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Thesis

Exploring the Critique Environment of Industrial Design Education in the US: the Influence of Critique Experience in Recent Graduates' Performance in the Design Industry

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ABSTRACT

Design critique is a vital component of design education, fostering creative and purpose-driven thinking through collaborative feedback sessions involving students, professors, and guest critics (NN Group). Upon graduation, students bring a range of skills gained from critique, which can impact their transition to the design industry. This study investigates how industrial design students apply their academic critique knowledge to the professional field. Specifically, it explores (1) the influence of critique knowledge on recent graduates' performance in the industry and (2) evaluates the extent to which the current critique environment accurately reflects the professional design field. Interviews were conducted with key stakeholders in US industrial design, focusing on their experiences in academia and the industry, as well as their perspectives on the role of critique in student transition. Thematic analysis reveals that critique enhances students' design identity but hinders their understanding of cross-functional industry culture, leading to challenges in collaborating with professionals from different fields. Additionally, the study finds that the current design education is limited in the involvement of diverse professional insights due to systematic challenges which makes design education predominantly design-focused. The study concludes by proposing strategies to enhance the critique experience of industrial design students and facilitate their successful transition to the industry.

Keywords: design critique, industrial design, design education, design industry

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Chapter 1 Introduction

1.1 Statement of the Problem

Over the past few decades, the field of industrial design (ID) has undergone rapid changes and significantly influenced our society through technological advancements. Industrial designers, who were once "bustle around factories and stores, streamlining stoves … squinting at this year's automobiles…" (Dreyfuss, 1955), now tackle a broader range of products, including devices, objects, and services. As the impact of industrial design continues to grow, it is crucial to assess how design education effectively supports students in their transition to an evolving and dynamic industry.

Unfortunately, numerous recent studies have highlighted the challenges faced by design students when moving from academia to the industry. Novice designers, in particular, appear to encounter difficulties in communication and soft skills, especially when collaborating with professionals from non-design backgrounds (Huang and Li, 2015; Menold et al, 2018). This struggle seems to intensify as the design industry becomes increasingly interdisciplinary in the wake of technological developments (Sanders and Stappers, 2008; Leitao, Marik and Vrba, 2013). Consequently, there is a need to reevaluate existing ID pedagogy to better support students' transition to the industry by providing a more realistic portrayal of the design industry.

Among the various pedagogical tools used in ID education, design critique has gained attention as a potential solution to address the aforementioned issues (Dannels and Martin 2008; Motley, 2017). Researchers argue that critique, as a platform for analyzing design work and exchanging feedback, has the potential to teach verbal and social interaction skills that are in

high demand within the current design industry (Scagnetti, 2017; Dannels, 2005). On the other hand, concerns have been raised regarding whether critique offers students an accurate representation of the professional design industry, including the possibility of idealizing the workplace contexts which potentially confuses their career goals (Dannels, 2005). Despite these differing perspectives, the potential of design critique in preparing students for the industry necessitates further exploration of this topic.

Despite ongoing efforts to investigate the critique environment and the challenges faced by design students transitioning to the industry, there are still research gaps to be filled. Existing studies often fail to recognize the interconnectedness between critique and students' struggles within the design industry. For instance, Menold et al (2008) have found that novice designers struggle to articulate their decision-making processes verbally, emphasizing the need for students to understand the relationship between prototypes, argumentation, and decision-making. However, these studies often focus on the engineering aspects of industrial design education and overlook the soft skills developed through class discussions. Conversely, Dannels and Martins (2008) emphasize that the critique environment extends beyond verbal communication and is similar to a "tribal activity" that indirectly reflects the social dynamics and culture of professional settings. While these studies shed light on the learnings derived from the critique process, there is a lack of exploration into how these learnings can be applied to students' performance in the design industry.

In essence, research on the transition of design students from ID education to the design industry tends to examine the critique environment and the struggles of novice designers in isolation. This research gap signifies a limited understanding of how the knowledge acquired

through design critique can be effectively applied to recent graduates' performance in professional settings. Therefore, it is crucial to approach these two areas from a new perspective, thereby fostering a more comprehensive understanding of the current student experience in industrial design education. Furthermore, this research can provide valuable insights into how to better support design students in preparing for the rapidly changing industry.

1.2. Focus of the Study

The goal of this study is to explore how the critique process in industrial design (ID) education impacts students' performance in the industry upon graduating. Specifically, the study will focus on the industrial design field in the United States, which accounts for approximately 30% of global industrial design services (Global Industry Analysts, Inc, 2021). By exploring this specific context, the research will provide a broader understanding of how ID students transfer their academic knowledge to real-world work environments and further suggest any structural developments required in the current design critique component of industrial design education.

While industrial design education has often been criticized for its traditional curriculum, there have been ongoing changes within the ID academia to present a more cohesive and realistic depiction of the design industry to students. Many design studio classes now adopt a cross-functional approach, integrating disciplines such as cross-modal user experience (UX) pedagogy, media application in model-making, or the incorporation of sociological strategies in design thinking (Chen and You 2008; Temor et al 2022; Jan 2012; Banerjee et al, 2022). These multidisciplinary approaches aim to facilitate diverse learning experiences within ID education, especially teaching students about the "complexity" of the current design industry.

However, addressing this complexity requires more than just improving functional and skill-based aspects of education. It involves capturing the dynamic interactions among different stakeholders in the design industry. Experts like Wormald and Rodber (2008) argue that education should focus on helping students become "opportunity identifiers" rather than solely "problem-solvers." This means developing a broader understanding of design that encompasses socio-political and economic considerations, going beyond a narrow focus on design knowledge. To effectively convey this greater complexity of the design industry, it is essential for industrial design education to emphasize the conversations that occur during the educational process. Conversations play a vital role in educational change (Jenlink and Carr, 1996), and they are equally significant in the context of design education. Unfortunately, critique, which is a critical component of the design education process, has undergone limited transformation within the ID curriculum.

Therefore, the purpose of this study is to explore the influence of design critique on students' performance in the professional design industry, specifically within the United States. The findings of this study aim to contribute to curriculum innovation in industrial design education, opening up a range of opportunities for future design students. It is important to acknowledge that, as a master's dissertation, this study may have limitations in terms of time and depth of research. Nevertheless, it can serve as an initial step for further research that strengthens the connection between ID education and the design industry.

Chapter 2 Literature Review

This chapter will review the relevant studies introducing what has been discussed around the topic of industrial design (ID) and how the research gap is formed. By discussing four key areas of industrial design, namely industry, designers, education, and critique, this study will be able to capture a clear picture of how the critique experience influences students' performance within the design industry. Ultimately, this exploration will underscore the significance of the present study and guide readers toward the research questions that will be addressed.

2.1 Industry: Industrial Design Industry, or Just a Design Industry?

The historical perception of industrial design primarily focused on form and function, heavily influenced by the Bauhaus movement (Ulrich and Eppinger, 2012). It was important for industrial designers to emphasize the cohesive connectivity between the form and function in manufactured products. Therefore, industrial design education predominantly emphasized skills such as model sketching/making, understanding material and manufacturing processes, and studying various design theories as preparation for entering the design industry (Goatman and Moody, 2014). This trend is well shown by iconic products from the 1950s to 1970s, including the Eames chair (1956) and Braun electric razor (1951). With technological development in the 1980s, industrial design underwent significant diversification. It extended beyond the boundary of form and function, and designers began to consider alternative product methods beyond manufacturing. Industrial designers started exploring different approaches to product delivery and collaborating with professionals from diverse fields.

A simple way to view this transformation is by examining the evolution of industrial design's definition. The World Design Organization (WDO), the worldwide non-government organization focused on industrial activities, periodically revises the definition of industrial design. In 1959, when the organization was known as the International Council of Industrial Design, it defined industrial design as follows:

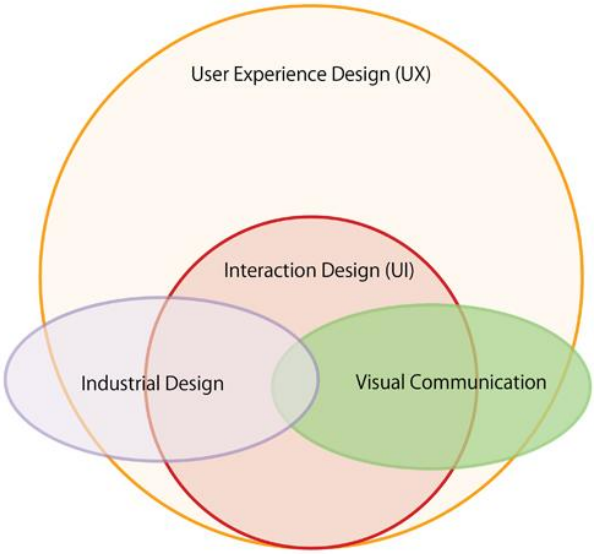
> "An industrial designer is one who is qualified by training, technical knowledge, experience and visual sensibility to determine the materials, mechanisms, shape, colour, surface finishes and decoration of objects which are reproduced in quantity by industrial processes.." (World Design Organization, 1959)

On the other hand, the WDO's definition of industrial design in 2015 showcases a substantial departure from its initial description:

> "… strategic problem-solving process that drives innovation, builds business success, and leads to a better quality of life through innovative products, systems, services, and experiences." (World Design Organization, 2015)

The most significant difference in the revised definition is the expanded scope of design subjects. Industrial designers now tackle a wider range of considerations, including people, techniques, and methods. Figure 2.1. Illustrates how industrial design now shares common ground with user experience design, interaction design, and visual design, highlighting the cross-functional nature of the contemporary industrial design field.

Figure 2.1. Industrial Design Ecosystem (Beyond Design, 2014)



2.1.2. Current Industrial Design Industry

To dig into the changes in the industrial design industry, we will utilize Jones' (2014) Four Generations of Design Method, as presented in Table 2.1, as our theoretical framework. This framework captures the transformation and expansion of design systems and methods over time. One of the key factors identified in Table 2.1 is the shift in design problems and how it has influenced designers' problem-solving approaches. Jones (2014) noted that designers have transitioned from a craft-focused approach to a transdisciplinary and empathic one, related to the increasing complexity of design problems. In other words, complex design problems require diverse strategies within the design industry, often involving transdisciplinary methods beyond traditional design skills (Buchanan, 1992; Kreuter et al., 2004; DUMAN and TİMUR, 2020).

Table 2.1. Four Generations of Design Methods (Jones, 2014)

Generation	**First**	**Second**	**Third**	**Fourth**
Orientation	Rational 1960's	Pragmatic 1970's	Phenomenological 1980's	Generative 2000's
Methods	Movement from craft to standardized methods	Instrumenality, Methods customized to context	Design research and stakeholder methods, Design cognition	Generative, empathic & transdisciplinary
Authors & Trends	*Simon, Fuller* - Design - Science - Planning	*Rittel, Jones* - Wicked problems - Evolution	*Archer, Norman* - User-centered Design - Participatory Design	*Dubberly, Sanders* - Generative Design - Service Design
Systems Influences (Design Problem)	- Science - System engineering	- Natural systems - Hard systems	- System dynamics - Social systems - Sofy systems	- Complexity

2.1.2.1. The Complexity of the Design Problem

What does it mean for design problems to become complex? As discussed earlier, the complexity of design problems is a central aspect of the changes occurring in the industrial design industry. This complexity arises from the involvement of multiple actors in the design process, resulting in diverse cultures, perspectives, and considerations surrounding the design problem (Bailey, 2008). As a result, researchers emphasize the importance of proficient communication skills, creative problem-solving strategies, and independent management skills for designers to adapt to this evolving environment. Communication, in particular, is frequently highlighted as a prerequisite competency for designers when dealing with complex design problems (Menold et al, 2018; Holt, Radcliffe, and Schoorl, 1985).

However, previous studies underscoring the significance of communication within the changing design industry often fail to provide practical implications for education. While they highlight the necessary preparation within the design community, they do not sufficiently extend the importance to design education, which weakens the connection between ID education and the design industry. Even studies that establish links between these two fields lack in-depth narratives from key stakeholders in industrial design, preventing us from fully capturing their experiences and insights (DUMAN and TİMUR, 2020). Consequently, there exists a research gap regarding the connection between ID education and the design industry concerning shifting trends and the required skills in the professional design field.

