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IMPACT OF DESIGN THINKING ON CONCEPTUAL DESIGN IN INTERIOR DESIGN STUDIO COURSES

Wael Rashdan

College of Design, Al Ghurair University, Dubai, UAE

wrushdan@hotmail.com

Abstract

Design thinking has gained prominence in teaching interior design studio courses. Exploring the applications of design thinking can help interior design students understand the complexity and importance of conceptual design, while also supporting their discovery of unique design approaches and innovative design solutions. This paper provides a review of literature on design thinking and design education, examining the factors that imply influence on design thinking application in interior design studio courses. This paper also discusses the impact of design-thinking applications on the design process, as well as its influence on conceptual design development within the context of interior design undergraduate education.

Keywords

Design Thinking, Interior Design, Interior Design Studio, Interior Design Education, Conceptual Design, Design Education

1. Introduction

Design thinking is a multi-epistemic process that uses multiple ways of knowledge perceiving and judging, such as thinking, feeling, sensing, and intuiting, to produce creative problem solving (Teixeira, 2010). It is the mental act behind the physical results of the design process (Orthel, 2015). Interior designers may follow more design-based learning approaches because they often think in a playful fashion, physically engaging with drawings, models, and prototypes when introducing design solutions (Lawson, 2006; Teixeira, 2010). Moreover, interior designers tend to take advantage of the tension between desirable and possible solutions; they usually start with the most desired solutions, then work their way back toward achievable solutions (Kolodner & Wills, 1996). Therefore, interior design thinking requires an epistemological shift from substance to process in order to generate solutions for complex problems that are generally beyond the capacity of cognitive and analytical problem solving (Pascale, 2011; Schrage, 2013). Design thinking also involves a number of cognitive abilities that are inextricably linked to design-process activities (Cross, 2011). It is essential for designers to have a clear understanding of the nature of the design process, if they are to actively pursue design thinking (Stolterman, 2008).

To this end, design educators have an obligation to continually improve their teaching methods and pedagogies in order to emphasize design-thinking approaches to problem solving. Linking design thinking to design process plays an important role in the understanding of how design thinking can transform students' actions and instructors' teaching, while also providing ways for future designers to reshape the position of design within academic. In this context, design thinking can help develop the concept of design, which is defined as the core of design thought and considered the base for all decisions that form the character and appearance of design solutions (Travis, 2011).

This paper provides a review of current literature on design thinking within the context of interior design education, exploring the factors that influence the design-thinking process in interior design studios. This paper also discusses the framework of design thinking in relation to the design process, as well as its influence on conceptual design development within undergraduate design studio courses.

2. Design Thinking and Education

Design thinking can be translated into a distinct teaching approach for instructing design students in the ways of perceiving and judging knowledge. The main goal of the design studio is to produce students who think like professional designers, providing ways to foster collaborative learning between students and experts through an iterative process of planning–acting–observing–reflecting (Eagen, 2010; Cross, 2011). Design students can act out the role of designer in small projects that are tutored by more experienced designers. Traditionally, design educators are designers first, and teachers second, having practiced design through multiple apprenticeships that support their development of knowledge, skills, and values (Cross, 2006). As such, design educators practice design thinking through their professional experience to some extent, as it is considered a key aspect of design creativity.

Design education could be improved by including more explicit explanations of design thinking, which may help designers create concepts that solve design problems and lead to unleashed innovation (Ambrose & Harris, 2010). Problem solving methods for designers are typically taught in studio courses, which teach design as an action or skill, and knowledge-based courses, which teach topical and technical subjects (Oxman, 2004). Many researchers have tried to reshape design studio pedagogy in order to prioritize the teaching of design thinking (Bose, Pennypacker, & Yahner, 2006). Fernando (2006) and De La Harpe et al. (2009) conducted a meta-review of literature on design pedagogy in order to determine the most-emphasized characteristics in studio courses; they concluded that these courses tend to emphasize the final product over the process used to produce the design. Embedding design thinking into studio curriculum can help students develop independent critical-thinking and decision-making skills in ways that emphasize design process over final project solutions (Bose, Pennypacker, & Yahner, 2006).

Schön (1990, 2010) discussed the reflective habits of new designers as they solve design problems, concluding that the fundamental concepts of design can only be practiced through design thinking. Schön (1988) considered the “reflection in action” tactic to be the basis of any design process, an iterative, collaborative method that combines both science and artistry into the development of a design professional. Schön (1990) also discussed the “knowing in action” tactic as one distinguished by spontaneous and dynamic professional knowledge, which cannot

be successfully taught through theory. He believed that “knowing in action” was inherent in the design process and could only be learned in a unique studio environment where design thinking addressed how designers can frame and re-frame a design process, bringing past experiences to bear (Schön, 2010). In this environment, consultations between students and educators occur regularly. It is through the demonstration of and reflection upon “knowing in action” that the expert conveys tacit knowledge to the student (Mawson, 2003). Employing teaching methods that use speaking and drawing in tandem, the teacher demonstrates how to explore and act as a designer (Broadfoot & Bennett, 2003). This reflects the image of the teacher as a professional and reflective practitioner who offers guidance and inspiration to students (Schön, 1990).

