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Abstract

Today, the influence of industrial design (ID) is expanding beyond the traditional field of physical modelling. However, ID students seem to struggle to cope with the changing trends of society under the traditional curriculum of design education. Even with this mismatch between ID education and the design industry, not many studies made connections between ID education and the design industry to understand how design students transfer their knowledge into the professional field of design. Despite the lack of literature on the bridge between ID education and the design industry, many studies emphasized the critique environment as an essential pedagogical space for design education and its foundational knowledge generation. Therefore, this study aims to explore the ID students' knowledge application in professional areas through reviewing the critique environment. Two research questions formed around the research aim: (1) what knowledge gained from critique helps and hinders recent graduates' performance in the design industry? and (2) how accurately does the critique environment portray the professional design field? With a qualitative approach, the study conducted in-depth interviews with six major stakeholders of industrial design in the US (recent graduates, educators, and designers). The study suggests that critique experience supports the identity formation of design students. In contrast, it hinders coworking with non-design fields due to students' lack of awareness of the cross-functional culture in the design industry. Additionally, the study indicated systematic complexities existed in a collaboration between higher education institutions and companies in the US, which inhibit the active involvement of professional insights in academic critique. The study concludes by highlighting strategies to improve the critique experience of industrial design students and further support a successful transition after graduation.

Chapter 1 Introduction

1.1. Statement of the problem

Today, the field of industrial design (ID) is broadly expanding in society. Unlike the industrial era, which required traditional skills that focus on physical production, the current knowledge economy grows the implication of industrial design to service and societal sectors (den Ouden, 2012). Therefore, almost every product, from spoons to apps that we use every day, is influenced by the design industry. Due to this, the designer's role no longer exists within the aesthetic boundaries but is closely linked to the life of humans.

With the expansion, designers encounter more products and opportunities that they can be involved in and more competencies demanded by the design industry (Sanders and Stappers, 2008; Leitao, Marik and Vrba, 2013). From the perspective of industrial designers who traditionally worked within artisanship and manufacturing settings, the design industry becomes cross-functional and multi-disciplinary. Therefore it invites more actors within design practices (Bailey, 2008; Aitchison, 2016). For example, if we say industrial designers used to work with engineers and other designers in the past, now they are asked to work with data scientists, business managers, graphic designers, engineers, etc.

However, ID recent graduates seem to struggle with the changes due to the conventional curriculum of ID education that does not reflect the shifted trends of the design industry. The disconnection between ID education and the design industry is also viewed in previous literature, which is lacking in exploration on the bridge between the two fields. Researchers are concerned concern that this mismatch could impede students' knowledge application to the professional

field after they graduate as ID education cannot support students sufficient to fit in the professional areas (Dannels, 2005; Dannels and Martin, 2008).

As the significant role of ID education is to provide practical knowledge transferrable to the professional field (Crowther, 2013), the struggle of recent graduates in the design industry should be considered from the exploration of the academic space. Among various pedagogical tools of ID education, researchers shed light on the critique environment to tackle the issue above (Dannels and Martin 2008; Scagnetti, 2017; Motley, 2017). As a place of sharing feedback and presenting design works, critique is a space for verbal and social interaction of students where students can gain various knowledge usable in a professional setting (Scagnetti, 2017).

Some studies tried to tackle the issue discussed above through the investigation on the critique environment of ID education or novice designer's performance in the design industry, but they overlook the interconnectedness of these two fields to discuss recent graduates' struggle, which remains a research gap at the bridge between ID education and design industry. For example, Dannels and Martin (2008) suggests that a critique environment is not just a space for verbal communication but almost a 'tribal activity' that ID students can indirectly experience the social mood and culture of the professional field. His studies, with other significant literature exploring critique environments, mainly focus on the learnings within critique space. This lacks an explanation of how these learnings can be applied in students' performance after the academic environment. Researchers explore the competencies of novice designers who encounter similar issues. Their studies portray what knowledge novice designers often possess and explore its strength and weaknesses in a professional setting but miss the implication of academic learnings. For instance, Mohedas, Daly and Sienko (2016) observe novice designer's defects in

communication skills at work with the problem of misunderstanding of design problems, rather than insufficient preparation from the educational field.

In other words, studies around students transition from ID education to the design industry tend to stay within their own areas. This research gap shows the lack of understanding on how the knowledge obtained in the critique of ID studio can link to recent graduates' performance in a professional environment. Due to this, the new angle linking these two fields needs to be considered to have a more comprehensive understanding of how to support industrial design students in preparing for the rapidly changing future practically.

1.2. Focus of the study

The current study aims to understand how the current critique environment of ID education impacts students' performance in the professional design field after they graduate. The study will be specifically looking at the industrial design field in the United States, one of the leading ID sectors that takes up 30% of world industrial design services (Global Industry Analysts, Inc, 2021). This will provide a broader understanding of how ID students transfer their academic knowledge to their work experience, and suggestions to improve the critique environment that could support design students more practically.

Many industrial design students are currently facing identity issues due to the mismatch between academia and the professional field (Wormald and Rodber, 2008). Therefore, students naïvely following the academic curriculum find themselves lost in recruiting market. As a design researcher completed undergraduates in industrial design, I confront lots of recent graduates struggling to follow up with recruiting trends and realizing the rationale for pursuing ID as a

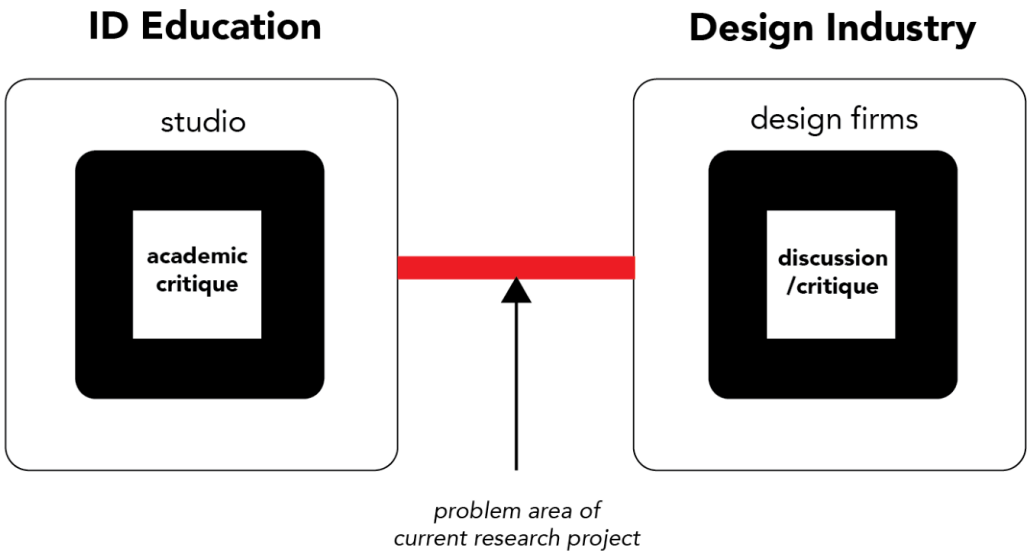
career. In this situation, ID students often feel difficult to find practical support on this issue and, in a worse case, being left out in the design community even with 4 years of dedication in the industrial design education.

In this study, therefore, I wish to explore the impact of academic critique on students' performance in the professional industrial design field within the context of the United States. I wish this exploration could further lead to innovative curriculum design of industrial design education that could closely work with the professional design industry which would be able to open a variety of opportunities to industrial design students in the future. Because it is a master's dissertation, this study might have some limitations in time and depth of research. However, this would be able to work as an initial stage of further research that reinforces the connection between ID education and the professional field of design.

Chapter 2 Literature Review

Industrial design (ID) is a complex topic. Despite the shortage of literature, ID was explored from multiple perspectives. With Figure 2.1 outlining the ID ecosystem, the study will discuss four major parts around industrial design: ID education, design industry, competencies of designers, and critique environment. Due to the increased demand in society, these fields gain strong research interests. Although researchers explore various areas of these four fields, the understanding of the connections within these fields, specifically on how ID education and the design industry are interconnected and share knowledge, is limited. Due to this, this chapter will review the relevant studies to introduce what has been discussed around the topic of ID and how the research gap is formed. This will explain the need for the current study as well as guide readers to major research questions of the study that will be discussed later in the chapter.