2.1.2.2. Transdisciplinary Methods

The changing trends in the design industry have led to the involvement of multiple stakeholders in the design process. As a result, researchers have shed light on the importance of transdisciplinary and cross-functional methods employed by designers within the industry (Bailey, 2008; Aitchison, 2016; Buchanan, 1992). In addition to common transdisciplinary approaches like design and engineering collaboration (de Vere, Melles and Kapoor, 2010), designers now increasingly need to collaborate with professionals from diverse fields such as marketing, public health, and finance (Han et al., 2018). Specifically, when designing products related to services and experiences, designers must consider human factors and cultural aspects, necessitating empathetic and in-depth discussions among various stakeholders involved in the design problem (Calvi, Sabiescu and Vermeeren, 2018). This highlights the importance for designers to equip themselves with strategies suitable for the cross-functional culture of the design industry (von Thienen, Meinel and Nicolai, 2014).

In summary, contemporary trends have transformed the design industry into a more cross-functional realm, characterized by complex design problems. This demonstrates that industrial design is no longer confined to its traditional definition and craft-focused activities but has expanded into broader fields of society. In response to this, researchers have illustrated the need for designers to possess advanced communication skills to tackle complex design problems involving various stakeholders. However, these studies often lack a connection to education, meaning that valuable findings from previous research tend to remain within the professional design communities. Even studies that establish a link to ID education often fall short in exploring how design students or professors are adapting to these changes, making it challenging for us to understand how the evolving competencies of designers and the design industry impact design students as they prepare for their careers. This highlights a research gap that exists on the bridge between ID education and the design industry.

2.2. Designers: Exploring Competencies and Challenges

The previous section briefly mentioned the changing competencies required for designers in response to shifts in the design industry. To gain a deeper understanding of the competencies expected from designers, particularly novice designers, and their reactions to these changes, it is essential to explore these competencies in more detail. This exploration will help establish a close link between the necessary skills for design students and their education.

2.2.1 Competencies in the Design Community

While the design industry demands advanced skills from designers, the definition of these advanced skills remains ambiguous. Therefore, a systematic conceptualization of the current

competencies, supported by a theoretical framework, is needed to comprehend the various levels of competencies within the design community. In this section, we will utilize Dreyfus and Dreyfus's model of skill acquisition (1980) to illustrate the different levels of competencies among designers.

According to the skill acquisition model, the key differentiating factor in competency levels lies in how designers apply their skills to problem-solving. As depicted in Table 2.2, novice designers tend to adhere to rules and solve design problems within given boundaries, whereas experts excel in blending their thoughts, feelings, and actions with creative intuition. This blending encompasses elements such as empathy, critical thinking, and independent decision-making within their problem-solving process (Mohedas, Daly and Sienko, 2016; Huang and Li, 2015). Novice designers, on the other hand, often struggle with data prioritization and synthesis, skills that improve with experience. In addition to the previously discussed significance of communication skills, this model underscores the importance of critical thinking, independent decision-making, situation awareness, and empathy-building in the successful performance of designers in the professional design industry (Verganti, 2009; Ramirez, 2012).

Table 2.2. Dreyfus and Dreyfus Model of Skill Acquisition from Mohedas et al (2016)

Level	Skills
Novice (Recent Graduates)	Is rule driven
	Uses analytic reasoning and rules to link cause and effect
	Has little ability to filter or prioritize information, so synthesis is difficult at best and the big picture is elusive
Advanced	Beginner
	Is able to sort through rules and information to decide what is relevant on the basis of past experience
	Uses both analytic reasoning and pattern recognition to solve problems
	Is able to abstract from concrete and specific information to more general aspects of a problem
Competent	Emotional buy-in allows the learner to feel an appropriate level of responsibility
	More expansive experience tips the balance in reasoning from methodical and analytic to more readily identifiable pattern recognition
	Sees the big picture
Proficient (Senior Designers)	Complex or uncommon problems still require reliance on analytic reasoning
	Breadth of past experience allows one to rely on pattern recognition such that problem solving seems intuitive
	Still needs to fall back to methodical and analytic reasoning for managing problems because exhaustive number of permutations and responses have provided less experience on particular problems
	Is comfortable with evolving situations; able to extrapolate from a known situation to an unknown situation
	Can live with ambiguity
Expert (Senior Designers)	Thought, feeling and action align with intuitive problem recognition and intuitive situational responses to problems
	Is open to notice the unexpected
	Is clever

Among these skills, communication skills and empathy-building are the emerging competencies that are specifically emphasized in relation to industry trends. Firstly, communication skills are essential for designers to express their thoughts and negotiate with various stakeholders within the complex, cross-functional design environment (Huang and Li, 2015; Kreuter et al., 2004). Moreover, empathy-building plays a significant role in multidisciplinary products which incorporate human factors, enabling effective problem-solving through accurate analysis of user needs (Norman, 2010; Calvi, Sabiescu and Vermeeren, 2018).

2.2.2 Novice Designer's Limitations

To delve deeper into the skills of novice designers, it is important to understand the areas in which they struggle to meet industry demands. This will shed light on the current challenges faced by novice designers and how they can be supported. Despite the various skills emphasized by researchers, incoming designers often encounter difficulties with their communication skills in the design industry (Huang and Li, 2015). Specifically, they face challenges in communication within cross-functional settings due to their lack of experience and knowledge. For instance, Menold et al. (2018) highlight that novice designers often struggle to effectively communicate with engineers during the design process, exacerbated by ineffective communication tools that fail to fully express the designer's thoughts. Given these struggles, some researchers emphasize the role and responsibility of industrial design education in helping students develop these skills before entering the professional design field (Arthur, Brennan, and de Weert, 2007). This raises the question of the role of industrial design education and how it responds to these changes to better support students as they progress along their career path. The next chapter will discuss industrial design education to explore these questions further.

2.3. Education: The Role of Industrial Design Education in Student Preparation

Industrial design education aims to equip design students with practical knowledge to become successful designers (Crowther, 2013). However, it has faced criticism for its passive approach to curricular innovation, which exacerbates the challenges faced by novice designers (Coyne, 2004; Aitchitson, 2016; Valtonen, 2016). For instance, Bollono (2004) argues that ID education overly focuses on teaching technical tools for physical product development, such as CAD and prototyping, neglecting important social factors like globalization, cultural diversity, and marketing. Wormald (2010) also emphasizes the need for design students to understand the complex dynamics and stakeholder strategies involved in the "fuzzy front end" of the design industry. These reviews highlight the necessity for curricular improvements in ID education to address the struggles faced by novice designers.

2.3.1. What is industrial design education?

Industrial design education is centered around studio teaching, where a small number of students, typically 12 to 20, explore simulated real-world scenarios through design assessments and discussions (Bender and Vredevoodg, 2006). At the end of the semester, students present their final assessments in a final review, receiving feedback from peers, instructors, and guest critics, often professional designers. (Crowther, 2013).

2.3.2 Assessments of Industrial Design Education

The unique format of studio teaching in ID education fosters a self-driven approach to design assessments. Students often engage in long problem-solving processes independently or in small groups. While this independence promotes learning autonomy, researchers are

concerned about its conflict with the collaboration and communication skills required in the current design industry, especially in cross-functional settings (Nicol and Pilling, 2000). To address this, Richard and Catherine (2015) suggest incorporating more teaching of collaboration, as the current student-centered learning principles may not adequately prepare students for group-based professional design practices.

2.3.3. The Curriculum of Industrial Design Education

In addition to assessments, social aspects, such as peer discussions, play a significant role in the design studio. Dutton (1987) describes the studio culture as, "active sites where students are engaged intellectually and socially, shifting between analytic, synthetic, and evaluative modes of thinking in different sets of activities (drawing, conversing, model-making)." (p.16). However, the research indicates that ID education often maintains a traditional curriculum that prioritizes craft-focused teaching over social and analytic activities. As the design industry transitions from a manufacturing to a service economy, with a focus on digital products and "design thinking" (Aitchison, 2016), the outdated curriculum of ID education has been subject to criticism. Duman (2020) suggests that current industrial design departments are yet to embrace the fourth generation of design methods, as described in Table 2.1, which underscores the importance of socialization in the design space. Due to this, the curriculum is suggested to be redesigned to enable students to comprehend the complex systems of society they are designing for, incorporating elements of social, economic, and political realms (Crowther, 2013).

Additionally, researchers emphasize the need to broaden students' education beyond product-centered and human-centered design. Norman (2010) asserts that ID education "does not

train students about … interlocking complexities of human and social behavior, about the behavioral sciences, technology, and business. There is little or no training in science, the scientific method, and experimental design." (Para.1). Researchers suggest that this broad range of teaching will expand students' options for applying their knowledge in the design industry (Mewburn, 2011), better adapting to the cross-functional nature of the industry.

In summary, industrial design education centers around studio experience, with a focus on assessments and feedback. However, previous studies suggest that ID education tends to overlook collaboration, interdisciplinary learning, and the complexity of design industry systems. This limits its ability to teach students about the overall ecosystem of the design industry, thereby affecting their preparation for professional practice. Furthermore, this section brought a general frustration from the lack of previous studies that specifically focus on ID studio pedagogy. A few studies utilized to understand the studio pedagogy in this section were focused on architecture. Although insights from architecture studio pedagogy can provide valuable understanding due to shared similarities between the two disciplines, it still highlights the need for more research in ID studio pedagogy and its impact on students.

2.3.4. Required Changes within Industrial Design Education

The outdated curriculum in industrial design education creates a mismatch between what is taught and the demands of the design industry, leading to struggles for design students in their professional careers. To address these challenges, researchers propose the need for platforms that allow students to actively practice knowledge transferable to the design industry (Garcia-Aracil, 2021; Arthur, 2007). Dialogue and discussion play a crucial role in design education, and

researchers highlight the importance of critique as a space for constructive feedback and problem-solving within the design studio (Biggs, 1999; Schon, 1984; Crowther, 2013). The significance of critique and its role in addressing the aforementioned issues will be further explored in the next chapter, which focuses on the critique environment.

2.4. Critique in Design Education

Schön (1983) emphasizes verbal interaction in design studio pedagogy. As critique is a central space for sharing verbal feedback, it is a significant topic to explore in this study. Critique has been studied in diverse disciplines, including the field of design, with many studies considering it as an essential space for student learning (Shulman, 2005; Ford, 2010). By reviewing the analytic literature on the critique that approaches the critique experience from various angles, this study will establish a strong foundation for understanding the critique experience in design fields.

2.4.1. What is Critique?

Critique is a pedagogical space where students exchange feedback on their design assessments. Typically, students present their design process through a public presentation to receive feedback from peers, professors, and guest critics. Researchers view critique not only as a curriculum element but also as a pedagogical tool that teaches social relationships, self-reflection, identity formation and independent thinking (Scagnetti, 2017; Motley, 2017). However, some studies have noted an overemphasis on visual craft in critique, which can hinder the development of essential skills such as communication and empathy-building, vital for addressing complex design issues (Gray, 2018; Morton and O'Brien, 2005). Thus, it is crucial to

have a proper understanding of the critique environment to leverage this pedagogical tool for creating a better learning environment for students. Researchers often explain two major elements of critique: the contents and structure of critique.

2.4.2. Contents of Critique

The contents of critique can be simply described as "feedback". As critique primarily involved verbal interactions, many researchers focus on the influence of oral genre in critique and its impact on student learning (Cronin and Glenn, 1991; Hargrove, 2013; Oak, 2000). Moreover, since feedback is conveyed by diverse actors in design disciplines, some researchers specifically analyze the nature of the feedback given and how it improves students' design process (Dannels and Martin, 2008).