Revans’s iterative model is considered a useful paradigm for active learning, which alternates between experience and preparation in design thinking (Beaty & McGill, 2013). The model is generally understood as a process of learning and reflection that happens with the support of a group of colleagues who focus on solving multifaceted design problems for which there are no single solutions (Beaty & McGill, 2013). Within this context, design thinking teaches students how to iterate upon their designs, based on reflection, questioning, conjecture, and refutation (Smith & O’Neil, 2003). This model shows that design thinking can help students take an active and responsible role in their learning, overcoming a tendency toward passivity in the learning process (Brockbank & McGill, 2007).

2.1 Factors Affecting Design Thinking in Studio Class

The design studio can be defined as an environment where projects are executed as an individually or collaboratively work, and these projects are selected based on their applicability and conformance to the practice of a given design topic and pedagogy (Shulman, 2005; Schön, 2010). Design disciplines are generally seen as bound by the methodology and praxis of the design studio, which is comprised of an informal learning environment shaped by exploration, peer and instructor critique, and minimal direct instruction (Gray, 2013; Cross, 2006). Design students learn to think and act within the context of design judgment and situational appropriateness, developing and defending solutions rather than using a predefined structure or linear process (Gray, 2013; Teal, 2010). Being solution-focused, constructive in nature, dominated by problem solving, and a way to address ill-defined problems are all important features of design thinking (Cross, 2006); therefore, design studio courses can typically benefit from being structured on the design-thinking model (Breslin & Buchanan, 2008; Teal, 2010).

The following sections discuss the potential factors that may influence students' thinking within the design process. These factors are identified through a thematic analysis of current literature, which were searched for using multiple keywords related to design thinking across a range of research databases. The literature was then divided into three categories: design studio environment, studio interactions, and constructive design.

2.1.1 Design Studio Environment

The studio environment can be identified as the composition of physical space and resources, the pedagogy that occurs within the design studio, and the tools used by students within the context of the studio (Reimer and Douglas, 2003). Firstly, physical space and resources can affect the kinds of activities that the studio can support (Shaffer, 2003). It should facilitate design-thinking processes rather than create obstacles in any of its stages, such as providing common areas for students to work while allowing for critique, peer interactions, and self-defined space (Wang, 2010). Secondly, studio pedagogy is considered a vital factor that shapes student design thinking since students are often more familiar with the traditional method of direct instruction, while studio pedagogy may rely on direct and indirect instructions (Demirbas & Demirkan, 2003; Burghardt & Hacke, 2004). Therefore, the role of pedagogical factors within the studio should encapsulate formal instruction, activities, and assessment that encourage design thinking (Shaffer, 2003). Thirdly, the studio is oriented towards sketching and rapid prototyping (Lee & Breitenberg, 2010). Students should therefore be familiar with a wide range of specialized tools that require mastery in self-expression and quickly captured thoughts, which are useful in translating the design-thinking process into visual concepts (Mawson, 2003; Akalin & Sezal, 2009).

2.1.2 Studio Interactions

The interior design studio naturally includes interactions with peers, professors, and design professionals. Design studio courses usually focus on collaborative group work, rather than isolated, individual work, in the creation of designs (Ochsner, 2000). Students must be willing to interact in a cognitive and consensus-oriented way in order to break traditional rules and encourage innovation, as such interactions are founded upon open-critique and peer feedback between students and professors (Lewis, 2005; Wylant, 2008; Wang, 2010). Clear, unbiased feedback enhances the quality of the design studio experience, providing opportunities to present design concepts, respond to peer and professor critique, and iterate the design

appropriately in order to meet defined constraints and desired outcomes (Gray, 2013; Schön, 1988). These approaches also serve a pedagogical purpose, spurring unexplored thoughts from studio participants and giving students opportunities to justify and defend their design decisions through intellectual development by questioning and being questioned (Demirbas & Demirkan, 2003; Logan, 2008; Walliss & Greig, 2009; Bleviss, 2010). Constructive interactions can encourage reflection on learning processes that incorporate design thinking (Logan, 2008; Pringle, 2009). Other forms of interaction that take place within the design studio are the communications between design artefact, concept, and feedback that form what we call a creative leap and help students develop their designs (Crilly, 2010). These communications between design elements emphasize the importance of design thinking as a regular practice within the design studio experience (Cross, 2006).

