

LEARNING DURING A DIGITAL TRANSFORMATION
IN COMMUNICATION DESIGN: FACULTY, PROFESSIONAL, AND STUDENT
VIEWS ON CHANGING PEDAGOGICAL PRACTICES

by

Laura S. Scherling

Dissertation Committee:

Professor Richard Jochum, Sponsor
Professor Olga Hubard

Approved by the Committee on the Degree of Doctor of Education

Date May 20, 2020

Submitted in partial fulfillment of the
requirements for the Degree of Doctor in Education
Teachers College, Columbia University

2020

ABSTRACT

LEARNING DURING A DIGITAL TRANSFORMATION IN COMMUNICATION DESIGN: FACULTY, PROFESSIONAL, AND STUDENT VIEWS ON CHANGING PEDAGOGICAL PRACTICE

Laura S. Scherling

Digital technologies have become fundamental to communication designers in their professional practice. The speed of technology change has been profound, and communication design educators, professionals, and students are challenged with reimagining what constitutes an education responsive to digital transformation. Attempts to address these changes have often been reactive, emphasizing digital skills requirements without always examining what practices best support design students as they prepare to pursue careers in various communication design-focused positions. The question of how educators can best prepare and support communication design students for what awaits them in the workplace is at the center of this study. Through mixed-methods research, including both survey analysis and in-depth semi-structured interviews (N=202), this dissertation attempts to answer that question by analyzing practices incorporated by communication design educators, professionals, and students.

© Copyright Laura S. Scherling 2020

All Rights Reserved

ACKNOWLEDGMENTS

There are many people who helped me with this process of completing this dissertation.

I would like to thank my advisor, Professor Richard Jochum, and the dissertation committee, Professor Olga Hubbard Orvananos, Professor Paulo Blikstein, and Professor Joey J. Lee.

I would also like to thank Dr. Laurence Wilse-Samson and George Njuguna for your editing advice and countless insights throughout this project.

Finally, I would like to thank my mentors Dr. Shannon Mattern, Dr. Nitin Sawhney, Professor Judith M. Burton, Professor Mary Hafeli, Peter Haratonik, Samantha Clay-Reagan and my colleagues Eunji Lee, Jaclyn Griner, and Brian Bulfer. I would like to thank Sohee Koo and Jung Hee Han for lending extra support and kindness this Spring—in the midst of an unprecedented Covid-19 pandemic—as I finished writing this. I would also like to thank my family—my husband, my son, my parents, aunts, and uncles for your endless support.

Finally, I'm grateful to the hundreds of research participants who contributed to the study survey and interviews—which made this dissertation possible.

L. S. S.

TABLE OF CONTENTS

Chapter I – INTRODUCTION	1
Background of the Problem	6
Problem Statement	12
Research Question and Study Hypothesis	14
Research Question	15
Study Hypothesis	16
Researcher Positionality and Theoretical Framework	16
Assumptions	22
Assumptions not to Be Debated.....	22
Assumptions to Be Debated.....	23
Significance of the Study.....	24
Chapter I Summary.....	26
Chapter II – REVIEW OF THE LITERATURE	29
A Digital Transformation in Communication Design Education: Changing Pedagogical Practices	30
A 21st-Century Digital Design Skills Debate.....	38
Job Satisfaction in Communication Design.....	44
The Rapid Emergence of Digital Technologies in Communication Design Education: 1960s to Present.....	46
A Historical Evolution of Communication Design Education	54
Apprenticeship Model.....	58
Studio/Workshop Model.....	61
Vocational Model.....	63
Trade schools.	64
South Kensington Model	65
Corporate Work Model.....	67
Bauhaus Model	70
Chapter II Summary	72
Chapter III – METHODOLOGY	75
Introduction.....	75
Methodology.....	76
Mixed Methods: Explanatory-Sequential Design.....	76

Quantitative Methodology: Explanatory and Exploratory Data Analysis	76
Qualitative Methodology: Thematic Coding	77
Mixed Methods: Developing a Joint Display	78
Design of Study	79
Participants.....	79
Student participants (interviews).....	80
Educator and professional participants (interviews).....	80
Recruitment channel (interviews).....	81
Data Collection	81
Open-Ended and Closed-Ended Survey Questions.....	82
Semi-Structured Interviews	84
Limitations of Research.....	87
Logistical Limits	87
Time limit.....	87
Geographical limit.	87
Participant sample size.....	88
Theoretical Limitation	88
Role as a Researcher	88
Cultural bias.....	89
Positive results bias.....	89
Data Analysis.....	90
Quantitative Data Analysis	91
Qualitative Data Analysis	91
Ethical Considerations.....	92
Confidentiality Procedures.....	92
Aliases.....	93
Informed Consent.....	93
Diversity.....	94
Research Benefits: Remuneration.....	94
Remuneration: additional considerations.....	95
Chapter III Summary	95
Chapter IV – FINDINGS	98
Introduction.....	98
Descriptive Analysis: Surveys.....	99

Demographic Data	99
Survey population demographics.....	99
Occupation	101
Job preparedness.	104
Attitudes on the development of digital technologies in design.	104
Use of digital technologies.....	105
Daily practices in communication design.	105
What educational practices to develop.	105
Digital Proficiency between Design Educators, Professionals, and Students	105
Analysis of Variance (ANOVA).....	106
Specializations in Communication Design among Design Educators, Professionals, and Students.....	107
Analysis of variance (ANOVA).....	107
Skills for digital technologies.	108
Descriptive Data: Interviews	109
Demographics	109
Survey population demographics.....	109
Thematic Analyses of Survey and Interview Data	111
Theme 1: Changing Practices in Communication Design Education.....	113
Technical/Digital Skills Development and Preparedness.....	113
Staying Up To Date with Practices in Communication Design.....	114
Technical Skills Development in Communication Design Education.....	118
Soft Skills Development in Communication Design Education.....	122
Theme 2: Pedagogical Challenges in Designing for the Real World	123
Learning To Design For the Real World	124
Learning To Use New Technologies for Real-World Applications	127
Theme 3: Pedagogical Practices to Support Students in Communication Design Education	129
Supporting Students Entering the Communication Design Profession	130
(Code 1) Flexible Learning with Digital Technologies	136
(Code 2) Conceptual Clarity	137
(Code 3) Communication.....	138
(Code 4) Abstract Thinking	139
(Code 5) Free Thinking and Creativity.....	140
(Code 6) Mentoring.....	142

(Code 7) Pedagogies for Self-Directed Learning and Continuous Learning	147
(Code 8) Teamwork and Collaboration	154
(Code 9) Experimentation and Play	160
(Code 10) Real-World Experience.....	169
Real-world simulation.....	169
Real-world experience – fieldwork, internships, apprenticeships, and job opportunities.	171
(Code 11) Mental Health and Well-Being	174
Chapter IV Summary	178
Chapter V – DISCUSSION	189
Study Reflection	189
Chapter V Summary	205
Chapter VI – CONCLUSION AND IMPLICATIONS FOR FURTHER RESEARCH	208
Educational Implications and Recommendations.....	212
“Capacity Building” For a Digital Transformation	212
Resource allocation.....	212
Self-directed learning.....	213
Agile learning and flexible learning methodologies.....	213
Conceptual clarity and teacher clarity.....	214
Productive failure.....	215
21st-century teamwork and collaboration.....	216
Real-World Pedagogies	217
Mentorship.	218
Mental Health and Well-Being	219
Epilogue.....	222
REFERENCES	224
Appendix A – Survey Protocol.....	249
Appendix B – Semi-Structured Interview Protocol	257

LIST OF TABLES

Table	Page
1. Historical Roles of Communication Designers.....	55
2. Common Educational Models in the History of Communication Design Education... 58	58
3. Participant Selection Criteria	80
4. Summary of Methods.....	83
5. Survey Protocol.....	84
6. Interview Protocol.....	86
7. Research Limits	90
8. Survey Respondents.....	100
9. Race and Ethnicity	100
10. Educational Attainment	103
11. Cross Tabulation and ANOVA: Digital Proficiencies among Groups	106
12. Cross Tabulation and ANOVA: Differences in Specializations among Groups	108
13. Cross Tabulation: Views on Practices to be developed in Communication Design. 109	109
14. Interviewees	110
15. Thematic Categories in Survey and Interview Responses.....	112
16. Thematic Codes in Survey and Interview Responses: A Summary of Codes and Examples.....	131
17. Mentoring.....	142
18. Career Development through Teacher Mentorships	143
19. Resource Allocation in Teacher Mentorships.....	144
20. A Culture for Mentoring	145

21. Professional Mentorship	146
22. Self-directed Learning and Continuous Learning.....	147
23. Time Allocation and Planning for Self-directed Learning	149
24. Time Management with Continuous Learning	151
25. Assessment of Continuous Learning Needs in Higher Education	153
26. Teamwork and Collaboration	154
27. Group Learning in Multidisciplinary Teams	155
28. Community-building and Networking.....	158
29. Places for Networking.....	159
30. Experimentation and Play	160
31. Methodologies for Experimentation and Play	161
32. Methodologies for Experimentation and Play	162
33. Research-driven Prototyping	163
34. Experimentation and “Playtesting”	165
35. Productive Failure	167
36. Entrepreneurship	168
37. Real World Experience	168
38. Mental Health and Well Being	174
39. Mental Health Resources	177
40. Self-care Resources.....	177

LIST OF FIGURES

Figure	Page
1. Job Satisfaction among Designers (AIGA 2017 Census, 2018).....	45
2. Digital Telepathy (Lopez, 2016).....	53
3. Study of a Thistle, 1850.....	65
4. Card-Exercise V: Vertical Repetition, 1878.....	67
5. Pedagogical Sketchbook, 1968.....	71
6. Participants' Occupation.....	101
7. Participants' Work Experience.....	102
8. Design Disciplines.....	103
9. Desired Outcomes of Flexible Learning and Conceptual Clarity.....	182
10. Desired Outcomes of Increased Flexible Learning Options.....	183
11. Activities Providing Opportunity for Productive Failure.....	184
12. Experiences and Teamwork for Preparing for the Real-World.....	185
13. Expanding and Nurturing Real-World Experiences.....	186
14. Desired Practices of Communication to Improve Teamwork and Collaboration.....	187

Chapter I

INTRODUCTION

The world we live in looks a lot different than what it did 20 years ago when commercial Internet use was just gaining popularity and finding its foothold in educational and professional settings. Technological advances occurring through a digital transformation constitute a phenomenon not seen or experienced before, with many of these changes occurring at a greater speed than the previous periods of technological advancements (Siebel, 2019; United Nations Secretary-General, 2019). Thanks to mobile and Internet connectivity, we now live in a more “digitally-connected world,” where there are “complex impacts on education systems and labor markets” (United Nations Secretary-General, 2019, p. 3). Digital technologies are changing society while initiating unprecedented advances. David Rogers, Faculty of Executive Education at Columbia Business School compares a digital transformation to earlier periods of mechanization and electrification:

Today our digital-born businesses (such as Google or Amazon) are like the electrical companies of the early electrification era. And our savvy digital adopters [...] are like the factories that learned to retool and advance into the next industrial age. (2016, p. 3)

Many researchers, educators, and organizations consider the digital transformation of work and education to represent a later stage of technological progress, suggesting that digitization is in the process of being better understood or achieved

(Collin et al., 2015; Grossman, 2016; Khan, 2016; Westerman, Bonnet, & McAfee, 2014). When an organization or a group in society has *digitized* or undergone the “process of converting [work] to [a] digital form,” it has undergone a digital transformation—yet many organizations, schools, in particular, are still in the process of implementing changes to enable “access to digital networks” and “digital goods,” learning to share digital resources, and finding ways to be more proactive about the use of digital technologies.

While a digital transformation is a technical process, it is also an educational and a learning process that widely applies to the way organizations function on a day-to-day basis and largely influences how education is designed and delivered, and the ways in which jobs are structured and carried out (Khan, 2016, pp. 3–5). According to education professor Michele Knobel (2008), “[...] *digital transformation* [...] is achieved when the digital usages which have been developed enable significant change within the professional or knowledge domain” (p. 173). Among varied concerns related to a digital transformation, from security to accessibility, the education of students is a major consideration and undertaking (AIGA & Google, 2016; Google, 2019; Maeda, 2019; Stinson, 2019; United Nations, 2019). According to a United Nations (2019) report on “Digital Cooperation”:

Modern schools were developed in response to the industrial revolution, and they may ultimately need fundamental reform to be fit for the digital age –but it is currently difficult to see more than the broad contours of the changes that are likely to be needed. Countries are still in the early stages of learning how to use digital tools in education and how to prepare students for digital economies and societies [...] (p. 13)

Organizations across all sectors of the economy are grappling with a digital transformation of education and professional work. It has now been decades since digital

technologies began to rapidly diffuse, first with commercial Internet use, followed by the development of “social media, [...] big data, and artificial intelligence”—changing education and work as we know it (Bughin, Manyika, & Catlin, 2019, p. 1). Yet, the digitization of education and work processes has been relatively slow; with organizations achieving only around “25 percent of the potential” in leveraging new and emerging digital technologies—with many businesses lagging behind “hyper-scale digital businesses” like Google, Amazon, Facebook, and Apple (Bughin et al., 2019, pp. 1–2; Huk, 2017; Knobel, 2008; Grossman, 2016; Westerman et al., 2014). It remains to be seen if the jolt of the COVID-19 pandemic will provide further impetus for the growth of online and digital education, including in communication design.

With these remarkable changes in mind, there is the question of whether communication designers today feel prepared to solve the most contemporary and complex digital and interactive challenges in their educational and professional work in order to stay relevant and to be forward-thinking (Arnett, 2019). Specifically, this dissertation investigates the ways digital transformation has impacted students studying to become communication designers. Are designers ready for a future where the very “context for professional practice” is constantly morphing (Davis, 2019)? As designer and educator Meredith Davis puts it, “technology plays an outsized role in shaping the future of design” (Davis, 2019). Designer and educator Michael Bierut (2019) posits that today, the “cost of entry to participate” is now the “software program or... fluency in one particular, specific kind of media application.” However, Bierut (2019) observed that these skills are a minimum requirement, and “what [the] future of design and the future of

design education [must do is] make room to prepare people to enter a world which is going to reward that sort of energy and curiosity.”

Communication designers now face a widespread digital transformation and need to respond to these changes both educationally and professionally. To a great extent, practices related to a digital transformation are deeply embedded in the profession of a communication designer, who creates and visualizes the communication and information systems that are used “to address functional communication needs” (National Association of Schools of Art and Design, 2017, p. 120). Communication design refers to a mixed professional focus in visual and graphic design, interactive and experiential design, website/user interface (UI) and product design, multimedia design, advertising design, user experience design, and visual communications research (Cezzar, 2017a; Parsons School of Design, n.d.). In communication design, designers think conceptually and “shape messages in content, form, and delivery,” — often for a mass audience (Luminant Design, n.d.; School of Visual Arts, n.d.). A digital transformation doesn’t impact professional designers alone. Instead, it impacts the entire design community of educators, professionals, and students.

Designer and technologist John Maeda and design writer Liz Stinson state that digital technology use in design is “rapidly unseating more traditional design fields” (Maeda in Stinson, 2019). With these extensive changes in communication design practice, Maeda argues that it is necessary for design professionals, educators, and students to learn to “shape and wield” technology in design (Maeda in Stinson, 2019). But, what precisely does it mean to *shape* and to *wield* technology in everyday practices as designers? Maeda and Stinson (2019) observed that as the “value” of traditional design

is “decreasing” and there is more pressure to “prepare themselves for a constantly shifting industry and constantly changing expectations,” designers must gain more real-world experience in digital product creation “to stay relevant.” With this in mind, there is pressure for designers to prepare for a “hybrid-skilled future” (Maeda in Stinson, 2019).

Designers—who collectively come from varied, but also intersecting, backgrounds in multiple disciplines of design, the visual arts, engineering, computer science, and research—together have described a future in design as being “digital” and “interactive” (AIGA & Google, 2016). The pressure that designers experience to conceptualize, prototype, *design*, and build digital media and content, electronics, and software has become an urgent matter to address in communication design education (see Cezzar, 2017a; Davis, 2019a; Davis, 2019b; Vizard, 2017).

In a digital transformation, digital technology use has permeated nearly every facet of our lives. For many, digital technologies are present from the moment we wake up and check our smartphones, imbuing educational and professional work, often saturating our evenings with browsing the Internet, communicating on social media, email, and messaging apps, as well as watching streaming video or downloading media.¹ Despite the pervasiveness of digital technologies, finding innovative, creative ways to adapt technology in schools and in the workplace can still be a challenge.

This research is motivated by my personal journey of learning to be a designer amidst a remarkable and accelerated period of technological change—between 2003 to present. During this time, I noticed that there was no particular code of ethics,

¹ Digital gaps continue to persist in many low-income, rural communities, and developing nations (Anderson & Kumar, 2019). Lack of access to digital technologies, or a digital divide, continues to be a central focus among many organizations and policy-makers who seek to make Internet services more readily available (Anderson & Kumar, 2019).

framework, model, a specific theory, or a set of guidelines for me, personally, to understand and make sense of a digital transformation in communication design and in my own education as a designer.

Background of the Problem

Since embarking on my design and research career in 2003, I have seen communication design move toward embracing digital technologies, at times struggling to seamlessly integrate new practices to accommodate the massive change in the way people communicate and exchange information. This change in media production and consumption led up to the invention of desktop publishing and growth in commercial Internet use, which created a demand for designers with digital skills—technical, conceptual, and social. Communication design—which was primarily print- and broadcast-based until the early 2000s—expanded to include roles such as interactive and web designer, motion graphics designer,² mobile interface designer,³ user experience designer, and user experience researcher,⁴ information architect,⁵ augmented and virtual reality designer, machine learning designer, and more (AIGA, 2015a, 2015b; Adweek Staff, 2017; Cezzar, 2017a; Heller & Womack, 2011, pp. 14–16; U.S. Bureau of Labor

² A motion graphics designer and animator designs for commercial broadcast and film.

³ A user and mobile interface designer designs software used for digital services and platforms for web and mobile (Cezzar, 2015).

⁴ A user experience (UX) designer conducts qualitative and quantitative research to inform human-computer interaction (HCI) (Cummings, 2017). One of the primary undertakings of a UX designer is to study and simplify the “total experience” of a computer and Internet user as they navigate through a website or a mobile application (Cezzar, 2015).

⁵ An information architect creates the structural design for web and mobile applications and information environments such as libraries and databases.

Statistics, 2016a, 2016b). However, as roles in design expanded to welcome the use of emerging technology use, it also became readily apparent that there were more “complex systems” to design, and there were new “issues of sustainability, technological feasibility, and economic viability” to confront (Davis, 2019).

To point out how the roles of communication designers have expanded, it is important first to describe some of the positions that have transcended traditional roles in print and broadcast design.^{6,7} Some designers work in brand identity-focused design positions at advertising firms and branding boutiques, such as Wkshops, 2x4, and Mother Design, where they balance their time designing for multimedia applications (including digital, print, and broadcast) with shaping their managerial capabilities, honing their creative problem solving and argumentation abilities. At the same time, they have to engage in frequent interactions with clients.

Research-focused design positions have also become increasingly important, with designers working at global innovation companies like IDEO or studios like Brave UX and Humanist. These companies require communication design students entering the profession to have a mastery of designing for multimedia applications, along with some skills in qualitative and quantitative research methods, data analysis, and the ability to translate these insights into visual and written recommendations, presentations, and case studies.

⁶ The contexts and terminology used in this paper have a limitation, in that it largely considers communication design in the context of the United States and in North America. However, there were a number of non-American research participants who participated in this study.

⁷ This list of communication design positions is not exhaustive, intended to illustrate a sample of the contemporary design positions available. A more comprehensive listing of communication design positions can be viewed through the AIGA Censuses (2017, 2019).

One of the most significant changes in the communication design profession has included the rapid growth of digital product design, which has resulted in the development of user experience (UX), and user interface design (UI) positions at technology companies such as Google and Facebook and technology start-ups, and in independent firms and studios that have growing computer science and information technology-focused job requirements for designer positions. Many of these UX and UI positions have also matured into roles where digital product designers are needed (Babich, 2017). Candidates coming in to fill these positions are frequently required to be well-versed in coding and web development practices, as well as be proficient in qualitative and quantitative research methods such as usability heuristics and A/B testing. In some of these positions, it may also increase a candidate's likelihood of success if they have some experience with algorithm design and development, data modeling, and immersive technologies such as augmented reality (AR) or virtual reality (VR) development.

Some designers specifically seek out roles that have a positive social impact on the communities they work in. These roles are hybrid positions where designers work in social innovation design studios and firms—operating as independent businesses, think tanks, and as in-house studios in organizations. They often require students to be well versed in print and digital design, in conducting community outreach, engaging with creative problem solving, while also having strong abilities in writing and designing research proposals and presentations. These design roles take part in “community projects that create positive social impact” (AIGA, 2017). In nonprofit organizations designers may also work with social media design, website development and administration, while

collaborating with other communication professionals on their team to measure overall marketing effectiveness of fundraising and awareness campaigns (AIGA, 2017).

Reflecting on my own earlier studies in design at the School of Visual Arts and the School of Media Studies at The New School (NYC), my interests and education were mainly focused on branding, advertising, and marketing design and research—with only some experience in coding and data analysis. In 2003, I did not foresee that such a broad scope of digital technology-focused design jobs would soon exist; yet, by 2007, at the start of my career as a junior designer, it became clear how quickly the desired and required skill set to become a designer were being redefined by digital technology use. Mass Internet culture, social media, mobile applications (apps), dynamic websites, big data, and immersive technologies were now integral components of what designers engage with in their everyday work in studios, businesses, organizations, and schools (AIGA, 2015b; Heller & Vienne, 2015; Heller & Womack, 2011).