2.4.2.1 Verbal Interaction in Critique

Critique and oral communication are inseparable, as critique predominantly occurs through verbal interactions. Previous studies on the oral genre have highlighted the communicative aspect of the curriculum, which supports student development, including identity formation and communication skills (Cronin and Glenn, 1991; Lichtenstein and Plowman, 2009). Specifically, researchers have noted the potential of critique environments to shape students' "Designer's Professional Identity (DPI)" - how designers perceive themselves in a professional setting (Kunrath, Cash and Kleinsmann, 2020). Through repeated reflections on their design knowledge and process during critique discussions, students develop metacognitive skills that enhance their understanding of their practices (Hargrove, 2013; Gray, 2020). Consequently, DPI formation resulting from critique experiences can influence students' decision-making regarding

their career paths after graduation, as it determines the type of professional designers they aspire to be.

Moreover, studies suggest that verbal interactions within critique spaces help students improve their communication skills on diverse topics and design knowledge (Cronin and Glenn, 1991). However, researchers delineate that the current format of critique, where students present their work and receive verbal feedback from the audience, may not effectively enhance the communication skills of design students. Oak (2000) asserts that critique is more beneficial for students who already possess advanced communicative skills, raising doubts about the efficacy of the conversation-driven nature of critique in student learning. Additionally, Martin-Thomsen et al. (2021) suggest the existence of a hierarchy in critique spaces, which can influence the quality of students' learning within the current critique culture. Therefore, further exploration is needed to understand how knowledge is acquired in a critique environment and how the current critique environment supports students in their preparation for a successful transition to the design industry after completing their education.

2.4.2.2. Feedback in critique

Many studies emphasize the significance of feedback in student learning during critique (Anthony, 2008; Dannels, Housley Gaffney and Martin, 2011; Scagnetti, 2017). The type and quality of feedback can vary based on the structure of the critique setting (Dannels, 2008), but academic critique environments often exhibit a tendency towards harsh styles of feedback delivery. Scagnetti (2017) delineates that students often develop a negative perception of critique due to the harsh criticism they have received in previous experiences. Harsh feedback can

transform the pedagogical space of critique into a place of humiliation or trauma, negatively impacting students learning (Smith and King, 2004). Since critique typically involves public presentations, harsh criticism can have a stronger and more personal impact on students As a result, researchers suggest the need for more indirect feedback in the critique environment citing cases where students who prefer direct feedback from teachers perform less successfully and highlighting the motivating effect of indirect feedback on continuous iterations of design work (Smith and King, 2004; Scagnetti, 2017; Kluger and DeNisi, 1996).

2.4.3. Structure of critique

The structure of critique can vary depending on the studio style, but there are typical formats commonly used in tertiary design education. Critique is often divided into three main parts: desk crit, pin-up, and review (Dannels, 2005). These divisions are based on the size of the audience and the type of feedback shared in each setting (Schon, 1985). Desk crits are informal and interim critiques conducted in a one-on-one format between students and instructors. Pin-ups are also interim critiques but involve a simple presentation in front of a small audience, usually consisting of peers and instructors. Reviews are formal critiques held at the end of an assessment, where students present their work and process to a larger audience, including "juries" or outside experts who provide professional insights.

Desk crits have been identified as successful in fostering student development. Hokanson (2012) suggests that desk crits provide a supportive setting that positively influences students' working process and enhances their problem-solving skills. However, when it comes to other critique structures, particularly final reviews, the tone turns negative. Hokanson (2012) describes

final reviews as the “least-successful” format of critique in terms of student learning. Shaffer (2003) also mentions that interim critiques, such as desk crits and pin-ups, are more beneficial for students in building their skills and developing their design process compared to a final review. This irony arises because ID education often places more emphasis on the final review by allocating formal space and inviting professional experts or guest critics to provide practical feedback. In response to this, McDonald and Michela (2019) express concerns about the role of juries in the final review and their impact on student skill development. While critique undoubtedly helps students improve the design knowledge required for the future, the final review appears to require further exploration to understand how professional insights influence ID education and create a stronger connection between ID education and the design industry.

In summary, the discussion above raises two key questions regarding the critique experience: the specifics of student learning and the impact of professional insights in the final review. These questions lead to a central curiosity about the goal of critique. Given the current concerns surrounding the critique environment, Scagnetti (2017) suggests that it is necessary to reconsider the goal of critique as a space for a communal practice where students prepare for the professional field. What should students gain from the critique experience today?

2.4.4. Research Gaps in Understanding the Goal of Critique

The issues of student preparation and criticism of the critique environment are not entirely new in academia. As mentioned earlier, Ramirez (2012) investigates the common weakness of industrial design graduates in communication skills. While previous studies have highlighted the weaknesses of ID students in applying academic knowledge in a professional

setting, there is a lack of exploration into the specific elements of ID education that hinder students' transition to the design industry.

This research gap is also evident in other studies. Design researchers have explored the critique environment from various perspectives, including student learning, relationships within the critique space, and the value of critique for instructors, aiming to understand its significance and limitations (McDonald and Michela 2019; Belluigi, 2016). However, these studies primarily focus on knowledge acquisition within the critique space and lack information on its impact outside the educational context. In particular, there is limited research that investigates how the knowledge obtained in a critique environment influences students' preparation and performance in the design industry.

Critique serves as a social space where students learn how to become professional designers. Therefore, the purpose of critique goes beyond reflecting on assessments; it provides an artificial social space where students can indirectly experience the realities of the professional world (Scagnetti, 2017; Dannels, 2005). Dannels (2009) even describes critique as a "tribal activity" through which design students learn about the demands of the professional field by experiencing the mannerisms, jargon, and tensions that exist in a professional design setting. However, a problem arises when critique, as a semi-real world, fails to accurately portray the actual professional world. Dannels (2008) argues that there is a gap between the academic image and the professional image of a "successful designer," which hinders the proper understanding of what it means to be a professional designer. Therefore, there is a need for further exploration of how critique contents are connected to the real world in order to improve the critique space and

better support students' preparation for their careers. The current study aims to address this issue by exploring how students apply the knowledge acquired from critique in a professional environment.

2.5. The Current Study

The literature review has provided an overview of the phenomena related to the problem area of interest and has highlighted the research gaps in previous studies. This section will discuss the limitations identified in the literature review and clarify the purposes of the current study. It will then outline the research questions that the study aims to address.

2.5.1. Limitations of Previous Research

The literature review revealed two main research gaps. Firstly, previous studies lacked a comprehensive examination of the connection between ID education and the design industry. As demonstrated in the literature review, researchers tend to focus on issues within either the academic setting or the professional field, without fully exploring the interrelationship between the two. However, it is crucial to understand how the current state of ID education supports the performance of recent graduates in the professional field, as they will eventually become members of that field.

Secondly, the question of how accurately the critique environment reflects the professional field of ID remains insufficiently answered. ID education utilizes critique as a means to provide practical knowledge and help students prepare for the real world, bridging the gap between academic practice and professional design tasks (Dannels, 2005). However, researchers are suspicious about the accuracy of the professional field portrayed in an academic

setting (DUMAN and TİMUR, 2020; Dannels, 2008) Furthermore, the limited impact of final reviews, which can be seen as a reflection of the weak influence of professional insights in a critique setting, further intensifies concerns regarding the representation of the design industry in an academic critique setting.

Therefore, a more thorough exploration of the relationship between recent graduates' experiences in the professional design industry and the image of the professional field portrayed in the critique setting is needed to better understand the practicality of the knowledge provided within the academic critique environment.

2.5.2. Purpose of the Study

The purpose of the present study is to address the two research gaps identified in previous studies and understand how the critique environment in the US design higher education (HE) supports recent graduates' transition to the professional field. Specifically, the study aims to explore how recent graduates apply the knowledge acquired through critique experiences in their work settings. This exploration will shed light on the influence of academic learning on the limitations experienced by novice designers in the field. Additionally, the study will provide a deeper understanding of the challenges recent graduates face in the professional field. Furthermore, it will investigate the accuracy of the critique environment in portraying the reality of professional fields, thereby guiding the improvement of critique settings to better support design students in their preparation for the future.

By addressing these objectives, the current research project seeks to bridge the gap between academic and professional fields of ID, thereby facilitating design students' preparation for their careers with the necessary knowledge demanded by society. Although the scope and duration of the research may be limited due to its nature as a master's level dissertation, this project has the potential to inspire future empirical studies on industrial design education.

2.5.3. Research Questions

Based on the research gaps identified in the literature review, the study aims to answer the following research questions:

1) In the context of US higher education, how do recent graduates in the field of Industrial Design apply the knowledge obtained from the critique environment in their work settings? Which aspects of the critique help or hinder their performance at work?
2) Based on the experiences of professionals in the field, how accurately does the critique environment portray the real-world setting?

These research questions will guide the exploration and analysis conducted in the current study.

Chapter 3 Methodology

This section will discuss the methodological framework of the research project. As Costley, Elliott, and Gibbs (2010) note, research methodology plays a crucial role in shaping how knowledge is generated and engaged in the study. Therefore, in this section, we will provide a detailed overview of the research methods, data collection techniques, and analytical procedures used to gather and analyze the data of the research. By outlining our methodology, it will deliver a clear understanding of our approach and the rationale behind it, as well as review the ethical considerations taken in the research.

3.1. Research Design

3.1.1. Philosophical Worldview

A philosophical worldview shapes the nature of research and influences how the researcher understands the world (Creswell and Creswell, 2018). In this study, the researcher adopts an interpretivist worldview, which emphasizes understanding the world through the perspectives, experiences, and feelings of individuals (Levers, 2013; Danermark, Ekström and Karlsson, 2019). Interpretivism comprises relativist ontology and subjectivist epistemology so interpretivist researchers do not believe in objective truth, but rather seek to understand the complexity of the world through the representation of human actions (Denzin and Lincoln, 2018).

Other studies that have adopted an interpretivist stance have similarly focused on uncovering the meaning behind human action to understand the problem area (Crotty, 1998). For example, Steele et al. (2020) explored the ethical considerations in virtual and augmented reality

product design by interpreting the experiences of product designers to understand the situation through individual perspectives.

The current study aims to understand the industrial design field by exploring the subjective ideas of individual design stakeholders. In this sense, the interpretivist worldview is a suitable approach for this study, given the complex and subjective nature of the problem area that the research tries to explore. Furthermore, the lack of previous studies on the topic discussed in this study makes the current research not suitable for a determined stance such as a positivist worldview, which requires an absolute solution in the problem area (Ryan, 2008).

Therefore, this study's two research questions - (1) How do ID recent graduates apply their learnings from the critique experience? And (2) How accurately does the academic critique portray the professional field of ID for student development? - require an approach that acknowledges the subjectivity of individual experiences rather than seeking a single, objective truth.

3.1.2. Qualitative Research

With interpretivist stance of the researcher, a qualitative approach was taken to explore the impact of academic critique on recent graduates' transition to the professional field of design. The qualitative approach is consistent with the nature of the study as it acknowledges the subjective representation of the problem area (Creswell and Creswell, 2018). This approach enables the research to explore the relationship between the academic and professional fields of industrial design through the lived experience of key stakeholders in industrial design education.

As the knowledge transition from ID academia to the professional field, specifically in the context of critique, remains insufficiently researched, the qualitative approach is suitable for uncovering this blurred field and raising awareness of the problem space. In summary, the current study will benefit most from a qualitative approach with an interpretivist worldview to explore the research problem.

3.2. Sampling

3.2.1. Purposive Sampling Strategy

Qualitative research often employs purposive sampling to select individuals who can provide a comprehensive picture of the phenomenon or situation being studied (Miles, Huberman and Saldaña, 2020). In the current study, which lacks prior literature compared to the studies on other fields like STEM (Science, Technology, Economics, and Math), intentional sampling is crucial to gain fruitful insights from the participants' lived experiences. Thus, purposive sampling was chosen as the sampling method for this study.

Purposive sampling is an "intentional selection of informants based on their ability to elucidate a specific theme, concept, or phenomenon." (Robinson, 2014, p.5244). The major objective of this sampling strategy is to select a proper representation of the population that is extremely relatable to the current study. Therefore, in this study, the participants were chosen based on their knowledge and experience in the ID culture. To select appropriate participants in the broad field of ID, the sampling criteria were formed based on the information from the previous literature, and the researcher's expertise from previous experience as a student and designer in the field of ID.