2.1.3 Constructive Design

Constructive design describes the relationship between developing students' design thinking and the achieved design concept and solutions (Akalin & Sezal, 2009). Design students enrolled in studio courses can reinforce their creation of designs through mental constructs based on theoretical knowledge and practical frameworks, which ultimately forms the design process (Boling & Smith, 2010; Yilmaz, Seifert, & Gonzalez, 2010). Developing students' design thinking can be accomplished by building an understanding of constraints in wicked problems, guiding students through a series of design barriers, and eliminating the idea that there exists a best solution, all of which can lead to unique and previously unconsidered design concepts and solutions (Lewis, 2005; Ludden, Schifferstein, & Hekkert, 2008). Eventually, this will help students to avoid linear problem solving, enhance their knowledge of design practices, and transform novice students into professional design thinkers (Akalin & Sezal, 2009; Teal, 2010).

2.2 Phases of Design Thinking and Their Relationship to the Design Process in Studio Courses

Design students develop a set of guiding principles that are influenced by their practical experience, steering their strategies in how they approach different design problems throughout their years of education (Lawson, 2006). These strategies can be described as the determine actions of thinking by students during the planning of a design process. There are three types of thinking within the design process: convention-based, situation-based, and strategy-based (Lawson & Dorst, 2013). Design thinking helps students identify the design problem using a

systematic approach, by exploring the design issue as a whole rather than being limited to components directly related to the design problem. This allows students to focus on understanding the problem from their own distinct and personal perspectives and come up with appropriate solutions based on the expected functions of the design, with an aim to create innovative design solutions (Cross, 2006). Thus, the design process reflects tangible results from intangible design thinking. The following sections further discuss the relation between the phases of design thinking and the design process within design studio courses.

2.2.1 Design Problem Formulation

The first step in the design process is the design programming, which is initiated when students receive a brief from their instructor about a design studio project. The constraints revealed in the design brief are considered the basis of determining students' design tactics (Lawson, 2006). Students must clearly communicate their intentions and the project requirements with their instructors in order to formulate appropriate design outcomes for specific purposes (Nelson & Stolterman, 2003). Many studies have discussed design students' tendencies to be solution-oriented, adopting a working process that leads to the identification of solutions during an earlier phase of the design process, before the design problem nor solution is clear (Lawson & Dorst, 2013; Wiltschnig, Christensen, & Ball, 2013). On the other hand, students who follow the framework of design thinking are able to address design problems more clearly, introduce their own constraints, and explore tentative solutions (Cross, 2006). Once the design problem has been identified, it is necessary for the students to contextualize the conditions, goals, and constraints that will help them generate their design concepts and formulate their cognitive strategies. Students should consider problem-framing as a key characteristic of reflective practice, during which a broader analysis is made in order to identify various aspects and requirements of the design problem, then particular areas of the solution space, so that new frames may be created for further exploration (Cross, 2006). Design problem formulation provides structure and direction to the design process, since framing allows students to adopt more realistic strategies for finding satisfactory design solutions, rather than focusing their energies on creating optimum solutions (Cross, 2006). This phase of design thinking allows students to be selective, directing them toward solution conjectures, and increases their abilities to be proactive in handling project complexities and impose their views about the design problem (De Bono, 2000; Lawson, 2006).

2.2.2 Design Concept Visualization

The second step in the design process is schematic design, where tentative design solutions are visualized (Cross, 2006). Interior design students utilize different, comprehensive, and meaningful combinations of verbal and non-verbal media, such as sketches, drawings, models, and writing, to generate a tangible form of their proposed design concepts. This step may end with an early singular idea, or several ideas that will work simultaneously, requiring students to utilize their capabilities in managing parallel lines of design thoughts (Lawson & Dorst, 2013). Students practicing design thinking will realize that the visualization phase is essential, allowing the designer's ideas to be externalized and giving the opportunity for design solutions to be discussed and developed as part of the stage for generating design solutions (Cross, 2011).

Once visualizations have been generated, students can engage in a dialogue about the results with their instructors and colleagues. These discussions, critiques, feedbacks, and reflections will adapt and refine the design solutions (Lawson, 2006). This will allow students the ability to generate more concrete ideas, move closer toward achieving the design outcomes, and propose more realistic design solutions during the design process (Nelson & Stolterman, 2003).