Soon after starting my career as a designer, I found that projects at work frequently required me to craft creative pitches and data-driven stories for clients in local and global projects. Moreover, designing in multiple modalities for both print and digital media—and more often for digital applications—became an undeniable necessity. Without much guidance, I learned to track the outcomes and success of various campaigns through user experience research, assessing users' behaviors in “real-time” digital modalities such as dashboards, in press coverage, and by generating and evaluating user-generated content on websites and social media.

At times, the new “digital” job requirements of being a designer seemed daunting. For example, I recall a time in 2008 when my manager asked me why I could not teach

myself programming and digital design skills more quickly. It often led me to question what was missing from my previous education and personal professional development. I had just begun developing my career; however, my encounters with digital technology change and the digitization of design encouraged me to re-assess my skills. I did not feel as though I had the skills needed to grow and succeed in the future. I identified gaps in my knowledge about digital technologies and began to plan how to become more responsive to changing job requirements, also with the concern of somehow falling behind.

I felt determined to become an avid participant in the “app generation.” In my free time, I learned to code websites. I built a new designer persona online, where potential clients and collaborators could view my work. Yet, even as I refined my technical skills, I worried that I lacked yet other skills, such as how to manage a design project effectively or how to build a meaningful strategic plan as part of a design. As I refined my technical skills with reservations to whether I was missing certain skills, digital technologies increasingly seemed to saturate every moment of the day, my career, as well as impacting my behaviors as a consumer (Boyd & Crawford, 2012). My career progressed and I became more involved in professional networking in communication design. I became aware of the design job landscape around me, and I observed the designers I knew working in hybrid digital and print jobs, or with digital technologies more exclusively. I saw that digital technology-use in communication design demanded much attention as social media, websites, blogs, podcasts, Apple and Android apps, and data visualization became increasingly more popular than printed materials.

Some of my colleagues became successful designers and creative directors working at boutiques specializing in editorial, book, and packaging design. Yet, digital technologies had also become a part of their “design” processes, as very little media could be executed by hand. In contrast, I also had colleagues who felt pressured to make the transition into a digital technology-focused design job. Another group of my colleagues—avid adopters of digital design—embraced these swift developments brought on by a digital transformation of communication design, and adeptly learned to code and to work with database design and other computer science-oriented areas of design. I wondered how they were learning to master these new technologies.

There was a sense of urgency around preparing and training for a digital transformation of design, where familiar hands-on tools and recognizable workflows in design seemed as though they were heading toward obsolescence. My immediate experiences with living and working through this transformation often led me to wonder what these changes would mean in communication design education. As designers completed their studies and moved into the workforce, what did they need to know to thrive and persevere in the field? How were design professionals and educators dealing with the digital transformation of communication design? As many design jobs move to embrace digital technologies, what kinds of jobs would now be available to design students as they entered the profession? This led me to further consider the dilemma that designers, specifically design students, were presented with, as the pressure to understand and work comfortably with emerging digital technologies continued to escalate.

Problem Statement

A digital transformation has substantial implications for communication design students, the educators who teach them, and the design professionals who will one day hire them. Together, design educators, professionals, and students play important and integrated roles in supporting communication design students' ability to solve "complex problems" driven by digital technology change (Davis, 2019). With digital technology change, there is a growing and urgent need to "acknowledge fundamental changes in what work demands," where careers in communication design in digital design and software development are estimated to increase by as much as 24%, while jobs in publishing are projected to decrease by as much as 14% (Davis, 2019; U.S. Bureau of Labor Statistics Occupational Outlook 2016–2026). In the U.S. alone, the AIGA approximates that "2,500 college programs [...] that teach content related to the field at some level, much of it grounded in principles of traditional graphic design" are at "risk overproducing graduates for types of work designers are unlikely to sustain across their professional careers" (Davis 2019, see AIGA Design Futures, 2019). In alignment with this outlook, as traditional jobs in communication design migrate to be digitally-focused, "designers in newspaper, periodical, book, and directory publishers are projected to decline 22 percent from 2018 to 2028," while designers well versed in "programming languages and digital multimedia tools" are "projected to grow 13 percent from 2018 to 2028," pointing to major shift in work, too (U.S. Bureau of Labor Statistics, 2020).

With these urgent changes in communication design in mind, implications of a digital transformation warrant new challenges and benefits, spurring unanswered

questions about how to best support design students through this rapid transition, entrenched in ongoing debates regarding the overall sustainability of existing design education practices, many of which have been relevant in design for centuries. The tangible processes and materials that designers primarily worked with to convey messages to their audiences have given way to intangible, digital, computational mediums that are heavily divergent from “materials of the past” (Maeda, 2019).

In response to an all-encompassing digital transformation, educational practices—or *pedagogical practices* in communication design—have been slow to respond, at times overemphasizing digital skills and skills-requirements before considering what other necessary steps can be taken to support design students learning to use digital technologies. In addition, there is a need to better understand what other skills, beyond facility with new software, communication design education should develop. Pedagogical practices in this research are understood as the comprehensive ways in which students actively engage with their learning processes. These processes include a combination of methods, activities, interventions, and frameworks. In considering some of the shortcomings with existing pedagogical practices in design, Davis (2019) cautions against a reactive response:

While there is never-ending pressure to expand students’ short-term skills to match qualifications for entry-level employment, college faculty must be cautious not to overload curricula with content of temporary relevance at the expense of more enduring knowledge that transcends a rapidly changing context (para. 15).

The question of what supportive pedagogical practices should be developed in communication design education is at the center of this study. Given the diverse perspectives on the problem, this research considers the views of educators,

professionals, and students, to best understand the challenges experienced among these three groups and to try to tease out from a variety of perspectives what changes in communication design education might be necessary in order to better prepare design students for a digital transformation (see Huk, 2017; Knobel, 2008; Grossman, 2016; Westerman et al., 2014).

Furthermore, combined with gaps in existing research on how to support communication design students and on what appropriate learning practices look like as the technological requirements of a designer's job deepen, additional research is needed about pedagogical practices in communication design that are sensitive to a digital transformation (AIGA Design Futures, 2019; Kolko, 2012; National Association of Schools of Art and Design, 2019; Maeda, 2019). This evidence on the challenges related to supporting communication design students learning with digital technologies as they pursue a profession in design has motivated the following research questions (AIGA, 2015b; College Board, 2015; Perrin & Duggan, 2015; Rainie, 2018).

Research Question and Study Hypothesis

Drawing on the background to the problem, the following research question, sub-questions, and study hypothesis are presented. The research question investigates the views of communication design educators, professionals, and students in their use of digital technologies, and feelings of preparedness when it comes to utilizing new and emerging technologies, as well as the pedagogical practices that these three groups of

designers incorporate. The study hypothesizes that digital transformation has significantly impacted views on educational and professional requirements among the groups studied and asks whether views on how communication design education should adapt differ between the three groups.

Research Question

Given a digital transformation in communication design, what pedagogical practices should communication design education develop and integrate to support design students entering the profession?

- How have pedagogical practices in communication design education been adapted to address digital transformation?
- Given that college-level communication design education is increasingly focused on the use of digital technologies, how prepared do students consider themselves to use them?
- As digital technologies have become fundamental to communication design and education, what changing practices and trends are communication design educators, professionals, and students faced with?
- What pedagogical practices do communication design educators, professionals, and students adopt to respond to a digital transformation in communication design education?
- How do the views of communication design educators, professionals, and students compare in terms of how they respond to a digital transformation?

Study Hypothesis

Pedagogical practices and frameworks in the digital transformation of communication design and design education have a significant effect on the educational and professional requirements of communication design educators, professionals, and students.

- Educators, professionals, and students have different perceptions as to how pedagogical practices should be adapted to a digital transformation in communication design.

Researcher Positionality and Theoretical Framework

Through my positionality as a researcher and practitioner, I am keenly aware of the transformative impact that digital technologies have had on communication design education. This has resulted in my sincere interest to pragmatically understand the disruptive and systematic changes that have occurred in communication design education, aligned with communication design's intrinsic relationship to digital technologies (Hayles, 2012; Mitcham, 1994; Scharff & Dusek, 2013). In a pragmatic view, I see that these changes can ultimately *not be resisted or neglected*, but critically, socially, and culturally interpreted to achieve the most transformative, supportive, and educationally inclusive outcomes possible.

My view is aligned with designers, design educators, and researchers such as Meredith Davis (2019), John Maeda (2019), Dana Arnett (2019), Michael Bierut (2019), Steven Heller (2006, 2009), Juliette Cezzar (2017)—who have all been prominent in publishing on topics related to digital transformation changes and challenges. In seeing that educational and professional work is increasingly mediated through technology, I draw from their research, viewing the importance of considering the social effects of technology but also seeing the need to engage in problem-centered, user-centered approaches to collaboratively understand and solve digital transformation problems, and better support design students. Keeping these design researchers' views in mind, design students and professional designers should not only be strong visual communicators but also develop a mastery of the digital technologies in design (see Heller, 2006). According to Steven Heller, the “rejection of digital technology in design” is no longer an option for most designers (Heller, 2006). Today, the scenarios and use cases for digital technology use continue to widen and many existing jobs in design are “vulnerable” to a digital transformation (Cezzar, 2017a). Juliette Cezzar observes that “technology will also shape the future designer, though not exactly the way you may think” as communication design increasingly shifts to embrace, for example, a focus in systems design, strategy and management (Cezzar, 2017a).

In agreement with these researchers' viewpoints, I see that thoughtful, action-oriented considerations should be made in order to ensure the longevity of the communication design profession, where design students' ability to navigate the complexities of a digital transformation might be viewed as a multi-faceted challenge. Meredith Davis (2019), John Maeda (2019), Dana Arnett (2019), and Michael Bierut

(2019) mention the importance of designers' making considerations to remain both relevant and forward-thinking (Arnett, 2019). Therefore, communication design education should consider moving on from a reactive condition toward emerging technologies (Davis, 2019), where we work together toward being more flexible in our response to a rapidly shifting profession with continuously shifting digital technologies (Maeda, 2019). As Michael Bierut (2019) described, we ought to think beyond having a basic set of technical skills and reward designers who approach technologies in an energetic and curious fashion. Looking back, in earlier periods of mechanization and industrialization, it is with this attitude and drive to solve problems that designers have overcome massive technological changes in design (Jury, 2012).

Furthermore, to date, there is limited research that addresses the role of a digital transformation in communication design education, with much of the ongoing research on pedagogical practices responsive to a digital transformation taking place in the digital humanities (Beetham & Sharpe, 2013; Hayles, 2001, 2012; Stommel, 2015) and in media production and theory (Celaschi, 2017; Cham, 2017; Hasnat, 2015). Prominent research in communication design education frequently considers the formal, social, critical, and theoretical aspects of design (AIGA, 2015b; Beller, 2017; Bridges, 2012; Butler, 1995; Eskilson, 2007; Giloi & Toit, 2013; Logan, 2006; Meggs & Purvis, 2006; Remington & Bodenstedt, 2003). In terms of design, digital humanities, and visual arts education research, I draw from the insights of Victor Margolin (1989), Ellen Lupton (1991), Nigel Cross (2001), David Jury (2012), Paul Duncum (2018), Johanna Drucker (2010), Clive Dilnot (2015), and N. Katherine Hayles (2001, 2012).

I also am influenced by research conducted by Shannon Beller (2017) and Amanda Bridges (2013). Bridges (2013), much like Beller (2017), mainly focused on design aesthetics and creativity in graphic design and addressed such competencies as interpersonal skills (Bridges, 2013, p. 4). These studies were influential to my dissertation research as they inquire into what design education responsive to students' needs can look like. I aimed to build on the named research through my extended focus on a digital transformation in communication design education.

This research is also influenced by scholarly work of design, media, and visual arts educators and theorists: Lewis Mumford (1934), Jacques Ellul (2001), Marshall McLuhan (1964), Neil Postman (1993), Lawrence Lessig (2002, 2009), Arthur Efland (1983), Sherry Turkle (2012, 2015), Clay Shirky (2009), Douglas Rushkoff (2011), Robert W. Sweeny (2010), Steven Heller (2009, 2015), Danah Boyd (2014), Howard Gardner and Katie Davis (2013), Johan Redström (2017), Juliette Cezzar (2018), and Daniela K. Rosner (2018). In these seminal works, the authors examine historical and contemporary technology change, its effects through industrialization, mechanization, and digitization, and the emergence of a digital transformation. This prominent research exhaustively considers technology change in a new digital economy, shaped by innovation and technology use.

Outside of research conducted in design, media studies and theory, and the visual arts, my positionality is influenced by the scholarly research conducted in business research, management, and analytics. Business educators and professionals have widely published on digital transformation, including works by David L. Rogers (2016), Neil Perkin and Peter Abraham, Lindsay Herbert (2017), Isaac Sacolick (2017), Chuck Martin

and Michael Lewrick (2018). Notably, a surge of these publications has appeared since the 2010s, with many of these researchers engaging in a similar argument—that a “fast-moving digital environment has been disorienting for traditional businesses” and to succeed, businesses need to harness a digital transformation (D. Rogers, 2016). While business research has some influence in this dissertation research, digital transformation in the financial and technology sector is not always generalizable to communication design and education.

It can be argued that this information-sharing gap in communication design research, visual arts research, and business research limits a more unilateral approach to pedagogical practices and skills development in communication design education. The data collected in the field of communication design has mainly drawn from the insights of communication design faculty and professionals, and views of students have infrequently been highlighted in key publications (AIGA, 2015a, 2015b; AIGA & Google, 2016; AIGA & NASAD, 2016; Google, 2019; Eskilson, 2007; Hollis, 2006; Meggs & Purvis, 2006; Meikle, 2005; Remington & Bodenstedt, 2003; Therrell & Dunneback, 2015).

In a history of technology, and in assessing its wide and varied role in society, “scientific knowledge” can bring us closer to developing “ideal relationships to the natural and social” world (Scharff & Dusek, 2013). Warwick, Terras, and Nyhan (2012) argued that in practice, philosophies that guide us in our understanding of how to use new technologies can help us to develop “thoughtful and critical affordances of physical and digital resources” (p. 6). As a designer, researcher, and educator, my work is inherently situated in problem-based learning, where “the problem [...] drives the motivation and learning” and where “theory meets action” (Cornell University Center for Teaching and

Learning, n.d.; Moody, 2019). By developing a sustainable and “ideal” relationship with new and emerging technologies—for example, learning to design and train an algorithm or to use the Internet of Things—the design process requires that these “critical affordances” are made. In the most pragmatic sense, there is a necessity in designing systems and objects that serve the needs of individuals and organizations. What implications does this have for educational practices?

This research reveals that the digital transformation of communication design education is not driven by a single system of philosophy (Creswell & Creswell, 2018, p. 10). Therefore, my motivation and positionality as a researcher is merged between two major areas, rooted in aspects of pragmatism: a “worldview” coming from the work of John Dewey (1908),⁸ William James (1907), Charles Sanders Peirce (1898), and Creswell and Creswell (2018, p. 10), and second, grounded by the understanding that we should move toward developing new pedagogical practices to address the use of digital technology in higher education (Hayles, 2012; Mitcham, 1994; Scharff & Dusek, 2003). I look to the contemporary interpretations by Creswell and Creswell (2018), Biesta (2009), and the Cornell University Center for Teaching and Learning’s research on problem-based learning (Cornell University Center for Teaching and Learning, n.d.). Pragmatism is a problem-centered, “real-world practice-oriented” approach to doing research. It is a view driven by taking “pluralistic approaches” to understanding a research problem (Creswell & Creswell, 2018, p. 10).⁹

⁸ In 1908, John Dewey published, “*What does pragmatism mean by practical?*” Dewey posited that it is a theory about reality where objects have meaning and we “look to future consequences” (Dewey, 1908).

⁹ I think it is important to add a footnote on my alignment with pragmatic thinking. My practical approach to design is a view I have held for a decade. I have a long relationship with pragmatism and problem-based learning. Outside of the pragmatic worldview, I align most closely with the transformative approach, which I apply in the areas of my research concerning design, sustainability, and ethics (Scherling, 2015; Scherling & DeRosa, 2020).

Designers often seek to solve problems with the motivation to look for solutions that are both creative and actionable while keeping in mind “what and how to research” each design challenge or creative brief they encounter (Biesta, 2009; Creswell & Creswell, 2018, p. 11). Through this real-world lens, I am motivated to research contemporary challenges in communication design education, inquiring into its digital transformation and the interventions that are the most supportive.

Assumptions

Assumptions not to Be Debated

- Communication design students are increasingly called upon to integrate digital technologies into their educational and professional work.
- As traditional print and broadcast media consumption declines, communication design education and employment will be digital technology-focused, and many of the design positions with a focus in analog media will become obsolete.
- Communication design education is undergoing a digital transformation where professional requirements have changed. This also impacts the curricula that educators prepare for students to meet the entry-level requirements.
- The communication design profession was primarily print- and broadcast-based until the 1990s, seeing a significant decline through the early 2000s. With the

development of digital technologies and the Internet, a rapid transition toward digitization and the need to accommodate a digital transformation in communication design education has presented several unanswered questions about the pedagogies that are best suited to address short-term and long-term effects of this transformation.

Assumptions to Be Debated

- Communication design educators and professionals view that it has become increasingly complex to prepare communication design students to master digital skills that change and obsolesce quickly.
- Communication design students find it increasingly complex to prepare to begin working professionally in design, with the requirements to utilize digital technologies expanding.
- There is limited guidance in communication design education on how to develop and maintain the skills necessary to be competitive and succeed in the short-term and long-term capacities.
- In communication design curriculum and teaching, emphasis is placed on skills development, yet more emphasis is needed on developing pedagogies that can nurture communication design students as continuous learners.
- There is a limited amount of well-defined pedagogical practices to guide communication design students on how to deal with the challenges associated with the digital transformation of their education and work.

- Existing pedagogical practices in communication design education require more institutional and organization reassessment in terms of their alignment and suitability for digital-technology-focused design practices and methods.
- The collective views of communication design educators, professionals, and students on what pedagogies are most responsive to a digital transformation are increasingly important, given the speed in which industry-requirements are now changing.

Significance of the Study

Given a digital transformation of communication design education, this study considers what pedagogical practices might best support design students entering the profession and what a communication design education responsive to a digital transformation might look like. In the following points, I consider the significance of this study as it relates to its intended audience and how the insights that come out of this study may be beneficial.

- 1) This research focuses on the evolving pedagogies that communication design education might nurture for students to enter the profession, taking into account whether they feel prepared as they transition from college-level programs and schools into the workforce in light of a digital transformation. Therefore, this research examines contemporary challenges in communication design education. These research findings have significance for a diverse

audience of design educators, designers working in hybrid disciplines, designers interested in learning more about changes in communication design education, and to researchers in other disciplines (e.g., media studies, digital humanities, social sciences, business) who want to learn more about the pedagogical practices being used to support students during a digital transformation.

- 2) The insights that emerge from this research will contribute to bridging the study of digital transformation in communication design and communication design education with what pedagogy or pedagogies are suitable to address these issues. While the focus of this dissertation research is on communication design practice and education, it may contribute to a “multidisciplinary pursuit” that informs how the phenomenon of digital transformation manifests in other disciplines (Spivey, 2015).
- 3) This research differentiates from the studies cited in this section as it analyzes new and existing pedagogical practices, trends, and experiences among multiple groups involved with communication design education.
- 4) This research merges qualitative and quantitative data, and to date, there has been a limited amount of mixed-methods research and quantitative research published in communication design, communication design education, and the visual arts (which I will address in the “Methodologies” section) (Broome, 2013; Milbrandt, 2014; Milbrandt & Klein, 2008). Therefore, this dissertation research is a mixed-methods study. According to the National Art Education Association (NAEA) (2016), there is “the need for demographic research

path” that evaluates descriptive, demographic factors—traditionally found in quantitative studies.¹⁰

- 5) The findings will highlight where communication design educators, professionals, and students agree and disagree on what an education responsive to a digital transformation looks like. This study will provide insights into how to help design students facing challenges related to the digital transformation of work, and into being more informed about pedagogical practices as they work with emerging technologies in communication design education. A study that incorporates these three groups—educators, professional, and student views—will provide additional data for the literature.

Chapter I Summary

The introduction and background to this dissertation is intended to ground my study in the current trends and debates on a digital transformation in communication design and communication design education. Communication designers—whether working as industry professionals or educators or studying to enter their first position—are challenged to collectively solve complex problems related to a digital transformation, with technology maintaining an “outsized role” in design (Davis, 2019). Maeda (2019) contended that “Computation is not something you can fully grasp after training in a

¹⁰ For more information about this survey, see <https://arteducators-prod.s3.amazonaws.com/documents/440/afb032f9-0b11-492f-a1a8-3bab79908e7d.pdf?1452874889>

‘learn to code’ boot camp” (p. xii). Pedagogies, or ways in which knowledge and skills are imparted in design educational settings, are frequently reactive, and there is still much research needed to help inform how these practices can become more sustainable in a way that best supports design students.

While the relationships between communication design, pedagogical practices, and a digital transformation, may seem ambiguous, it is this very ambiguity with technology education in design that drives my inquiry in this dissertation study. This same curiosity has arisen time and again in my own practice as a designer learning to use digital technologies. Through my initial research, I have found that other communication designers have had a similar experience: career paths have become digitally focused, the demands of educators have been particularly confounding, and rapid skills development is at odds with a fulfilling educational experience with learning to use new technologies.

We are living in an exciting, yet ambiguous moment in time where digital technologies in learning, for designers and non-designers alike (see Hayles, 2012)—have limitless potential to be envisioned, shaped, constructed, deconstructed, and integrated into every facet of our lives (Maeda, 2019; Resnick, 2002; Shirky, 2009; Turkle, 2015). Post-modern literary critic N. Katherine Hayles (2012) argues that we are at a crossroads where we should address our concerns about digital technology use and implementation by “building a framework in which [...] can catalyze new insights, research questions, and theoretical agendas ...” (p. 20).