3.2.2. Participants

To ensure a comprehensive understanding of the research problem, the study involved the perspectives of major actors around the bridge between the academic and professional fields of ID. The participants were selected based on their knowledge and experience in the ID culture, including recent graduates, design educators, and professional designers. This approach aimed to capture a range of perspectives and experiences, especially the perspectives shown from the interconnections between ID stakeholders, which can provide a rich and in-depth exploration of the research questions.

A total of six participants were involved in the study, including two recent graduates, two design educators, and two professional designers. While the sample size may appear small, it was selected purposively and carefully to include a range of perspectives and experiences within the industrial design field. Rather than aiming for a large number of participants, the study sought to achieve a comprehensive understanding of the research problem by blending detailed experiences of knowledge informants and exploring the intersectionalities of the lived experiences (Rubin and Rubin, 2005). While the COVID pandemic limited the ability to recruit additional participants, a small number of in-depth interviews are commonly used in qualitative research and can provide valuable insights into the topic at hand.

The selection criterion for each group of participants varied slightly. Recent graduates who graduated from US design universities within the past 2 years and are currently working as novice designers at design firms were selected to provide up-to-date experiences around the bridge between academia and the professional field. For design educators, professors of the

Industrial Design department at leading US design universities (Quacquarelli Symonds, 2020) who have 10 or more years of teaching experience and were currently teaching a studio course were recruited for the research. This allowed for insightful instructor experience on student learning as well as studio critique. Lastly, for professional designers, the researcher sought out designers currently working in an ID role, such as product designers, UI/UX designers, or design strategists, with 3 or more years of work experience. This allowed them to share their experiences with recent graduates and further their mentoring experience, which could be a direct observation of recent graduates' performance at work. Table 3.1 summarizes the information about the participants.

Table 3.1. Sample information

Participant	**Category**	**Work Experience**	**Graduation Year**	**Profession**
1	Educator	11 years	-	Professor
2	Educator	30 years	-	Professor
3	Recent Graduate	1.5 years	2019	Product Designer
4	Recent Graduate	1 year	2020	Design Strategist
5	Professional Designer	15 years	-	Design Consultant
6	Professional Designer	4 years	-	User Experience Designer

3.3. Data Collection

The present study utilizes interviews as a method for data collection, as it was deemed the most suitable method to collect qualitative data that would explore the research topic given the philosophical worldview and research design of the study. By using interviews as a "symbolic interaction" that portrays the knowledge of society (Silverman, 2021), the objective of the qualitative data was to vividly depict the connection between the academic and professional fields of ID through the lived experiences of major stakeholders and answer the research questions of the study.

The interviews were conducted in a one-on-one, online setting in a semi-structured format, with most interviews lasting from 45 minutes to 90 minutes. This format was chosen for two primary reasons. Firstly, it allows researchers to ask both open-ended and theoretically driven questions, which can capture a broader range of interviewees' lived experiences (Galletta and Cross, 2013). This was particularly helpful for the current study, which has a small number of interviewees in different stakeholder groups. Furthermore, the semi-structured format facilitates a liberal discussion within a structured framework, providing a comfortable environment for participants to share their personal experiences while accommodating the limitations of time and the remote setting (Rogers, 2001).

The interview schedule, as shown in Table 3.2, was constructed to explore the lived experience of participants with four themes representing the area researched in this study. These themes were identified in the literature review of the present study. The themes of academic critique and professional critique are intended to elicit experiences and perspectives within the

specific field of industrial design. On the other hand, the themes of comparison and industrial design aim to reveal the connection between the academic and professional fields of ID, providing a comprehensive picture of industrial design reality.

To gather more detailed and nuanced responses, the interview questions for each sample group were tailored to their specific experiences and perspectives within each theme. For recent graduates, the interview questions focus on their general experiences with critiques, as well as their perspectives on the benefits and hindrances of academic learning. For design educators, the interview questions focus on their teaching experiences and perspectives on student learning within the academic setting. This will shed light on the knowledge that industrial design education aims to provide students, as well as the aspects of the professional field that academics seek to depict in a critique setting. For professional designers, the interview questions focus on their experiences with recent graduates in the work environment and their general perspectives on industrial design education. Additionally, all interviewees are asked about their thoughts on the purpose of industrial design to capture the overall perspectives on the field of industrial design across different stakeholders. The interview questions were designed to blend a variety of perspectives in the field of ID and provide insights into the research questions of the study.

Table 3.2. Interview Schedule Guideline

<table>
<tr><th>Themes / Participant Group</th><th colspan="2">Academic Setting (critique)</th><th>Work Setting (critique)</th><th>Comparison</th><th>Industrial Design</th></tr>
<tr><td>Recent Graduates</td><td colspan="2">- general experience
- learnings
- relationships (students, educators, guest critics)
- challenges</td><td>- general experience
- skill usage
- relationships with colleague
- challenges</td><td>- changes from transition
- impact of academic critique / academic learnings</td><td>- purposes
- effectiveness
- impact
- limitations</td></tr>
<tr><td rowspan="2">Design Educators</td><td>Education</td><td>Critique</td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2">- purposes
- effectiveness
- impact
- curricular development
- limitations</td></tr>
<tr><td>- general experience
- goal of teaching
- challenges
- curricular limitations</td><td>- function
- structure
- skill development
- relationships with students
- challenges</td></tr>
<tr><td>Professional Designers</td><td colspan="2">- thoughts on education
- experience as a jury/guest critic
- limitations</td><td>- skills
- mentoring
- interactions with recent graduates
- challenges with recent graduates</td><td></td><td>- purposes
- effectiveness
- limitations</td></tr>
</table>

3.4. Data Analysis

In this research, thematic analysis was utilized to analyze the collected data. Thematic analysis is the process of "identifying, analyzing and reporting patterns (themes) within data" (Braun and Clarke, 2006, p.4). This approach was taken due to its flexibility which allows the

researcher to interpret a variety of information on the research topic (Nowell et al., 2017). Specifically, the researcher conducted interviews with three different stakeholder groups so that flexibility plays a significant role in blending diverse perspectives wisely. However, researchers are concerned that thematic analysis does not have a clear guideline for its process (Attride-Stirling, 2001; Braun and Clarke, 2006). Due to this, the current study follows the qualitative data analysis framework introduced by Miles and Huberman (1984) to provide a concrete and credible analytic process.

Figure 3.1. Miles and Huberman's (1994) components of data analysis

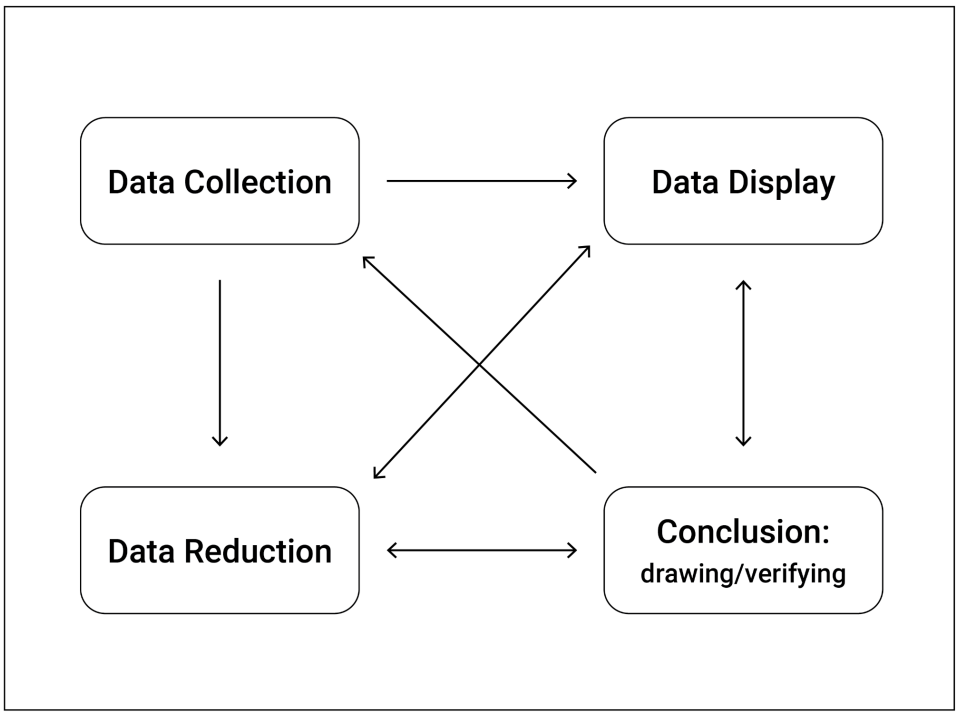


Figure 3.1 shows the inductive process of the analysis framework, which starts with raw data and progresses through continuous data display, reduction, and verification to develop conclusions. The interview recordings were transcribed verbatim using both manual and

software-based methods to ensure accuracy. In the first phase of data display, the raw data were coded thematically in NVivo, a tool chosen for its ability to enhance consistency and precision in the coding process, which was supported by literature guidelines (Richards, 1999). This phase produced descriptive codes that enabled the researcher to understand the informants' experiences without making inferences (Richards, 1999).

The coded data is categorized by patterns and refined through a cycle of data reduction, drawing/verifying, and data display. The resulting pattern codes provide interpretive data that can represent the research topic (Punch and Oancea, 2014). This process is centered around the research questions. For the first research question, which explores recent graduates' knowledge transition from academia to the professional field of ID, the data analysis focused on the patterns of recent graduates' experiences and was further shaped by patterns observed in data from educators and professional designers. For the second research question, which discovers the representation of the professional field of ID in a critique environment, the insights from professionals and recent graduates' experiences were blended, and the pattern codes of educators were used to describe the differences between academia and the professional field of ID. This approach allows the researcher to identify which aspects of the critique environment support the accurate representation of the real-world settings in the studio classes and to understand the rationale for representation. By exploring diverse experiences and perspectives around the research questions, the analytic approach aims to provide a comprehensive understanding of the research topic.

3.5. Ethical Consideration

This study is structured around humans and their experiences. Due to this, it is highly responsible for the researcher to consider possible ethical issues and corresponding methods to minimize harm from the research (British Educational Research Association [BERA], 2018). To ensure this, the current research project received ethical clearance from Departmental Research Ethics Committee through the CUREC 1a procedure. Beyond ethical approval, this section will discuss major ethical concerns and methods applied to relieve them in the research.

3.5.1. Informed Consent

The major ethical concern of the research comes from the involvement of human subjects. As a researcher, I prioritized the rights and freedom of participants in the research, specifically as the participation is voluntary (Cohen, Manion and Morrison, 2018). Therefore, informed consent was provided to all participants before the interview to ensure the equal relationship and understanding between the researcher and participants (Brooks, Riele and Maguire, 2014). In addition to the consent form, I verbally reassured the voluntary involvement and confidentiality considered in the research before and after the interview to relieve the possible power relationship that existed in the formal paperwork. This includes aspects like interviewees can terminate the interview whenever they wish to refuse to answer questions, as well as how the researcher will treat their data after the interview. From the effort, I wished to build trust between the researcher and participants and ease the power relationship that possibly existed in the interview setting.

3.5.2. Minimizing Harm

Beyond the interaction with the participants, I am aware that ethical issues can arise at every step of the research process. Therefore, I tried to reflect on possible harms that can be produced throughout the research process repeatedly. To ensure this, I utilized Creswell and Creswell's (2018) interpretation of Ethical Issues in Qualitative, Quantitative, and Mixed Methods Research as a guideline. This helps the research to be situated on the right track with reflexivity and rigor while minimizing the harms of social science research.

Chapter 4 Findings

This section presents the interview findings. It will provide insights into the experiences of key stakeholders in Industrial Design(ID) education and the design industry regarding students' transitions from academia to the industry.

4.1. Confusing Identity of Industrial Design

4.1.1. Need to Redefine the Term ‘Industrial Design’ in Education

From the interviews, the complexity of the term “industrial design” was repeatedly mentioned by all three stakeholder groups (recent graduates, designers, and educators). They argued that the term ‘industrial design’ is outdated as we no longer live in an industrial era and designers coming from industrial design backgrounds no more solely focus on industrial works that are related to manufactured products. Even though the teaching and curriculum have evolved with the trend of society, interviewees still wish to redefine what ‘industrial design’ is, to offer more precise direction for students.