2.2.3 Design Movements

Allowing students to discuss the formulation of design concepts and visualize their thoughts will lead them to initiate new and different types of design movements. These movements are especially helpful for the design development stage in that they can encourage creative leaping between divergent thinking (to create options) and convergent thinking (to make decisions) (Lawson, 2006). In essence, movements can be viewed as a bridge across the chasm between problem and solution, where students work out their ideas in detail and form the basis toward realizing a satisfactory design concept and innovative design solutions (Cross, 2006; Lawson, 2006; Wylant, 2008). The selection of design movements for each project is dependent on the time allotted for the project, the students' thinking skills, and the quality of the instructor's guidance and studio pedagogy (Logan, 2008). In this stage, students will become more aware of the design possibilities, therefore developing their knowledge of approaching design problems and setting a framework for them will help students to control design problem subjectivity. This will present an opportunity to stimulate the generation of further ideas, while also improving

upon students' earlier suggestions through the use of different design techniques, and eventually leading to enhanced formulations of the design concept (Gause & Weinberg, 1989; Lawson, 2012; Lawson & Dorst, 2013).

2.2.4 Design Evaluation Process

Students generate alternative design solutions throughout the design process. In order to evaluate their proposed solutions, students collect different opinions and suggestions for enhancement through productive brainstorming and critique sessions, as well as comments from their instructors (Lawson, 2006). The evaluation process is inextricably linked with design movement's phase for all design ideas that arise throughout design process. Hence, design evaluation process is necessary for the students to make decisions about which ideas to pursue or abandon (Nelson & Stolterman, 2003; Lawson, 2006). Design-thinking evaluation is dependent upon a convergent process that goes beyond mere intuition; it has a pragmatic value and involves critical judgment (Cross, 2011). There are different types of evaluation, such as intellectual, practical, and ethical, that do not operate separately; however, they do overlap with each other, ensuring relative objectivity in the decision-making process (Nelson & Stolterman, 2003). Students should consider any constraints during the evaluation process so that they may achieve the most innovative and satisfactory solutions. These constraints include working within reasonable and realistic time frames that serve design expectations and respect the design criteria, requirements, and limitations set during the formulating phase (Nelson & Stolterman, 2003). Students should also consider self-imposed criteria such as aesthetics, technical and legal issues, and advanced design technologies (Cross, 2011).

2.2.5 Reflections on Design Feedback

In the reflection phase, students focus on monitoring design decisions made during the process, rather than the final design outcomes (Lawson, 2006). This phase allows students to enhance their design-thinking capabilities and learn more about their design outcomes.

There are two main types of reflection on design thinking: reflection in actions, in which students are constantly moving back and forth between the previous phases, and reflections on notable changes to their designs and whether they have successfully achieved their design outcomes. This reflection type also allows students to explore important avenues taken during the design process, building their experience and thus benefiting future projects.

Reflection on actions type take place once the design outcomes have been achieved, and allows students to ensure that the design-thinking phases have properly addressed the design problems and determine the extent to which the design solutions have been successful in achieving stakeholders' intentions (Lawson, 2006).

3. Conclusion

Design thinking involves the cognitive abilities of knowledge perceiving and judging that typically complement the aims of design education. The design thinking process consists of a number of interacting mental actions, which enable designers to create unusual and realistic design outcomes. Design Thinking is characterized by a dynamic approach that offers unique, individual solutions to problems. The phases of design thinking process are non-linear in nature, yet interdependent; both the process and its results are contingent on the particular circumstances or problems that the designer faces. Design thinking therefore has significant potential in supporting innovation within design education, rather than mere improvement.

This paper identified the factors that affect design teaching under design thinking principles, paving the way for a teaching framework that accommodates these influential factors and lays the groundwork for innovation in the classroom.

This paper also explored the relationship between design thinking and the phases of the design process, as well as to what extent the application of design thinking can improve students' capabilities in penetrating design barriers and producing design solutions in ways that reflect the needs of the professional world.

Design educators should consider embedding alternative approaches for teaching and applying design thinking into higher education curricula, such as adopting teaching pedagogies from studio courses, encouraging design critique, and demonstrating more diverse perspectives and methods in addressing design problems. For advanced levels of design studio, design thinking should be implemented after students gain a solid understanding of the design process.

Strategic design thinking requires that students have sufficient knowledge of the design process so that they may predict the actions required of them, interpret the available information across different design situations and integrate that information into the design process, make use of the arising consequences, and support design students in their personal search for ways to deal with a design problem and commit to their chosen strategies. All of these recommendations will

help students develop their design concepts and receive the maximum benefits of studio learning, as well as give them the intellectual tools and practical experience to think in a “designerly way,” ultimately decreasing the challenges they will face when transitioning to their professions (Akalin & Sezal, 2009; Cross, 2011).

Finally, this paper recommends that interior design institutions and authorities build educational networks that can introduce the capabilities of design thinking to professionals, design educators, and students. These networks can further facilitate the sharing of results from implementing design thinking, to aid in continual evaluation, reflection, and enhancement.

This paper can be utilized as a ground for further empirical studies that measure the effectiveness of applying paper hypotheses within several interior design curriculums.

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