With a gap in extant research, it is not clear how educators should best prepare and nurture design students in a digital age (Hayles, 2012; Jandrić & Boras, 2015; Raman, 2016). This has led me to form a research question and a study hypothesis that

examine students', professionals' and educators' perception of their preparedness to deal with digital technology change, and where these parties agree or disagree.

Grounded in a “real-world” lens, I view traditional media becoming increasingly obsolete, simultaneously disrupting traditional work in design and the minimum requirements asked of design students, whether working in studios and firms, schools, start-ups, or in research. Research indicates that digital skills development is not purely about becoming technically proficient. This paradox is not new to the design field, where the push and pull between being creative, autonomous, and technically proficient has posed an ongoing dilemma. This dilemma is further explored in the next chapter.

Chapter II

REVIEW OF THE LITERATURE

In order to analyze the challenges with digital technology use in communication design education, I examine a digital transformation in higher education and how pedagogical practices have been adapted in design to address these changes. In the first section of this review of literature, I explore two aspects of changing educational practices in design. First, I examine the contemporary debate surrounding digital transformation challenges and its specific manifestation in communication design education. Next, I explore the rapid growth of digital technologies between the 1960s to present; pointing to evolving pedagogical practices in relation to computing, the Internet and the World Wide Web, and networked global communications.

In the next section, I note historical pedagogical practices that have contributed to a contemporary notion of practices used in communication design. In both sections, I emphasize the various challenges that educators, professionals, and students encounter.

A Digital Transformation in Communication Design Education: Changing Pedagogical Practices

The industry requires communication design students to be skilled in many areas, such as having a technical proficiency in designing interactive and print-based products and services, strong conceptual design and strategic thinking skills, and an understanding of the latest emerging technology trends (AIGA, 2015b; College Board, 2015; U.S. Bureau of Labor Statistics, 2016a). Entry-level requirements for communication design professionals are diverse, and educators and professionals are engaged in this discussion to which practices and activities, and technical, conceptual, strategic, and social skills are most appropriate to sufficiently support designers who are preparing to enter what is now a highly digital-centric profession. The parameters for pursuing a career in design can go well beyond these requirements as set forth by the AIGA (2019), the College Board (2019), and the U.S. Department of Labor (2020). Designers' career paths, increasingly driven by the adoption of digital technologies, have reframed what it means to become a communication designer in a highly adaptable 21st-century work environment; and these requirements not only expand the minimum requirements to develop a design practice but also make the requirements much more varied for students (AIGA, 2015b; Cezzar, 2017a; Fitzgerald, 2017). With students pursuing roles in interactive design, motion graphics, user experience design and research, in augmented and virtual reality design, machine learning, data science, and more, it is important to research what pedagogical practices have been used and have been developed in communication design. Doing so could provide insights into how we have arrived in an urgent situation where design

students might look beyond traditional work, transitioning to work with complex digital technologies and systems in order to “thrive in the future” —or risk losing contemporary relevance and having a competitive edge (AIGA, 2015; Bughin et al., 2019, p. 10; Cezzar, 2018; Davis, 2019a; Heller & Womack, 2011, pp. 14–16).

Although there have been many technological transformations in the history of communication design education, a digital transformation in design, in education, and broadly across job sectors (from education to retail, information technology, and more) has been remarkable in its speed and spread. A digital transformation and related challenges represent an area of scholarship that requires further research, providing more insights into the pedagogical practices used in higher education, where for various reasons, schools and programs have found it difficult to make the transition (Hayles, 2012; Davis, 2019; Maeda, 2019).

Communication design educators and their students are not alone in trying to keep up with the massive disruption triggered by the sheer “speed of technological innovation and industry demands” (King, 2015). In their book, *Digital Agency in Higher Education: Transforming Teaching and Learning* (2020), authors and professors Toril Aagaard and Andreas Lund observed that higher education institutions have had difficulty embracing digital technologies. Finding a disconnect in communication among university leadership, faculty, and administrators about how to make the best use of digital resources, the institutions argue for a transformative agency to support a digital transformation (Aagaard & Lund, 2020, p. 5). The dangers of higher education institutions lagging behind is not an isolated concern. In a survey conducted by IBM Institute for Business Value (2015), researchers found that 51% of respondents viewed

that “the current higher education system fails to meet the needs of students” (King, 2015, para. 3). Michael D. King, Vice President and General Manager of IBM’s Global Education Industry (2015) stated:

Universities have to start embracing and exploiting new technologies in analytics, cloud computing, mobility, and social media to provide greater access to educational content, integrate physical and digital worlds for more engaging experiences, and improve decision making. (King, 2015, para. 6)

In communication design, these concerns have been mounting over the past decade. The digital learning experiences of design students represent an emerging focus for design educators and professionals, the universities and programs they teach with, and the organizations that employ communication designers (AIGA, 2015b; Cezzar, 2017a; Fitzgerald, 2017). More broadly, the design and development of suitable pedagogical practices for learning amidst a digital transformation has posed a concern in higher education communities overall—with many existing pedagogies “built for the learning needs and behaviors premised on the requirements of the Industrial Age rather than the Digital Age” (Raman, 2016, p. 6; Wright & Osman, 2018). A considerable amount of research has been conducted, and the topic of teaching and learning in response to a digital transformation has gained more traction in the digital humanities, media and mass communication studies, and in computer science education, and in studies in various disciplines of economics, psychology and education psychology (See, for example, Boyd & Crawford, 2012; Gardner, & Davis, 2013; Hayles, 2012, Jandrić & Boras, 2015; Lessig, 2009; Postman, 1993; Resnick, 2002; Rushkoff, 2011; Shirky, 2009; Turkle, 2012). These scholarly inquiries have been siloed from scholarly work in communication design, thus making it more confounding on how exactly to understand, define, and implement pedagogical practices in design education. Some of this may be attributed to

the fact that design has been a traditionally vocational field, where designers increasingly “build connections across disciplines” and “collaborate in teams composed of experts from many fields” (Davis, 2009). Furthermore, it has been traditionally difficult to define which non-design disciplines communication designers should align with in order to engage in knowledge-sharing (Davis, 2019).

According to the University of Montreal design professor Alain Findeli (2001), it is challenging to assess the role of “art, science, and technology in a design curriculum”—including their “relative importance” and ways to articulate these relationships (Findeli, 2001). Echoing Findeli’s sentiment, University of Arts London (UAL) design professor Fred Deakin (2017) observed that it is a confusing time to be entering the profession during a “cultural and technological revolution” where it is hard to predict what a “digital world will look like in 6 months.” Deakin (2017) also argued that considering the digital transformation in design and a subsequent paradigm shift, communication design education is heading toward a new norm where designers need to be *multi-skilled*, as opposed to specialists in an area of design.

Deakin’s argument places core competencies into question. While the debate about core competencies in design education has long existed, it is now amplified by “evolving expectations” and an expanding digital technology focus in the field ... which in turn deepens the disagreements regarding pedagogical practices that best integrate with a contemporary changing communication design curriculum. Design educator James Pannafino (2015) contends:

If you graduated college in the ‘90s with a graphic design degree, you might have learned valuable skills related to visual communication, typography, creative problem solving, compositional layout, etc. Times have really changed. No matter how you view it, educators are tasked with teaching much more than they did in

the past. Communication design will always be an aspect of a designer's education, but many programs are expanding their approach to incorporate user-centered design thinking. Educators who teach communication design and [user experience] may incorporate visual design, web design, user interface design, user experience, interaction design, front end development, motion design, and much more.

Amidst a digital transformation, the skills that Pannafino (2015) cites not only quickly obsolesce but are also highly susceptible to change, hence raising further doubts in terms of sustainability and longevity (Deakin, 2017). Given these developments, there is a drive to push for rapid digital skills development. Design students and designers are inundated with self-help articles, social media posts, and advertisements for short courses, which promise (in extreme cases) to help designers to up-skill and become user-experience designers in five weeks, or to learn to code and become product designers in 30 days. Nevertheless, many of the approaches to rapid digital-skills development are reactive and temporary solutions contributing to “a new design paradigm” that favors technical and analytical approaches over physical, hands-on production (Davis, 2019). Thus, these types of short-turnaround solutions generate further questions about which pedagogical practices can best support designers to have fulfilling experiences learning with new and emerging technologies. Beyond some of these concerns about how knowledge on the use of digital technologies is imparted, it is clear that “having a detailed understanding of how to use computer technology” is viewed as highly important as are the required soft and social skills (Rainie, 2018).

Many industry professionals and design educators readily voice their support for educating designers to be digitally proficient and multi-skilled. However, the conversation often defaults to defining this around technical skills, such as digital design

skills and or through advancing a designer's coding skills rather than defining the pedagogies or learning processes within which these types of digital skills are situated (AIGA, 2015b; Beetham & Sharpe, 2013; Deakin, 2017; Domeyer, 2015; Freyermuth, 2016). Design educator and practicing professional Sherry Saunders Freyermuth (2016) contends that it is now the time to “consider the role of *coding as craft* as a new pedagogical model in teaching practice.” Nevertheless, she also acknowledges that it is challenging to incorporate coding into her design course curriculum (p. 1), pointing to a conundrum regarding how to shape computer programming into a pedagogical practice as opposed to a mechanical task.

The United States Bureau of Labor Statistics reported an expected 20% increase in digital design jobs between 2016 and 2024, and an estimated 24% increase in software development jobs between 2016 and 2026. This suggests that besides the need to update skills, there is a need for a more profound reassessment of the pedagogies used in communication design education (U.S. Bureau of Labor Statistics, 2016a, 2016b).

In a 2016 design census survey facilitated by Google and AIGA, the highest-ranking description of what a “design future” looked like was related to “digital” and “interactive” design among 905 participants (N=905) (AIGA & Google, 2016). Concurrently, design jobs in “newspaper, periodical, book, and directory publishers [are] projected to decline by 22 percent from 2016 to 2026” (U.S. Bureau of Labor Statistics, 2016a). However, in a lot of these higher-level statistical analyses of communication design jobs, analysis of how educators should prepare design students is frequently missing from the equation, and the industry's call for “multi-skilled,” “flexible,” “nimble” designers is somewhat ambiguous (AIGA, 2015b).

Given these changes in communication design, the question of how to teach and support students to meet entry-level requirements *is not* a straightforward endeavor (Fitzgerald, 2017).

The quest to be multi-skilled has also led many design students to look for skills-enhancement courses outside of the classroom through online learning platforms like Coursera, Code Academy, EdX, Lynda.com, Udemy, and Data Camp in addition to their coursework. For some communication design students vying to gain an advantage in skills development like coding, these extra-academic offerings are low-cost and accessible, yet also only offer short-term solutions to the longer-term challenge of remaining relevant in an ever-changing digital technology-driven field. As of 2018, approximately 987 and 2130 design-related courses were available on Coursera and Udemy, respectively (Coursera, 2018; Udemy, 2018). However, it takes a certain level of self-discipline to complete a massive open online course (MOOC), and it is not always a feasible solution for design students looking to expand their skills as new skills requirements are introduced simultaneously. Furthermore, between 2014 and 2015, HarvardX and MIT-X reported around a 5.5% completion rate, indicating that most of these courses are challenging for students to complete (Ahearn, 2017).

Beyond MOOCs, some communication design students look to intensive design and technology-focused boot camps offered at vocational schools like General Assembly (GA) and Shillington, who advertise their services as the “solution to the global skills gap” and less formalized solutions to skills development by watching YouTube and listening to podcasts (Schwartz, 2020). While the reviews of GA courses are generally positive, approximately 45% of those who take them are working professionals who

receive tuition reimbursement from their employers, indicating that this, too, is not always a feasible option for design students.

There is also a question of feasibility to make digitally focused educational practices work well for students. Many educators have the view that there is not sufficient flexibility in their course load to implement the changes they want to see or teach the skills for students to become a multi-skilled, highly flexible 21st-century designer (Fleischmann, 2015; Heller, 2006). On top of this, the amount of courses students can pack into their degree programs is limited, too. Designer, educator, and writer Steven Heller (2006) noted, “Four years is not enough time to address all the needs of students today. It may be enough time to produce a marketable portfolio but not enough to master both the technology and theory of visual communications.”

Many design schools and programs in the United States and throughout the world are now in a continuous cycle of redesigning their curricula to be responsive to a digital transformation in communication design. The 2005-2006 *National Association of Schools of Art and Design* (NASAD) handbook, which is a formidable publication with standards and guidelines for degree and non-degree granting institutions in art and design in the US, outlined 12 essential competencies in the study of communication design, for example, recommending a student’s mastery of solving communication problems, understanding design history, and basic business practices (National Association of Schools of Art and Design (NASAD), 2006). However, less than a decade later, in its current edition (2018), the handbook has eliminated design history in place of communication theory, and the requirements for students have nearly doubled to 22 categories and sub-categories in essential competencies, which include the ability to

develop strategies and incorporate research, and a “functional understanding of how to continue learning technology, recognizing that technological change is constant”

(National Association of Schools of Art and Design (NASAD, 2017).

With all these factors considered, what do responsive pedagogies in communication design education look like? Beyond skills development, what practices can sustain constant digital change?

A 21st-Century Digital Design Skills Debate

Digital technologies and the World Wide Web rapidly *redesigned* the communication design education space through the late 1990s to the start of the 21st century. The design and development of digital technologies heralded massive global changes in information consumption and exchange, representing an exciting and fast-paced moment in time inundated by software applications, smartphone technology, cloud computing, and machine-to-machine communications—radically transforming every aspect of the way we communicate, make friends, and conduct business (Anderson & Rainie, 2018). Digital technologies and mass digital communications rapidly reshaped mass communications in a period of not more than 40 years, creating new demand for digital skills. Researcher and designer Katja Fleishmann (2015) observed that, “The emergence of digital media [...] brought a paradigm shift requiring new ways of thinking and the development of new design knowledge and skills.” In comparison to previous periods of technological development in communication design, these changes represented a more accelerated phase.

Accelerated technology development was staggering for many design programs and schools, making it more challenging to anticipate what organizational and pedagogical changes should be implemented along with figuring out how to support communication design students eager to pursue digitally focused careers (Davis, 2016; Fleischmann, 2015; Heskett, 2001). Many of the fundamental changes in communication design first took place in industry settings, from technology firms and start-ups to e-commerce, advertising, and financial services (Fleischmann, 2015). For many communication design programs and schools, it was expensive and time-consuming to renovate existing facilities to accommodate the use of digital technologies, which combined with the challenge of inadequate institutional and technical personnel support to rapidly implement these changes (P. Rogers, 2000, pp. 8–10). Businesses and organizations broadly have consistently pointed out that this has resulted in a “talent shortage”¹ where they have struggled to find communication designers with specialized “digital” skill sets (Academy Xi, 2017; Kumar, 2019; MacArthur, 2019). Coming from this business lens, Infosys president and chief operations officer Ravi Kumar S. has argued that the “digital skills shortage” is both a “paradox” as well as a “crisis” where a “workforce transformation” is needed.

Reflecting on these changes, design educator Meredith Davis (2016) noted that, “Schools often lag behind in their reconsideration of curricula under this radically reconfigured [digital] context for design. Many rely on ‘curriculum by accrual’ tacking new skill development onto the end of course sequences” (Davis, 2016). While curricula were modified by tacking on skills training, the broader question of how teaching should

¹ See Academy Xi.

change has gone relatively unaddressed (Kumar, 2019; MacArthur, 2019). In a comprehensive report on emerging trends in education, Google for Education (2019) emphasizes “digital literacy,” “computational thinking,” “innovating pedagogy,” “emerging technologies,” “collaborative classrooms,” and “life skills and workforce preparation.”

In envisioning how communication design students should be prepared, educators and professionals continue to hold reasonably disparate views. Some educators argue that existing pedagogies in communication design education should incorporate more innovative uses of digital technologies and “transmedia concepts,” others argue for more emphasis on research methodologies, while others look to the importance of interdisciplinary work, and with others citing all of the above and more (AIGA & NASAD, 2016; Cartwright, 2016; Grefe, 2012, 2013; Heskett, 2001). Looking through a more interdisciplinary lens, contemporary communication design education challenges and technology skills gaps are at times perceived to be more about *relationships*— “a complicated web of interactions among people, settings, activities and technology” (Davis, 2016). However, in the design and technology-focused education debate, there has also been discomfort about the uses and interpretations of emerging technologies, what pedagogical practices should matter the most, and what will best support students.

Design educator Jennifer Cole Phillips warned that technological “know-how” and having all of the necessary tools and equipment does *not* necessarily *equate* to creative thinking (Lupton & Phillips, 2008, p. 10). To this point, MIT Media Lab professor Mitchel Resnick (2002) argued for more attention toward the recognition of the full creative capabilities of new digital technologies in design (p. 33). Resnick (2002, p.

33) observed, “If we use computers simply to deliver information to students, we are missing the revolutionary potential of the new technology for transforming learning and education.” Arguments by Cole Phillips (2008) and Resnick (2002) have depicted fundamental issues around the role of creativity, innovation, and education in a digital transformation of communication design education, also pointing to broader concerns about how to fully utilize the potential of digital technologies in design pedagogy (Fleischmann, 2015).

In contrast to these arguments, some communication design professionals are in favor of traditional methods and taking a more intellectual approach. At the extreme, some educators support rejecting the Internet and reviving traditional methods in screen-printing, letterpress, and sign making (Tucker, 2015). It is not disputed that rapid adoption of computer and Internet-based technologies has posed a potential threat to centuries of epistemological traditions and practices in communication design education, with modes of digital learning swiftly obsolescing traditional kinesthetic modes of learning (Gosling, 2016a). Designer and curator Kenya Hara (2007) argued,

... we shouldn't use computers in the manner of just swallowing whatever software comes along, but need to think deeply and carefully about what kind of intellectual world can be cultivated based on this new material... design today has been given the role of presenting the latest innovations of technology and here, too, is strained. (pp. 125–126)

In spite of the varied intellectual, social, and creative points for debate on a digital transformation in design education, most communication design educators, professionals, and their students have accepted that digital technology is now fully integral to the field, growing and evolving, and in many ways eclipsing design's rich history in the hands-on

making. Heller (2009) argued that a blatant rejection of digital technology in design has essentially equated to a form of “professional suicide.”

A digital transformation in communication design education has presented significant challenges, especially given that schools and programs often must negotiate with institutional resistance to technology change, while challenged to stay apace with the speed of these technological changes that have often required “specialized expertise beyond the capacity of any one individual” (Fleischmann, 2015, p. 50). It has led to the question of what a sustainable approach to education—one that upgrades and changes with computing power and advancements—actually consists of, looks like, and behaves like (AIGA & NASAD, 2016; Grefe, 2012). In terms of arguments presented by businesses and employers of communication design students coming out of school, it has also become increasingly urgent to confront broadening skills requirements and technical skill gaps that persist in design, but with little agreement among designers on facing digital transformation challenges (AIGA & NASAD, 2016; Grefe, 2012).

With little consensus about how communication design education should adapt to a digital transformation and changing job requirements, it is also important to take a step back and reassess the situation. Putting aside prescribed notions about the future of communication design education, Fleischmann (2015) posed the following questions:

- What kind of a designer is needed?
- More specifically, what depth or breadth of knowledge does the industry require of a young designer or design graduate to participate in a contemporary work environment successfully?
- Furthermore, how can they be educated?

While these questions may seem fairly expansive, Fleischmann's (2015) reference to industry preparedness among students clearly points to the urgency in supporting communication design students in their ability to "successfully participate in a contemporary work environment." She also warns against more subjects being "cramped" into the existing communication design education structure. This observation highlights the overall fragmentations that exist and have existed in debates on technology change in design, and, more recently, digital transformation.

On the one hand, there was the challenge of learning to use digital technologies in the most creative and intellectually thoughtful possible way (Lupton & Phillips, 2008; Resnick 2002). Yet, on the other hand to Fleischmann's point, design students should be prepared to participate in the workforce successfully.

Programs that have been in favor of traditional, hands-on work have inevitably seen the growth of deeper concentrations in digital and product design, finding ways to ensure that students have acquired core competencies to secure jobs in a competitive field (AIGA & NASAD, 2016; Grefe, 2012).

Many programs have readily undertaken the challenge to transform digitally, but the standards and processes among programs for digital adaptation vary. Confronting emerging digital technologies in communication design education has, in many ways, been an exciting provocation for design educators, presenting opportunities for innovative practices and processes. Schools such as MIT's Media Lab embraced the challenge presented by the digitization of design education practices relatively early on, leading the way to address the "design of technology" (Eskilson, 2007, p. 380). The Cranbrook Academy of Art (Cranbrook) was also at the forefront of experimentation with

design and technology. Cranbrook sought a fresh simplicity in their approach, looking to “embed necessary information in the design of the [digital] object” and in their approach to education (Meikle, 2005, p. 202). Responding to the call to integrate digital technologies in design, Parsons School of Design developed a Design and Technology Master of Fine Art program while the Otis College of Art and Design established an Interactive Product Design major (Otis College of Art and Design, 2017). And throughout the 2000s, design programs and schools—such as the Rhode Island School of Design (RISD), School of Visual Arts (SVA), and the Maryland Institute College of Arts (MICA)—also began to modify communication design education to incorporate the use of digital technologies, while fighting to maintain traditional tactile approaches to designing as the “craft aspects of design” obsolesced (Gosling, 2016).

Job satisfaction in Communication Design. The pedagogical challenges to digital transformation have been multifaceted—ranging from job preparedness concerns to organizational, institutional, and financial difficulties. Moreover, while some educators and professionals may have found themselves at odds over what a supportive and comprehensive communication design education responsive to digitization should look like, survey data has suggested changing tendencies on career satisfaction among communication designers. A 2017 AIGA survey with over 13,000 participants (>N=13,000) demonstrated that the highest job satisfaction was reported among communication designers working in game design, data science, virtual or augmented

reality, civic design, front-end development, animation, and research (AIGA 2017; Census, 2018) (see Figure 1).

