which design studios embodied the characteristics of “communities of innovation,” as opposed to “communities of practice” (p. 822) or “learning communities” (p. 838). In some cases, those with interest in IDT studios argue for a theoretical shift in definitions of curriculum. If the classroom becomes a studio, then curriculum becomes the problems that studio students are asked to solve; the problems and their solutions drive the content of a studio-based course (Nelson 2003).

Consistently throughout the literature, the theoretical framing of IDT studios is prominent; clear and practical discussions of pedagogy—prescriptive guidance for instructor behaviors—are much less common. Perhaps the relative balance between theoretical and pedagogical discussion is useful; after all, when pedagogy is the focus, IDT studios might become too linear and mechanistic. As Boling (2004) noted, a strong approach to design in IDT must move away from linear model application and toward subtlety as qualities of the designer. Some general discussion of pedagogy within IDT studio literature exists. Sometimes, the discussion of pedagogy is circular, though, in that it merely points back to the theoretical frames. Hooper et al. (2015), for instance, labeled the theory of constructionism as “a pedagogy” (p. 68); yet, the authors defined this “pedagogy” through a restatement of the purpose of a studio: Constructionism is a matter of “affording opportunities for students to construct learning artifacts” (p. 68). Tripp (1994) gets more at the heart of pedagogy by noting that studio directors “guide the students through their design projects, while sharing their knowledge and experiences.” Tripp continues

by noting that it should be a “master-apprentice relationship,” which he characterizes using words like “advise, criticize, . . . question” and “suggest” (p. 121). Perhaps these characterizations are similar to the vision of Clinton and Rieber (2010) who, throughout their article, labeled the studio director as a negotiator, organizer, preparer of agendas, orienteer, moderator, and facilitator. Hooper et al. (2015) noted that design studio instructors “should seek out opportunities to discuss students’ work to identify important design principles” (p. 74). Nelson and Palumbo (2014) noted that the studio professor served as a “consultant to the teams at various points of difficulty, as a client when quick decisions were necessary regarding project goals or vision, and as a team member when production problems arose” (p. 84). Boling and Smith (2014) point to modeling of thinking and question asking as useful pedagogical approaches. While all of these characterizations and labels are generally evocative, none of the above-mentioned articles offer solid practical and prescriptive guidance on *how* the studio director can best maximize the studio experience toward learning. Indeed, Clinton and Rieber claim that in some studio experiences the “class structure/guidance” is “high” (p. 757), but they are quite vague in explaining and describing that guidance. They did note that, near the start of the studio experience, “students are presented with information about flow theory and encouraged to look for the experience in their design and development process” (p. 765). In another place, Clinton and Rieber offer some description of the ways that students in the studio are oriented toward their responsibilities:

In the first Studio course, seminars and discussions are held specifically to address the nature of self-directed learning. These become very personal in the sense that participants are asked to tell stories of self-directed learning in everyday life. . . . The seminars and discussions about self-directed learning help to reveal the incompatibility and incongruence of the desire for a simple directed learning experience within a complex learning and working context such as that of designing a multimedia project. (p. 769)

These generalized descriptions are useful. However, some evidence from the literature suggests a need for more focus on pedagogy within the IDT studio, as some students in IDT studios feel a need for more structure, scaffolding, and instructor-led support (Clinton and Rieber 2010; Orey et al. 2000; Song and Hill 2004).

Recapitulation, Analysis, and Forward Directions

The previous section considered the use of design studios as a formal training ground for IDT students. It has been instructive in that it described the nature of IDT studios and discussed key literature about IDT studios. As noted earlier in the paper,

IDT design studios have been discussed in theoretically-robust terms, which certainly support a view that the use of studios within IDT can be valuable. Scant in this literature, though, is specific and meaningful prescription for pedagogy within IDT studios. In fact, Boling and Smith (2014) seem to imply that the environment of the studio itself is a “signature pedagogy” (p. 38)—the place is the teaching. A premise of this paper is that pedagogy needs to be more strongly considered within an IDT studio environment if studios are to thrive. A starting point for addressing IDT studio pedagogy is to consider the goals of design studios. Prescriptions for pedagogy must aim toward fulfilling those goals.