Figure 2.1. Industrial design ecosystem



2.1. Industrial design in the design industry

2.1.1. What is industrial design?

The field of industrial design used to be understood as physical product making. Although physical production has long been significant in the field of ID since the industrial revolution, ID is expanding its influence into diverse topics beyond the craft and form. Periodically, the World Design Organization (WDO), the worldwide non-government organization focused on industrial design activities, presents the definition of industrial design. It plays a vital role in the design community as it shows the latest trends and changes within the design industry through the updated definition. According to the latest WDO conference, industrial design was defined as:

> "… 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, para. 2).

This shows that the field of industrial design is not limited to product-making but expanded to system, service, and experiences of human life. Due to this, researchers no longer emphasize the physicality of end-products, instead, focus on the problem-solving process and various skills applied to it. This is shown by researchers investigating the skill-learning of designers related to the current shift of the design industry in their studies, which will be discussed further in later sections.

2.1.2. Major changes in industrial design

To explore more details of the situation discussed above, the Four Generations of Design Method by Jones (2014), which is shown in Table 2.1, will be used as the theoretical framework. His study captures how design has transformed and expanded over time. The major factor identified in Table 2.1 is the evolution of the system influencing the design methods. Jones (2014) indicated in his study that the method of design has evolved from craft-focused to transdisciplinary and empathic as the design problem becomes more complex. Therefore, researchers focus on the complexity of design problems and transdisciplinary methods to better understand the changes within the current design industry (Buchanan, 1992; Kreuter *et al.*, 2004; DUMAN and TİMUR, 2020).

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



2.1.2.1. Complexity of the design problem

Within the exploration, researchers show that the complexity of design problems is closely linked with the expansion of industrial design. As more actors are involved in the design process, the design space contains diverse cultures, insights, and traits on the table which makes the complex relationships around the design problem (Bailey, 2008). Due to this, researchers emphasize adept communication skills, creative problem-solving strategies, and independent management skills from designers to cope with the changing environment. Specifically, the significance of communication is often mentioned in previous research by considering it as a prerequisite competency to possess as designers to confront complex design problems (Menold *et al.*, 2018; Holt, Radcliffe and Schoorl, 1985).

However, previous studies demonstrating the significance of communication with the changes within the design industry rarely provide practical implications to education. While it emphasizes the preparation required within the community of designers, it does not expand its implication to design education which blurs the connection between ID education and the design industry. Even the studies create links to ID education on the current trends and relative skills required in the field (DUMAN and TİMUR, 2020), it lacks in-depth narratives of actors around ID so that we cannot capture the experiences around these issues. Due to this, as shown in Figure 2.1, there is a research gap in the connection of ID education and the design industry related to the shift of trend and required skills in the professional field of design.

2.1.2.2. Transdisciplinary methods

As discussed above, the shift of trends in the design industry brings multiple stakeholders in the design process so that researchers shed light on the transdisciplinary and cross-functional culture created in design industry (Bailey, 2008; Aitchison, 2016; Buchanan, 1992). Beyond the collaboration between design and engineering which was often discussed as transdisciplinary or multidisciplinary approaches in design (de Vere, Melles and Kapoor, 2010), the field of design now requires more active collaboration with various fields of professions, such as marketing, public health, and finance (Han *et al.*, 2018). Specifically, when the product is related to service and experience, it contains human factors and culture that needs to be carefully approached with empathy and in-depth discussion between different stakeholders around the design problem (Calvi, Sabiescu and Vermeeren, 2018). This suggests that it is significant for designers to equip themselves with strategies suitable for a cross-functional culture of the design industry (von Thienen, Meinel and Nicolai, 2014).

In summary, the contemporary trends shifted the design industry more cross-functional with complex design problems. This shows that industrial design is no longer stagnated in its traditional definition, the craft-focused activities, but expanded into broader fields of society. From the change, the researchers illustrated that designers are required to equip advanced communication skills to tackle complex design problems with various stakeholders on the table. However, these studies are limited in their connection to education so that great findings from the previous studies tend to stay within the professional design communities. Even few studies that made the connection to the ID education is lacking in their exploration on how design students or professors are reacting to the changes so that this makes it challenging for us to

understand how current changes on competencies of designers and setting of design industry would impact design students preparing for their career. Due to this, it indicated a research gap located on the bridge between ID education and the design industry shown in Figure 2.1.

2.2. Competencies of Designers

The previous section briefly mentioned the change of competencies required for designers due to the changing trends and setting of the design industry. This highlights the need to explore the designers' competencies more thoroughly to understand what changes are required for designers and how they are reacting to them. This will be able to further explore the skills specifically expected from incoming designers which are closely linked to design students.

2.2.1 Different levels of competencies in the field

While the design industry calls for 'advanced' skills of designers, the standards of advanced skills of designers are blurry. As the industrial design field is expanding in society, the competencies get even more diversified which needs systematic conceptualization with a theoretical framework to understand the different levels of competencies in the design community. Therefore, Dreyfus and Dreyfus model of skill acquisition (1980) will be used to demonstrate different levels of competencies of designers.

The comparison of the skill acquisition model shows that the key area that differentiates the level of competencies is how they utilize the competencies in problem-solving. As shown in Table 2.2, experts seem to be skilled in blending their thoughts, feelings and action with creative intuition which can view as containing empathy, critical thinking, and independent decision-

making within their problem-solving process (Mohedas, Daly and Sienko, 2016; Huang and Li, 2015). Add on to the significance of communication skills discussed in the previous section, this model shows the significance of critical thinking, independent decision-making, and empathy-building of designers in the successful performance in the professional design industry (Verganti, 2009; Ramirez, 2012).

Table 2.2. Dreyfus and Dreyfus model of skill acquisition from Mohedas et al (2016)



Within those skills, communication skills and empathy-building are the emerging fields of competencies specifically emphasized in relation to the trends of the design industry. Firstly, communication skills are required for designers to express their thoughts and negotiate with

various stakeholders around the complex design problem in a cross-functional setting of a design environment (Huang and Li, 2015; Kreuter *et al.*, 2004). Moreover, empathy-building plays a significant role in multi-disciplinary products which contain more human factors by allowing proper problem-solving through accurate analysis of user needs (Norman, 2010; Calvi, Sabiescu and Vermeeren, 2018).

2.2.2. Limitations of novice designers

Along with the demands of society, it is significant to understand how current novice designers are responding to the demand of the field. Despite the emphasis given by researchers, incoming designers seem to struggle with their weak communication skills in the design industry (Huang and Li, 2015). Specifically, novice designers face difficulties in communication in cross-functional settings due to their lack of experience and knowledge. For example, Menold *et al.* (2018) introduced that novice designers often struggle to talk to engineers in the design process and this is intensified by uninfluential communicative tools utilized in their conversation that doesn't fully express the designer's thoughts. Due to the struggles of novice designers, some researchers emphasize the role and responsibility of ID education to help students preparing these skills before entering the professional field of design (Arthur, Brennan and de Weert, 2007). This raises the question that what is the role of ID education and how they react to the changes in this situation to support students moving forward on their career path. Therefore, the next chapter will discuss industrial design education to discuss more on these questions.

2.3. Industrial Design Education

ID education has the objective of supporting design students to equip them with practical knowledge to become successful designers (Crowther, 2013). However, industrial design education has been criticized for its passive approach on taking curricular innovation and this intensifies the struggle of novice designers in the field of design (Coyne, 2005; Aitchison, 2016;). For instance, Bonollo (2004) concerns ID education put too much focus on teaching technical tools within the traditional boundary of making physical products such as CAD and prototyping so that he suggests that the educational field should consider more social factors that broadly link design practices to the society, such as globalization, cultural diversity, and marketing. It shows that current ID education is stagnated in its traditional curriculum and is linked to the struggles of novice designers shown in current design fields.