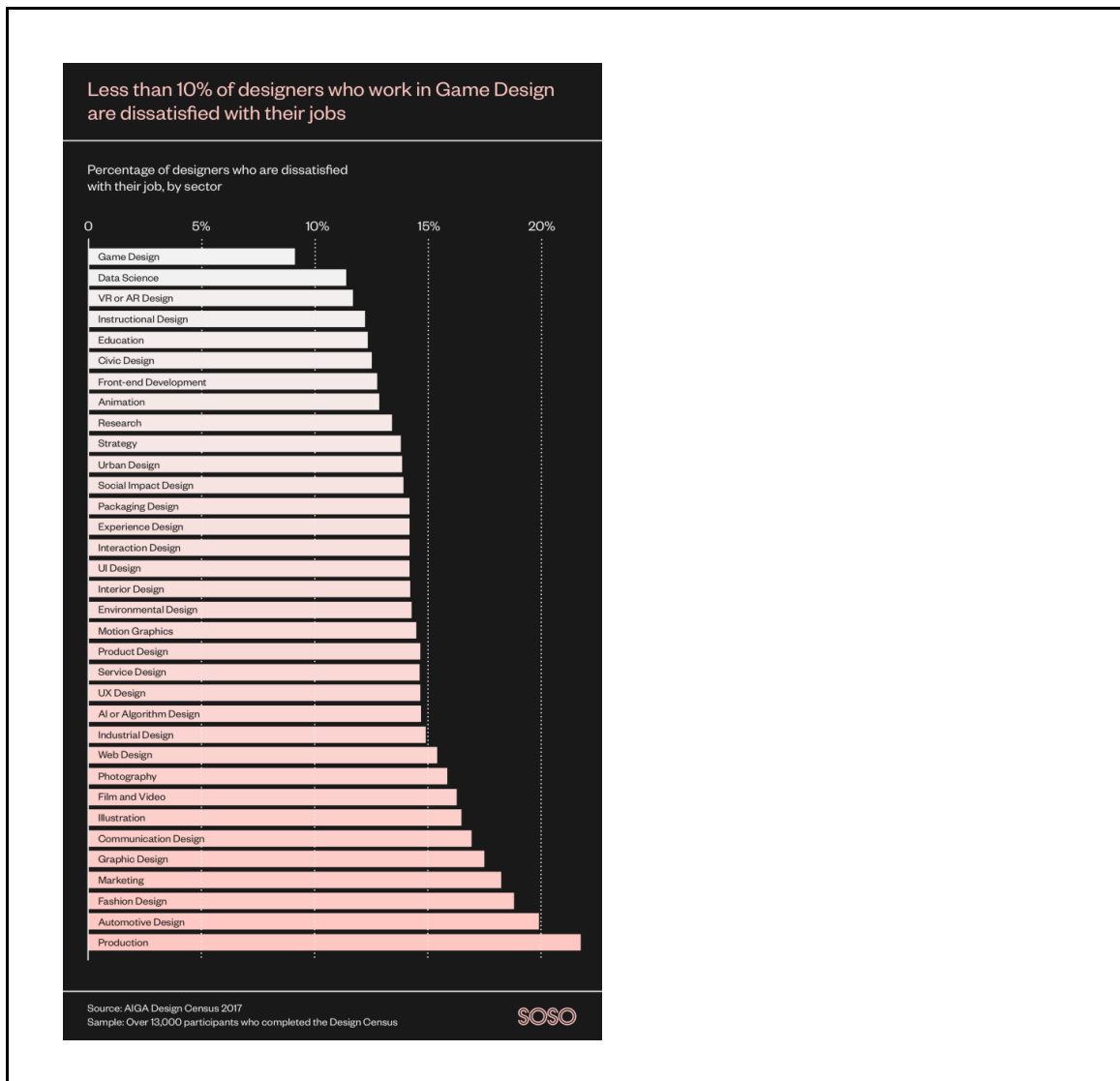


Figure 1. Job Satisfaction among Designers (AIGA 2017 Census, 2018).

Among the positions that designers reported to be least satisfied with included design production, marketing, and graphic design (AIGA 2017; Census, 2018).² The

² Automotive designers and fashion designers were also ranked among designers least satisfied with their positions in AIGA's survey on job satisfaction. This is omitted from the description above, as these positions are not relevant to communication design.

survey also suggested that communication design positions are highly varied, now branching out in a myriad of directions (AIGA 2017 Census, 2018).

In her essay “Changing Technology Changes Design,” historian Estelle Jussim (1989) described, “In a very real sense, the history of communication is simultaneously the history of graphic design ...” (Jussim, 1989, p. 105). To such a degree, digital technology had rapidly disrupted communication design education and a lot was changing with the types of jobs available, along with how job satisfaction correlated. The relationship between technological change, evolving business needs, and adaptations in the job requirements has long been evident (Jury, 2012).

Digital transformation has instigated an ongoing debate, impacting career pathways available to design students, while simultaneously placing traditional design practices at varying levels of risk of obsolescence. During this period of transition, there needed to be some consensus between design educators and professionals at large to fully support the students who would also shape the future of the profession (Grefe, 2013).

The Rapid Emergence of Digital Technologies in Communication Design Education: 1960s to Present

It is critical to point out that the digital transformation studied in this literature primarily points to a period, starting around 2000, where many jobs in sub-disciplines of

communication design have begun transitioning toward work primarily based in digital modalities (Nayak, 2017; Jurkowitz, 2014; Clarke & Keeley, 2016).

These substantial—at-times disruptive—changes in communication design education through a digital migration signify that the design profession has been permanently altered. On such changes, systems theorist Graeme Snooks (1996) argued that a technological paradigm shift “involves a fundamental change in the technological and, hence, economic foundations of human society”; which require cultural changes, various regional adaptations, and “periods of technological fine-tuning” (p. 240). Media theorists like Marshall McLuhan (1964), Neil Postman (1992), N. Katherine Hayles (2012), and Sherry Turkle (2015) have frequently pointed to the theoretical and practical manifestations of a digital transformation, in society and education, alluding to the possible outcomes of these transformations in many cases long before they even occurred. In 1964, McLuhan examined the outbreak of a digital age, noting that an “electric implosion” would compel “commitment and participation, regardless of any point of view” (1964, p. 5). In 1992, in Postman’s critique of technology in culture, he observed that “new technologies” would “alter the structure of our interests: the things we think about” (p. 20).

These changing technologies and changing perspectives call for content and messaging, designed by designers, with a serious shift toward a digital transformation beginning the same year that McLuhan (1964) published *Understanding Media*. That year, the first computer with a range of commercial, creative, and scientific applications—the IBM 360 Series—was released (IBM Archives, 2003; Palacio & Vit,

2011).^{3,4} While access to computer technologies was limited in the 1960s-70s, many design educators, professionals, and students welcomed the incoming challenge of computing in design. British design researcher and educator Nigel Cross (2001) declared the 1960s as a “design science decade.” Pioneering architect and design technologist Buckminster Fuller reinforced this by arguing in favor of rationalism and technology (Cross, 2001, p. 49). The professional move in design toward rationalism and technology was closely mirrored in education. Through curriculum reform in the US, a “hierarchy was developed,” which prioritized science education as a discipline over arts and humanities as subjects (Efland, 1990, p. 241). Design education, along with art education, was relegated to a lower status by the federal government of the U.S., as the question persisted for many design educators and professionals about whether design should align with the arts or sciences (Efland, 1990, p. 241; Lozner, 2013). Furthermore, while there were some deep reservations and resistance from the design community about efforts to “scientise”⁵ design, computer technologies continued to advance toward practical home

³ The emergence of a commercially viable computer began as a state-funded military endeavor to build robust national defense during and after World War II. Significant contributions, including Konrad Zuse’s “The Z3,” Alan Turing and Harold Keene’s Nazi communications decryption machine—the “British Bombe,” and Bell Labs’ relay interpolator (also known as the Bell Labs Model II) were a few of the major milestones in the history of computer science that would lead toward the development of a personal computer (Computer History Museum, n.d.).

⁴ Forecasting computer and Internet use, media theorist and educator Marshall McLuhan (1964) wrote in his seminal work *Understanding Media: The Extensions of Man*, “Rapidly, we approach the final phase of the extensions of man—the technological simulation of consciousness, when the creative process of knowing will be collectively and corporately extended to the whole of human society, much as we have already extended our senses and our nerves by various media” (pp. 3–4). McLuhan (1964) envisioned a global networked society as the “natural adjunct of electric technology” (p. 5), also positing that the electronic age would fuse with information and learning (p. 350).

⁵ This term appears in Nigel Cross’ paper “Designerly Ways of Knowing: Design Discipline versus Design Science” (Cross, 2001).

and business use, demonstrating that media could also be expressed digitally (Cross, 2001; Victoria and Albert Museum, 2013).

A wave of innovative, design-focused products and services followed the invention of mainframe computers. Adobe Systems was founded in 1982. Desktop printing arrived in 1983. A year later, the Apple Macintosh personal computer was released with many of its signature user interface icons (e.g., the paintbrush, the trashcan, and Moof), which were created by graphic designer Susan Kare (Tobin, 2001).

Computer-aided design steadily integrated into the design profession. Early digital design pioneer April Greiman printed single-sheet versions of *Design Quarterly* exclusively with a Macintosh computer (Meggs & Purvis, 2006, p. 454). Greiman's process included new considerations of how to deal with bitmap fonts, the digitization of imagery, and, above all, how to effectively visually communicate with hardware and software (Meggs & Purvis, 2006, p. 457). Meggs and Purvis (2006) note that desktop printing was faster than constructing position photostats, and designers such as Greiman and Rudy VanderLans helped to push the boundaries of what could be done with desktop printers and personal computers.

Between the 1990s and the 2000s, communication designers and educators began taking on significant amounts of digital work in their practices at work and in schools. This was initially limited to desktop applications and desktop publishing until the public launch of the World Wide Web (1991), soon followed by commercial Internet use. The Internet quickly went from a pioneering phase in the 1980s to a growth phase in the mid-1990s. By the late 1990s, America Online (AOL), an early leader in Internet services, was adding millions of Internet users "every month or two" (Case, 2011). An estimated

150 million websites were live in 1997, many of which designers had created in a hurry to keep up with this sudden paradigm shift (Meggs & Purvis, 1998, p. 470). That same year, in 1997, Google registered as a domain, Netflix was founded, and the dot-com sector started to “bubble” with start-up enterprises (Pew Research Center, 2014). With these changes, it had become clear that the field of communication design was undergoing a serious transformation (Bonsiepe, 1994, pp. 47–52). There were some basic similarities with earlier shifts in technology, but on the whole, this was an unprecedented change in communication design. Therefore, traditional kinesthetic modes of learning quickly shifted into new methods of digital learning and called for a pedagogy (or pedagogies) specific to digital technologies, digitization, and the digital transformation of education and work (Bonsiepe, 1994; Eskilson, 2007; Meggs & Purvis, 2006).

The concept of pedagogy or pedagogies is critical to this research—and conceptually central to this study in its entirety. Pedagogies can include methods and activities; for example, guidelines, strategies, “thinking skills” like critical thinking—“embracing an essential dialogue between teaching and learning” (Beetham & Sharpe, 2013, p. 2; Cambridge Dictionary, n.d.; Raman, 2016; Wright & Osman, 2018). Methods and activities are often components within a pedagogy, and these can be understood as pedagogical practices. These practices relate to how students actively engage with their learning processes. When multiple methods and activities are utilized, these actions can make up a “pedagogic design” (Beetham & Sharpe, 2013, p. 8). Although the concept of developing new pedagogical practices can seem complex or theoretical in nature, these guiding principles have historically shaped the educational ideologies, missions, and priorities that schools and organizations uphold—both formally and informally.

While pedagogies in design have long been used as models for learning, there was insufficient time to develop new pedagogical practices in communication design education in anticipation of a digital transformation because the process of “going digital” happened expeditiously. Through the 1980s and 1990s, designers embraced new types of hardware, software, and Open Type scalable computer fonts,⁶ integrating new tools into their studio and workplace practices (American Printing History Association, n.d.). Traditional hands-on processes that graphic designers used were augmented with software such as layout and graphic design programs *QuarkXpress* (1989) and *InDesign* (1994 and 2002),⁷ image editor *Photoshop* (1990), and the vector graphics editor *Adobe Illustrator* (1986-87). A visually chaotic postmodern aesthetic emerged in graphic design during the 1990s, with grunge design, conceptual design, and a technology-infused style of eclecticism surfacing in digital media, as well as in print media (Eskilson, 2007, p. 391). By the late 1990s, American designers Jessica Helfand and Joshua Davis approached website design in its infancy and demonstrated that graphic designers could problem-solve for interactive media (Finck, 2000; Meggs & Purvis, 1998, p. 472). Helfand’s interactive design work for The Discovery Channel stood out for its attention to typography, color, and other formal aspects of visual language (Meggs & Purvis, 1998, p. 472).

Some designers were skeptical of these changes because they feared the “collapse of design standards due to the limitations with programming in HTML and widespread access to [webpage] design by individuals without design training” (Meggs & Purvis,

⁶ American typeface designers such as Carol Twombly and Robert Slimbach were at the forefront of the creation of digital conversions of time-honored typefaces (Meggs & Purvis, 1998, p. 465).

⁷ *Adobe InDesign* was originally released as *Adobe Pagemaker* but was unable to compete with *Quark Xpress*. It was redesigned and released in 2002.

1998, pp. 472–73). These changes were also closely aligned with patterns of digital and corporate globalization, about which many designers expressed concerns.⁸ Despite lingering reservations, 52% of American adults were online by 2001, in a period referred to as Web 1.0 (Eskilson, 2007, p. 391; Perrin & Duggan, 2015). By 2006, 71% of American adults were using the Internet and actively generating content (e.g., posting to social media streams, blogging, commenting on online discussions on forums), and downloading and interacting with rich media such as audio and video. This period of more user-generated Internet activity was referred to as Web 2.0 (Perrin & Duggan, 2015). However, with these massive changes, the integration of digital technologies and digital media signified that design education processes and curricula would, once again, require an in-depth reassessment—arguably, to a greater extent than was ever anticipated. In search of a new pedagogy responsive to these changes, the *First Things First* manifesto was updated from its 1964 edition and republished with “33 signatories’ names” in 2000 (Garland, 1999). The revised manifesto challenged commercial work requirements of communication designers, citing the “explosive growth of global commercial culture” and the fact that “many young designers have little conception of the values, ideals, and sense of responsibility that once shaped the growth and practice of design” (Garland, 1999).

Yet, by the 2010s, digital technology had deeply refashioned how communication design was practiced, taught, and learned—therefore also changing the design skills requirements needed for students to enter the field successfully (Fleischmann, 2013). The

⁸ Between the late 1990s and the 2000s, many designers expressed concern about globalization. This not only reflected the concerns of designers but also that of people all around the world who voiced their concerns about the collapse of other standards such as the loss of small businesses, a rise in income inequality, and an increase in outsourced sweatshop labor in a series of “globalization” protests (Kristof & WuDunn, 2001).

debate between educators and professionals was firmly implanted, as traditional methods of teaching and learning in communication design education were increasingly at odds with technical and social practices that had become the primary focus of businesses, design studios, and advertising firms.

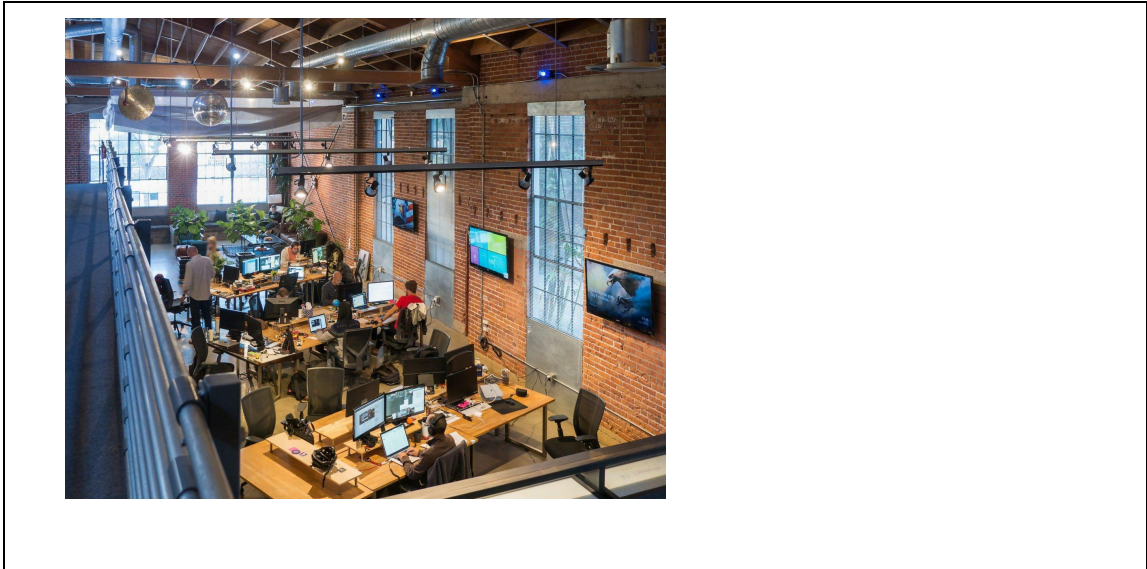


Figure 2. Digital Telepathy (Lopez, 2016).

The pre-digital design studio was mainly becoming a dwelling of the past—once filled by lightboxes, bookbinding units, lever cutters, and printing frames (Hague, 1957). The 21st-century design studio and studio classroom were primarily equipped with Mac computers, Adobe design software, scanners, and a limited physical toolkit (see Figure 2). Even the most sophisticated professional design studio had transformed into an airy, modernized computer lab with very few hands-on tools (Brito & Kennedy, 2016).

Although many studios and classrooms had made the necessary technical upgrades by the 2010s, the thinking behind these new projects and practices was still not fully developed, inspiring deep reflection among design educators, practitioners, and

scholars to what would be the next big step in developing communication design and developing relevant, forward-thinking skills among students (AIGA & NASAD, 2016; Cartwright, 2016; Davis, 2016; Fleischmann, 2014, 2015; Gosling, 2016a, 2016b). With such a significant transition, it seemed like the “designers that [would] survive [would] do so by rapidly and creatively exploiting new techniques and methods appropriate to new situations and challenges” (Heskett, 2001).

It has also been evident that many educational approaches used in contemporary design and education have both historic and conflicted origins. For instance, pedagogical approaches in design have been susceptible to significant reinterpretation, sometimes leaning heavily toward teacher-centered approaches while at other times giving way to less authority-driven student-centered approaches for centuries. All this points to a legacy of indecision, where design has been at odds with itself and the businesses and institutions it has served. In the next section, I examine a sample of these historical pedagogic designs.

A Historical Evolution of Communication Design Education

The pedagogies that communication designers utilize have historically evolved with technological paradigm shifts (Eskilson, 2007; Findeli, 2001; Jury, 2012). Communication design has, to an extent, been sensitive and responsive to technology change in businesses and organizations. Historically, communication designers have been known by many different professional titles (see Table 1), and designers have often been called upon to radically reassess and redesign professional requirements and pedagogical

approaches according to emerging innovations in technology and business needs (Jury, 2012).

In communication design's rich history of visual ideation and technology use, the field has often been at the helm of working with innovative technologies (Ainamo, 2009, p. 260; Cross, 2001; Wheelwright, 1992). Before communication designers held the professional title as communication designers, they worked closely as printers, applied and commercial artists, and worked with inventors, entrepreneurs, and businesses using movable type, the mechanical printing press, photography and photocopy technologies, and computer- and Internet-based technologies.

Table 1. Historical Roles of Communication Designers⁹

Sample of Roles	Period
Master Printers, Craftsmen	1000 CE-19th Century
Commercial Artist/Applied Artist/Jobbing Printer	19-20th Century
Graphic Artist, Graphic Designer, Communication Designer	20-21st Century
Communication Designer, Product Designer, Digital Designer, User experience designer, User interface designer	21st Century

Educators and professionals working in communication design-related positions have not always agreed about how to educate the next generation in design. With each

⁹ Communication designers have been known under many professional titles. This table outlines examples of these titles and the period they are associated with. The information in this table cites David Jury's book, *Graphic Design before Graphic Designers* (Jury, 2012).

technological paradigm shift in design, technology, and communication, there have been considerable changes in finding the best possible ways to use text and visual content to capture experiences and ideas with some approaches being highly “behaviorist” or instructor-centered, and others being more constructivist or student-centered (Beetham & Sharpe, 2013; Cezzar, 2017b; Stommel, 2015).¹⁰

In thinking about pedagogies that follow the tradition of a behaviorist or constructivist model, several pedagogies have historically been understood as fundamental. Pedagogies such as behaviorist, constructivist, and social-constructivist have been heavily studied and implemented (Tes Editorial, 2018). Methods and activities belonging to such pedagogies could be considered as practices. For example, when a teacher is the main authority in a classroom, this could be interpreted as behaviorist (Tes Editorial, 2018).¹¹ A behaviorist pedagogical approach could include lecturing and teaching through demonstration and rote learning (or memorization). A combination of these approaches can make up a pedagogical framework. It is also commonly understood that a constructivist pedagogical approach is individualized and student-centered¹² while a social constructivist pedagogy, which builds on constructivism, is blended as “student-centered” and “teacher-guided.” Digital pedagogy, which has existed since the advent of long-distance learning, is “variously defined” and has undergone a transformation through its reliance on digital technologies (Stommel, 2015). In a simplified definition, it is the set of approaches to learning to use new and emerging technologies from a “critical pedagogical perspective.” Nonetheless, it remains arguably ambiguous and underdeveloped, and according to Beetham

¹⁰ Also, see Findeli (2001).

¹¹ See also Skinner (1953) and Thorndike (1911).