Intended Goals of Design Studios

This section of the article establishes and explicates goals for the design studio. The presentation of these goals is the primary intellectual contribution of this article. Certainly, the goals partially are derived from literature about studios in IDT; more substantively, though, the goals are constructed through a consideration of interdisciplinary literature. Interdisciplinary consideration is both necessary and appropriate. It is necessary because the literature on IDT studios alone is not substantive enough to establish strong goals for the studio. It is appropriate since IDT literature clearly acknowledges that design studios come directly from other disciplines (see, for example, Hooper et al. 2015; Nelson 2003; Rieber 2000). Thus, it is not unreasonable to draw on those disciplines in determining potential goals for an IDT studio.

What literature is considered? First, the goals are constructed from literature about studios in other disciplines. For instance, because studios are, as both Salama and Wilkinson (2007b) and Wang (2010) noted, particularly well established within the discipline of architecture, literature from architecture is prominently featured in this section. Second, the literature about creative thinking (see, for instance, Csikszentmihalyi 1996) and design thinking (see, for instance, Cross 2011; Nelson and Stolterman 2014; Owen 2007) can be useful in establishing goals for design studios within IDT. Third, the literature about teaching and learning within higher education environments is considered, since IDT studios clearly should fulfill an educational function.

Identifying goals is important as a foundation for promoting prescriptive pedagogy within IDT studios. The goals answer a question: Toward what should studio pedagogy be aiming? An assumption of this article is that good pedagogy must aim, to some extent, toward the intended goals of design studios. As will be seen, each goal discussed in this section is paradoxical. The paradoxes present unique challenges for professors who serve as studio directors.

Successful Design Experience

At its broadest, design studio students should experience success. Yet, to scope out success and situate it within a studio setting reveals a paradoxical complexity, as success is a multidimensional construct. Success defined how? Success at what point during the process? Success from whose perspective? Success at what cost?

Success could be defined as the production of artifacts that satisfactorily addresses the design problem. If student designers solve the design problem, then they were successful. To contradict that definition, success could be defined in terms of the processes that deepen students' design skills, beliefs, values, or even enjoyment of design. If student designers engaged in processes that contributed to their education or seemed useful, then they were successful. This dichotomy of success as solution versus success as process is quite real in discussions of design (see, for instance, Nelson and Stolterman 2014); the dichotomy clearly can be seen in architecture design studios. Some design studios in architecture use a “design-build” model that emphasizes the importance of results; other architecture design studios place a “central emphasis . . . on poetic design,” where results seem almost “incidental” and secondary to student designers engaging in design as an art form (Wallis 2007, p. 202). These different approaches to a studio constitute a clear paradox: Solid results and meaningful processes are contradictory definitions of success.

Can studio directors simultaneously aim students toward both definitions? If studio directors primarily aim student designers toward successful products at the end of a studio experience, then potential conflict with meaningful processes might emerge. For example, an over focus on products might lead studio directors to usurp students' authority and design sensibilities in the name of an appropriate outcome of the design experience (Yanar 2007). This tendency on the part of studio directors might be particularly strong if the students are producing work for an actual client who is defining success in terms of a high-quality end product.

If, though, success is more process-driven than product-driven, then studio directors face a quandary of what type of processes best help students achieve. Process-driven success could be defined, for instance, in terms of student enjoyment. The environment of design studios should be “anything but austere” (Wang 2010, p. 176) and should allow for a “freedom-to-play position” (Love 2007, p. 98). Perhaps studios can be free places of play, if the definition of success is a short-run euphoric experience. If, however, the definition of success is a long-run perspective—success throughout students' career trajectory that goes far beyond their transient time within a university studio setting—then good reasons might exist for studio directors to set aside student enjoyment and complete freedom and, instead, teach toward processes that force students to operate outside of their comfort

zone, which is more congruent with austerity than with play. For example, Clinton and Rieber (2010) summarize dissertation research that was conducted about the IDT studio experience at UGA. Among the highlighted findings is the idea that overcoming conflict and difficulty is productive within a studio experience:

“Transformation of students' beliefs . . . occurred when students overcame difficulties and conflicts that challenged their beliefs and abilities and made them frustrated. The more that students were challenged and frustrated, the more possibility there was for them to change their beliefs once they got over the difficulties” (p. 774).