Therefore, recent graduates and designers were struggling to connect their current position in the industry with industrial design even though they share core disciplines. To be specific, each individual had a slightly different understanding of what industrial design is so this created confusion and different explanations of their current work in relation to industrial design. For example, one participant introduced his current occupation outside of industrial design as it no longer deals with manufacturing while another participant described his role as an extension of industrial design because he considers ID more of a broader concept that does not limit to the physical making of a product but a design for people.

"I'm .. user experience designer…. So it's not really industrial design. As you know, like UX and Industrial Design, very different but there the core connection point…" (Participant 6, Professional Designer)

"Industrial design is basically, in my opinion, designing something for someone and that thing and the generation you are designing for is changing faster than ever" (Participant 3, Recent Graduate)

4.1.2. Confusion in Realizing the Boundary of Industrial Design

Due to the complexity of the term 'industrial design', recent graduates also shared their difficulties in recognizing the boundary of industrial design during their transition to industry. In line with previous studies that criticized the traditional curriculum of ID education (Bonollo, 2004; Coyne, 2005), they believe industrial design education is still very traditional which does not provide enough options in response to the changing trends of society.

"Whether it's education or professional, [industrial design] is to be more flexible and adaptive. I think people are struggling, or these institutions are struggling because I think they aren't flexible enough." (Participant 3, Recent Graduate)

"I think overall design is very stuck in its, this is, you know, Bauhaus. … these bigger institutions, which have built their entire ethos around these ideas, really struggled to find their way out of it." (Participant 4, Recent Graduate)

According to recent graduates, skills and projects that helped facilitate their successful transition into the design industry were self-taught. While both interviewees are currently working in corporations, they highlighted that the university curriculum did not offer enough opportunities to create projects suitable for applying for design roles in popular industries. Consequently, one recent graduate had to create a personal project outside of the curriculum to apply for a job that aligned with their interests. Another recent graduate faced a similar experience - although interested in social impact design, the department did not offer a related course, forcing her to collaborate on a personal project with like-minded friends. These examples illustrate the limited curricular support of ID education in preparing students to navigate the rapidly changing field of design.

4.2. Critique Knowledge that Supported Students' Transition to the Industry

4.2.1. Building Identity as a Designer

During the interview, both recent graduates and professional designers expressed general appreciation for the critique experience. Recent graduates specifically asserted that critique culture helped them to build their identity as a designer. They believe philosophical discussions on various design problems with peers allow them to encounter several aspects of design as well as encourage them to think deeply about the objectives of design activities.

> *"Overall I think meeting people with similar backgrounds, and [professors] and all of that really helped me understand kind of what I felt about design and what I wanted to*

do. And without that, I think I really would have struggled a lot more to know what I was interested in and like all of those types of things." (Participant 4, Recent Graduate)

However, the interaction with professors in an academic critique environment seems to vary depending on the trust between students and professors. For example, one recent graduate mentioned that when professors do not give enough attention to students' work, they begin to lose trust in the professor's feedback. This weak bond between students and professors seems to lead students to rather rely on a conversation with peers during critiques.

In this situation, educators are struggling as well. To support the identity formation of students, educators challenge themselves in two parts: knowing the strength of students and providing proper suggestions to develop the strength. When educators shared feedback, they found that indirect guidance from professors helps students to be more creative in critique. For the interview question, 'How has your critique style transformed throughout your teaching careers?' educators delineated that they stopped providing direct feedback and tell students what to do. Instead, they prefer to create space for students to navigate their problems independently to build their own identities.

"I'm sometimes not sure like how harsh or direct the criticism should it be. ... You assume they can take something, but sometimes they can't. Or like how do you say what I want to say in a little bit more constructive software that they can get it and there's a lot of thinking that goes around it." (Participant 1, Educator)

"Some students who are not strong, if you ask them, they'll say something like '[Professor]wants me to do it, this is the way he wants me to do it.' You know what I mean, and that's never nice to hear. It's because they don't have a way." (Participant 2, Educator)

4.2.2. Basic Skills Gained from Critique Experience

In addition to identity formation, recent graduates shared a few key insights from critiques that supported their transition. Firstly, they highlighted the development of their ability to discern the quality of design work. Through critiquing various projects presented by their peers, students learn to recognize the underlying story embedded in the design and identify any flaws present. Moreover, this process helps students accustomed to receiving feedback from others and incorporating that feedback into developing their design works. Designers also affirmed the significance of this aspect, noting that critique experience allows students to be more adaptable and flexible during discussions. Consequently, designers find it unfortunate that these valuable skills and perspectives of recent graduates are somewhat undervalued during the pandemic when face-to-face interactions and physical conversations are less prevalent.

4.3. Struggles of Recent Graduates

4.3.1. Struggles from the Differences Between Academia and Industry

4.3.1.1 Styles of Sharing Feedback

In the interview, recent graduates demonstrated their struggles to familiarize themselves with the gentle critique style of the industry. Due to the harsh critique style of the academic environment, it was challenging for recent graduates to share constructive feedback in an indirect

way. However, they now believe the gentle style of sharing feedback in critique is much healthier and hope the academic environment to relieve its tension in critique as well.

This part was also echoed by professional designers. They illustrated that learning how to share feedback is specifically significant because incoming designers need to work with many non-designers and share feedback around diverse expertise. When people with different expertise gather around one problem, acute feedback or criticism can cause emotional conflict and even delay work progress. Therefore, designers emphasized the strategies to share feedback lightly to prevent any further emotional conflict. Sometimes this requires senior designers to act as a buffer between incoming designers and non-designers to ease the discussion in a critique environment.

> *"So for example, let's say we're making a tool that's pulling in a database that another team is managing from the product. And they start to get the sense that what we are designing could obsolete some aspect of their tool … it needs that conversation … like, 'here's how we can help you and you can help us kind of way'. Because otherwise they'll start to get threatened and closed off and then suddenly … will no longer write an API to help transfer data from their tool to ours… " (Participant 6, Professional Designer)*

In this situation, educators say this struggle around feedback has already existed during academic critique. Design educators observed that students are struggling to provide feedback because they are unclear about what is considered proper feedback. Due to this, educators try to

encourage students to be more mindful of what they are saying by facilitating the discussion in critique.

> *"I think it's good that people are more mindful [of] what they're saying. But at the same time people withhold… they're making judgment and then because of that they're holding back the good things they actually can't say or should say, because that process of judgment within you of what to say is not well balanced." (Participant 1, Educator)*

4.3.1.2. Emotional Investment

When first entering the design industry, recent graduates acknowledged the need to detach themselves emotionally from their projects while juggling work and personal life. They found it helpful to maintain objectivity throughout the design process and be more open-minded to feedback. However, they also expressed that learning to remove personal emotions from their work proved to be challenging. This contrasted with the academic environment where design projects directly represent students and their individual identities. It was a struggle for recent graduates to accept that professional design projects did not solely reflect an individual, but rather the collective effort of an entire team. Furthermore, it took time for them to understand that the success of a project was not solely determined by the performance of a single designer, but rather by the product's performance in the market and overall ecosystem of the design industry. Therefore, recent graduates dedicated a significant amount of time and effort to reducing the emotional attachment to their projects and gaining a broader understanding of the industry as a whole.

In addition to that, participants working as product designers in a corporate environment emphasized the importance of teaching students that "design is not everything." Because academic design projects are mostly self-driven, students control every single step of the design process. Participants see this as making students think "design is everything" which is the opposite to the reality of most design industries, especially in a cross-functional team. Therefore, participants highlighted that knowing the boundaries of design in a cross-functional setting is crucial in design students' transition from academia to industry.

Professional designers also indicated that sometimes the industry is not as receptive as the academic field, so they emphasized the skills to balance emotions and creative energy for a successful transition into the industry. One designer shared his experience with an incoming designer who was full of creative energy ended up frustrated in the process of fitting into the culture of the company. Again, he emphasized that it would be helpful for recent graduates to understand their work environment before entering the industry to adapt to its different cultures.

4.3.2. Struggles in Encountering Cross-Functional Culture

4.3.2.1. Challenges of Communication with Non-Designers in the Industry

Working with non-designers proved to be the most challenging experience for recent graduates. After entering the industry, they realized that the academic critique setting operated within its own comfort zone, where basic design knowledge was assumed as the default in discussions. Therefore, when transitioning to a professional work setting, recent graduates found themselves accustomed to presenting the design process without specific explanations. However, in a professional context, they were required to engage in discussions not only with fellow

designers but also individuals with different functional expertise. This required them to articulate and justify every design decision they made. The recent graduate participants of the study recalled this experience as unexpected and challenging.

> *"But I'm presenting the process to … engineer or data scientist, they will literally ask, the reason behind every single design decision. And being able to articulate my design decision at that level was definitely very challenging… And I think that's been the most challenging thing that I've experienced at a professional level, because I'm only used to showing my work and receiving feedback from creative people from school." (Participant 3, Recent Graduate)*

Furthermore, this seems to be another aspect that senior designers are required to become a buffer between recent graduates and non-designers in discussion settings. Participants revealed that miscommunications between recent graduates and non-designers would sometimes arise, requiring the intervention of senior designers, who typically served as mentors to incoming designers. These senior designers would provide additional explanations about the design process to help individuals with limited design knowledge fully grasp the underlying concept behind design decisions. Nevertheless, professional designers recognized the effort of ID education in addressing these issues through the curriculum but believed that more fundamental changes were required to support design students in understanding the communication dynamics of the industry.

"I think it's something that academia relies on group projects to teach that as trial by fire. But it's not. It's different because your students in a very stressed out environment and there's just a different attitude, different peer to peer attitude. It doesn't quite simulate the coworker or co-team or manager hierarchy that actually exists in the corporate environment." (Participant 6, Professional Designer)

4.3.2.2. Existing Obstacles in Involving Non-Designers in Industrial Design Education

Recognizing the challenges presented by working with non-designers, recent graduates who participated in the study expressed their desire for a more proactive approach to involving non-designers through the entire process of student projects, instead of the current passive approach of inviting non-designers solely as guest critics or speakers. By involving non-designers in a more constructive manner, participants hoped that students would develop stronger relationships with individuals outside the design field when addressing design problems.

However, interviews with educators indicated the systematic obstacles that often hinder collaboration with companies in academic settings. Educators pointed out the legal issues and institutional complexities surrounding the ownership of ideas pose limitations on the active involvement of non-designers in the curriculum.

"So [involvement of non-designers] should happen more. But if they ever want to benefit even more tiny bit from students… they had to pay money… [some schools] all ideas belong to student … whereas other schools it's not always the case. School owns that. Or if you do with a corporate project, corporations fully own it… So it's all mashed up in

tangent. But I think there's lots of obstacles in between simple collaboration, so if those obstacles can go away, I think it's better." (Participant 1, Educator)

In light of these challenges, educators emphasized the need for institutional action to alleviate existing struggles and create awareness of the systematic obstacles between the industry and academia. They expressed hope for more generous collaboration between professionals and students once these obstacles are addressed.

4.4. Weak Impact of Professional Insights in Final Reviews

4.4.1. Loss of Motivation at the End Stage

Recent graduates revealed their frustration with the structure of the current critique environment. Unlike the excited attitude towards early to mid-stage critique, they often find it demotivating to participate in final reviews. Participants found it demotivating because final reviews do not have any next steps or requirements to move the project forward after receiving feedback during the critique. Due to this, recent graduates think students are less engaged in either receiving or providing feedback in the final review, as well as less value the professional insights shared by guest critics.

"Whatever people said in our final critique, it's like, OK, that's it though. I'm done now… I don't have time to add in more things because we have another project due next week." (Participant 4, Recent Graduate)

“I know all about this project now at this point, like, it's sort of pointless for me to say ‘Hey, remember, I told you like two weeks ago.’ ... because it's the final project, like Final Critique, there's no further development.” (Participant 3, Recent Graduate)

Furthermore, recent graduates added that students sometimes consider the final review as more of a celebratory moment of validating their effort in front of the audience. Therefore, even though students appreciate the feedback from professional designers, there is a lower chance for them to deeply think and apply those feedback in their own projects after the final review. They found it also because students are somewhat satisfied with the quality of their project on a personal level even before the critique so they become much more defensive of criticism.