¹² See also Dewey (1908, 1997), Jonassen (1999), Piaget (n.d.), the Steiner Method, and the Montessori Method.

and Sharpe, “there are really no models of e-learning per se,” pointing to the fact that there is a need for better defined pedagogical approaches related to learning with digital technologies (Beetham & Sharpe, 2013; the University of Toronto, n.d.).

While educators, professionals, and students coming from communication design education disciplines may fundamentally align with these foundational pedagogies, how they interpret and incorporate them varies extensively throughout design’s history and in a more contemporary conception of design. However, interpretations of these pedagogies have played a role in the design ethos, contributing to some of the challenges faced within communication design education today—as described by Arnette (2019) and Davis (2019), we need more “enduring knowledge” to deal with shifting contexts, addressing digital pedagogies, in particular. Furthermore, communication design in itself has also undergone some changes and is intrinsically multifaceted in educational and professional contexts, communication and the design of communication being highly sensitive to changing and emerging technologies. As the use of digital technology has widened and deepened, particularly in the last decade with the rise of various mobile applications, so have the pedagogical practices that exist within communication-oriented design (Cezzar, 2017a).

Table 2. Common Educational Models in the History of Communication Design Education

Type of Educational Model	Pedagogical Tradition
Apprenticeship model	Behaviorist; teacher-centered, lecture-based, rote-learning and memorization
Studio/workshop model	Behaviorist, Social-Constructivist, teacher-centered and student-centered, lecture-based, rote-learning and memorization
Vocational model and trade schools	Behaviorist, Social-Constructivist, teacher-centered and student-centered, lecture-based, rote-learning and memorization.
South Kensington model (in design and communication design)	Behaviorist; teacher-centered, lecture-based, rote-learning and memorization.
Corporate model	Behaviorist, Social-Constructivist, teacher-centered and student-centered, lecture-based, rote-learning and memorization, experiential.
Bauhaus model	Constructivist, Social-Constructivist, teacher-centered and student-centered, lecture-based, experiential

Apprenticeship Model

In earlier design pedagogies, apprenticeships were a convenient means for the transfer of professional knowledge. Today, contemporary pedagogical practices in communication design contain prominent vestiges of the pedagogical traditions of Asian and European apprenticeships, which valued the teacher or master as the authority figure (Davis, 2013). For example, in the Song Dynasty (960–1279 CE), block cutters, printers, and their apprentices engaged in rigorous training to meet the needs of a thriving industry

of bookmaking, book collection, and print trade—incorporating innovative technologies such as xylography,¹³ moveable earthenware type,¹⁴ and color printing—while always working in strict servitude toward their sponsor (Brokaw, 2007; Mokyr, 2013). Cultural historian Christine Moll-Murata observes that guilds, which were associations of craftsmen and merchants, were also common in China, much like in Europe (pp. 1–2). In guilds, apprentices received professional training but received low or “sub-market” wages (Moll-Murata, 2013, p. 226).

In Europe, around the same period (1100s CE), the monastic scriptoria¹⁵ had begun outsourcing work to craftsmen to keep up with a growing demand for manuscripts, which led to the formation of guilds. In light of this demand, European artisans and craftsmen acquired more work and gained independence from the monastic system, forming guilds and companies like those in Asia, and establishing a multilevel master/apprentice model that is still evident in the communication design profession and education today—yet, in its pedagogical design, it was still strictly behaviorist (Barnes, 1971, p. 75). The education of a craftsman began with an indenture as an apprentice around the age of 13 or 14, an age at which one would be bound to years of technical training under a master. Importantly, a contract of indenture could be extended to include several years of schooling in reading and writing (Salzman, 1971, p. 81). The apprentice

¹³ Xylography is a form of engraving and block printing. It was a prominent technology in China until the 19th century. The exact year of its emergence is unknown. However, there is evidence of block printing in Eastern Asia as early as the 7th century (Yee, 1983). There is evidence of papermaking as early as the Han period in China (Gunaratne, 2001).

¹⁴ Bi Sheng invented movable type technology between 1041 and 1048 A.D. (Gunaratne, 2001).

¹⁵ The scriptorium was a room in a monastery devoted to the creation, design, and reproduction of manuscripts.

would then transition into the role of a journeyman before graduating into the role of a master (Barnes, 1971, pp. 76–79).

Working with the guild, craftsmen designed and produced intricate manuscripts that were laboriously constructed with relief printing from woodblocks—then a state-of-the-art technology—which some historians argue was acquired through trans-Eurasian trade along the Silk Road (Gunaratne, 2001; Needham & Tsuen-Hsuei, 1985; Special Collections & Archives Research Center, n.d.). Guilds in Europe, like those in Asia, were austere environments to learn and train in, both requiring periods of indenture. In European guilds, educational practices were documented. Less documentation exists about the day-to-day life and education of Asian apprentices, such as those training in the Song Dynasty (Moll-Murata, 2013, p. 226). These examples illustrate adaptations in the teaching and learning of printing methods, exhibiting a “human outcome of a [technological] paradigm shift” with the rise in demand for print media as a modality for communicating (Snooks, 1996, p. 240). These events resulted in increased literacy rates and demand for print media (Special Collections & Archives Research Center, n.d.). The diffusion of moveable-type printing methods began at a *relatively* slow pace; it, nevertheless, accounted for hundreds of years spent “fine-tuning” technological innovation and involved elaborate modes of kinesthetic-tactile learning (Snooks, 1996, p. 240). Yet, thanks to these foundations in guild education, the “complex systems and subsystems necessary to print a typographic book” were in place—manifesting in a major

technological paradigm shift: the invention of Johannes Gutenberg's mechanical movable-type printing press (Meggs & Purvis, 1998, p. 61).

Design historians and educators agree that the mechanical printing press is one of the most prominent and essential inventions in the history of design (Drucker, 2010; Eskilson, 2007; Jury, 2012; Meggs & Purvis, 1998). After an unsuccessful enterprise in producing metal hand mirrors, Gutenberg invented the first mechanical movable-type printing press around 1434 in collaboration with financier Johannes Fust (Schneider, 2008). This new technology would gradually stimulate an information technology revolution from Mainz and then the rest of Europe, spreading to Mexico City¹⁶ and, eventually, the rest of the globe (Aldis, 2011). Gutenberg's new printing technology enabled mass production of books and printed materials at an unprecedented scale, reframing the training requirements of craftsmen in the history of communication design (Eskilson, 2007, pp. 14–16; Meggs & Purvis, 2006, pp. 62–69).

Studio/Workshop Model

The apprenticeship model evolved by responding to society's changing needs and adapting the multilevel apprentice model to work in a print workshop setting. This marked a dramatic turn for the craftsman's role, evolving into that of commercial and applied artists, taking on some pedagogical design aspects of being both teacher- and student-centered. While the apprenticeship continued "in name," Ainley and Rainbird

¹⁶ Mexico City was an early adopter of printing technologies, with the printing press having been brought to America by Juan de Zumárraga (Castañeda, 1940).

(2014) observe that the education setting for craftsmen became less restricted, with the gradual abandonment of the “mutually binding nature of indentures” and an “increase in scale of operations” that led to less immediate supervision by a master printer of his craftsmen and apprentices (p. 17). Craftspeople established the foundations of graphic and communication design as a profession and gained more agency both as students and future professionals and business owners (Hollis, 2006, p. 97). These changes also signified the birth of a new “style of apprenticeships” that combined printing with engineering, evolving to this point toward the start of the Industrial Revolution (Ainley & Rainbird, 2014, p. 17).

Notably, at this historical technological transition—from movable type to the mechanical printing press—the work of the scribe became less relevant to that of the craftsperson through the emergence of mechanical processes in print production (Grycz, 1991). In this early instance of automation, new media educator Jay David Bolter (1991) and Elaine Keating (2004) observe that early craftsmen who had adopted mechanical processes initially continued to emulate the work of scribes, replicating books to look like fine manuscripts, relying on pedagogical traditions in rote learning and memorization. Yet as the demand for printed media increased, these replication techniques became less manageable, and the job requirements for craftspeople expanded again to be less passive and more critical. London School of Economics professor Jeremiah Dittmar (2011) observes that “cities that adopted print media benefitted from positive spillovers in human capital accumulation” (p. 4), and thus the role of the craftsperson grew, and craftspeople (in terms of pedagogic design) became more self-directed.

The growing demand for print publications (e.g., books, newspapers, and advertisements) led to the development of a commercial printer workshop that brought together craftsmen, apprentices, merchants, and scholars (Dittmar, 2011). At this juncture in the 16th and 17th centuries, the design studio setting developed as a multidisciplinary location of production and instruction that embraced a range of technologies, tools, and production methods. It can be argued that this was a significant historical achievement in design.

Vocational Model

The 18th and 19th centuries ushered in the next technological sea change, with the sprawling and disorderly commercial centers expanding during industrialization and accompanying changes in the skills and expertise transmission models. A climate for knowledge-sharing and competition drove a collective invention that spurred the early phases of the Industrial Revolution (Nuvolari, 2004). Notably, steam-powered printing enabled the mass output of advertising posters throughout Europe and the United States (Eskilson, 2007, p. 47). Thus, industrialization represented another series of landmark changes in the history of communication design. Modern industrial societies widened, the role of commercial and applied artists developed and broadened, and as a result, so did the education and professional skills required (Efland, 1983, p. 45). There was now a need for a new type of applied artist, skilled in working with a variety of materials and manufacturing technologies,” with the ability to create complex and “aesthetically pleasing” designs (Ledsome, 2011, p. 136). Yet, the need the applied artist’s practice,

much like a communication designer's practice utilizing digital technologies today, was also unequivocally paradoxical, in that it called for the designer to be creative and to have self-agency, following a more constructivist or social-constructivist pedagogical tradition, which also required a focus on their teacher or mentor's guidance, upholding more behaviorist traditions in pedagogy. Complicating this further was the development of trade schools after which many communication design programs are still modeled today.

Trade schools. Fueled by growing industrialized economies and the need to support the manufacturing industry, academies in France, Germany, and Great Britain created programs to train commercial and applied artists to meet these emerging needs. Trade schools such as the Geneva Drawing School were established. The applied arts programs started splitting off from the academies of fine arts, with France establishing the *atelier* and Germany developing one of the first dual applied art and fine art education systems (Efland, 1983, p. 152). Under the influence of the British and European academies, the United States established the National Academy of Design in 1826, where “practical training was devoted to lectures given by such distinguished figures as William Cullen Bryant, Gulian C. Verplanck, and Alexander Jackson Davis, on topics that included anatomy, perspective, ancient history, architecture, and mythology”—once more aligned with a more teacher-centered style of learning and memorization, that was also evident in Great Britain's globally-institutionalized South Kensington model (National Academy of Design, n.d.). In these traditions in design, it was evident that the philosophical differences in educational traditions were in a continuous state of flux, as they continue to be today.

South Kensington Model

In Great Britain, design education continued to advance thanks to stable public finances, government-funded programs, and a “fully integrated global marketplace,” which meant there was a continuous demand for designed goods and services (Mokyr, 2006; Special Collections & Archives Research Center, n.d.). In 1837, the British House of Commons founded the Government School of Design¹⁷ to continue supporting commercial growth and an Aesthetic Movement (Efland, 1983, p. 58). The curriculum taught in the school was the South Kensington system, a highly technical 23-stage course of art instruction that valued accuracy and the “habit of correct observation” (Kantawala, 2012, p. 213) (see Figure 3.)



Figure 3. Study of a Thistle, 1850.¹⁸

¹⁷ The Government School of Design is now the Royal College of Art (RCA). The RCA has also gone by the name of the South Kensington School of Design and the Normal Training School of Art.

¹⁸ British Government School of Design artist and administrator Richard Redgrave drew this pen and ink drawing of a thistle, *Study of a Thistle*, in 1850. During a period of widespread industrialization, Redgrave helped to design the 23-stage syllabus for the South Kensington system, which was adopted internationally by art and design educators. *Study of a Thistle* embodies the illustrative characteristics of technical,

Despite its prescriptive behaviorist nature of instruction, the South Kensington method was widely adopted to support the skills development of applied and commercial artists. To implement a similar type of professional art instruction in the United States, South Kensington-trained art educator Walter Smith was hired as an art supervisor for the city of Boston and as an art education supervisor in 1871 (Efland, 1990, p. 96). Smith established a version of the South Kensington system along with the first training program for visual arts educators in the US. By doing so, he profoundly influenced aesthetic values in North American art and design education (see Figure 4; Efland, 1990, p. 96; Stankiewicz, 1992, p. 169).¹⁹ While Smith helped to bring his South Kensington method to the US and Canada, other South “Kensingtonians” such as educator David Philip Blair helped carry this method of instruction to South Africa, Australia, and New Zealand (Chalmers, 1985). This method continued to spread globally, introducing some level of standardization into design curricula. Adapting to technology change in increasingly industry and business-focused settings, the skills required of design students had changed again, and so had the “design” and implementation of communication design education.

ornamental drawings that were produced according to this syllabus. Retrieved from Victoria and Albert Museum’s online archives at <http://collections.vam.ac.uk>.

¹⁹ I argue that the full extent of Walter Smith’s impact on design education in the United States is not fully realized or studied. Walter Smith has gained more recognition in the history of art education than in design education.



Figure 4. Card-Exercise V: Vertical Repetition, 1878.²⁰

Corporate Work Model

Emerging from the frenetic and gritty start of the Industrial Revolution and ushering at the beginning of a 20th-century Machine Age, commercial art education and the work of jobbing printers and typographers became integral to the fabric of U.S. commerce and everyday life. By the early 20th century, printing was one of the largest industries in the US, and advertising was a significant component of the industry (Jury,

²⁰ A card exercise found on page 122 of Walter Smith's teachers' manual on "Practical Design" and "Vertical Repetition" in his book *Teachers' Manual for Freehand Drawing in Primary Schools* published in 1878. Smith was a student of the South Kensington system in England and helped to bring this system to the United States. Retrieved from Victoria and Albert Museum's online archives at <http://collections.vam.ac.uk>.

2012, p. 202). Competition among publishers and advertisers ensued as new media—newspapers, magazines, and posters—entered the mainstream (Eskilson, 2012, p. 53). To accommodate the production of high-volume goods and keep costs lower, there was a need for higher-speed technologies. High-speed printing became a reality with technologies such as the PhotoStat, the Rectigraph, modern screen-printing, and the flatbed cylinder proof press (American Printing History Association, n.d.). As businesses continued to refine the way they communicated with their consumers, and technologies in the commercial arts accelerated, education practices and the visual language of design once again evolved.

Modernism²¹ emerged as a philosophical movement and in reaction to Victorian-era practices in art and design. As the modernist movement spread from Europe to North America,²² the intricate motifs of the Aesthetic Movement and the Arts and Crafts Movement simplified, welcoming abstract and universal forms in design and design education practices (Remington & Bodenstedt, 2003, p. 16). Modernist ideologies contributed to the creation of a theory of design and a new language for graphic designers that included the elimination of traditional forms; the integration of geometric shapes, primary colors, and sans serif typography; and the use of rational, systematic methods such as grid systems and analysis of content and form (Remington & Bodenstedt, 2003, p. 50).

²¹ Late 19th century and early 20th century modernism consisted of multiple movements such as Art Deco, Commercial Modern, German Expressionism, Expressionism, Dada, De Stijl, Futurism, Cubism, Constructivism, Surrealism, to name a few.

²² The Modernist aesthetic arrived later in North America, with Art Deco and Commercial Modern movements emerging in the 1930s. Some of these transformations in American print design can be viewed in the 1930s issues of *Fortune* and *Vanity Fair* (Eskilson, 2012, p. 233).

Vocational schools re-established curriculum for design and industrial drawing and manual training, attracting students from outside apprenticeships and academy education. Despite the negative perception of vocational schooling as an option for those of “lower social status,” this new pedagogical interpretation of the vocational model, both teacher- and student-centered, allowed independent designers seeking to improve their skills to enter the field (Encyclopedia Britannica, n.d.; Jury, 2012, p. 256). By the time of the Great War, the divide between art education and vocational/industrial design schools was fully pronounced, influencing instructional design considerations (Efland, 1990, pp. 177–184). Design schools faced the challenge of how to frame commercial advertising practices in curriculum, debating whether to conceive of it as an art or a science—many businesses preferred the latter.

American designer William Addison Dwiggins, who is widely cited for establishing the term “graphic design” in his article “New Kinds of Printing Calls for New Design,” was also a firm believer in the division between art and design. He wrote that “all the main purposes of printing can be served without calling upon the help of art” (Dwiggins, 1992; Jury, 2012, pp. 263–264). For designers entering the field, this presented a quandary. Was it better to be skilled as a designer in the fine arts? Was it better to be skilled as a designer in the sciences? Furthermore, was vocational education suitable with more education choices available outside of apprenticeships?

Bauhaus Model

Schools such as the Bauhaus and its founder, Walter Gropius, sought to uphold an education philosophy that blended art, design, and technology to erase the “boundaries between craft instruction and fine art training,” calling for collaboration between craftsmen and artists in his *Bauhaus Manifesto* (Droste, 2016, p. 15; Lupton & Miller, 1991, p. 5). Drawing from the work of the Pre-Raphaelites and Morris, German Expressionism, and the Modernist movement, Gropius proposed a student-centered pedagogy for art and design education (Weber, 2009). This multifaceted “tripartite” model, which combined training in “drawing, crafts, and academic theory” was developed and modified between 1919 and 1933 and is arguably one of the most publicized and is highly regarded for its interdisciplinary approach (Droste, 2016, p. 22). Bauhaus archive historian Magdalena Droste (2016) also notes that the model was a phenomenon, defying other established apprenticeship, academy, and vocational design education models (pp. 1-22). The Bauhaus model integrated studies in art, design, architecture, typography, and textiles such as weaving, industrial design, and interior design (Lupton & Miller, 1991; Meggs & Purvis, 1998; Weber, 2009).

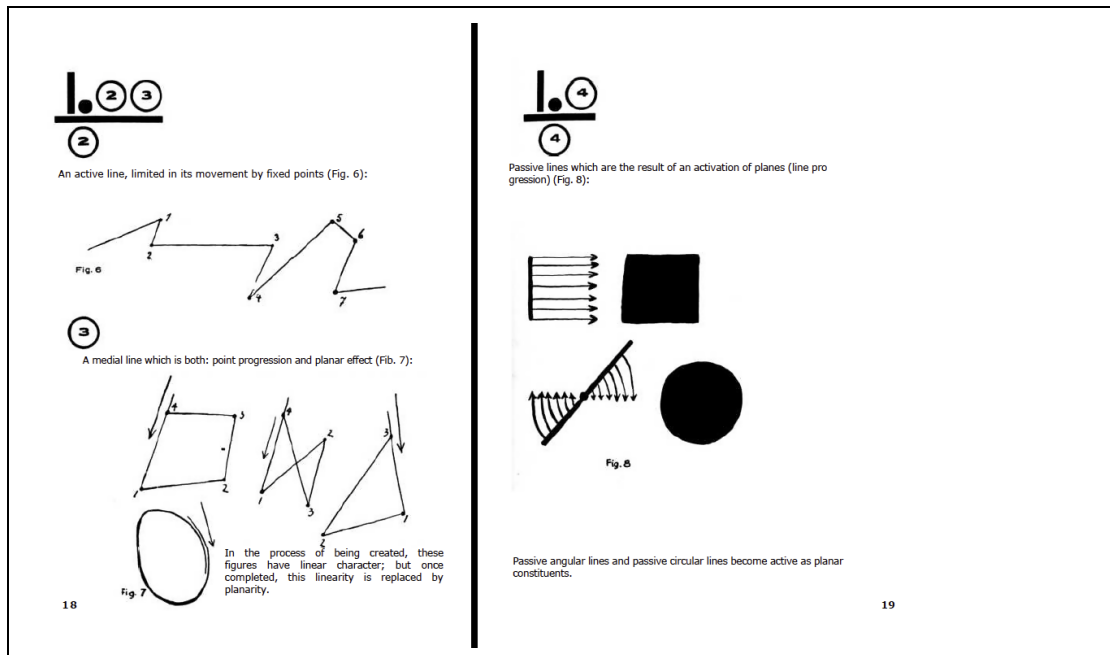


Figure 5. Pedagogical Sketchbook, 1968.²³

The Bauhaus stance on science and technology was heterodox and embraced the theory of relativity, Gestalt psychology, and the work of Gestaltists such as Kurt Lewin and Karl Duncker (Behrens, 1998, p. 300). The modernist style of design incorporated in Bauhaus curriculum eschewed the illustrative qualities that were typical of the Government School of Design and the American arts and crafts movement, as can be viewed in Bauhaus instructor and prominent artist Paul Klee's *Pedagogical Sketchbook* (Klee, 1925 & 1968; see Figure 5).

Despite the success and recognition of the Bauhaus model of design education, the rise of Nazism and World War II led to the termination of the Bauhaus in 1933. The school's notable faculty fled to various parts of the world, with many of them such as

²³ Pages 18 and 19 of artist and Bauhaus instructor Paul Klee's English-translated book *Pedagogical Sketchbook*, published in the United States in 1968. The book was originally published in Germany in 1925. This book consists of 43 design exercises drawn from Klee's lectures at the Bauhaus. Retrieved from <https://archive.org/details/KleePaulPedagogicalSketchbook1960>.

Gropius, Josef Albers, and Lazlo Moholy-Nagy resuming their work in the US. Over the next two decades, the influential ideas of the Bauhauslers, in America and abroad, led to the establishment of interpretations of Bauhaus ideology in schools such as Harvard Graduate School of Design,²⁴ Black Mountain College, Yale School of Art, and the New Bauhaus School.²⁵ The ideas also led to the rise of new design education philosophies that blended ideologies of the Bauhaus with the work of American education reformer and philosopher, John Dewey (Buettner, 1975, p. 389). These schools of design that prospered through the 1950s—many of which remain prominent in contemporary communication design education—are still working towards developing new pedagogical practices that are responsive to a digital transformation.