2.3.1. What is industrial design education?

Industrial design education is centred around studio teaching. The studio is a pedagogical space of design where a small number of students, ranging from 12 to 20, explore simulated real-world scenario topics through a number of design assessments and discussions, usually called critique in design context (Bender and Vredevoogd, 2006). At the end of the semester, students complete the curriculum with a final review where students present their final assessment in front of peers, instructors, and guest critics, usually professional designers, to receive feedback. (Crowther, 2013).

2.3.2 Assessments of industrial design education

Within the unique format of a studio, researchers reveal the self-driven nature of design assessments in ID education. This means that design students often work on a long problem-solving process independently, or in a small group, in ID education. The independent workstyle of design students seems to be beneficial to build independence in learning, however, researchers concern about this situation as it is conflicting with the skills required in the current design industry, such as group work or communication (Nicol and Pilling, 2000) Therefore, (Richard and Catherine, 2006). suggest that ID education needs more teaching of collaboration as the current student-centered learning principles is not support students' preparation for professional design practices of a group learning environment.

2.3.3. Curriculum of industrial design education

Beyond the assessment, social aspects, such as peer discussions, also play a significant role in a design studio. Therefore, 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, researchers illustrated that ID education maintains its traditional curriculum by giving emphasis on craft-focused teaching rather than social and analytic activities. While design fields are shifting from, "a manufacturing to a service economy; a focus on physical to digital products and a focus on designing to 'design thinking." (Aitchison, 2016, p. 7), ID education is not free from criticism of its outdated curriculum. According to (DUMAN

and TİMUR's, (2020) assertion on current industrial design departments focusing on teaching product-centered and human-centered design education, it has not yet arrived in the Fourth generation of design method described in Table 2.1. Due to this, the outdated curriculum that overlooks the significance of socialization in the design space will challenge students to learn about the professional setting for their career path (Crowther, 2013).

Furthermore, researchers emphasize the need for ID education to redesign the studio curriculum to support students to be aware of complex systems of the society that they are designing for, such as social, economic, and political elements of the design realm. Norman (2010) asserts that ID education "do 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). This does not only limit students in learning but also reduce the options available for students to apply their knowledge in the design industry (Mewburn, 2012). This reassures the limitation of current ID education in portraying the cross-functional culture of the design industry.

In summary, industrial design education is led by studio experience which is centered around assessments and sharing of feedback. However, previous studies suggest that ID education seems to be outdated as it overlooks the significance of group work, learnings beyond the traditional field of ID, and the revealing complexity of systems in the design industry. Due to this, it is limited to teach the overall ecosystem of the design industry within the structure of ID education which further influences students' preparation for professional practice. In addition, 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. As design studio pedagogy, especially between architecture and industrial design share a similar structure and concept of the studio, it does not limit the understanding of the research space, but it showed the need for more studies conducted around industrial design education and its studio pedagogy.

2.3.4. Required changes within the ID education

Due to the outdated curriculum that creates a mismatch between ID education and the design industry, it is not surprising to view the design students' struggle in the professional field. To tackle the struggles of ID students in tertiary education, researchers call for platforms to invite students to actively practice the knowledge transferable to the design industry (García-Aracil, Monteiro and Almeida, 2021). As much of learnings in design education is fostered in dialogue and discussion, researchers shed light on critique, a space for discussion and exchange of feedback in the design studio, as a space to tackle for solving the issues discussed above (Schön, 1983; Crowther, 2013). This will be further discussed in the next chapter which discusses a critique environment.

2.4 Critique Environment

As Schön (1983) emphasized the verbal interaction in design studio pedagogy, critique, a central space for sharing verbal feedback, is a significant topic to explore in this study. With many studies considering the critique environment as an essential space of student learning,

critique has been studied in diverse disciplines including the field of design (Shulman, 2005; Ford, 2010). By reviewing the analytic literature of critique that approaches the critique experience with various angles of thought, it will provide a strong foundation of 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. Therefore, students usually present their design process through a public presentation in front of the audience to receive feedback from peers, professors, and guest critics. As critique is a space of discussion within different groups of people and settings, researchers consider critique as not only just one element of the curriculum but a pedagogical tool that teaches social relationships, self-reflection, identity formation, and independent thinking (Scagnetti, 2017; Motley, 2017). However, some studies concern the emphasis on the visual elements in the critique which hinder vital knowledge developed from critique experience, such as communication and empathy-building skills which further link to their problem-solving process on complex design issues (Gray, 2018; Morton and O'Brien, 2005). Therefore, a proper understanding of the critique environment is important to use this pedagogical tool to promote a better learning environment for students. Among diverse approaches to study critique environment, two major elements of critique are often examined by researchers: contents and structure of critique.

2.4.2. Contents of Critique

The contents of critique are simply described as “feedback”. The feedback is mostly carried verbally throughout the critique so that many researchers mainly look at the influence of oral genre in critique as well as its impact on student learning (Cronin and Glenn, 1991; Hargrove, 2013; Oak, 2000). Moreover, as feedback is transferred by diverse actors in design disciplines, some researchers specifically look at the “feedback” itself by analyzing what feedback is given and how does that improve students’ design process (Dannels and Martin, 2008).

2.4.2.1 Verbal interaction in critique

Critique and oral communication are undetachable because critique is mostly proceeded by verbal interactions. Based on the early study on oral genre, the communicative aspect in the curriculum is known to support student development, specifically identity formation and communication skills (Cronin and Glenn, 1991; Lichtenstein and Plowman, 2009). Firstly, previous studies pay attention to its potential on forming students’ Designer’s Professional Identity (DPI) which is how designers view themselves in a professional setting (Kunrath, Cash and Kleinsmann, 2020). By critique environment encourage students to reflect on themselves repeatedly throughout the multiple discussions on their design knowledge and process, students develop their metacognitive skills which improve their understanding of their practices (Hargrove, 2013; Gray, 2020). Due to this, this suggests that DPI formation from a critique environment can further influence students’ decision-making into the career path after graduation as DPI determines what kind of professional designers they want to be.

Furthermore, previous studies suggest that students improve their communication skills through verbal interactions on diverse topics and design knowledge within critique space (Cronin and Glenn, 1991). However, researchers delineate that the current format of critique, in which students present their work and get verbal feedback from the audience, is not fully supported in building the communicative skills of design students. Oak (2000) asserts that critique is more beneficial to students who already possess advanced communicative skills which raises suspicion on the effectiveness of the conversation-driven nature of critique in student learning. Moreover, Martin-Thomsen *et al.* (2021) suggests the existence of hierarchy exists in critique space that could influence the quality of students learning in the current critique culture. Therefore, it seems to require more exploration on how knowledge is obtained in a critique environment as well as how practical the student learning process is in the current critique environment to support students in their preparation for a successful transition to the design industry from ID 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. While the type and quality of feedback seem to vary by the structure of the critique setting (Dannels, 2008), what is often viewed in the academic critique environment is the harsh styles of sharing feedback. Scagnetti (2017) delineates that the students tend to have a negative image of critique due to the harsh criticism they received from previous experience. Therefore, she suggests that harsh feedback sometimes shifts the pedagogical space of critique into a place of humiliation or trauma which could have a negative impact on student learning (Smith and King, 2004). As the

structure of the critique requires the presentation in front of the audience, harsh criticism can impact students stronger and more personally in a public setting. Due to this, researchers suggest that more indirect feedback is required in the critique environment by introducing the case in which students who prefer receiving direct feedback from teachers perform less successful than students as well as indirect feedback is more motivating for students to continuously iterate their design works (Smith and King, 2004; Scagnetti, 2017; Kluger and DeNisi, 1996).

2.4.3. Structure of critique

Critique settings can be flexible based on the studio style. However, there are some typical structures of critique that are universally utilized in tertiary design education. The structure of critique in three big parts: desk crit, pin-up, and review (Dannels, 2005). Following the framework of Schon (1985), it is categorized by the size of the audience and the type of feedback shared in the setting. He suggests that desk crit is an informal and interim critique that is often conducted in one-on-one format between student and instructor. Pin-up is also interim critique, but it requires a simple presentation in front of an audience, which is mostly the insiders, peers and instructors. Reviews are formal critiques conducted at the end of the assessment so that students present their work and process in front of a bigger number of audiences including "juries", the outside experts, to gain professional insights.