“because we were genuinely excited to complete our project to the quality that we like, even if the professor's comments were not helpful or wasn't very engaging, at a personal level, everyone sort of, like, had that strive to complete it at the quality that we [wanted] as designers…” (Participant 3, Recent Graduate)

Furthermore, participants showed different expectations toward guest critics, especially between students and professors. While professors expect guest critics to share their professional expertise and up-to-date knowledge, students, especially senior students who are preparing their transition to the industry, are expecting more realistic aspects such as recruitment tips or opportunities for job interviews from guest critics.

Participants, especially design educators, revealed that they do aware of the weak motivation involved in the final review so they tried utilizing their own strategies to make the final review more engaging and useful for students. For example, one educator said that he prefers to assign short-term projects instead of long final projects to prevent students from finishing their projects without any application of feedback at the end.

> *"I'm known for doing short project … I used to teach thesis but I never liked it. 'Cause people convinced of tread water and you never actually come to the beach … I just don't like. And that's not the way officers generally work." (Participant 2, Educator)*

Moreover, participants, the design educators, shared that they try to invite guest critics more carefully to provide relatable feedback to students' projects in the voice of professionals. Therefore, some educators provide a list of guest critics with their profession and expertise before critique to help students determine what to focus on when receiving feedback.

4.4.2. Students Become Experts in Their Personal Projects

Participants also mentioned that students are less motivated in final critique when they become an expert in their projects. For the final project, design students get a long period of time to analyze the design problem and create design solutions through systematic research. Participants found that the time and effort spent on a project make students knowledgeable on a project topic to the extent that they know the most about the design problem in the class. This phenomenon is intensified when students choose their own design problems to

tackle, such as thesis projects. Therefore, participants believed that this weakens the impact of feedback from peers, instructors, and designers in final reviews.

> *"I feel like everyone is the expert in whatever they're presenting. There's no one in the class who knows more because you're the one who did the research, and so everyone just trust your intuition that this is the best solution." (Participant 4, Recent Graduate)*

One recent graduate shared her experience when she worked on a project with a less popular topic. As she found herself the only one working on the selected topic, she became the most knowledgeable about the topic which made the feedback from the critique less influential and helpful on the progress of her design process.

> *"And if no one in the class knows anything about accessibility design, then there is no way to actually for them to critique it based on that, you know, so we don't know what we don't know, and so it's very hard for people to understand where the gaps are." (Participant 4, Recent Graduate)*

4.5. Constructive Method Required to Structure Critique Environment

4.5.1. Methods to Capture Feedback

As the critique environment is centered around verbal discussion, educators and senior designers suggested that we need a more constructive method to capture feedback in critique. They believe this can relieve the issues of academic critique: hierarchy within space and loss of information during verbal interactions.

Firstly, during the interview, design educators revealed their concerns about the hierarchy existing in the student body which creates the critique context around a few vocal students. Therefore, it is easier for students who are uncomfortable with public speaking or have a language barrier to withhold helpful feedback. Moreover, they found that the verbal exchange of feedback doesn't last long in space unless students take notes during their presentations. Due to this, both educators and designers participated in the interview suggested establishing a more constructive method to share and store feedback in a critique setting. Currently, design educators who joined the research seem to utilize their own strategies to promote a more active exchange of feedback. For example, one professor asks people to write feedback collectively while another professor gives people prompts before the critique to provide a guideline for giving feedback on design works.

In addition to that, during the pandemic period, participants found enormous potential in virtual communication tools as a method to capture feedback in critique. While conducting critique through video communication software, educators found students actively utilize the comment section to exchange feedback. They think the setting puts less pressure on students to voice their opinion while maintaining the flow of the critique. Designers also found online collective space effective in sharing feedback without hierarchy as it secures anonymity in the process.

> *"We use Miro [collective brainstorming software] … We make a point to not have names… All the work that's done is anonymous and not attached to anyone's identity…*

So what we'll do is … vote and tag comments on it ... So the work kind of has to then stand on its own without a presentation." (Participant 6, Professional Designer)

From the interview, collective brainstorming software like Miro seemed to become a common tool to share ideas during pandemic situations. The software allows voting or commenting without revealing the identity of the user, which showed the potential of removing personal identity from ideas or any presentation on the virtual whiteboard so that it allows smooth decision-making without the influence of hierarchy.

4.5.2. Method to Structure Critique Environment

However, as educators utilize their own creative strategies to create an active critique environment, the style of critique seems to change depending on the professors. For example, one professor conducts a blindfold critique to encourage students actively involved in the critique context while allowing the design work to stand alone.

"All the works up in the wall. Everybody gets to see it. And then everybody puts on the blindfold. With the exception of the person making the presentation. So now they have to talk about the work, without everybody in the class seeing it, which is kind of weird, right?... it's just very different way to see it." (Participant 2, Educator)

This participant asserted that interacting with design projects physically encourages students to be more actively involved in the verbal setting of the critique which could relieve the hierarchy possible to exist within the student body. In addition, the unique method of critique

such as the blindfold technique allows providing a new perspective in reviewing design projects which gives potential to a creative critique structure detached from the traditional setting.

On the other hand, other professors seem to prefer having more formal critiques to teach students proper presentation skills in a professional setting. Whether the setting of the critique is creative or formal, educators sometimes wish to have concrete principles or a foundation that holds the entire critique setting. One example suggested by the participant was a social contract between students and professors in a studio environment for students to understand the range of topics that will be discussed in a critique environment.

> *"it would be really great if industrial design could establish … contract for everybody to have as a department in what it is that we're trying to do… then there are a lot of students who are interested more in collective… direction like, 'OK we are only going to tackle project that's a social justice, it has that element of social justice, or the environmental justice…'" (Participant 1, Educator)*

Furthermore, participants believed that the critique environment without a concrete structure limits the range of topics discussed in the space which could hinder students' design thinking. Specifically, they complained about the lack of discussions on ethics and moral consideration in the current academic critique environment. In the current critique setting of ID education, discussion on ethics is optional so that only students who are interested in the topic share thoughts on it. Due to this, this shows that all three major actors of critique, recent

graduates, professors, and designers, are looking for a systematic innovation to the critique structure.

Chapter 5 Discussion

In this chapter, the research questions will be explored based on the findings of the study. Additionally, the significance and limitations of the research will be reviewed to propose potential future implications arising from the current research.

5.1. RQ 1: The Influence of Critique Knowledge on Recent Graduates' Performance in the Industry

This section will look into the first research question based on the study's findings. To provide a comprehensive analysis, the discussion will be divided into two parts. The first part will focus on the benefits derived from critique experience, while the second part will explore the limitations of critique knowledge during students' transition to the design industry.

Research Question 1: How do recent industrial design graduates apply the knowledge acquired from critique environments in their professional work settings? What aspects contribute to or hinder their performance in the industry within the context of US higher education?

5.1.1. Benefits: Designer's Professional Identity (DPI) formation

The formation of a Designer's Professional Identity (DPI) through critique experience plays a vital role in supporting students' transition into the industry. Consistent with previous research highlighting the connection between DPI formation and critique (Motley, 2017; Kunrath, Cash and Kleinsmann, 2020), the qualitative findings of this study also supported that critique experience contributes to the development of students' independent identity as designers, facilitating a smoother transition into the appropriate design field. Former studies on

metacognitive development in critique have shown that the process of continuous discussion and self-reflection in critique enables students to gain a better understanding of their design interests (Hargrove, 2013; Gray, 2018). This comprehensive exploration of personal and professional identity empowers students to make independent decisions regarding their career paths. Given the findings on the complex nature of industrial design identity discussed in section 4.1, the potential of a critique environment to help students identify their design interests within professional domains is evident, addressing the challenges of recognizing one's position within the diverse boundaries of the design industry.

However, in contrast to previous studies emphasizing the role of professors in DPI formation (Kunrath, Cash, and Kleinsmann, 2020), the findings of this study highlight the significance of peer influence in students' identity formation during critique. While professors play a crucial role in structuring critique sessions, they tend to have a less active presence in the discussion and instead encourage independent engagement among peers. Thus, the role of peers in the critique environment proves to be equally significant in shaping students' identity through critique experience.

Nevertheless, as shown in section 4.1.2, the benefits from the critique environment do not receive full support from the academic curriculum. While academic critique supports students in building their identity and identifying their areas of interest, the industrial design curriculum appears to provide inadequate resources to meet the diverse needs of students preparing for their transition into the industry. The study reveals that students have to rely on self-teaching to acquire essential elements for a successful transition. This aligns with previous research

criticizing the traditional pedagogy of industrial design education (Dannels and Martin, 2008; Dannels, Housley Gaffney and Martin, 2011). Specifically, students interested in emerging design fields such as UI/UX face disadvantages in terms of curricular preparation for their transition.

In summary, previous studies on DPI formation within a critique environment provide support for students' transition from academia to the industry. Peer influence in discussions has been revealed to be as significant as the role of professors. However, the traditional focus of industrial design pedagogy impedes the full realization of the benefits from DPI formation through critique experiences, as students lack sufficient curricular support for a successful transition into their chosen design fields, particularly within emerging domains. This observation is supported by the findings presented in section 4.1.2. which demonstrates that recent graduates relied more on self-taught skills rather than academic knowledge during their transition process.

5.1.1.2. Hindrance: Absence of Non-Design Field in Critique

Along with the researchers asserting the need for more multi-disciplinary actions needed in industrial design (Han et al., 2018), this study highlights the struggle of recent graduates in understanding the cross-functional nature of the industry due to the monodisciplinary atmosphere of the critique. Unlike the academic critique which primarily focuses on design expertise, the cross-functional setting of the design industry introduces a new hierarchy of expertise in discussions, influencing what and how information is communicated during critique sessions. Consequently, recent graduates who lack experience working with non-design fields find it challenging to explain their design process and provide feedback to individuals without a

background in design. This phenomenon aligns with Menold et al.'s (2018) study that illustrates recent graduates' struggles in effectively communicating with non-designers.

This struggle to understand the cross-functional setting of the design industry contradicts the notion shown in previous studies that the critique environment serves as a mirror reflecting the real industry (Dannels and Martin, 2008). Particularly in relation to the work setting, academic critique fails to capture the multi-disciplinary nature of the professional field of design.

One element that is intended to portray the professional environment is the involvement of guest critics or jurors during the final review. However, this element also falls short in facilitating students' understanding of the cross-functional setting, as the impact of their insights appears to be weak. As Hokanson (2012) introduces, the final review is often the least-successful format of critique, and the findings of this study confirm the demotivating structure of the current final review as described in section 4.4.1. Recent graduates express dissatisfaction with the lack of follow-up steps to apply professional insights for iterating design ideas. This demonstrates that the role of guest critics remains limited without encouragement to incorporate their insights into the iterative design assessment process, consistent with concerns raised by McDonald and Michela (2019) regarding the weak influence of the jury in academic design critiques.

Due to this, a systematic approach is needed to address professional insights and involve industry voices more effectively in industrial design education's final review. Interestingly, the shift to virtual critique settings during the current pandemic offers new perspectives on structuring critique. Platforms like Miro, discussed in section 4.5.1, have enormous potential for

collaborative and cross-functional design activities even after the pandemic subsides. Therefore, some of the tools discovered during the pandemic could be implemented in the traditional critique space to address existing issues.

In short, the critique context primarily focused on design expertise hinders students' understanding of industry culture, which poses challenges for recent graduates when engaging with non-design fields. Additionally, the limited impact of professional insights within the current critique structure, particularly through the involvement of guest critics at the end of the design process, exacerbates the hindrance.

5.2. RQ 2: The Portrayal of the Industry through Academic Critique

Building upon the exploration of knowledge transition from ID education to the industry in the previous research question, this section will offer a more comprehensive understanding of how ID recent graduates apply their knowledge by addressing the second research question.