To date, how this is best done has not been fully articulated or implemented, with much of the vestiges of industrial age means of instruction still prevalent in contemporary 21st-century education. It is this age-old debate, there is a constant push and pull between traditional and new pedagogical practices. This led me to design a study to explore this quandary further, seeking to understand how communication design students might be supported while undergoing a digital transformation of design.

Chapter II Summary

At the start of the 21st Century, the development of digital technologies brought unprecedented changes to information consumption and exchange, transforming every

²⁴ Walter Gropius and Marcel Breuer were faculty members at Harvard Graduate School of Design.

²⁵ Lazlo Moholy-Nagy founded the New Bauhaus School, which would later become the Institute of Design.

aspect of our lives. Communications design educators, professionals, and students have been challenged to develop pedagogical practices, and to make sense of disparate views on approaches to learning with emerging digital technologies (AIGA & NASAD, 2016; Cartwright, 2016; Fleischmann, 2015; Grefe, 2012, 2013; Heskett, 2001; Phillips, 2018; Resnick, 2002). In contemporary education and work, the rejection of digital technology use may no longer be a viable option if students are to, upon graduation, excel in contemporary design jobs (Fleischmann, 2015; Heller, 2009).

Yet, designers are hardly new to responding to technology change. In the 1990s, designers responded to the dot-com bubble, quickly evolving their repertoire to create and design websites and develop new digital products and services (Meggs & Purvis, 1998). With the rise of digital media, designers have embraced new techniques, problem-solving for digital technology-focused challenges (Heskett, 2001). Looking back further into the history of communication design, designers—who have gone by various professional titles over time as artisans, applied artists, and commercial artists—worked in scriptoriums, apprenticeships, and in print workshops to create the cutting-edge communication medium at that time: print media (Ainley & Rainbird, 2014; Eskilson, 2007; Meggs & Purvis, 2006). Before communication designers acquired the title “designers,” they shaped the processes and techniques by which there was a mass scale of information delivery for the first time (Eskilson, 2007). The pedagogical practices prescribed for centuries were often quite clear and distinct. Designers frequently worked in multi-level apprenticeships in commercial printer shops (Ainley & Rainbird, 2014). Later, as economies industrialized, designers found education outside of the master-apprentice model in trade schools and applied art programs (Efland, 1990). It was not

until the 20th century that communication designers found themselves working in a corporate work model, directly within businesses, advertising firms, and design studios, where pedagogical practices grew more dispersed into different schools of thought—from the Bauhaus school of thought that fostered art, design, technology, and theory in difference to vocational schools and South Kensington-derived pedagogical models that directly pipelined designers into supporting commercial economic growth (Dwiggins, 1992; Jury, 2012). Yet, these traditional models in design are not fully relevant in the face of a rapid digital transformation, as they were developed to address different needs. The concept of pedagogical practices specific to communication design remains largely underexplored (Davis, 2012; Hayles, 2012).

In light of a digital transformation, the requirements to begin professional work in communication design have changed significantly. Thus, the pedagogical practices to be developed are in need to be in closer alignment with a Digital Age than with an Industrial Age where print publications were a primary form of communication (Cezzar, 2017a; College Board, 2019). Through a digital transformation, the contemporary role of the communication designer has shifted from print and graphic designer to nearly unrecognizable roles in product designer, digital designer, user experience designer, user interface designer, to name a few (Jury, 2012). With this in mind, there is a need for more research to examine the pedagogical practices that are best suited for communication design education in light of a digital transformation. This research aims to contribute to an emerging body of work that addresses what suitable pedagogical practices should look like. In the next chapter, I present the research design I have employed to examine these issues.

Chapter III

METHODOLOGY

Introduction

In this section, I describe the methodology and primary instruments for data collection required to analyze pedagogical practices in communication design education, in light of a digital transformation. In so doing, I examine which pedagogical practices can be developed to help students entering the profession. In search of rich insights into how communication design educators, professionals, and students are navigating digital transformation challenges, I surveyed 193 anonymous participants (n=193) and interviewed nine participants (n=9) (N=202). In the design of the study, it was important to gather findings that were as generalizable and unbiased as possible.

I considered the views of communication design faculty, professionals, and students, and how these views compare and contrast. With communication design education adapting to a digital transformation, the question of what pedagogical practices are critical to support students through this transition is not well understood. In the following subsections—Methodology, Design of Study, and Data Collection—I describe the necessary steps I took to carry out this dissertation research.

Methodology

Mixed Methods: Explanatory-Sequential Design

I chose to employ an *explanatory sequential mixed-methods* study for this research. Collecting quantitative data first allowed the insights gathered to be more generalizable and guided me as to what qualitative data to collect in the *second phase* of this explanatory mixed-methods study (Wiersma & Jurs, 2005, p. 89). The quantitative data collected was intended to highlight overall trends and verify the primary study hypothesis on whether there was a significant effect of a digital transformation of design on educational and professional requirements of communication design educators, professionals, and students, and the extent to which the groups agree or disagree. Guided by these quantitative trends, I next collected qualitative data in response to the research questions.

Quantitative Methodology: Explanatory and Exploratory Data Analysis

The first step in this research was the collection of quantitative data. I initially recruited an anonymous group of survey participants who self-identified as communication design educators, professionals, and students (Wiersma & Jurs, 2005, p. 85). I incorporated closed-ended questions on a Likert scale and with ranking questions to

measure tendencies, followed by several open-ended questions to look for generalizable trends (see Appendix A and B).

The initial results provided a snapshot of tendencies in terms of whether students view themselves as being prepared to use digital technologies in digital transformation as a phenomenon. Additionally, the statistical tests were used to look for any significant differences between groups. This then helped to shape the questions asked of participants in the qualitative phase of this study, where I probed potential differences in perceptions around preparedness and studied additional pedagogical practices that communication design educators and professionals utilize, getting a better sense of their “shared, lived experiences” (Creswell, 2007). Collecting quantitative data and, after this, qualitative data, provided verification while also strengthening the internal and external validity of the study findings—that a digital transformation drives change in design and design education, and as a result, drives the re-examination of pedagogical practices that may be best suited for these changes. Yet while the descriptive data and verification through statistical tests gave detailed higher-level results, specific, more granular stories, narratives, and ideas came through in qualitative data collection and through thematic coding.

Qualitative Methodology: Thematic Coding

According to Merriam (1998), a qualitative study seeks to “discover and understand a phenomenon, a process, or the perspectives and worldviews of people involved” (p. 11). Drawing on Merriam’s insights, this second phase of the study looked

to analyze the shared human experience—capturing the views that communication design educators, professionals, and students hold regarding the study questions (Creswell, 2012; Eisner, 1990). In structuring the qualitative study, I aimed to construct an *emergent* research design where I created a “complex picture” of individual and group experiences with designing pedagogical practices in light of a digital transformation in communication design and communication design education (Creswell, 2012, p. 47). By looking at this “complex picture” from “individuals who have experienced the phenomenon” of changing pedagogical practices, I was able to compose an in-depth account that cannot be depicted by quantitative insights alone (Creswell, 2007, p. 79). In the semi-structured interviews, I searched for “clusters of meaning” that emerge from the nuanced individual and group experiences of educators, professionals, and students, thus gaining a better understanding of what communication design education looks like in light of a digital transformation (Creswell, 2007, p. 80, 2012, p. 47; see Appendix A and B).

Mixed Methods: Developing a Joint Display

By combining quantitative insights from survey data with interview data from the three groups, I compared multiple accounts (in total, N=202) to create a rounded understanding (Creswell, 2007; Eisner, 1990; Fielding & Fielding, 1985; Maxwell, 2013, p. 102; Merriam, 1998, p. 204). Therefore, by comparing the data and presenting it in a joint display, I aimed to construct a snapshot of the size of the effect of a digital transformation in communication design education as expressed in the views held by the

three groups on what skills communication design education should develop (Maxwell, 2013; Merriam, 1998, p. 204). By collectively interpreting qualitative and quantitative data from a range of participants ensured that these views had greater internal and external validity (Creswell, 2012, p. 251; Creswell & Creswell, 2018; Merriam, 1998, p. 204).

Design of Study

In this section, I describe the participants, selection criteria, and channels for recruitment that were used.

Participants

I surveyed 193 anonymous participants (n=193) and interviewed nine participants (n=9), including three students, three communication design educators, and three professionals in the field (see Table 3 and Table 4). Drawing from a rich and nuanced quantitative and qualitative sample enabled me to construct a dissertation from a substantial range of views. To carry out this study, I employed a criterion for participant selection, summarized in Table 3, below.

Table 3. Participant Selection Criteria

Participant Type	Criteria
Communication Design Students	<p>Currently matriculated as an undergraduate or graduate student in communication design program or school.</p> <p>Undergraduate students will be in their junior or senior year.</p> <p>Graduate students will be in their first or second year of study, but will have already completed a semester of graduate coursework.</p> <p>A strong interest in innovative practices.</p> <p>Dedication to entering the communication design field upon graduation.</p>
Communication Design Educators	<p>Currently teaching as a communication design program or school.</p> <p>Experience with an emphasis in practical applications in design, rather than theoretical or historical.</p> <p>Three or more years of experience teaching.</p> <p>A strong interest in innovative practices.</p>
Communication Design Professionals	<p>Currently working in a communication design studio in a senior or leadership role.</p> <p>Experience with leading innovative design projects from concept to finish.</p> <p>Three or more years in a senior or leadership role.</p> <p>A strong interest in innovative practices.</p>

Student participants (interviews). The communication design students were primarily in their 20s or early 30s, in the midst of completing their studies, preparing to apply for their first entry-level design positions. They were graduate-level communication design students preparing to apply for a design position. For design students, the final year of study is a crucial transitional moment where they decide on their career paths in the communication design field.

Educator and professional participants (interviews). What mattered in the recruitment of educators and professional participants was their experience and accomplishments in communication design and their dedication to the field of

communication design. They needed to be consistently employed and open-minded about innovative practices in the field of communication design. The age of communication design educators and professionals was not relevant to my research questions.

Recruitment channel (interviews). The primary recruitment channel for interviewees in this study was higher education communication design schools and programs and professional design studios. The majority of recruitment sites were in the NYC area. NYC is a vibrant, global center for design, with a high density of programs, schools, and design studios. To mitigate validity threats, I approached design educators and professionals with whom I did not have existing relationships. I facilitated several open calls for interviews and collaborated with program administrators at communication design programs and schools to reach out to members of the three participant groups to interview. The schools from which I attempted to recruit educators and students included Pratt, Queens College (CUNY), St. John's University, Brooklyn College of Technology (CUNY), Parsons School of Design, and the School of Visual Arts. Design studios I targeted to recruit design professionals included the Microsoft Learning Lab, Facebook's in-house design studio, Pentagram, 2x4, Project Projects, and Google Creative Lab.

Data Collection

I employed several research methods to gather communication design faculties', professionals', and students' views on a digital transformation in communication design education and the changing needs of communication design students. The primary

instrument for data collection was a long-form survey, and the secondary method included semi-structured interviews (see Table 4). However, given that this was a sequential mixed-methods study, the quantitative survey data collection informed the qualitative interview data collection. I began with descriptive and inferential questions in quantitative analysis, which then guided my recruitment of participants best suited to interview.

Open-Ended and Closed-Ended Survey Questions

I facilitated surveys using the online survey software Qualtrics (see Appendix A and B). The surveys were intended for communication design educators, professionals, and students who, at the time of the survey distribution, primarily lived in the United States; however, participants from outside of the US were able to participate. This broadened the scope of the analysis. The surveys were consistent with the interview protocol, including the same 4–5 major research questions and sub-questions, helping me to gather additional data about the changing pedagogical needs of communication design students from a broader pool of respondents. The surveys took approximately between 10 and 12 minutes to complete. I aimed to collect 150-200 responses through the facilitation of a Qualtrics survey on Amazon Mechanical Turk. I received 193 survey responses.¹ Table 5 outlines the survey protocol.

¹ The 193 survey responses that were accepted were reviewed and selected from over 600 submissions, many of which were incomplete.

Table 4. Summary of Methods

Methods	Participants	Primary Data Collection Method	Secondary Data Collection Method	Meeting Frequency (# of times, length)
Open and close-ended survey (n=193)	193 anonymous participants coming from communication design education and professional background Total: 193	X		One online survey, 10-12 minutes per participant
Semi-structured interviews (n=9)	3 Communication Design educators 3 Communication Design professionals 3 Communication Design students Total: 9 participants		X	One 30-60 minute meeting

Table 5. Survey Protocol

<p>1. Which of the following roles do you currently fulfill in communication design? Please check all that apply.</p> <p>Design Educator Design Professional Design student</p> <p>2. Specifically, what position do you hold in communication design?</p> <p>3. What region do you currently work in? Please reply to one answer.</p> <p>4. What is your gender?</p> <p>5. Please specify your race and/ or ethnicity. Check all that apply.</p> <p>6. How long have you been working or studying in the field?</p> <p>7. How much college-level education have you received in communication design? Please check all that apply.</p> <p>8. Have you held a design internship? If "yes," specify the total amount of internships you have held.</p> <p>9. What sub-discipline in communication design best describes your work in communication design? Check all that apply.</p> <p>10. If you work as a professional, how well prepared did you view yourself to work professionally in communication design after graduation?</p> <p>11. If you are still a student, how well prepared do you feel you to begin professional work?</p> <p>12. Describe an enriching educational experience that helped you prepare to be a communication designer.</p> <p>13. Describe a challenging educational experience you have encountered in studying to become a communication designer.</p>	<p>14. Describe how you stay up-to-date with practices in design.</p> <p>15. How do you view the development of digital technologies in the design field?</p> <p>16. How do you view your proficiency with the use of current digital technologies in communication design?</p> <p>17. Are there disciplines in communication design that benefit more than others in the design field from the use of digital technologies?</p> <p>18. Describe your current professional practices in design (such as strategies and processes) in terms of digital technology use.</p> <p>19. In which part of your design practice do you rely on digital technologies? Check all that apply.</p> <p>20. Describe the digital skills you would still like to acquire.</p> <p>21. What areas of communication design do you interact with daily?</p> <p>22. What educational practices should communication design educators and professionals develop to help students entering the profession? Please be as specific as possible.</p> <p>23. What educational practices should communication design educators and professionals develop to help designers who have already entered the profession? Please be as specific as possible.</p> <p>24. What educational practices should communication design educators and professionals develop to support designers' use of digital technologies? Please rank the following (0 is the least helpful, and 100 is the most helpful).</p>
---	--

Semi-Structured Interviews

Interviews were the secondary instrument for data collection. Semi-structured interviews were necessary for data collection because they foster purposeful, open

conversation to encourage “inter-relational” dialogue without being overly prescriptive (Kvale, 1996, pp. 44–45). The structured questions helped to build consistency in and allowed comparison across the responses from communication design faculty, professionals, and students, whereas the open questions fostered an informal “conversation with a purpose” (Merriam, 1998, p. 71). This style of semi-structured interviewing helped me to investigate the extent to which and how communication design faculty, professionals, and students incorporated print and digital media in their practices, and what they viewed as most important to fulfill the needs of the new communication design curriculum.

To follow a semi-structured format, the interview protocol consisted of 4-5 major research questions and a series of prompts. The interviews were approximately 30 minutes to 1 hour in length. All of the interviews were recorded on a Sony Recorder, and the audio files were then transcribed. I collected nine responses in total from three communication design students, three communication design educators, and three communication design professionals. Table 6 outlines the interview protocol.

Table 6. Interview Protocol

1. Can you tell me about your work as a communication design [educator/ professional/ student].

Prompts

- Currently, what position do you hold in communication design?
- How long have you been [working/studying] in the field?
- What do you do on a day-to-day basis?
- How do you stay up-to-date with practices in design?
- What digital skills do you miss in your role as ...? What skills would you still like to acquire? What steps are you taking to acquire those skills?
- For educators/professionals: When you first began working in communication design after graduation, how well prepared did you find yourself?
- For students: How well prepared do you think you are to begin professional work?

2. How do you respond to the digital transformation of design and design education?

Prompts

- How do you view the development of digital technologies in the design field?
- In which part of your design practice do you rely on digital technologies? How has this been changing during your career?
- What advice would you want to give to students to respond to these changes?
- What methods or pedagogical practices do you think are working well in response to these changes? (Can provide a definition if prompted)
- What specific processes/ practices have you implemented in your [classroom/studio/studies] to help you navigate the rapid technological changes in communication design education?
- How do you overcome challenges resulting from technology change in your practices?

3. Looking back, can you describe an enriching educational experience that helped you prepare to be a communication designer?

- What about a challenging experience?
- What's been missing from your educational/professional development? School can't necessarily cover everything that you need in your career, but what are the one or two things you wish you could (had) learn(t)?

4. A lot of designers I have spoken with consider real-world experience as essential to developing the pedagogical practices needed to excel in the profession.

Prompts

- Do you think schools prepare students adequately for what awaits them in their profession?
 - How can we help students entering the profession? Can you share an example?
 - How can we better support designers after they have entered the profession?
-

Limitations of Research

There were logistical and theoretical constraints in this study regarding time, geography, the participant sample size, the theoretical framework, and my role as a researcher. In this section, I will briefly review these limits (see Table 7).

Logistical Limits

Time limit. This research was limited by time and the number of interactions that could occur between me, the researcher, and the participants during this period. The data collection process took 12 months. The survey and interview data collected during this period represented just a “snapshot” of faculty’s professionals’, and students’ insights about technology in communication design education at the moment of data collection. Because the field is always dynamic and technologies are ever-evolving, this study illuminates a period where digital media gained prominence.

Geographical limit. The survey and interview data collected was not geographically limited to a specific region. Among the nine interview respondents, five participants were from New York City, with the other participants coming from San Francisco, the Netherlands, Arizona, and Maryland. The geographical constraint limits educator, professional, and student interviews primarily to NYC and the US. The semi-structured survey, however, broadened the group of participants and allowed analysis beyond the United States, with anonymous participants coming from the US, Canada,

Asia, and Europe. The views in this study, in summary, were largely American, or North American.

Participant sample size. The size of the participant sample limited this research. While the size of the sample is relatively large for a mixed-methods study, it only accounts for a small percentage of the design population as a whole. Therefore, these findings may not be fully generalizable and are intended to provide insights on digital transformation in communication design and the changing pedagogical practices that design educators, professionals, and students might contend with.

Theoretical Limitation

This research is grounded in the pragmatic view that design as an innovative practice is ever-evolving and expanding with changing technologies, needs, and interests. While many researchers, educators, professionals, and students may agree with this theoretical approach, not everybody in the field accepts it. This pragmatic view that I hold as a researcher is a constraint that shapes the study, creating boundaries within the study, and a definitive worldview in my approach to data collection and conducting the research.

Role as a Researcher

As the sole researcher of this study, I have existing views about communication design and the roles of communication design educators, professionals, and students. The

perceptions I hold come from my long-time experiences in the communication design field as a communication design student, practitioner, and educator. My career has been largely focused on my work as a designer; therefore, I enter the study with several biases. I acknowledge these biases with the aim to minimize them as much as possible. They include the following:

Cultural bias. Many of my views and beliefs in this study come from my direct experiences in the communication design field and the associated professional culture. With more than a decade of experience in the field, I hold certain beliefs about what design students need. This also presented a limitation with the types of designers who were recruited for this research. This research focused on communication designers who were considering and reflecting on their use of digital technologies, however there are designers who work primarily with physical materials, like letterpress or calligraphy. While I recruited survey participants, I did not screen out participants working with traditional, hands-on processes, however they only made up a minority within the respondents. During interviews, I attempted to exclude leading questions that would have resulted in answers that confirmed my own biases.

Positive results bias. I anticipated navigating a “positive results bias,” where communication design educators, professionals, and students tend to be overly positive about their work in communication design. The study participants frequently work in client-facing business relationships that require a high level of etiquette and keen attention to how they market themselves to sustain business relationships. Therefore, it was crucial that the participants felt comfortable and open before engaging in interviews.

Table 7. Research Limits

Type of Limit	Justification for Limit	Limitations of the Research
Time	This research was collected over a period of one year.	The time limitation placed a constraint on the amount of information that can be collected.
Participant Sample Size	The sample size was limited to approximately 200 participants. The larger survey sample size informed the collection of qualitative data in the second part of the study.	The sample size, while offering rich insights, belongs to a specific group of communication design educators, professionals, and students. These are reflections of part of the communication design community, not the field of communication design in its entirety.
Geographical	The interview data was primarily collected in NYC for multiple reasons. The location was convenient and well-chosen as it is a flourishing center of the design industry.	This research mainly reflected what communication design educators, professionals, and students in English-speaking countries view, primarily the US, with some respondents coming from Canada, India, and Europe.
Theoretical	The pragmatic lens through which this research was constructed—that design is an innovative real-world practice—shaped the study, and the aims of the study.	The theoretical framework was a worldview that shaped the study. The belief that communication design is an innovative and real-world practice was inflected throughout the study.
Role as a Researcher	As the primary researcher, I came into this study with existing sets of beliefs. My perceptions were influenced by my education and professional endeavors in communication design.	A sole research constructed this research. As the only researcher in this study, my views are inflected throughout the study.

Data Analysis

I analyzed the data through inductive and deductive methods. I used deductive reasoning to test a hypothesis and inductive reasoning to analyze survey and interview

text developed into thematic categories. Then, I compared and contrasted the collected data in this mixed-methods research.

Quantitative Data Analysis

I analyzed the quantitative data collected to identify tendencies among communication design educators, professionals, and students (representing three independent variables). That is, this research asked whether there were differences between educators, professionals, and students, as well as views on the importance of digital transformation in communication design.

First, I used a chi-squared test to test for differences between groups quantitatively, both in terms of views on a digital transformation in communication design against evolving skills required among communication design students. Next, I analyzed and summarized the descriptive statistics, looking for the tendencies and the overall means of individual groups.