Within many design studies analyzing critique structure, desk crit was one of the successful fields that bring student development. Hokanson (2012) suggests desk crit has a supportive setting that positively influences students' working process and further guides better problem-solving skills. However, when they illustrate other structures, specifically final reviews, tones turn negatively. Hokanson (2012) suggests that final reviews are the "least-successful"

format of critique in regard to students learning. Shaffer (2003)also mentions that interim critiques, such as desk crit and pin-ups, are more useful for students to build their skills as well as develop their design process compared to a final review. It seems to be ironic because ID education put more effort into the final review by reserving formal space and inviting professional experts, the juries or guest critics, to provide more practical feedback. Due to this, McDonald and Michela 2019) raised his concerns about the role of juries in the final review to support student skill development. While we cannot deny that critique is helpful for students to improve design knowledge required for the future, the final review seems to be a space for more exploration required to understand how professional insights influence the ID education which further pictures the bridge between ID education and design industry more vividly.

In summary, the discussion above expresses two major questions around critique experience: inconsistency of student learning, and impact of professional insights in the final review. These questions lead to central curiosity about the goal of critique. With current concerns on critique environment, Scagnetti (2017) suggests that we need to rethink the goal of critique as a space for communal practice that students prepare for the professional field. What should students gain from critique experience today?

2.4.4. Research gaps in understanding the goal of critique

The issues of student preparation and critique environment are not completely new in academia. As mentioned in the previous section, Ramirez (2012) investigated that industrial design graduates are typically weak in communication skills. Even though previous studies

reveal ID students' weaknesses in academic knowledge application in a professional setting, it lacks in the exploration on the detail of which element of ID education or which setting of critique is hindering students' transition to the design industry.

This gap is seen in other studies as well. Design researchers explore the critique environment in many different perspectives, including student learnings, relationships within critique space, and value of critique to instructors, to understand its value and limitation (McDonald and Michela 2019; Belluigi, 2016). However, studies mainly focus on knowledge acquisition within critique space but missing information on its impact outside of the educational space. In particular, the research that links how does the knowledge obtained in a critique environment influences students' preparation and performance in the design industry is limited.

Critique is a social space where students learn how to become professional designers. Therefore, the purpose of critique is not just reflecting on assessments but providing the artificial social space that students can indirectly experience the taste of the real world (Scagnetti, 2017; Dannels, 2005). Dannels (2009) even describe critique as a "tribal activity" that design students learn the demand of professional field by experiencing the manner, jargon and even tensions that exist in professional design culture.

However, there is a problem that arises when critique, the semi-real world, does not portray the real world. Dannels (2008) asserts that there is a gap between the academic image and the professional image of a "successful designer" which disrupt the proper understanding of a professional designer. Therefore, this illustrates the need for more exploration on the connectedness of critique contents with the real world to improve the space of critique and

further support student preparation for a career. The current study will be able to address this issue by exploring how students utilize the learnings from critique in the professional environment.

2.5. The Current Study

The literature review summarized the phenomena around the problem area of interest and illustrates the research gaps of previous studies. This section will discuss the limitations revealed in the literature review and finalize the purpose of the current study. Then, it will outline the research questions of the study.

2.5.1. Limitations of previous research

In the literature review, there were two research gaps revealed. Firstly, previous studies were lacking in the connection between ID education and the design industry. As shown in the literature review, the design researchers tend to explore the problem limited to one space so that studies on ID education tends to explore the issue around students, while the issues around the design industry tend to stay within a professional setting. However, design students will become a member of professional design field one day which makes them significant to understand the design industry from academic practice to better encounter the design tasks as a professional designer. Although researchers realize this interconnection between the ID education and design industry, there is still a mismatch between the two fields which could hinder the understanding of

how the current ID field is supporting recent graduates' performance in the professional field after they graduate.

Secondly, the question of how accurate the critique environment portrays the professional field of ID is still not sufficiently answered. With the objective of providing practical knowledge that helps students transition to the real world, ID education utilizes critique as a tool to help them familiarize themselves with the professional environment and practice higher education (HE) knowledge application (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, researchers have argued the weak impact of final reviews which can be referred to as the weak impact of professional insights in a critique setting. This intensifies the concerns on the portrayal of the design industry in an academic critique setting. Due to this, it needs more thorough exploration on the relationship between recent graduates' experience in the professional design industry with the image of the professional field portrayed in the critique setting to better understand the practicality of knowledge provided in the academic critique environment.

2.5.2. Purpose of the study

The present study, therefore, aims to explore two research gaps revealed in previous studies to understand how to critique environment in US design HE supports recent graduates' transitions to the professional field. Due to this, the study will explore how recent graduates are utilizing their knowledge practiced in the critique experience in their work setting. This will be

able to explore how do limitations of novice designers in the field is influenced by academic learnings as well as a more profound understanding of recent graduates' struggle in the professional field will be possible. To this end, it will also provide how accurate does the critique environment portrays the reality of the professional fields which guides the critique settings to be more supportive to design students preparing for the future.

From this approach, the current research project wishes to rearrange the mismatch between the academic and professional fields of ID, which further supports design students preparing their design career with proper knowledge demanded in society. With the setting of a master's level dissertation, the range of exploration and time spent in the research could be limited but this project can provide some potential for future research to promote more empirical studies on industrial design education.

2.5.3. Research Questions

From the research gaps revealed during the literature reviews, it brings two research questions of the study:

1. In the context of US higher education, how do the ID recent graduates apply the knowledge obtained from a critique environment in a work setting? Which part helps or hinder their performance at work?

2. From the experiences of professional fields, how accurately does the critique environment portray the real-world setting?

Chapter 3 Methodology

This section will discuss the methodological framework of the research project. Research methodology plays a significant role as it shapes how knowledge is generated and engaged in the study (Costley, Elliott and Gibbs, 2010). Therefore, this will picture how the researcher engaged with the data to answer the research questions.

3.1. Research Design

3.1.1. Philosophical worldview

A philosophical worldview shapes the nature of research and portrays how the researcher understands the world (Creswell and Creswell, 2018). With the explorative approach required to answer the research questions, the researcher took an interpretivist worldview in the study. Interpretivism comprises relativist ontology and subjectivist epistemology that understands the world through individuals' perspectives, experiences, and feelings (Levers, 2013; Danermark, Ekström and Karlsson, 2019). Therefore, interpretivist researchers do not believe in having objective truth in the research problem but rather try to approach the complexity of the world through the representation of human actions (Denzin and Lincoln, 2018) . For instance, (Steele *et al.*, 2020) explored the ethical considerations in the field of virtual and augmented reality (VR and AR) product design by interpreting the experiences of VR and AR product designers to understand the situation through individual's perspectives. Other studies taking an interpretivist stance also focus on realizing the meaning behind human action to understand the problem area (Crotty, 1998).

Therefore, the interpretivist worldview supports the current study to understand the industrial design world by exploring subjective ideas of individual design stakeholders. Furthermore, due to the complexity of the problem area with the lack of previous studies, the current research is not suitable for a determined stance, such as a positivist worldview, that requires an absolute solution in the problem area (Ryan, 2008). Instead, by taking the interpretivist stance, the current study portrays the complexity of recent graduates' transition more vividly, which can respond to two research questions of the current study: (1) How do ID recent graduates apply their learnings from critique environment? (2) How accurately does the academic critique portray the professional field of ID for student development?

3.1.2. Qualitative research

Therefore, with interpretivist stance of the researcher, a qualitative approach was taken to explore the influence of academic critique in helping recent graduate's transition to the professional field. The qualitative approach continues the nature of the study because it approaches the research topic by respecting the subjective representation of the problem area (Creswell and Creswell, 2018). This enables the current research to explore the bridge between the academic and professional fields of ID through the lived experience of major actors around ID education.