Yet another dimension in literature about success relates to opportunity cost. The cost of success is the experience of failure. In engineering, for instance, failure is an important aspect of a design experience (Petroski 1992). To go even further, it could be said that stable success may be contradicted by the very nature of design tasks, which can be “a little frightening” “unpredictable”, and full of “uncertainty” (Smith 2011, p. 167). Because of the complexity inherent to design tasks, design studio students in architecture “are in danger of being overwhelmed or overloaded by data and communications relating to the daily operation of the studio” (Wang 2010, p. 176). Similarly, some would argue that creativity, imagination, and curiosity come from places of psychological and emotional instability (Csikszentmihalyi 1996). So, to aim for an experience where students, on the one hand, experience stability and success but, on the other hand, experience creativity, imagination, and curiosity presents a contradiction that design studio directors must consider as they pedagogically promote success.

Authentic Design Experience

Clinton and Rieber (2010) allude to authenticity by setting students within “communities of practice” that allow for a type of “enculturation” into authentic design experiences (p. 766). Indeed, drawing on the work of Brown et al. (1989) and Lave and Wenger (1991), Clinton and Rieber noted the need for design studios to be “embedded in authentic and meaningful contexts” (p. 766). Prima facie, the notion of an “authentic” design experience seems useful; upon closer examination, however, authenticity within a university studio is a paradox in terms of contextual elements and in terms of design students' knowledge and skills. Studio directors face the challenge of navigating these paradoxes toward the goal of creating an authentic experience.

Contextual Elements Studios in university contexts are, by definition, “artificial” in that they are courses taken for credit,

not authentic for-hire work. Even if belief can be suspended to accept the authenticity of an IDT studio setting within a university, deeper analysis further illustrates the lack of authenticity of context. For example, in some professional (i.e., authentic) design experiences, the desire to appease clients sometimes conflicts with sound design practices that can enhance learner performance and achievement. Similarly, in professional design experiences that might occur in studios, project goals are often a moving mark as many different stakeholders assert influence on a given project (Nelson and Stolterman 2014; Owen 2007). Some of those stakeholders might be immediately relevant; but, do not overlook that within the types of professional design that might occur in studios, the “contexts and environments” can be robust, often involving “other people, other systems, . . . other purposes[, and] the history of events leading up to a design project’s formulation” (Nelson and Stolterman 2014, p. 225). In considering design studios within the field of architecture, Habraken (2007) summarizes and conceptualizes this point: “[W]hile projects in the real world tend to get larger and larger, the world of the [university] studio shrinks more and more, shying away from what most of our students will make a living from” (Habraken 2007, p. 15).

Students’ Knowledge and Abilities In studio settings “knowledge and skills must be applied but cannot be taught in any depth without seriously derailing studio’s central purpose” (Habraken 2007, p. 14). Based on this point, Habraken concludes that it is impossible to integrate knowledge and skills authentically into a university design studio. Consider, for example, the collaborative component of knowledge integration that occurs in professional design studios (see, for instance, Tracey 2015). Productive design collaboration assumes expertise both in design knowledge and group processes (Nelson and Stolterman 2014). As Kendall (2007) noted, studio students in architecture “are given the difficult task to both learn their discipline and to interact with others who are also learning theirs, quite a different situation from seasoned professionals who work out of a well-established knowledge base” (p. 167). Yanar (2007) seemed to agree that there are a variety of “tacit things that are not explicitly taught, although required to be learned,” including the “invisible systems of norms, values, and tacit knowledge.” So, the student “might be unsuccessful, not because of knowing too little but because of not knowing the ‘right’ things, in addition to not being what he is expected to be.” All of this “places . . . students in an unequal footing with one another” within the university design studio setting (p. 69).

Instructional design is iterative and recursive (Morrison et al. 2011). Design recursiveness creates ambiguity (Petroski 1992). Ambiguity is heightened because of the diverse theories and schemas underlying solid design (Nelson and Stolterman 2014). More ambiguity comes from the

evolution of projects in a practical sense. There is an assumption that design studios do not need to include instruction in design processes because studio students both acquire design expertise in action and apply their design knowledge from previous non-studio-based courses. But, do they?