Dannels (2005) emphasizes the role of critique in supporting students in envisioning and gaining indirect experience in the professional design industry. However, this study reveals that the current academic critique is limited in accurately portraying the culture and atmosphere of the design industry, which may contribute to the struggles observed among recent graduates in RQ 1.

Research Question 2: Based on experiences in professional fields, to what extent does the current critique environment accurately reflex the real-world setting?

5.2.1. Climate of Critique Environment

In previous studies, researchers showed concerns about the potential negative impact of harsh criticism on students during academic critique (Scagnetti, 2017; Smith and King, 2004). These concerns from researchers were reaffirmed in this study by revealing that the current harsh critique experience of students may hinder their understanding of professional fields, as it diverges from the way feedback is shared in professional settings. As discussed in section 4.3.1.1, students face difficulties in adapting to the new, gentle critique environment of professional fields. Fortunately, there has been a push to create a more supportive and gentle atmosphere in academic critique, driven by considerations of psychological factors in student learning.

Yet, this disparity between the critique atmosphere of ID education and the design industry is still evident and may impede an accurate portrayal of the industry, which subsequently affects recent graduates' performance in the workspace. Several factors contribute to this gap, including the presence of power dynamics within the student body, as explored in Martin-Thomsen et al.'s (2021) study, and the emotionally invested nature of design assignments, which leads students to be defensive about their projects. As a result, critique discussions may be dominated by a few verbally active students, disrupting the constructive flow of critique. It is crucial to carefully consider the structure and mood of critique to foster a healthier climate that more closely aligns with the reality of the design industry, enabling students to become more familiar with professional practices.

5.2.2. Idealized Perceptions of Design Workspaces

The study also explored the idealized perception of the design workspace within the academic critique. Since critique primarily focuses on design knowledge, students tend to prioritize design in the professional work process, which differs from the reality of the design industry. In the industry, designers are usually part of cross-function teams, collaborating with various disciplines throughout the entire work process. However, as discussed in RQ 1, recent graduates struggle to grasp the multidisciplinary culture, highlighting the limitations of portraying the boundary and position of design in a professional environment.

This finding strengthens the significance of understanding the role and responsibility of professional designers in society. Researchers have emphasized the need for discussions that go beyond technical feedback in critique, addressing moral and ethical considerations of design practices (Dannels and Martin, 2008; Scagnetti, 2017). Therefore, such discussions should be actively incorporated into the critique environment. This point was also emphasized by recent graduates in the interviews, shown in section 4.5.2. By discussing the philosophical aspects of design, including ethical considerations and moral duties, recent graduates gain a better understanding of the responsibilities of designers in the field and develop a clearer understanding of the boundaries of design practice within a cross-functional setting.

5.2.3. Challenges in ID Education-Industry Collaboration

Among various types of critique, the final review is the stage where professional insights are actively involved. However, as discussed in RQ 1, this approach alone is insufficient to capture the full ecosystem of the design industry. Therefore, there is a need for a more active

involvement of industry professionals in current ID education. However, the study unveiled an unexpected obstacle, which is the systematic difficulties in the collaboration between ID education and the design industry. It is the legal issues around complex policies on collaboration between design universities and public or private companies. Molinoff (2009) highlighted the conflicting interests that often arise in collaborations between American universities and companies. A key point of contention in the field of design is the ownership of ideas and creative property developed within the academic setting. Therefore, it is crucial to consider how the portrayal of the design industry in an academic context is influenced by the existing institutional complexities.

In short, the current academic critique has certain limitations in accurately portraying the professional design field. Firstly, the contrast between the harsh critique style in academia and the more gentle critique culture, in reality, needs to be acknowledged. In this sense, it is significant to consider the hierarchical dynamics within the discussion space and students' protective attitudes toward their projects. Additionally, the critique environment often overlooks the interconnectedness between design practices and other professional domains, hindering a comprehensive understanding of where design fits within the larger work processes of the design industry. Furthermore, the study reveals an unexpected aspect that inhibits the accurate portrayal of the design industry in academic critique: the systematic complexities surrounding the ownership of creative ideas, which restricts active collaboration between the two fields. Therefore, it is essential to take these factors into account when examining how the academic critique environment shapes the image of the design industry and professional designers for design students.

Chapter 6 Conclusion

The expanded influence of industrial design in society has opened up numerous career opportunities for recent graduates, emphasizing the need to carefully explore the role of ID education in supporting their successful transition into the industry. This study has indicated that the critique environment plays a crucial role in supporting students' independent identity formation, enabling them to realize their interests within the design field. However, the preparation process for entering the industry seems challenging, as the critique environment is limited in providing adequate resources to understand the intricacies of the design industry. One major limitation viewed is the inadequate portrayal of the cross-functional culture of the industry, which hinders recent graduates' ability to build relationships with non-designers in a professional space. Additionally, the study recognizes the systematic complexities in collaboration between design institutions and companies, particularly in the context of the United States, which limits the application of professional insights within the academic design space.

6.1. Significance of the Study

This study illustrates its significance by bridging the research gap regarding the application of knowledge acquired in ID education to the design industry. The findings of this study have far-reaching implications for major stakeholders in industrial design, including recent graduates, educators, and professional designers. For recent graduates, the study shed light on the challenges they may face in their educational journey, thereby reducing their struggles during career preparation and performance in cross-functional work environments. For educators, the study offers an evaluative overview of the current critique environment, enabling them to update their curriculum and foster inclusiveness by incorporating industry context, such as the

multi-disciplinary aspect. This will aid in the development of a more effective critique structure to support future graduates in their transition to the industry. Lastly, professional designers will find value in the study's emphasis on the need for a more accurate portrayal of the industry within the academic critique, which can alleviate the mentoring challenges faced when guiding novice designers.

Furthermore, this research reaffirms previous studies on ID education and the design industry, thereby strengthening the connection between these two fields. In the realm of ID education, the study underscores the significant role of a Designer's Professional Identity (DPI) formation in supporting students, while highlighting the limitations of traditional curricula and the relatively weak impact of juries in final reviews. In the professional design field, the study reinforces the consistent struggles of novice designers, particularly in their communication skills with non-designers. By establishing these connections through the present research, a more robust foundation is established for understanding the transition of ID students from academia to the industry.

6.2. Limitations of the Study

On the other hand, the current study contains limitations as well. The major limitation was the situational factor that impacted the entire methodological process of the study. Due to the COVID-19 pandemic, the interviews had to be conducted in a virtual format, and the recruitment and interview process experienced delays from the unprecedented spread of the virus in the US. Consequently, the online interview may have influenced the rapport between the researcher and the interviewees. Nevertheless, previous studies have indicated that the negative impact of online

interviews is primarily significant for less-responsive participants (Deakin and Wakefield, 2014). To mitigate this, the interviews were conducted for a longer duration than originally planned, allowing sufficient time to establish rapport within the virtual interview space.

Furthermore, the study faced limitations in terms of the sample size. The pandemic situation resulted in a reduction in the planned sample size. Despite this constraint, the study was able to generate rich qualitative data with descriptive narratives from participants representing various fields within industrial design. This approach facilitated the exploration of multiple perspectives on the research problem and provided in-depth illustrations of individual experiences. Additionally, the identification of important themes in this study opens avenues for further exploration in larger qualitative studies in the future.

6.3. Further Exploration of the Research

Based on the research findings, the present study suggests several areas for future exploration. Firstly, further research on tools to structure the critique environment would provide rich insights into addressing the issues raised in the current research. The need for increased philosophical discussion, inclusiveness of various topics, and effective methods for capturing feedback within the critique space were also highlighted. Investigating and developing tools to address these issues would significantly contribute to improving the critique environment in ID pedagogy. Additionally, given the potential demonstrated by virtual tools during the pandemic period, further exploration of their use in creating a critique experience would be beneficial.

Secondly, the study identified systematic obstacles in the collaboration between ID education and the design industry that need to be further explored. Improving the active involvement of professional actors within the academic space is crucial for enhancing student preparation in ID pedagogy. This complex aspect requires multidisciplinary investigation, encompassing not only the design field but also legal practices and institutional relationships. Conducting in-depth interviews with major stakeholders, such as department chairs and legal teams of companies, would provide a comprehensive overview of the conflicts of interest involved in the collaboration between design higher education institutions and companies.

Lastly, in link to the findings on the identity issue of industrial design, more research is required to inform the design of ID curricula, providing students with up-to-date resources and an accurate understanding of the boundaries of industrial design in the design community. This fundamental area of exploration is essential for addressing various issues in industrial design, including those within the critique space. Therefore, further research could explore the definition of industrial design in the design labor market and examine the implication of the current curriculum in the dynamic field of design, ensuring that students are equipped with the knowledge and skills to apply design trends effectively.

In conclusion, this study explored the influence of critique on recent graduates' transition from ID education to the design industry in the US context. By addressing two research questions regarding the impact of ID education on the transition and the portrayal of the design industry in ID education, the present study revealed important findings that foster our understanding of the bridge between ID education and the design industry. The study

demonstrated that critique experiences support students in developing their identities as designers but are limited in preparing them for the future due to outdated curricula. Additionally, the lack of non-design perspectives in academic critique hinders the understanding of the design industry's cross-functional nature, affecting recent graduates' performance in non-design areas. This suggests the need for a more systematic approach to structuring the critique environment, encouraging active student participation, and promoting the involvement of professional insights and non-designers for an accurate portrayal of the design industry.

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Appendix A: Information Sheet

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Exploring the Critique Environment of Industrial Design Education in the US: the influence of critique experience in recent graduates' performance in the design industry

PARTICIPANT INFORMATION SHEET

1. Why is this research being conducted?

Design critique is a unique value of industrial design(ID) education that allows students to explore design projects with a critical approach. Research suggests a design critique not only influences students' understanding of the design process but also constructs their identity as a designer in the workspace. The form of design critique evolves in the professional work environment and it is significant for design higher education to understand how the current design critique structure helps and limits students to work in a professional design field after they graduate.

2. Why have I been invited to take part?

You have been invited because you are a key stakeholder in Industrial Design education. From your insights and experience shared in the interview, I hope to gain a better understanding on the quality of design critique and its impact on supporting ID student transitions after graduation.

3. Do I have to take part?

No. You can ask questions about the research before deciding whether or not to take part. If you do agree to take part, you may withdraw yourself from the study, without giving a reason, by advising me of this decision. The data collected about the participant until the point of withdrawal will be removed from the study if the participant doesn't want their data to remain.

4. What will happen to me if I take part in the research?

If you are happy to take part in the research, you will be asked to attend a semi-structured interview about purpose, evaluation, challenges, and future paths of design critique in ID education. Due to the current pandemic situation, the interview will be conducted online. With your consent, I would like to video record you for accurate analysis. The recordings of the interview will be used only for the research-purpose and will be stored in a password-protected folder for analysis.

5. Are there any potential risks in taking part?

The researcher will make every effort to keep your confidentiality and anonymity. To reduce any potential risks, your personal data will be pseudonymized or anonymized in the final report.

6. Are there any benefits in taking part?

There will be no direct or personal benefit to you from taking part in this research, but your participation will contribute to the development of Industrial Design education.

8. What happens to the data provided?

The information you provide during the study is the **research data**. Any research data from which you can be identified (name, date of birth, video recording etc.) is known as **personal data**. **Other research data** (including consent forms) will be stored for at least 3 years after publication or public release of the work of the research. The researcher and the supervisor will have access to the research data. Responsible members of the University of Oxford may be given access to data for monitoring or audit of the research.

Any direct quote used for research will not be identifiable by pseudonymization and the researcher's effort to secure anonymity. I would like your permission to use direct quotes in any research outputs.

9. Will the research be published?

The research will be written up as a student's thesis. On successful submission of the thesis, it may be deposited both in print and online in the University archives to facilitate its use in future research. If so, the thesis will be openly accessible.

The University of Oxford is committed to the dissemination of its research for the benefit of society and the economy and, in support of this commitment, has established an online archive of research materials. This archive includes digital copies of student theses successfully submitted as part of a University of Oxford postgraduate degree programme. Holding the archive online gives easy access for researchers to the full text of freely available theses, thereby increasing the likely impact and use of that research.

The research may also be published in academic/design journals and conferences.