The knowledge transition from ID academia to professional in the context of critique is not yet sufficiently investigated. Due to this, the qualitative approach is suitable to explore the blurry field of ID to continue the awareness of the problem space and lead to future studies around the topic. 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 uses a purposive strategy in sampling to nest in proper individual's experience that can picture the phenomenon or situation (Miles, Huberman and Saldaña, 2020). Especially in the case of the current study, which lacks previous literature compared to the studies on other fields like STEM (Science, Technology, Economics, and Math), intentional sampling is required to gain fruitful information from lived experiences. Therefore, purposive sampling was chosen as a 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 samples were chosen based on their knowledge and experience in the ID culture. To select a proper informant in the broad field of ID, the sampling criteria was formed based on the information from the previous literature, and the researcher's expertise from previous experience as a student and novice designer in the field of ID.

3.2.2. Participants

To answer the research questions, it required the involvement of major actors around the bridge between the academic and professional fields of ID. Therefore, instead of solely rely on the recent graduate's experience, the researcher also explored the perspectives of design educators and professional designers who can provide a more comprehensive representation of

the problem area. Due to this, the variety of perspectives from the interconnections between recent graduates, design educators, and professional designers represent the area in relation to the research questions.

A total of 6 samples across the industrial design field was involved in the study. This includes 2 recent graduates, 2 design educators, and 2 professional designers. Instead of recruiting a large number of samples, I recruited a small number of interviewees with various fields of professions to blend different perspectives which will be able to provide a thorough understanding to overview the complexity of the problem area (Rubin and Rubin, 2005). I was originally hoping to recruit a larger number of samples, but few people were willing to participate in the study due to the COVID pandemic. However, this was not a serious problem in conducting the current study because the small number of in-depth interviews are common in qualitative research.

The criterion for the selection slightly varies for each group. For recent graduates, people who graduated from US design universities within 2 years and currently working as novice designers at ID related firms were selected to receive more 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 years or more of teaching experience and are currently teaching a studio course were recruited for the research. This will allow an insightful instructor experience on student learnings as well as studio critique. Lastly, for professional designers, I was looking for a designer who is currently working in an ID role, such as product designers, UI/UX designers, or design strategists, with 3 years or more of work experience. This will allow them to share their experience with recent graduates and further their mentoring experience which can be a direct

observation of recent graduates' performance at work. Table 3.1 shows the summarized information of the participants:

Table 3.1. Sample information

Participant	Category	Work Experience	Graduation year	Profession
1	Design Educator	11 years	-	Associate professor
2	Design Educator	30 years	-	Adjunct professor -CCE
3	Recent Graduate	1.5 years	2019	Product Designer
4	Recent Graduate	1 years	2020	Design Strategist
5	Professional Designer	15 years	-	Consulting role at tech company; former product designer
6	Professional Designer	4 years	-	Senior UX designer at investment company; former product designer

3.3. Data collection

The present study utilizes interviews as a method for data collection. Along with the philosophical worldview and research design of the study, the interview is the most suitable method to collect qualitative data that explores the research topic. Using interview as a "symbolic interaction" that portrays the knowledge of the society (Silverman, 2021), the objective of qualitative data is to vividly picture the connection between the academic and professional field of ID through the lived experience of major stakeholders to answer the research questions of the study.

The interview was conducted in a semi-structured format with a one-on-one online setting. Most interviews last from 45 minutes to 90 minutes. The above format was chosen for

two major 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 is specifically helpful with the current study that has a small number of interviewees in different stakeholder groups. Furthermore, the semi-structured format generates a liberal discussion in a constructed structure which provides a more comfortable environment for participants to share their personal experiences while coping with existing limitations of time and coldness of the setting (Rogers, 2001).

As shown in Table 3.2, the interview schedule was constructed around 4 themes refers to the literature review of the present study: academic setting, professional setting, comparison, industrial design. Themes of academic critique and professional critique ask experiences within the specific field of ID and themes of comparison and industrial design will ask questions to portray the bridge between the two fields so that 4 themes can capture the overall picture of the ID culture.

To portray a more detailed experience of individuals, the questions for each sample group slightly varies in each theme. For recent graduates, the interview questions focus on their experiences in critiques, and its comparison to reveal the hindrance and benefits of academic learnings. For design educators, interview questions focus on academic settings, specifically about their teaching experiences and perspectives on student learning. This will provide information about what knowledge ID education does try to provide to students as well as which part of the professional field of ID do the academics try to depict in a critique setting. For professional designers, the interview questions build around their experiences with recent graduates in the work environment and general perspectives on ID education. Additionally, all interviewees are asked about their thoughts on the goal of industrial design to view the overall

perspectives on the field of ID across different stakeholders. Within this framework, the interview questions will help answer the research questions by blending the variety of perspectives in the field of ID.

Table 3.2. Interview Schedule Guideline

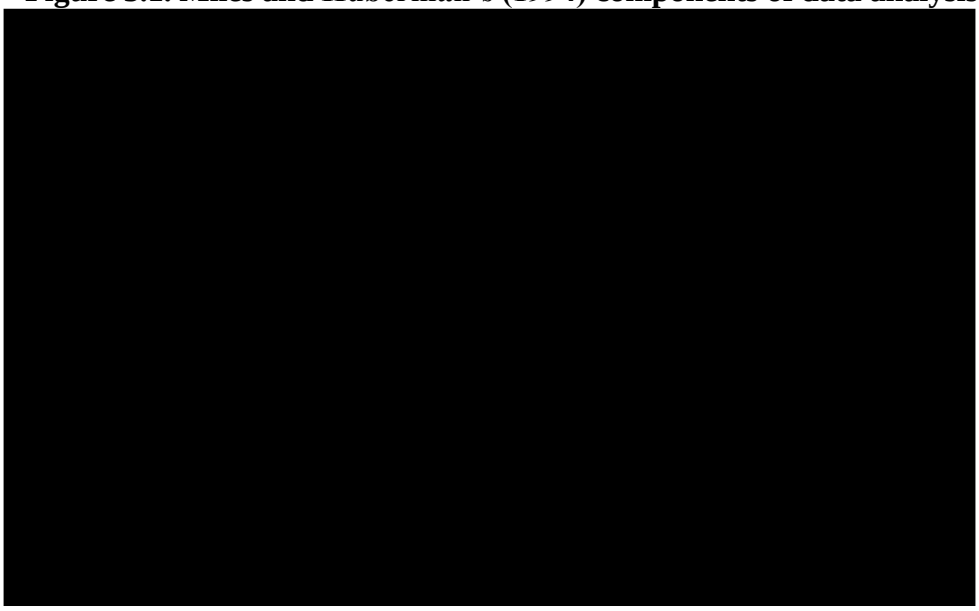
Interview Guidelines					
	Themes				
Participant Category	Academic Setting		Professional Setting	Comparison	Industrial Design
Recent Graduates	- experience of critique - learnings from critique - relationships in critique environment - challenges		- experiences of critique - skill usage in critique/discussion - relationships in critique environment - challenges	- changes from transition - influence of academic critique - influence of academic learnings	- purpose of industrial design - limitations of industrial design
Design educators	ID education - goal of teaching - teaching experience - student experience - challenges in teaching - limitations	Critique - function of critique - structure of critique - skill development - relationships in critique environment - challenges - student challenges			- purpose of industrial design - limitations of industrial design
Professional designers	- thoughts on education - experience as a jury/guest critic - limitations		- skills required in critique - experience with recent graduates - challenges in mentoring - challenges of recent graduates		- purpose of industrial design - limitations of industrial design

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 that 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



As shown in Figure 3.1, the analysis framework takes an inductive process that begins with raw data and develops the conclusion through continuous data display, reduction and verifying. For analysis, the interview recordings are transcribed verbatim by both hand and software for accurate transcription. Then, in the first data display phase, the raw data will be coded in NVivo for thematic analysis. NVivo was chosen as a coding method to increase consistency and accuracy in the coding process and the procedure was supported by relevant literature illustrating guidelines (Richards, 1999). This phase will provide descriptive codes that

help researchers to understand the experiences of informants without inferences (Richards, 1999).