Within IDT studios, some evidence suggests that students do not make large gains in developing their knowledge and skills dynamically (West and Hannafin 2011). In architecture, “the experience of many design educators suggests that this linear conceptual categorization of knowledge acquisition and application does not work properly” (Salama and Wilkinson 2007a, p. 187). That is, it is inauthentic. After all, authentic design experiences in most disciplines require designers to engage in flexible cognition—shifting among various filters, lenses, schemas, and perspectives (Nelson and Stolterman 2014). But, flexible cognition is only made possible because of the careful study of the domain itself (Csikszentmihalyi 1996; Petroski 1992). Students who are enrolled in design studios often do not have the grounding in either content or design processes such that they can engage in flexible cognition. For studio directors, a pedagogical challenge exists of helping student designers appropriately apply their knowledge and skills in an authentic way, even though the nature of an IDT studio and the iterative nature of design might well work against that authenticity.

Development of Design Thinking

Where the two previously discussed studio goals focus on the nature of the design experience, the final goal focuses on the type of thinking that studios should cultivate. Laurillard (2012) emphasized sound thinking as being inherent to design science; thus, the development of certain ways of thinking should be important within IDT design studios. This “certain way” of thinking will be called “design thinking” in this article. By the term “design thinking,” I am not trying to build a sophisticated vocabulary requiring book-length manuscripts for understanding (see, for instance, Cross 2011). In this context, the term “design thinking” simply means “thinking like a designer”—engaging in the types of thinking necessary to enable purposeful design. While this definition might, at first, seem overly simplistic, it is functional because it is consistent with the definition of design thinking found in an article on design studios within an IDT context. Hooper et al (2015) define design thinking as a means that “introduces students to design culture and how designers solve problems” (p. 67). This type of thinking requires both a specific “mindset” and “knowledge set” (Nelson and Stolterman 2014, p. 230). Studio directors must confront various challenges inherent to student designers engaging in “design thinking.” These challenges come to the forefront if we both deconstruct notions of “thinking like” and explicate subsets of design thinking.

Analysis of “Thinking Like” Many believe that university courses within the professions must help students develop “habits of mind” (Hassel and Lourey 2005, p. 3) and the ability to “think like”—thinking like a biologist, economist, linguist, and so forth (McConachie and Petrosky 2010, p. 18). In practice though, “thinking like” often manifests itself as a kind of “theater”, where by the student mimics the behavior of a modeling professor without any real understanding of the model’s essence (Hagopian 2013, p. 14). That is, many professors either do not provide insight into the rhyme and reason of the model, leaving students to their own inferences of the types of performances that will earn favor; or even if professors successfully model their view of design thinking, such views sometimes get lost in a murky compilation within students’ minds. The result often is poor thinking by design studio students.

Inherent to any discussion of “thinking like” is an ingredient of “thinking unlike”—bringing a “tangential...non-disciplinary” and outsider perspective to the social norms and culture of a learning situation (Hagopian 2013, p. 15). Many of the most transformative, paradigm-shattering innovations in both science and technology arose because of the value of “thinking unlike” (Csikszentmihalyi 1996; Hagopian 2013; Sims 2011). In discussing design thinking, Nelson and Stolterman (2014) framed this idea as a type of “intentional not knowing” (p.39)—being open to the emergent moment, even if that means operating outside of an expected way of knowing.

Yet, within design studios, student designers often “are expected to discard their existing preconceptions and personal biographies and to adapt to the given understanding of professional judgments and strategies” (Yanar 2007, p. 67). Yanar further extrapolates on this idea by noting that the voice of student designers “is first suppressed by teaching the language of the teacher and the rules of the prevailing [studio] discourse. Then, after adopting this new way of speaking, the student is invited to express himself—possibly excluding his unique experiences and ideas that cannot be expressed using the teacher’s language.” The result of this approach is an “uncritical socialization of the students into the status quo of the professional practice” (p. 67). To the extent that Yanar’s perspective about architecture design studios holds true in IDT, it presents a powerful irony, as notions of design studios themselves are the result of “thinking unlike.” Professors of IDT had to “think unlike” to see a studio’s value. Yet, the studio experience might well squelch the same type of contrarian thinking in IDT studio students.