11. Who has reviewed this study?

This study has been reviewed by, and received ethics clearance through, the University of Oxford Central University Research Ethics Committee. [redacted]

- ***Who do I contact if I have a concern about the study or I wish to complain?***

If you have a concern about any aspect of this study, [redacted] and we will do our best to answer your query. I will acknowledge your concern within 10 working days and give you an indication of how it will be dealt with. If you remain unhappy or wish to make a formal complaint, please contact the Chair of the Research Ethics Committee at the University of Oxford who will seek to resolve the matter as soon as possible.

- ***Data Protection***

The University of Oxford is the data controller with respect to your personal data, and as such will determine how your personal data is used in the study.
The University will process your personal data for the purpose of the research outlined above. Research is a task that is performed in the public interest.
Further information about your rights with respect to your personal data is available from http://www.admin.ox.ac.uk/councilsec/compliance/gdpr/individualrights/.

- ***Further Information and Contact Details***

If you would like to discuss the research with someone beforehand (or if you have questions afterwards), please contact: [redacted]

Appendix B: Interview Schedule

[Interview aim]

Interviews will explore the knowledge production and quality of design critique in industrial design field to learn about students' knowledge usage in critique/discussion environment transition after graduation through three themes:

- The purpose and value of critique in industrial design education
- Students' perspective/experience on the quality of critique in industrial design education
- Student pain points related to adapting critique environment of the professional industrial design field
- Future of critique structure in industrial design education

Recent Graduates

- *Graduated from first Bachelor's degree within 3 years*
- *Currently working in ID field*

Thank you for agreeing to participate in this interview. Your answers will be anonymized and pseudonymized. You don't have to answer the question you do not wish to answer and ask any question that is unclear to you.

Background

1. Can you tell me about your position in your organization?
2. How long have you been in this position?
3. Then when did you graduate from design university? Did you start the job right after you graduate?

Academia

Student experience

1. How would you describe your experience in design university *(projects, topics you covered, stakeholders you've met)*?
2. Within those projects, you had numerous critiques in studio. What do you think the purpose/function of design critique in industrial design education?
3. Do you think it works well in the curriculum?
4. Can you share some of your experience of design critique while you are enrolled in university (related to your answer)?

5. What do you think the major development you had in academic critique?
    - Independent design identities
    - Help working boundary/ understand the reality *(How much did it help you the understand the real field/ professional field?)*
    - Critical thinking
6. Were there any specific types of critique helped you develop as a student (desk-crit, one-on-one, final critique with guest critics)?

Relationships

1. How was the relationship with professors worked in critique environment?
    - Pros and cons
2. How was the relationship with other stakeholders (guest critics) worked in critique environment?
    - Pros and cons

Challenges

2. What were some challenges you faced during design critique at school?

Professional field

Work experience

1. What do you think the basic skills that novice designer should have to participate in critique in work environment?
2. Why do you think so? Can you share a specific experience?
3. What was major challenges you faced when you first enter the field after graduation?
4. What do you think the purpose of critique in the work environment?

Comparison

1. Is your attitude/mindset about critique changed over time?
2. Is there any difference between academic and professional critique environment?

    - Discussing Social issues
    - Communication skills

3. How does academic critique help you in professional work experience?
4. What are the limitations of academic critique related to difficulties you had in professional discussion/critique?

5. Within those limitations, is there anything you wish for academic critique to improve?

Industrial Design as a whole

1. We faced rapidly changing society and industrial design is trying to react to those changes with innovation. What do you think about the goal of industrial design field *(both education and work)* now?
2. How do you imagine the structure and style of design critique in industrial design education in the future?
3. Is there anything do you wish for ID education and professional environment to cooperate?
4. Any last notes you would like to mention?

Professional Designers

- *5+ years of work experience including mentoring experience in ID field*

Thank you for agreeing to participate in this interview. Your answers will be anonymized and pseudonymized. You don't have to answer the question you do not wish to answer and ask any question that is unclear to you.

Work Experience (discussion / critique environment)

1. Can you tell me about your role in your company?
2. What do you think the key skills needed in professional design discussion/critique environment?
    - Problem solving / concept building
    - Interaction with other teams (UX researchers, engineers or clients)

3. Then, in the critique/discussion space at work, what do you think the usual role of incoming designers (recent graduates)?
    - Problem solving/concept building
    - Cooperation with other fields (working together)
    - Their reaction/attitude when they be in that role in a discussion setting

Mentoring

2. Do you have any mentoring experience? Can you share your experience of mentoring incoming designers?
3. In the eye of mentor, what was the struggles of incoming designers?
4. What were the challenges in mentoring incoming designers?
    - Was there any specific goal as a mentor?
    - What you try to take our from incoming designers?
5. What are the key skills you wish for incoming designers to have in?
    - Is there anything specifically required in critique or discussion?
        1. Was there any experience that made you consider those factors important?
        2. Soft skills

Jury: Education related

2. Have you ever had an experience of guest crit or jury in design school review?

- How was the experience, in general? What you trying to offer?
- What was difficult in giving them feedback?
- Wish for critique to be improved when you see?

1. If not, when you are looking back at your school crit, and now you are working as a senior-level designers, what are the things you feel this could have been done, shared by guest crit in critique environment.
    - Structural?
    - Contents?

ID education

1. When you see incoming designers, what kind of skills or knowledge well learned/transferred from of ID education?
2. What do you think about the limitation of ID education? Especially when you see incoming designers in critique/discussion?
3. Is there any specific part that you wish for academic critique to improve?
    - I saw your past projects, and it has to do with experience a lot (in those, discussions and feedback is very important). Interesting escape room and games, in those processes was there any specifically helpful feedback or memorable feedback/critique you had?

Industrial Design as a whole

2. How do you imagine the structure and style of design critique in industrial design in the future?
3. Is there any part you wish for ID education and professional environment to cooperate?
4. We faced rapidly changing society and industrial design is trying to react to those changes with innovation. What do you think about the goal of industrial design field now?
5. Any last notes you would like to mention?

Professors (undergraduate teaching experience only)

- *Industrial design department of leading design HEI*
- *+10 years of teaching experience*

Thank you for agreeing to participate in this interview. Your answers will be anonymized and pseudonymized. You don't have to answer the question you do not wish to answer and ask any question that is unclear to you.

Background

2. Can you tell me about your role in the department?
3. How long have you been in this role?
4. What did you do before this role? What brought you to teaching?

General Studio

2. What class are you currently teaching (class you taught this year - *about what topic?*)
3. Can you briefly describe your studio/class format?
4. How does critique work within your class structure?

Critique

Function/role

1. What do you think about the function of critique in class?

    - Mirror/observe where students are at
    - Feedback and iteration

2. Then, what do you think the key knowledge that help student development in critique?
    - What is the key takeaway for students in critique?
3. How do you lead critique environment to reach the aim/function?
    - How does communication skills work?
    - Implication of social issues?

Type/form of critique

1. How your critique style transformed throughout your teaching career?
2. How do you use different types of critique (desk crit, one-on-one, final crit with guest crits), how do you use these effectively in h elping students in preparing for professional field?
3. Do you think there are some differences between critique environment in academia and professional ID field?

Role of professionals (including professor)

1. How do you balance your role as both instructor and critic in critique?
2. What do you think about the role and impact of guest crits?
    - Who do you usually invite for guest crits?

Student

1. Can you share any interesting/special memory that you have about student development during critique?
2. Is there anything you wish for students to prepare/improve for studio critique?
3. Then, during critique, what do you think students' pain points would be?

Challenges

1. What are some challenges you had during critique?
2. Within those challenges you mentioned, are there any struggles from outside of studio, such as departmental, curricular constraints?

Industrial Design as a whole

1. We are facing rapidly changing society with lots of concerns and issue. What do you think purpose of industrial design education now?
2. How would you imagine the structure and style of design critique in industrial design education in the future?
3. Is there any part you wish for professional ID field to cooperate? (*As universities are sending design students to the field)*

Appendix C: Consent Form

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PARTICIPANT CONSENT FORM

Exploring the Critique Environment of Industrial Design Education in the US: the influence of critique experience in recent graduates' performance in the design industry

Purpose of Study:

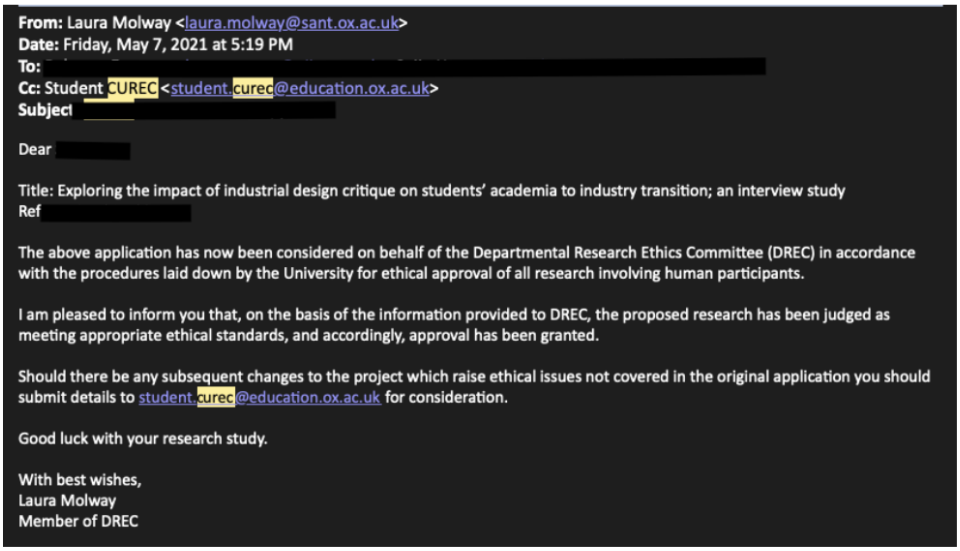
Design critique is a unique value of industrial design(ID) education that allows students to explore design projects with a critical approach. Research suggests a design critique not only influences students' understanding of the design process but also constructs their identity as a designer in the workspace. The form of design critique evolves in the professional work environment and it is significant for design higher education to understand how the current design critique structure helps and limits students to work in a professional design field after they graduate.

1	I confirm that I have read and understand the information sheet version dated March, 12, 2021 for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.
2	I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, and without any adverse consequences or penalty.
3	I understand that research data collected during the study may be looked at by authorised people outside the research team. I give permission for these individuals to access my data.

4	I understand that this project has been reviewed by, and received ethics clearance through, the University of Oxford Central University Research Ethics Committee.
5	I understand who will have access to personal data provided, how the data will be stored and what will happen to the data at the end of the project.
6	I understand how this research will be written up and published.
7	I understand how to raise a concern or make a complaint.
8	I consent to being audio recorded
9	I consent to being video recorded
10	I understand how video recordings will be used in research outputs
11	I agree to the use of direct quotes, attributed to my name, in research outputs **OR**
12	I agree to the use of pseudonymised quotes in research outputs **OR**
13	I agree to the use of anonymised quotes in research outputs
14	I agree to take part in the study

_____	dd / mm / yyyy	_____
Name of Participant	Date	Signature
_____	dd / mm / yyyy	_____
Name of person taking consent	Date	Signature

Appendix D: CUREC Approval



From: Laura Molway <laura.molway@sant.ox.ac.uk>
Date: Friday, May 7, 2021 at 5:19 PM
To: [redacted]
Cc: Student CUREC <student.curec@education.ox.ac.uk>
Subject [redacted]

Dear [redacted]

Title: Exploring the impact of industrial design critique on students' academia to industry transition; an interview study
Ref [redacted]

The above application has now been considered on behalf of the Departmental Research Ethics Committee (DREC) in accordance with the procedures laid down by the University for ethical approval of all research involving human participants.

I am pleased to inform you that, on the basis of the information provided to DREC, the proposed research has been judged as meeting appropriate ethical standards, and accordingly, approval has been granted.

Should there be any subsequent changes to the project which raise ethical issues not covered in the original application you should submit details to studentcurec@education.ox.ac.uk for consideration.

Good luck with your research study.

With best wishes,
Laura Molway
Member of DREC