Then, the codes are categorized by patterns and shaped within the cycle of data reduction, drawing/verifying, and data display. These pattern codes provide interpretive data that can represent the research topic (Punch and Oancea, 2014). Therefore, this process is specifically centered around research questions. For the research question about recent graduates' knowledge transition from academia to the professional field of ID, data analysis was centered around the patterns of recent graduate experiences and then further shaped with patterns shown in data from educators and professional designers. On the other hand, the second research question of the representation of the professional field of ID in a critique environment focused on blending the insights from professionals and recent graduates' experience. Then the pattern codes of educators were utilized as a supporting detail to describe the different understandings between academia and the professional field of ID. This will allow the researcher to illustrate which part of the critique environment hinders the accurate representation of the professional field in the studio as well as the rationale for the representation in the perspective of academics. From the analytic approach, I hope to explore diverse experiences and perspectives around research questions.

3.5. Ethical Consideration

This study is structured around humans and their experiences. Due to this, it is highly responsible for researchers 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 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 participant and relieve the power relationship that possibly existed in the interview setting.

3.5.2. Minimizing harm

Beyond the interaction with the participant, I am aware that ethical issues can arise in every step in 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 on 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 discusses the findings from the interview with three groups of stakeholders in the industrial design field. This captures diverse experiences around the connection between ID education and the design industry. This debrief will demonstrate students' transitions from academia to the industry which further illustrates academic knowledge application in the design industry, as well as the portrayal of the professional field in a critique environment.

4.1. Confusing Identity of Industrial Design

This section will portray the entire industrial design field. Even though it does not specifically focus on the critique environment, it touches upon the overall system of ID education that further influences the learnings from critique. Due to this, this section will be able to capture different perceptions of the critique setting through the representation of ID field.

4.1.1. Need to redefine "industrial design" in education

I conducted interviews with people who graduated from or currently working in the "industrial design" department of leading US (United States) design universities. Within the interview, the complexity of the term "industrial design" was repeatedly mentioned with all three stakeholders, 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 field of design 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 that this created different explanations of their current work in relation to industrial design. For example, one participant introduced his current occupation outside of the industrial design field 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, Senior UX 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, Product designer)

4.1.2. Struggle to realize 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 adoptive. I think people are struggling, or these institutions are struggling because I think they aren't flexible enough." (Participant 3, Recent graduate, Product designer)

"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, Design strategist)

In this phenomenon, recent graduates shared that skills and projects that helped their successful transition into the design industry were self-taught. While both interviewees are currently working in corporations, they illustrated that the university curriculum did not provide enough opportunities to create projects suitable for applying for design roles in popular industries. Therefore, one recent graduate had to create a personal project outside of the curriculum to apply for a job that he was interested in. Another recent graduate shared a similar experience. While in school, she was specifically interested in social impact design, but a related course was not offered in the department, so she had to work on a personal project with friends of the same interest. This shows the limited curricular support of ID education in preparing students to find their path in the rapidly changing field of design.

4.2. Knowledge that Supported Student Transition to the Industry

4.2.1. Building Identity as a Designer

During the interview, both recent graduates and designers expressed general appreciation for the experience of critique culture. Recent graduates specifically asserted that critique culture allows 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.

> *"Uh, but 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, Design strategist)

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 leads students to rather rely on a conversation with peers in a critique.

In this situation, educators are also struggling. 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 of professors helps students to be more creative in critique. For the interview question, 'How 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, Design educator, Associate professor)

> *"Some students who are not strong, if you ask them, they'll say '[Professor]wants me to do it, the way he wants me to do it.' You know, I mean, and that's that's never nice to hear. It's because they don't have a way."* (Participant 2, Design educator, Adjunct professor – CCE)

4.2.2. Basic skills from critique experience

In addition to identity formation, recent graduates introduced a few basic learnings from critiques that supported their transition. Firstly, recent graduates learned the eyes to sense the quality of design work. While students encountering various projects presented by peers in critique, they learn to capture the story blended in the design as well as to detect the flaws of it. Furthermore, this process makes students familiar with accepting feedback from others and apply those feedback to develop their design works. Designers also agreed on this part by saying that critique experience allows students to be more flexible in a discussion. Therefore, designers think it is unfortunate that these great aspects of recent graduates are less valued during the pandemic period when conversations in a physical setting are missing.

4.3. Struggles of Recent Graduates

4.3.1. Struggles from the differences between two fields

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 sharing 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, uh, it needs that that conversation needs to be had in a 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 then they will no longer write an API to help transfer data from their tool to ours… "*
> (Participant 6, Professional designer, Senior UX 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 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 like well balanced."* (Participant 1, Design educator, Associate professor)

4.3.1.2. Emotional Investment

When first entering the design industry, recent graduates learn to invest less emotion in the project as they realize the distance between the project and themselves. This helps them keep objective in the design process as well as be more open-minded when receiving feedback. However, recent graduates described this process of taking out emotion from their work as challenging. Unlike the academic environment where design projects directly representing students, professional design projects do not represent any individual but the entire team. Moreover, the success of the project is not determined by the performance of a single designer but by the product's performance in the market. Therefore, recent graduates tried to put less emotion into their projects and rather understand the overall ecosystem of the design industry.

In addition to that, the recent graduate currently working as a product designer in a corporation 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. Recent graduates 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, knowing the boundaries of design in a cross-functional setting was significant in recent graduates' experiences.

The emotional investment of recent graduates also appeared in the interview with designers. Sometimes industry is not as receptive as the academic field, so designers emphasized the skills to balance emotions and creative energy for a successful transition into the industry. One designer shared his experience with an intern 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 the different cultures of the design industry.

4.3.2. Struggles from encountering different actors in space

4.3.2.1. Design expertise set as default in academic critique

Working with non-designers appeared to be the most challenging experience for recent graduates. After entering the industry, recent graduates realized that academic critique lives in its comfort zone where basic design knowledge is implemented as default in discussions. Therefore, students are familiar with presenting the design process without a specific explanation. On the other hand, in a work setting, recent graduates need to discuss their design process not only with

designers but also the people with different functional expertise which require them to explain every single decision they made. Recent graduates recalled this experience as unexpected and challenging.

> *"But I'm presenting the process to … engineer or data scientist, they, 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, Product designer)

Furthermore, this is another aspect that senior designers are required to become a buffer between recent graduates and non-designers in a discussion setting. Sometimes there are miscommunications between recent graduates and non-designers so that senior designers, the mentors of incoming designers, provide additional explanations on the design process to support people with limited design knowledge fully understand the concept behind the design decision. Professional designers are aware of ID education's effort to tackle these issues in the curriculum, but they believe it requires more fundamental changes to support design students to understand the critique environment of the industry.

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

4.3.2.2. Existing obstacles to involve non-designers in ID education

Due to the struggles with non-designers, recent graduates are looking for a more constructive approach to involve non-designers through the entire process of student projects, instead of the passive approach like inviting them as guest critics or speakers which the current ID education often do. They believe this will help students familiarize themselves with keeping relationships with non-designers around design problems.

However, interviews with educators indicated the systematic obstacle that often arises in collaboration with companies in academic settings. Educators introduced that there are some legal issues as well as institutional complexities around ownership of ideas that limit 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] the 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 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 it's better." (Participant 1, Design educator, Associate professor)

In summary, the major struggle of the recent graduates is coming from the mismatch between ID education and the design industry. The limited understanding of the industry culture challenges recent graduates in their communication, relationship, and emotional control in the work process.