The point in the above analysis is not to undermine the need for studio directors to model design thinking. Certainly, studio students must learn elements of “thinking like.” Instead, the point is to acknowledge that modeling specific thinking approaches presents pedagogical difficulties, since design thinking, properly understood, does not conform to heuristics and algorithms but is “unscripted” (Nelson and

Stolterman 2014, p. 29). Studio directors must find a balance between the modeling of design thinking and the encouragement of studio students to bring to the studio environment those experiences, personalities, and backgrounds that add the type of “thinking unlike” that will deepen the studio experience for all participants.

Subsets of Design Thinking Collapsing the holistic nature of design thinking into discrete categories is inauthentic and impractical. Why? Inherent to the studio experience, at least within architecture, is an emotional component (Austerlitz and Aravot 2007; Wang 2010). After all, architectural projects built in the studio are “created in a field of tension between reason, emotion, and intuition,” all of which is “rooted in humane traditions” (Salama and Wilkinson 2007b, p. 3). Humane traditions are inherently holistic (Nelson and Stolterman 2014). Still, merit exists in considering various subsets of design thinking that might be enhanced within IDT studios. This seems somewhat consistent with the view of Cross (2011) who argued that design thinking is based in “developed forms of certain tacit, deep-seated cognitive skills” (p. 8). Understanding some of those skills discretely might be useful in better understanding design thinking. Here, I focus on the notion of creativity as a subset of design thinking and action. For the purposes of this discussion, creative thinking includes all cognitive strategies and processes that likely are to manifest themselves in novel and useful solutions. The idea of process, novelty, and usefulness are common parameters of a definition for creative thinking (Knowlton and Sharp 2015). Creativity is an appropriate focus because it often gets overlooked in the IDT studio (Clinton and Hokanson 2012); yet, it is both important to design thinking (Owens 2007) and the “most glamorous trait of design action” (Nelson and Stolterman 2014, p. 173).

Creativity is paradoxical and can create administrative and pedagogical difficulties within a studio setting. For instance, creativity is important within IDT (Clinton and Hokanson 2012; Yanchar and Hawkley 2014); therefore, most IDT studio directors likely would value creative thinking from design students. At the same time, however, when students push themselves toward a strong sense of creativity, studio directors may not necessarily approve of those students’ attitudes and behaviors. Indeed, true creativity requires a strong confidence toward the self and the harnessing of all powers of consciousness toward the task at hand (Csikszentmihalyi 1996; Sims 2011). While some claim that “to devote oneself” is one of “the roots of the design studio” (Smith 2011, p. 163), studio directors must recognize the problems of this type of self-involvement by design students—seeming arrogance (Csikszentmihalyi 1996) and disruptive tendencies (Sims 2011), for instance.

The treatment of creativity that I have just offered certainly is not comprehensive, as creativity has its own large body of

literature, and even a consideration of a few sources (see, for instance, Csikszentmihalyi 1996; Knowlton and Sharp 2015; Sims 2011) reveals a robustness that cannot be captured in a single paper. In what follows, though, I explicate a few subsets of design thinking that often are associated with creativity. The point is that each of the explicated elements contributes to the conflation between design thinking and creative thinking, and each is inherently problematic and paradoxical when activated within design studio settings.

First, good judgment is important in creative achievements (Csikszentmihalyi 1996). Furthermore, judgment is essential within design achievement, as designers regularly are “fully responsible and accountable” for ten different types of design judgments that range from “default” to “compositional” (Nelson and Stolterman 2014, p. 150). Congruently to importance in creativity and design, judgment “is the main subject of studio life. . . . It is the irreplaceable ability by which we can steer towards coherence, if not beauty, in the midst of a host of often conflicting demands and criteria” (Habracken 2007, p. 11). In her examination of approaches to teaching design that might serve the field of IDT, Boling (2004) noted the role of good judgment as important, yet not covered by traditional IDT design models; this combination of “importance” and a lack of “coverage” might suggest that the non-traditional environment of a studio would be an appropriate place to broach questions about judgment. To student designers, though, it may well be paradoxical that good judgment is essential in efforts to creatively design, yet suspending judgment is essential when trying to creatively design (Nelson and Stolterman 2014). Studio directors, then, are faced with the challenge of helping student designers deal with this paradox.