Qualitative Data Analysis

The qualitative data collected aimed to synthesize, compare, and contrast the views of communication design educators, professionals, and students. By working with three distinct groups in this study, I looked for emergent themes and collective experiences (Creswell, 2007; Creswell & Creswell, 2018; Glaser, 1994; Glaser & Strauss,

1967; Strauss & Corbin, 1990). Through this inductive method, I was able to analyze participants' responses on changing requirements and the migration of the communication design profession toward a digital technology focus (Richards, 2012, p. 60; Strauss & Corbin, 1990). By examining word frequencies in the qualitative responses in the survey and interview data, I organized the data thematically into "composite descriptions," which look at the "common experiences of participants" (Creswell, 2007, p. 80).

Ethical Considerations

There were several ethical considerations in this research. While the Teachers College Columbia University Institutional Review Board categorized the study as low in risk, there were still some necessary considerations with confidentiality procedures, informed consent, diversity, and how the research might benefit participants.

Confidentiality Procedures

Ensuring participants' confidentiality was a key aspect of this study. I compared and contrasted the views of communication design educators, professionals, and students, so there was some potential for disagreements to emerge on the research topic: the needs of communication design students. The anonymization of participants enabled them to speak freely and comfortably about their understanding of the needs of communication

design students without worrying about sharing views that could be perceived as controversial, damaging to their reputation or design practice, or to others' reputations within the field.

Aliases. The use of aliases helped to ensure that all of the participants remained anonymous. Nonetheless, the use of realistic pseudonyms helped to retain the believability of the narrative. Interview participants (n=9) were given realistic pseudonyms while each survey participant (n=193) was assigned a set of two randomized initials.

Informed Consent

The participants had to understand what the research was about before entering the study. The study required communication educators, professionals, and students to engage in deep thinking about the needs that communication design curriculums should fulfill and what design students think of their education. Part of this involved considering how communication design education has and has not met the goal of preparing students to enter the field. It was of particular importance that the participants understood that problem-solving is part of the interview and survey questions, and they were provided with prompts to think deeply about their answers. Participants could skip a question or withdraw from the study at any time. I did everything possible to provide a supportive,

safe, and non-judgmental environment to engage in conversation about communication design education.

Diversity

It was important for me to include a culturally and ethnically diverse group of participants in this study to embrace communication design as a field that is “global, multicultural, and interconnected” (Carroll, 2014). While I did everything I could to ensure that the researchers cited throughout this study came from varied backgrounds, much of the literature in this paper was cited from a North American and European lens, who publish a majority of existing literature and research in communication design written in the English language; and continue to make up much of the professional and educational field (Carroll, 2014). Initiatives like the AIGA’s “Diversity and Inclusion: learning basics” and the AIGA’s “Diversity & Inclusion Initiative” seek to support a more inclusive culture of design (see AIGA, n.d.; Carroll, 2014).

Research Benefits: Remuneration.

A final ethical consideration is with regard to financial remuneration. The nine communication design educators, professionals, and students contributed to this study on a pro-bono basis. However, the survey participants received \$2.00 per response. This was meant to ensure that participants got a living wage for their time. Each survey was

expected to take 10 minutes to complete. As of December 21, 2019, the minimum wage in the State of New York was \$11.80. The survey payment, adjusted to this, was estimated at \$12.00 per hour.

Remuneration: additional considerations. The anonymous survey participants needed to provide complete data written in coherent sentences. Given this criterion, only 30.9% of the surveys were accepted. I sent rejection letters thanking participants who were unable to complete the survey, submitted multiple entries, or submitted plagiarized responses for their time. I manually reviewed and carefully checked each survey for integrity. While it was challenging to reject incomplete surveys, I decided that surveys with missing data should not be analyzed for this study.

Chapter III Summary

In Chapter III, I proposed a mixed-methods research study that aimed to incorporate the views of design educators, professionals, and students. For the design of the study, it was particularly important to incorporate the diverse viewpoints of these three groups and develop a sampling design with as little bias as possible. Drawing on the work of Creswell and Creswell (2018), I selected an explanatory mixed-methods research design because it was critical to first, collect quantitative data to test the study hypothesis and develop a snapshot of the trends in digital technology use among design educators,

professionals, and students, and then gather qualitative insights that could provide more in-depth accounts.

The primary instrument for data collection was surveys, and the secondary instrument for data collection was through interviews. While the quantitative data provided higher-level descriptive data on a digital transformation as it relates to pedagogical practices in communication design, there was a need for these richer, nuanced descriptions found in the interview data (Creswell & Creswell, 2018). Through the survey data and interview data, I was able to get a sense of what pedagogical practices might be developed to support communication design students through a digital transformation, while also getting a sense of the study participants' overall preparedness regarding the use of digital technologies in communication design education.

In this research, there were clear limitations in terms of time the study was carried out, the geographic scope of the data collected, and the extent to which the sampling design was unbiased. The recruitment effort was fairly extensive, resulting in 202 participants (N=202), including 193 survey respondents and 9 interviewees. Over 600 survey respondents were recruited; however, the criteria for inclusion required thoughtful and detailed answers, so I rejected surveys that were incomplete or unclear. Among the interviewees, the criteria for inclusion required that: design educators and professionals be actively teaching and working in the field and possessed no less than three years of experience, with a demonstrated record of achievement, and that student participants be

fully matriculated, approaching their final year of study, and also demonstrated a record of active participation in communication design education.

It was also important to mitigate research biases to the greatest extent possible. Recruiting anonymous survey participants (where reidentification was not possible, rather than recruiting through a snow-balling method or through advertising and word of mouth) was beneficial, as it allowed the data to speak for itself. The survey sample size was also a key consideration as it provided more reliable tendencies. Finally, all of the participants gave their informed consent through Qualtrics (for survey respondents), and by signing consent forms (for interviewees). All relevant IRB protocols were observed.

Chapter IV

FINDINGS

Introduction

The study results conveyed in this “Findings” chapter revealed rich and complex views held by design professionals, educators, and students on the use of digital technologies in communication design education, pointing to evolving educational and professional requirements responsive to a digital transformation. The findings are divided into three sections. The first section highlights the descriptive statistics gathered from the anonymous survey participants (n=193) and interviewees (n=9). In the second and third sections, the qualitative and quantitative data is merged—the results are presented according to major thematic categories, sub-thematic categories, and codes.

The primary study hypothesis asked whether pedagogical practices in the digital transformation of communication design and design education have a significant effect on the educational and professional requirements of communication design educators, professionals, and students. The data collected in this study confirmed the hypothesis. In the following section, I first examine whether, statistically, there are differences in beliefs between groups. Then, I analyzed the qualitative insights on the effect of the digital transformation of design on communication design, while highlighting the changing requirements in communication design that study participants identified. The survey and

interview questions were extensive enough to answer the study research question and sub-questions.

Descriptive Analysis: Surveys

Demographic Data

Survey population demographics. My quantitative analysis started with an online survey distributed via Amazon Mechanical Turk. Survey respondents were primarily drawn from North America: 73% (n=140) reported that they lived in the United States, while 3.5% (n=7) indicated they were from Canada, and 23.4% (n=45) were from outside of the US or Canada. The gender distribution of the respondents was split fairly evenly, with 42% identifying as female and 58% identifying as male. The racial composition of the respondents was mixed, with 57.6% of respondents identifying as White, followed by Asian at 26.1%. Those who identified as African American were 8.4% (n=17), 4.4% were of Hispanic or Latino/a ethnicity (n=9), and 2.4% were of American Indigenous or Alaska Native ethnicity (n=5) (see Table 8 and Table 9).

Table 8. Survey Respondents

#	Answer	%	Count
1	I live in the United States Specify the town/city and state	72.92%	140
2	I live in Canada Specify the municipality and province	3.65%	7
3	I do not live in the US or Canada Please specify your city and province	23.44%	45
	Total	100%	193 ¹

Table 9. Race and Ethnicity²

#	Answer	%
1	White	60.9%
2	Black or African American	8.4%
3	Hispanic or Latino/a	4.7%
4	Asian	27.6%
5	American Indigenous or Alaska Native	2.6%
6	Hawaiian or Pacific Islander	0.0%
7	Other. Please specify	1.0%
	Total	100%

¹ In this table, there was 1 non-response.

² In terms of reporting on race and ethnicity, participants were allowed to select multiple responses. A total of 10 (n=10) participants identified with more than one race and ethnicity.

Occupation

More than half of respondents (54.2%) indicated that they had been in the field of communication design and communication design education for between 3 and 5 years, 18.8% for between 0 and 2 years, 15.6% for between 6 and 8 years, and 11.5% for more than eight years. In this survey, 48% of respondents identified as design professionals, 23% reported working as design educators, and 29% identified as design students (see Figure 6).

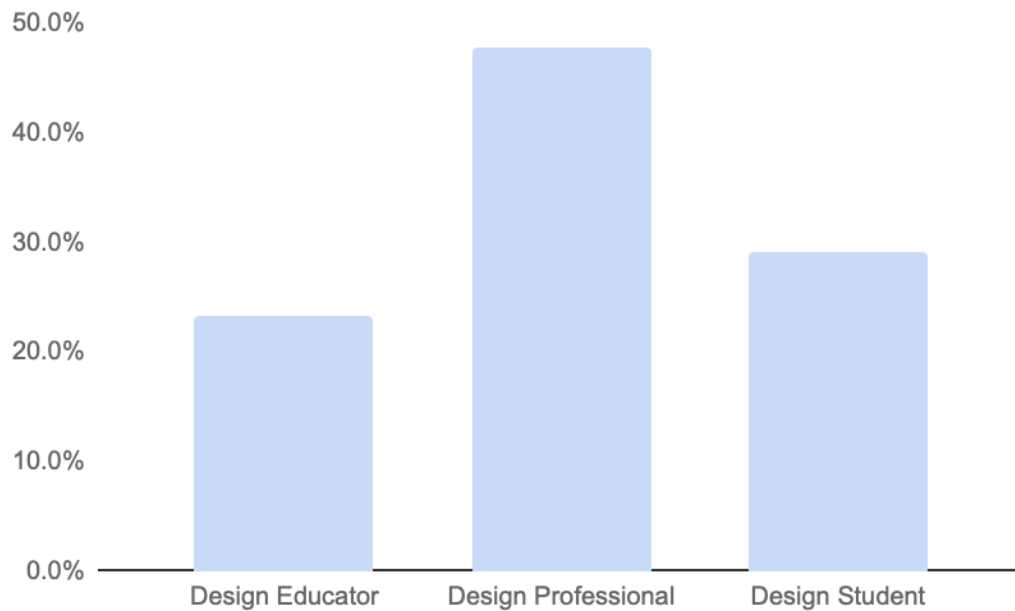


Figure 6. Participants' Occupation

Educational attainment also varied across the respondents. Among the respondents, 48.0% reported completing 4-year degrees, 26.2% had a Master's degree, and 15.4% had 2-year degrees. A portion of them (5.9%) reported being self-trained. Across all respondents, 42.0% (n=81) reported having held a design internship. The minimum internship completed was 1.00 per survey participant, and the maximum reported was 2.00, with a standard deviation σ of .49 (see Figure 7 and Table 10).

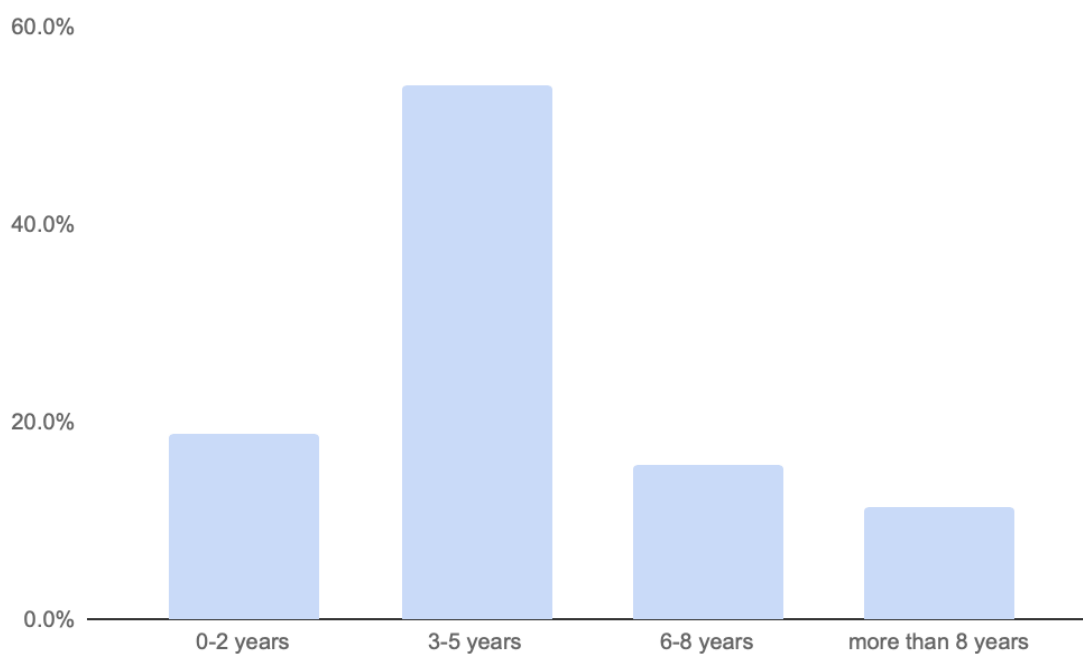


Figure 7. Participants' Work Experience

Table 10. Educational Attainment

#	Answer	%
1	2-year degree	15.4%
2	4-year degree	48.0%
3	Master's degree	26.2%
4	Doctorate	1.5%
5	Certificate	2.9%
6	Self-trained	5.9%
	Total	100%

The plurality of respondents described their work in communication design as digital design (45.2%), print design (18.2%), strategic design or design management (15.2%), UX research (10.3%), and social impact design (8.8%) (see Figure 8).

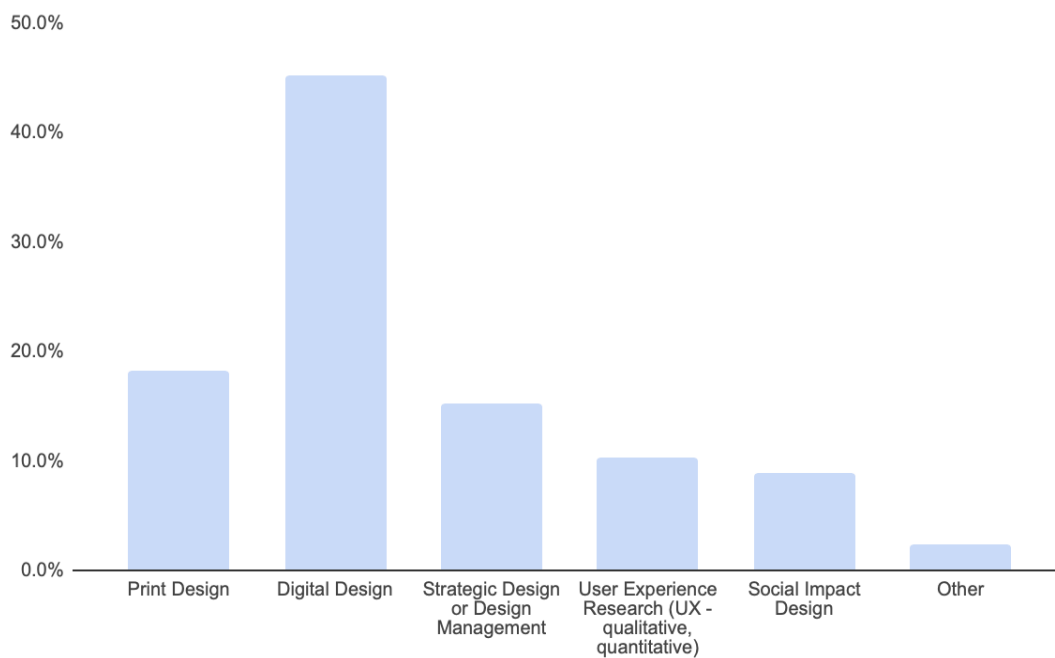


Figure 8. Design Disciplines

The survey respondents held various jobs across the named sub-disciplines of communication design. The most frequent specialization positions within these sub-disciplines included digital and web designers and front-end developers (n=31), graphic designers working at junior and senior levels (n=30), multimedia designers (n=6), design engineers (n=7), design managers and creative directors (n=17), marketing and social media designers (n=6), user experience designers (n=5), animator and special effects designers (n=4), and print production artists and printers (n=4). While 42 instances of specializations were in a strictly digital modality, only four cases of specialties were in a purely print modality; however, many of the specializations were in hybrid print, digital, and research specializations. Among the survey respondents (N=193), a total of n=104 reported a specialty, while 89 were either not reported or not specific to a modality.

Job preparedness. Respondents, who were either educators or professionals, were asked whether they felt prepared to work in communication design upon graduation. Among these respondents, 64% felt prepared or extremely prepared, but a full 36% felt either somewhat prepared or not proficient. Students were also asked whether they felt prepared to begin professional work. Among the total, 74% felt prepared or extremely prepared, while 26% felt somewhat prepared or not proficient.

Attitudes on the development of digital technologies in design. Most respondents viewed the development of digital technologies in design favorably, with 78.4% of them having a favorable or highly favorable view. Most respondents felt proficient with their use of current digital technologies in communication design—59.7%

felt prepared or extremely prepared, while 40.3% felt just somewhat proficient or adequately prepared.

Use of digital technologies. The reliance on digital technologies was most significant in digital design (41.2%). It was also substantial in print design (19.1%), strategic design and design management (16.7%), social impact design (11.1%), and UX design (10.2%).

Daily practices in communication design. Daily, the respondents interact most with digital design (43.9%), strategic design and design management (17.3%), print design (17.0%), UX (12.0%), and social impact design (9.4%).

What educational practices to develop? The respondents ranked digital design (78.4 out of 100) as the most important practice for educators and professionals to develop to support designers' use of digital technologies. Next were coding and web development, and design thinking (68.0), Design Theory (67.2), qualitative research (64.6), quantitative research (64.0), management (63.4), formal concepts (61.6), writing (60.1), print design and production (60.0), and, lastly, Typography (59.3).

Digital Proficiency between Design Educators, Professionals, and Students

There was a significant difference in views on proficiency in digital technologies among design educators, professionals, and students. Table 11 shows that while 69.6% of design professionals felt prepared or extremely prepared with digital technologies, only

40% of students felt the same way, suggesting that a fair amount of training in these technologies needs to take place on the job.

Analysis of Variance (ANOVA). The calculated χ^2 test score was 22.42 (with 8 degrees of freedom (d.f.) and a p-value of 0.00), confirming that there was a significant difference in the way design professionals, educators, and students viewed digital proficiency.

Table 11. Cross Tabulation and ANOVA: Digital Proficiencies among Groups

	Design Professional <i>A</i>	Design Student <i>B</i>	Design Educator <i>C</i>	Total
Not proficient <i>A</i>	00.00%	00.00%	00.00%	00.00%
Somewhat proficient <i>B</i>	10 9.80%	16 25.8%	4 8.00%	27 14.3%
Adequately prepared <i>C</i>	21 20.6%	21 33.9%	14 28.0%	49 25.8%
Prepared <i>D</i>	40 39.2%	20 32.3%	22 44.0%	76 20.0%
Extremely Prepared <i>E</i>	31 30.4%	58.06%	10 20.0%	3820.0%
Mean	3.90	3.23	3.76	-
Total	102100.0%	62100.0%	50 100.0%	190 ³ 100.0%
How do you view your proficiency with the use of current digital technologies in design communication	Chi-Square		22.4*	
	Degrees of Freedom		8	
	p-value		0.00	

³ Three respondents did not answer this question.

Specializations in Communication Design among Design Educators, Professionals, and Students

Overall, there was an insignificant difference in specialties among design educators, professionals, and students, indicating that specializations were generally equally distributed. However, in terms of the overall averages, there were some noteworthy differences. Design professionals were 13% more likely to work in digital design than design educators were, and only 2.4% more likely than design students were. Design educators were 11% more likely to work in print design specializations than design professionals, and only 4.5% more likely than design students were. Design educators were also 5% more likely to work in strategic design and management than professionals were; however, 24.7% more likely than students. Design professionals were 7% more likely to work in user experience research in design than educators were, and only 5.3% more likely than students were. For professionals, educators, and students working with social impact design, there was only a mean difference of 4%.

Analysis of variance (ANOVA). The score of the calculated χ^2 test equaled 13.4, with 10 degrees of freedom (d.f.) and a p-value of 0.2, meaning that at a 0.05 significance level, I could not reject that the groups were similar in terms of specializations.

Table 12. Cross Tabulation and ANOVA: Differences in Specializations among Groups

	Design Professional	Design Student	Design Educator	Total
Print design	2929.0%	2235.5%	2040.0%	5830.9%
Digital design	8383.0%	5080.7%	3570.0%	14979.3%
Strategic design and design management	3939.0%	1219.4%	2244.0%	5931.4%
User experience (UX, qualitative, quantitative)	2323.0%	1117.7%	816.0%	4117.0%
Other, please specify	00.00%	11.61%	12.00%	21.06%
Total	100100.0%	62100.0%	50100.0%	188100.0%
What areas of communication design do you interact with daily?	Chi-Square	13.4*		
	Degrees of Freedom	10		
	p-value	0.20		

Skills for digital technologies. Table 13 shows the differing weights on training for digital technologies across those self-identifying as design students, educators, and professionals. Design students (81.6) and professionals (80.2) reported a stronger emphasis on digital design than educators (71.1) did. Students (71.2) also put greater weight on coding and web development skills than educators (63.8). Educators placed stronger weight on qualitative research (72.0 vs. 64.0), design thinking (78.7 vs. 71.6), and typography (66.6 vs. 58.1) than students.