4.4. Weak Impact of Professional Insights in Final Reviews

4.4.1. Loss of motivation at the end stage

Unlike the benevolent attitude towards early to mid-stage critique, recent graduates expressed their criticism on final reviews. Students are usually less motivated to learn in the final review because they are not required to move the project forward after the critique. Due to this, recent graduates think students are less engaged to either receive or provide 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, Design strategist)

"I know all about this project now at this point, like, it's sort of pointless for me to say like, like, 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, Product designer)

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 students to deeply think and apply that feedback in their own projects after the final review. This is also because students are somewhat satisfied with the quality of their project on a personal level so that they are 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, the quality that we we are as, as designers ourselves were satisfied with." (Participant 3, Recent graduate, Product designer)

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

Educators were also aware of the weak motivation involved in the final review so that they utilize 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, Design educator, Adjunct professor-CCE)

Moreover, educators invite guest critics more carefully to provide relatable feedback to students' projects in the voice of professionals. Therefore, some educators provide the 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 of their personal project

Recent graduates also realized that students are less motivated in final critique when students become an expert of 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. The time and effort spent on a project, therefore, makes 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, 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, Design strategist)

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, Design strategist)

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 suggest 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, educators are concerned 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, 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 suggested establishing a more constructive method to share and store feedback in a critique setting. Currently, educators 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 in giving feedback for design work.

In addition to that, during the pandemic period, educators and senior designers 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 voicing 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, Senior UX designer)

The collective brainstorming software like Miro becomes a common tool to share ideas during pandemic situations. The software allows voting or commenting without revealing the identity of the user, which could remove personal identity from ideas or any presentation on the virtual whiteboard so that it allows smooth decision-making with 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 changes 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, Design educator, Adjunct professor-CCE)

By interacting with design projects physically, it 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 give potential to creative critique structure detached from the traditional setting.

On the other hand, other professors prefer to have more formal critique 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. This can be 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 and also kind of come to a like a 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, Design educator, Associate professor)

Furthermore, recent graduates believe that the critique environment without 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 design process. 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 approach to structure the critique.

Chapter 5 Discussion

This chapter will discuss the research questions based on the findings of the study. It will also review the significance and limitation of the study to suggest the future implication possible from the current research.

5.1. RQ 1: Knowledge transition from ID education to design industry

Research Question 1: In the context of US (United States) higher education, how does the ID recent graduates apply their knowledge obtained from a critique environment in a work setting? Which part helps or hinders their performance at work?

This section will explore the first research questions from the findings of the study. To answer the question systemically, it will be discussed in two parts. The first part will be centered around the benefits from critique experience while the second part will discuss the limitation of critique knowledge in students' transition to the design industry.

5.1.1. Benefits: significance of critique experience in Designer's Professional Identity (DPI) formation

The DPI formation from critique experience seems to support students' transition to the industry significantly. In consistent with previous studies that described the connection between DPI formation and critique (Motley, 2017; Kunrath, Cash and Kleinsmann, 2020), the qualitative

findings supported that critique experience constructs students' independent identity as a designer which help their transition to the proper field of design. As shown in the previous studies on the metacognitive development in critique (Hargrove, 2013; Gray, 2018), critique is the process of continuous discussion and self-reflection which allows students to understand their field of interest in design. This process seems to encourage a thorough consideration of personal identity and profession, leading to independent decision-making on the career path. Link to the findings on the confusing identity of industrial design, shown in section 4.1, this expresses the potential of a critique environment to support students find their design interests in professional fields to tackle the struggle of recognizing their position in a complex boundary of the design industry.

However, unlike the previous studies that emphasized the role of professors in DPI formation (Kunrath, Cash and Kleinsmann, 2020), the findings expressed the significance of peer influence in students' identity formation during critique. While professors play a key role in structuring the critique, they tend to have light involvement in the discussion and rather suggest an independent discussion environment within peers. Due to this, the role of peers in the critique environment seems to be as significant as the role of professors in students' identity formation from critique experience.

However, shown in section 4.1.2, the benefit from the critique environment does not seem to get full support from the academic curriculum While academic critique helps students to build their identity and find the field of interest, the ID curriculum seems to provide insufficient resources on the various demands of students preparing for the transition. The study has shown

that students prepared the significant elements in their transition by self-teaching. This is in line with the previous study that criticized the traditional pedagogy of ID education (Dannels and Martin, 2008; Dannels, Housley Gaffney and Martin, 2011). Specifically, students who are interested in the emerging field of design in the US, such as UI/UX, are disadvantaged by the traditional curriculum in preparation for the transition.

In summary, the previous studies on DPI formation in a critique environment seem to support students' transition from academia to the industry. In this process, peer influence in the discussion was revealed to be as significant as the role of professors. However, the traditional focus of ID pedagogy seems to hinder this benefit from DPI formation in critique experience as students do not get enough curricular support for a successful transition to the chosen field of design, specifically the emerging ones. It was supported by section 4.1.2. which showed recent graduates benefited from self-taught skills rather than academic knowledge in their transition.

5.1.1.2. Hindrance: absence of non-design field in critique

Along with the previous study asserting more multi-disciplinary actions needed in ID (Han *et al.*, 2018), the study emphasized that recent graduates are struggling to understand the cross-functional setting of the industry due to the monodisciplinary atmosphere of the critique. Unlike the academic critique centered around design expertise, the cross-functional setting of the ID industry seems to create a new order of expertise in the discussion which shifts what and how to communicate in critique. Due to this, when recent graduates are not used to working with non-design fields, it is inevitable that they struggle to explain the design process and share feedback

to the people with the absence of design knowledge. This phenomenon confirms Menold *et al.'s (*2018) study that illustrated the recent graduates' struggle to communicate with non-designers.

This phenomenon, the struggle to understand the cross-functional setting of the design industry, seems to conflict with the previous study considering the critique environment as a mirror to portray the real industry (Dannels and Martin, 2008). At least in relation to the work setting, the academic critique does not capture the multi-disciplinary setting of the professional field of ID.

The major element that portrays the professional environment is the involvement of guest critics, or jury, in the final review. However, this element also does not seem to support students' understanding of the cross-functional setting because the impact of their insights appears to be weak. As Hokanson (2012) introduced the final review as the least-successful format of critique, the findings confirmed that the current structure of the final review is a demotivating pedagogical space. As shown in section 4.4.1, recent graduates expressed the demotivational structure of the final review that does not have any next steps to apply professional insights for iterating design ideas. This shows that the role of guest critics will stay weak without the encouragement to involve their insights in the iterative process of design assessments, which is consistent with McDonald and Michela's (2019) concerns on the weak role of the jury in a design critique.

Due to this, the final review seems to require a systematic method to deal with professional insights and involve more voices from the industry in ID education. Interestingly, the current pandemic situation which shifted the critique setting into virtual space seems to

provide new perspectives on structuring critique. Platforms like Miro, shown in section 4.5.1, has an enormous potential to be implemented in collaborative, and cross-functional design activities even after the pandemic is over. Therefore, some tools discovered during the pandemic period could be implemented in the traditional space of critique to tackle the existing issues.

In short, the critique context centered around design expertise hinders students' understanding of the industry culture which challenges recent graduates' encounters with the non-design fields. Additionally, this is intensified by the delicate impact of professional insights in ID education from the current critique structure that involves guest critics at the end of the design process

5.2. RQ 2: the portrayal of the industry in academic critique

Research Question 2: from the experience of professional fields, how accurately does the critique environment portray the real-world setting?

As the first research question discusses the knowledge transition from ID education to the design industry, this section will discuss the second research question to provide a more comprehensive understanding of ID recent graduates' knowledge application.

Dannels (2005) emphasized the role of critique in supporting students to imagine and have indirect experience of the professional design industry. However, the study expressed that

current academic critique is limited in portraying the culture and atmosphere of the design industry which could be linked to recent graduates' struggles viewed in the RQ 1.

5.2.1. Climate of critique environment

In previous studies, researchers were concerned about the negative impact of harsh criticism on students during academic critique (Scagnetti, 2017; Smith and King, 2004). Therefore, this suggested the reconstruction of academic critique into a gentle atmosphere, majorly due to the psychological factors in student learning. This also hinders proper understanding of professional fields in critique because the current setting of academic critique conflicts with the way professional fields share feedback. Therefore, as discussed in section 4.3.1.1, students are struggling to adapt to the new, gentle critique environment of professional fields.