Second, curiosity is important both for creative achievements (Csikszentmihalyi 1996) and good design thinking within a studio setting (Smith 2011). Curiosity is paradoxical in that it is important to good thinking; yet, it is also seen as a “lowly vice. . . . Nonetheless, political, ideological, and pedagogical shifts over the past two decades have retained . . . duplicities of curiosity in both society and the studio setting” (Smith 2011, pp. 162–163). As a subset of design thinking and creativity, curiosity manifests itself in the unrelenting desire to explore a variety of ways of both understanding the design problem and implementing appropriate solutions. Studio directors must facilitate studio activities in ways that help student designers find appropriate avenues for both pursuing and setting aside their curiosity.

Third, metaphorical thinking is ubiquitous and informs creative and design achievement (Lakoff and Johnson 1980). In creative thinking, the arts often provide useful analogues for scientific creativity, and sciences become metaphors for artistic creation (Root-Bernstein and Root-Bernstein 2004). In terms of design, Schlossberg (1998) noted that good design often emerges through metaphors of forging relationships. Elsheshtawy (2007) noted that metaphors must be a

component of the architectural studio. In a design studio for graphic arts, Logan (2007) discovered that “rich metaphorical descriptions and imagistic language” resulted in “accessible” discussion of more ethereal graphic design qualities (pp. 7–8). Within an IDT course framed as a studio, students’ metaphors of an agile design experience allowed for more personalized understanding of design (Knowlton 2004).

In spite of the seeming power of metaphor, design studio directors must be aware that not all metaphors are created equally, as inappropriate metaphors can hinder design thinking (Knowlton 2004). For instance, in a recent studio, I asked students to share their metaphors for a holistic consideration of design. Some of the metaphors were quite rich allowing for layers of interpretation and symbolism. One student designer, for instance, equated being a designer to Sisyphus finding meaning through continually pushing a boulder up the hill. Another student designer noted that to design is to be fully alive, yet to be surrounded by zombies. Other metaphors were more superficial, allowing for only very general parallels to design—“design is like making homemade pizza,” as one of my students declared. Studio directors must have strategies for helping students think metaphorically and exploit their own metaphors to find layers of meaning.

Implications and Conclusions

This article has pointed out that design studios within IDT have been discussed in academic literature. On average the literature theoretically conceptualizes the IDT studio strongly. However, discussions of the goals for IDT studios and considerations of prescriptive pedagogy are not well developed. All of this adds up to an important step in design scholarship as practiced within an IDT studio. As Nelson and Stolterman (2014) noted, design scholarship is about “sweeping in and integrating” the paradoxical influences on one who is “becoming a designer” (p. 224), while design always occurs in a “design milieu [that] influences, facilitates, and limits what an emerging designer can deal with” (pp. 224–225), encapsulating studio goals is important. These goals were derived from a broad array of interdisciplinary literature. The goals have implications for theory development and pedagogy.

Theory Development

A critique of these goals is needed, and I encourage a wide-array of analysis and critique of these goals. Possible questions include the following:

- What additional literature about design studios might lend credence or contradict the cogency of the goals discussed in this article?

- What additional literature about design, more generally, seems to support or refute the goals constructed within this article?
- How do students' experiences within IDT studios encounter these (or other) goals as being authentic to (and organic with) the design processes that they use?

Pedagogy

This article has articulated the point that the literature on IDT studios does not strongly discuss prescriptive pedagogy within studios. One reason that this article adds value is because it establishes a foundation toward which studio pedagogy can aim. But, aim how? What are the implications of the goals articulated in this paper for prescriptive studio pedagogy? This question needs to be answered in two different ways: First, a framework that can guide pedagogical activity is needed. Second, that framework needs to be supported with practical advice. Indeed, a contention of this article is that any thinking about teaching and learning within IDT studios must be horizontally developed from goals to pedagogical frameworks that culminate in practical behaviors among studio directors. Those behaviors must support the goals. The Scholarship of Teaching and Learning literature could offer much guidance in supporting both frameworks and practical guidance.

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