This gap between the critique atmosphere of ID education and the design industry might disrupt the proper portrayal of the design industry which further impacts recent graduates' performance at work. Within the several factors influencing the gap, it seems to be in line with the existence of power dynamics within the study body explored in Martin-Thomsen *et al.'s* (2021) study and the self-driven nature of design assignments that makes students emotionally attached to their own projects. While students tend to be defensive towards the criticism of their projects, the critique discussion sometimes leads to few verbally active students which distort the constructive flow of critique. Due to this, it seems to require careful consideration on structuring the mood of the critique to allow a healthier climate of academic critique which is closer to the reality that could further help students familiarize themselves with the professional field.

5.2.2. Image of a successful designer

The study also explored the idealization of design workspace in academic critique. As the critique is centered around design knowledge, students tend to prioritize design in the professional work process which is different from reality. The majority of the design industry is working in a cross-function setting where designers become one group of communities involved in the entire work process. However, as discussed in RQ 1, recent graduates are struggling to view the multi-disciplinary culture, and this emphasized the limitation in portraying the boundary and position of design in a professional environment.

This also strengthens the significance of understanding the role and responsibility of professional designers in society. As researchers emphasized the discussion on the goal, role, and relationship of design activities in critique (Dannels and Martin, 2008; Scagnetti, 2017) the discussion beyond technical feedback, such as moral or ethics, needs to be considered more actively in the critique environment. It was also emphasized by both recent graduates in the interview, shown in section 4.5.2. By discussing the philosophical aspects of design such as ethical considerations of designers, recent graduates seem to have a better understanding of the designer's responsibility and further realize the boundary of the design practice in a cross-functional setting.

5.2.3. Systematic obstacles in the collaboration between ID education and design industry

Within several types of critique, a final review is where professional insights are actively involved. However, as described in RQ 1, this approach is insufficient to portray the ecosystem

of the design industry. Therefore, more active intervention of industry might be needed in the 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. As Molinoff (2009) illustrated the conflict of interests on the collaboration between American universities and companies, the involvement of professional actors in US design education has a complex issue to tackle. In the context of design, the major conflict is the ownership of ideas and creative property designed in the academic setting. Due to this, it seems to be important to consider the portrayal of the design industry in an academic setting connected to the systematic complexity that existed in institutions.

In short, the current academic critique has some limitations in portraying the professional field of ID. Firstly, the harsh critique style of academia conflicts with the gentle critique culture of reality. Therefore, it is significant to consider the hierarchy that existed in the discussion space as well as students' protective attitude on their projects to view this situation. Furthermore, the critique environment seems to overlook the connections between design practices and other fields of profession. This could hinder the proper portrayal of where design stands in the professional work process in the design industry. In addition, the study explored the unexpected aspect that could inhibit the accurate portrayal of the design industry in critique. It is the systematic complexities around the ownership of creative ideas that decrease the active collaboration between two fields. Therefore, it is significant to consider these aspects in discussing how the academic critique environment generates the image of the design industry and professional designers to design students.

Chapter 6 Conclusion

The expanded influence of industrial design in society opened more career opportunities for recent graduates. Therefore, it requires careful exploration of the role of ID education in supporting students' successful transition to the industry. The study indicated that the critique environment supports independent identity formation of students which helps them realize the field of design interest in their career. However, the preparation process for the field seems to be challenging as the critique is limited in providing resources to understand the design industry. The major limitation was the poor portrayal of the cross-functional culture of the industry which hinders recent graduates' relationship with non-designers in a professional space. Moreover, the study recognized the systematic complexities in the collaboration between design higher institutions and companies in the context of the US, which limits the application of professional insights in the academic design space.

6.1. Significance of the study

This study illustrates its significance by filling the research gap on the knowledge application from ID education to the design industry. Therefore, this could benefit major actors around industrial design, including recent graduates, design educators, and professional designers. For recent graduates, the result of the study portrays their challenging experiences in the field of education which can reduce the further struggles of recent graduates on the career preparation and performance in the cross-functional workspace. For design educators, the study provides an evaluative overview of the current critique environment which suggests an up-to-date curriculum, and inclusiveness of the industry context such as the muti-disciplinary aspect.

This will help educators form a better critique structure to support future recent graduates in their transition to the industry. Lastly, for professional designers, the emphasis on the better portrayal of the industry needed in academic critique could ease their mentoring role by reducing the struggles of novice designers.

Moreover, the present research confirmed the previous studies on ID education and the design industry which could make the connection between the two fields more vivid. For the field of ID education, the study confirmed the significant role of DPI formation in supporting students while depicting the disadvantages of the traditional curriculum and the weak role of juries in final reviews. For the professional field of design, the weak communication skills of novice designers, especially non-designers, are shown to be consistent in the findings of the study. By linking these studies from the result of the current research, it will provide a stronger foundation for understanding the ID students' transition 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 impacts the entire methodological process of the study. Due to the pandemic, the interviews had to be conducted in a virtual format as well as the recruitment and interview process was delayed from the unprecedented spread of the virus in the US. Therefore, the online interview could have influenced the rapport between the researcher and the interviewees. However, supported by the previous study illustrating that the negative impact of the online interviews is only significant to less-responsive participants (Deakin and Wakefield,

2014), the interview was conducted longer than the original plan so that it could provide enough time to build rapport within the interview space.

Moreover, the small sample number of the study is another constraint viewed in the study. Due to the pandemic situation, the sample size was reduced from what was planned. Therefore, the study expressed rich qualitative data with descriptive narratives of actors in different fields of industrial design to tackle the issue of a small sample. This provided multiple perspectives on the research problem as well as in-depth illustrations of the individual experiences. Additionally, this study identified some important themes that could be explored in larger qualitative studies in the future.

6.3. Further exploration of the research

Based on the research findings, the present study suggests a few areas that are possible to expand in the future. Firstly, further research on the tools to structure critique environment would provide rich data to tackle the issues raised from the current research. As the present study indicated the need for increased philosophical discussion, inclusiveness of various topics, and the method to capture feedback within the space of critique, further investigation on the tools to tackle these issues will be meaningful to improve the critique environment in ID pedagogy. Additionally, the current study recognized the potential of virtual tools used during the pandemic period so that this can support the further exploration of the tools to create a critique experience as well.

Secondly, the systematic obstacles in the collaboration between ID education and the design industry need to be further explored to improve the active involvement of professional actors within the academic space. This is a significant but complex aspect to tackle to improve the student preparation in ID pedagogy. Therefore, future research could explore the issue with various approaches, which is not only from the design field but also the external area such as legal practices and institutional relationships. It would be impactful to take a qualitative approach with in-depth interviews with major stakeholders, such as department chairs and legal team of companies, to vividly overview the conflicts of interests tangled 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 in the curricular design of ID to support students with up-to-date resources while providing an accurate boundary of industrial design in the design community. This is a fundamental area to investigate to tackle various issues around industrial design, including the critique space. Therefore, further research could explore the definition of industrial design in the design labor market as well as the implication of the current curriculum in the popular field of design to support students with the application of design trends.

This study explored the influence of critique in recent graduates' transition from ID education to the design industry in the context of US. Led by two research questions asking the impact of ID education in the transition to the design industry and the portrayal of the design industry in ID education, the present study revealed important findings that could foster the understanding of the bridge between ID education and the design industry. The study showed that critique experience supports students to build their identities as designers but is limited in supporting their preparation for the future due to the outdated curriculum. Moreover, the absence

of non-design fields in academic critique limits the understanding of the design industry's cross-functional setting, hindering recent graduates' performance with non-design areas. It suggests a more systematic approach required to structure critique environment to encourage students more actively participate in the discussion while promoting more involvement of professional insights and non-designers to have 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 <u>academic critique</u> 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

UNIVERSITY OF OXFORD
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Email:general.enquiries@education.ox.ac.uk

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: Rebecca Eynon <rebecca.eynon@oii.ox.ac.uk>, Sejin Hwang <sejin.hwang@education.ox.ac.uk>
Cc: Student CUREC <student.curec@education.ox.ac.uk>
Subject: CUREC ED-CIA-21-188 - Approval

Dear Sejin,

Title: Exploring the impact of industrial design critique on students' academia to industry transition; an interview study
Ref: ED-CIA-21-188

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 student.curec@education.ox.ac.uk for consideration.

Good luck with your research study.

With best wishes,
Laura Molway
Member of DREC