Table 13. Cross Tabulation: Views on Practices to be developed in Communication Design

	Design Educator	Design Professional	Design Student	Total
Digital Design	71.1	80.2	81.6	78.8
Management	69.7	61.5	64.3	63.9
Coding/Web Dev	63.8	67.2	71.2	67.7
Design Theory	71.1	65.5	69.9	67.9
Qualitative Research	72.0	61.9	64.0	64.5
Quantitative Research	68.6	60.2	65.6	63.5
Design Thinking	78.7	69.7	71.6	72.0
Typography	66.6	55.2	58.1	58.3
Writing	67.8	57.2	61.0	60.4
Formal Concepts	65.3	58.4	66.0	62.0
Print Design	63.7	56.1	61.7	59.3

Descriptive Data: Interviews

Demographics

Survey population demographics. Interview respondents primarily resided in North America: 73% (n=8) while n=1 was from outside of the US, in Amsterdam in the Netherlands. The gender distribution of the respondents was split relatively evenly, with

42% (4) of them identifying as female and 58% (5) identifying as male. The race, ethnicity, and age of interview respondents were not requested.

The nine interviewees in this study included three design professionals (two creative directors, one front-end developer), three design educators who regularly teach courses in design, and three students who are currently in university engaged in studies that have aspects of design. In contrast to the survey respondents, all the three design professionals interviewed had a considerable amount of experience in communication design education roles, ranging from more than ten years of experience in their current roles to more than 35. Table 14, shows a brief profile of each interviewee, with the names of the interviewees changed to protect their identities.

Table 14. Interviewees⁴

<i>Sarah, Creative Director and Artist</i>	Sarah is a creative director who is regarded as a pioneer and leader in digital design, specifically interface design, and based in California. She has worked with major technology companies and also maintains a fine arts practice.
<i>Alan, Designer and Creative Director</i>	Alan is a designer and creative director, primarily based in the Netherlands. He has worked with public- and private-sector clients and has worked for several well-established independent design studios and firms.
<i>Grant, Front-end developer</i>	Grant is a front-end developer with a background in graphic and communication design. As an independent developer, he works with several non-profit organizations. Grant is based in New York City.
<i>Gian, Design Lab Director and Lecturer</i>	Gian is the founding director of a virtual reality lab and visual communications lecturer at a public university in Arizona. His work and research focus on interdisciplinary collaborations.
<i>Candice, Associate Professor</i>	Candice is an associate professor at a private university in New York City teaching courses in design and technology, game design, and data visualization. Her research focuses on how media and game design can contribute to social engagement and experiential learning.

⁴ All of the participants in this study have been de-identified. A realistic alias has been assigned to each of the participants. Specific organization affiliations have also been de-identified.

Elizabeth, <i>Designer, Curator, and Educator</i>	Elizabeth is a designer, curator, and educator. She publishes books on design and directs a graduate-level design program.
Eva, <i>Designer majoring in neuroscience</i>	Eva is a communication and fashion designer pursuing a second career in neuroscience and neuroscience education. She was completing a master's in neuroscience education. In her research, she is interested in designing AI applications and neuroimaging techniques.
Julie, <i>Design student majoring in design and creative technologies</i>	Julie is a design student studying in a graduate-level design and technology program in New York City. Coming from a background in economics, Julie is interested in the role of analytics in design, including the use of machine learning and data visualization.
Sharon, <i>Design student majoring in design and creative technologies</i>	Sharon is a design student studying in a graduate-level design and technology program in New York City. Sharon came from a background in architecture. Her interests were more aligned with design research and analog techniques that can be applied to creative technologies.

Thematic Analyses of Survey and Interview Data

The following section merges the survey and interview data in this research, organizing thematic areas developed through categorical coding. The data collected from the research participants (N=202) demonstrated pedagogical approaches through school and well into their professional lives. Table 15 details the major themes that came out in the open-ended survey responses and interview data. Three major categories emerged from the survey and interview data in this section of the results. First, exploratory results

are presented as descriptive statistics that emerged about how design students, educators, and professionals engaged with changing practices and skills development in communication design education. Next, in the following thematic area, the data is presented through themes and sub-themes—investigating the results as they relate to real-world challenges and in terms of enriching educational experiences that the respondents identified. Within these three major categories, I identified sub-themes, and nested within these sub-thematic categories are codes and descriptions of the codes. Table 15 outlines these major themes and subthemes that emerged from the data. The 11 codes and related examples that resulted from these themes, or major categories in the results, are discussed in the third section of this chapter.

Table 15. Thematic Categories in Survey and Interview Responses

Major Theme	Subthemes
Changing practices in communication design education	<ul style="list-style-type: none"> ● Staying up to date with practices in communication design. ● Technical skills development in communication design. ● Soft skills development in communication design.
Challenges in designing for the real-world	<ul style="list-style-type: none"> ● Learning to design for the real-world. ● Subtheme: Learning to use new technologies for real-world applications.
Pedagogical practices to support students in communication design education	<ul style="list-style-type: none"> ● Enriching educational experiences in communication design education. ● Pedagogical practices to support students entering the communication design profession.

Theme 1: Changing Practices in Communication Design Education

Study participants were asked how they stay up to date with practices in communication design and what practices they were interested in developing. For both survey participants (n=193) and interviewees (n=9), navigating the influx of digital technologies in communication design education resulted in varied concerns.

Technical/Digital Skills Development and Preparedness

A large share of survey respondents specialized in digital design (43.9%), with 31% of the respondents not feeling prepared to enter the field as students. Among the interviewees (n=9), 78% had a specialization in digital design; however, 89% of the interviewees had digital skills they wanted to develop. For both groups, there was a keen interest in improving their capabilities to work with digital technologies, but everyday engagement with digital technologies did not necessarily help participants to achieve their goals in learning to code and develop apps, conduct research, or create visual effects, for example. This pointed to a dilemma.

In terms of digital resources, study participants pointed to the vast array of products and services available to support the learning of new digital skills and techniques in design; however, *access to digital resources did not always lead to participants feeling more prepared to do their work*. Despite not always feeling prepared

to do digital design work, the participants reported on a multitude of available digital resources.

Staying Up To Date with Practices in Communication Design

Regardless of their roles, study participants frequently pointed to digital media platforms, search engines, and open-source online courses as a means to stay informed of the changing practices in communication design. They mentioned design blogs, Facebook, YouTube, Google Search, Twitter, Muzli, LinkedIn Learning, Behance, and Instagram as a sample of top platforms they engaged with. Also, survey respondents cited social media influencers and experts, along with their friends in the industry, as a means of staying up to date with design practices.

A total of 91 or 47.1% of survey respondents cited online digital resources for learning, available outside of traditional classroom settings, as a primary means of staying informed. Only a small percentage (12%) of survey respondents (n=23) in this research reported staying up to date through face-to-face interactions and in-person modalities.

Few survey responses cited print media as an outlet for staying up to date. One survey respondent F.H. (2019) noted the declining influence of print media in design,

Newspaper page design is becoming a dying art, and I'm not sure there's a lot to stay up-to-date on. My small newspaper does not offer workshops or training,

except when it changes or updates operating systems (which seems to happen every few years).

Given the switch from print-based media toward using digital resources for learning, related insights emerged among the study participants on how to negotiate a digital transformation of these resources. Q.B., a New York-based design student and survey respondent, noted the importance of robust online engagement on web-based forums and discussion boards. While online forums are important for information exchange, prominently since the 1990s, Q.B. observed that today's "digital world is saturated," suggesting browsing for relevant content and contributing to discussions to stay up to date. Q.B. (2019) described:

Online forums and discussion boards can be full of tailored information on specific topics and industries...Make sure you contribute to discussions as well as take in what you're learning from others. The digital world is saturated with written, audio, and visual media to immerse yourself in. There are loads of respected bloggers out there whose opinions are as credible as paid newspaper journalists are. Do a regular Google search and see what you can find... (Q.B., survey respondent).

Seven survey respondents, like Q.B., reported being interested in online forums like Reddit and Designer Hangout to stay informed of recent developments in communication design education developments, while 16 survey respondents reported YouTube as their preference for delivery of educational content on design subject matters. These participants cited the usefulness of YouTube tutorials where users can learn "basic and intermediate techniques" from leading professionals (O.W., survey respondent, 2019; N.T., survey respondent, 2019). However, most participants saw value in acquiring information from *a mix* of digital resources. A creative director from Spokane, Washington, stayed up to date through a subscription to Adobe's newsletter and

“other online publications and YouTube channels” (K.Y., survey respondent, 2019).

H.A., a California-based design professional, found that the best means to stay up to date depended on the career stage of the designer:

As a student, take advantage of practical opportunities for learning, such as internships and workshops in the community. Once you’re finished with your degree, don’t abandon your pursuit of new skills. Instead, look for continuing education courses in graphic design and seminars, conferences, and workshops for graphic designers. Any graphic designer today spends hours and hours online. Make great use of that time by looking for inspiring graphic design blogs, social media accounts to follow, case studies, tutorials, and portfolios. When you find a great blogger or graphic artist you admire, engage with them online to learn even more from what they do. By practicing your techniques, you hone your craft while testing out new trends and ideas. This allows you to stay creative, improve your techniques, and get rid of ideas that aren’t as good. Most importantly, it helps you nurture and develop your unique style as a designer. (H.A., survey respondent)

Candice, an interviewee and professor at a university in New York City who teaches courses in design and technology, game design, and data visualization, also described the value in online tutorials found on YouTube, noting:

There’s an incredible generosity out there; people make tutorials on YouTube and other things for others, and I think that that’s an incredible thing. It is something that I am really thankful for. Whether it is fixing a broken toilet or a piece of code that I am trying to figure out or some kind of design problem that I am trying to solve. (Candice, interviewee, 2019)

While digital resources and online communities were the primary channels to learn about design practices and industry developments, some study participants retained that in-person interactions were important in a designer’s learning process. As noted, only 12% of survey respondents (n=23) preferred to stay up to date using face-to-face means.

The interviewees (n=9)⁵ had more evenly split views (see footnote), with five interviewees (55.5%) taking a more cautious approach to their amount of engagement with digital, online resources, linking excessive browsing to mental health problems.

For Sharon, an interviewee and graduate student studying design and technology, being “enrolled in a degree and being “surrounded by a lot of people who are constantly talking about what is going on in the design and technology world” was most beneficial (interviewee, 2019). In Sharon’s case, some interactions with her peers took place on student-led Slack channels, and a balance between face-to-face interactions with online resources worked best. For Eva, a graduate student studying neuroscience—with a background in design—volunteering for projects had been an important way for her to stay up to date. Eva described, “I volunteer for anything, and I wish I had more time [...] every time there is an opportunity to design something, I always seek it” (interviewee, 2019).

While it was clear that survey respondents tended to look to digital resources, a total of 23 survey respondents (11.9%) used face-to-face resources to stay up-to-date, which included: attending conferences and educational workshops, interacting with colleagues in the workplace, pursuing internships, joining professional associations, reading about communication design history and design theory, sketching out ideas, and reaching out to friends for advice.

An even smaller percentage of survey respondents (n=4 or 2%) cited the importance of face-to-face, in-classroom learning, speaking to rapidly changing

⁵ At a sample size of n=9, the views among interviewees were less likely to be generalizable. Six of the interviewees were also experts in the field and more likely to have a balanced understanding of digital versus in-person resources.

conceptions of learning in design. G.W., a graphic designer from Baltimore, Maryland, preferred attending classes and collaborating with friends and colleagues. B.V., a marketing designer from Madison, Wisconsin, specified that a research assistantship position, completed for a professor, contributed to an ongoing dialogue between them, keeping her in touch with design practices. R.N., a website administrator from Toledo, Ohio, reported that he regularly went back to school to “take classes to improve” his “design procedures” with a focus to learn more to become a “better communicator” (survey respondent, 2019). Similarly, M.L, a visual image developer from the US, also described the importance of taking “refresher courses” (survey respondent, 2019).

Importantly, participants’ motivation for finding resources to support their learning experiences in design went well beyond staying informed. Regardless of location, age, or specialty, study participants frequently held a fundamental interest to self-educate in order to acquire and advance their digital skills, presented with the challenge of expanding their skills to accommodate quickly evolving education and professional requirements.

Technical Skills Development in Communication Design Education

The majority of study participants (89%) reported a digital technical skill⁶ they wanted to develop further. Study participants were interested in improving their abilities in coding and designing web interfaces, performing web analytics, learning to research

⁶ Here, I define technical skills as digital technical skills. Technical skills can also relate to mechanical skills or other analog manual techniques. However, the majority of communication design education-related work in this study is related to digital.

user experience design, prototyping, virtual reality design, and artificial intelligence design. Survey respondents also expressed interest in learning more about user-interface design, search engine optimization, animation, 3-D rendering and computer-aided design, color retouching and image manipulation, sensory design, and ergonomics design. Both groups still viewed Adobe Creative Suite (e.g., Photoshop, Illustrator, In-Design, After Effects) as foundational; however, there was anxiety related to traditional software programs becoming less relevant than techniques requiring more advanced programming knowledge. Traditional design work in print design and print production generally requires the use of digital tools and applications like the Adobe Creative Suite, but only five (2.3%) of 192 survey respondents conveyed an interest in developing print design abilities.

Fifteen survey respondents (n=15) viewed social media marketing and design practices as increasingly important in a designer's role. The respondents interested in social media-related skills development reported interest in learning more about paid advertising for search engine marketing, and content marketing overall. R.A., a design educator living outside of the US, observed that "it should come as little surprise" that it is important to learn about search engine optimization (R.A. survey respondent, 2019). Q.P., a survey respondent and a design educator living in India, observed on social media:

Social media marketing goes beyond posting a tweet or Facebook update; it is about understanding the dynamic relationship between brands, influencers, and consumers. (Q.P., survey respondent, 2019)

Above all, study participants most frequently cited keen interest in learning to code. The definition of "coding" used across respondents fell into many sub-categories,

but the most common definition was directly related to computer programming for software development and engineering, with goals ranging in complexity depending on the respondent and their personal and professional aspirations.

All nine interviewees identified the value in learning to code, and six expressed the desire to improve their coding abilities. In total, among all study participants, there were 54 instances of these design educators, professionals, and students wanting to learn to code. Some respondents wanted to learn highly technical skills such as iOS and Android development, PHP, and Java. The most common reports related to mastering the basics of coding. Research participants saw coding as an increasing requirement; important for meeting the changing requirements of the communication design profession. The respondents also viewed coding as essential to becoming more knowledgeable about how the products and services they were designing actually functioned.

I.Z., a marketing designer from Minneapolis, Minnesota, described, “Programming is still something I need to learn. I’ve dabbled with JavaScript and HTML, but I have a long way to go” (I.Z., survey respondent, 2019). Seeing a disconnect between graphical production and development, Y.F., a graphic designer from Albany, N.Y., remarked, “I would like to learn more about web design right now. I mostly create things to put on websites, but it would be interesting to learn how to set up the websites themselves around the products” (Y.F., survey respondent, 2019). For O.G., a web designer from Detroit, Michigan, who reported being “somewhat proficient” in his work, he recounted using tools and platforms that can be used without any programming languages. Nonetheless, acquiring the “know-how of coding” would be much better for

his work (O.G., survey respondent, 2019). Problematically, learning to code was viewed as being overly confusing, yet essential for making digital front-end designs more appealing. Ultimately, given the digital transformation of education and work, it was also viewed as “where everything is heading towards” (R.N. survey respondent, 2019).

Student interviewees also stressed the importance of coding, pointing to its relevance in future developments in design and education. Eva (2019) conveyed, “I don’t know how to code [...]; however, it would be cool if I knew how to do that. I need to get on that because I feel like the future is coding and AI.” Shirley offered that she had some programming abilities, specifically working with JavaScript. However, she stated, “I can’t say that I am an expert in any of them, and I am still constantly working on them every day.” Similarly, Julie, a design student studying graduate-level design and technology, described having a level of proficiency in coding, specifically Unity, but admitted she doubted she would become a software developer or engineer, and that coding was something that she “struggled” to learn daily (Julie, interviewee, 2019).

The interviewees working in industry and design education roles shared similar experiences. Grant, a front-end developer coming from a design background, who had extensive experience in coding, also described needing to expand and update his programming abilities by learning additional JavaScript application frameworks. Sarah, a creative director and pioneer in user-interface design, mentioned an interest in being better at prototyping where she would generally depend on programmers to implement her work into the “whole user experience” in design (Sarah, interviewee, 2019). Coming from the view of a design educator, Colleen remarked on the importance of learning to code, explaining:

It is essential to have experience and roll up your sleeves and to write your own code. Even if you're never going to write code in your career, you should understand how it works. (Colleen, interviewee, 2019)

The sentiments among the study participants on the topic of learning to code were significant. Although they viewed coding as fundamental, the majority of respondents were not confident in their coding ability.

In terms of skills development, however, participants were also hoping to advance their soft skills. Soft skills development was also viewed as increasingly important in communication design education.

Soft Skills Development in Communication Design Education

Looking beyond hard skills, the participants cited the need for continuing soft skills development in communication design education. A moderate 11% of survey participants (n=21) and 100% of interviewees (n=9) specified soft skills in their responses, identifying: creativity, critical and strategic thinking, design management, communication and presentation skills, client relations, and research as meaningful to communication design education.⁷ Those interested in developing research skills in design (n=4) thought of it in terms of user experience research and data analysis. C.S, a survey respondent and design student living in Canada, pinpointed the necessity of “problem-solving and information-handling.” For S.J., a web designer from Lake Isabella, California, “analytics would be something that [she] would very much like to

⁷ The survey respondents (n=23) identified the soft skills listed in this section before being asked to provide the rankings for similar characteristics in the survey protocol (see survey protocol in Appendix A).

acquire.” For interviewee Julie, research was especially integral to her routine in graduate school, and she described spending much time researching in the university library.

The respondents also regarded digital literacy as a “requirement for organizations of all types and sizes to succeed” (U.Y., survey respondent and design educator living in Canada). They also considered ethics in design as an area for further development. F.D, a design educator from India and survey respondent, expressed, “Good ethics [are] a fundamental requirement of any profession. It is integral to the success of the business as well.” Furthermore, they considered the practicality of maintaining a digital practice, with L.M., a design student from Stroudsburg, Pennsylvania, sharing, “I would like to go outside of digital design in the future. I have been curious about print design for a while, though I believe staying digital might be the most economical choice.”

The need for more soft skills development, in addition to hard skills development, alluded to a complex and changing landscape in communication design education. These complexities also spoke to the challenges of learning to design for real-world applications as a design student.

Theme 2: Pedagogical Challenges in Designing for the Real World

The second major theme that emerged related to designing for the real world. Study participants were asked to describe a challenging experience they encountered in studying to become a communication design professional, regardless of whether they were students, professionals, or educators. Among the survey respondents, 96.3%

reported a challenging experience while studying to become designers, with only 7 participants reporting they had not encountered any issues in their design education. Among the survey respondents, 39 (or 20.3%) pointed to challenges with bridging their experiences as current or former students with gaining more hands-on experience. All 9 interviewees described a challenge encountered in studying to enter the field. These challenges frequently pointed to learning to communicate on the job and to use new technologies in real-world settings.⁸

The desire to gain more real-world experience also touched on preparedness. The interviewees (n=9) generally described feeling moderately prepared to enter the professional workplace. Among all survey respondents, an average of 69% indicated they were ready to begin work after graduation.

Learning To Design For the Real World

Many research participants found a disconnect between their education and entering the workforce. B.V., who completed a 4-year degree in design with a focus on strategic design and design management, found the transition from school to work “a bit jarring.” She detailed,

Being in school and learning and then working in a company and learning are completely different. The transition from school to work professionally was a bit jarring. Working professionally on a product and service project was the most challenging educational experience that I had to help me become a designer. (B.V., survey respondent, 2019)

⁸ In terms of the theoretical framework that grounds this dissertation research, it is understood in this research—and generally agreed upon in industry and across educational settings—that communication design and communication design education are “real-world practice-oriented” (Creswell & Creswell, 2018; Moody, 2019). Much of what was reported was consistent with the pragmatic viewpoint taken in this research.

N.P., a user experience designer from Tampa, Florida, who had completed a 2-year degree, stressed the importance of “getting enough practice at school before applying for a job.” D.N, a product development engineer from Exeter, New Hampshire, who had completed a 4-year degree, found it necessary to understand “how marketing really works in the real world,” including “demographics and societal impacts.” Alan, an interviewee designer and creative director who had graduated with a degree in graphic design in 2004 in Amsterdam, shared a similar observation:

When I just started as a designer, on a scale of 1 to 10, I would say 1 or 2 maybe in terms of being prepared. I was actually in lucky circumstances, where at the end of my teachings, we had very practical assignments. Back then, I had to make a book for school, and this was actually printed—100 copies or something like that—so I had some practical knowledge. How I was taught more of the opinion of teachers than the skill sets I needed for reality. (Alan, interviewee, 2019)

Although the participants viewed internships as important for gaining real-world experience, they also had mixed reviews on the same. For instance, 42.0% survey respondents (n=81) and 66.6% of interviewees (n=6) had held at least one internship before beginning work.⁹ X.I., a user experience designer from Omaha, Nebraska recalled, “I struggled with many places taking me seriously. There were plenty of opportunities for internships, but not many people who believed in my ideas and such to put them into practice” (X.I., survey respondent, 2019). R.N., who had completed a 4-year degree and had more than eight years of experience working in communication design-related work, relayed that, “The step from being an intern to actually being in charge of projects as a

⁹ In terms of a research limitation, it is also important to note that all of the respondents in this study are those who decided to remain in the communication design profession regardless of their experiences in school or how much exposure they had to real-world settings during their education.

professional was definitely a challenge. There was no one there to fix my mistakes. I had to do it all on my own” (R.N., survey respondent, 2019). Other respondents saw internships as helpful in bridging the gap between theory and practice. A.R., a designer and team leader living in India, noted, “College education helped me to improve my skills; however, only theoretically but not practically. The internship helped me in a practical way.” (A.R. survey respondent, 2019)

Participants also noted that higher education classrooms, clubs, and activities provided different benefits that internships could not, offering a place to be more creative, experimental, and theoretical—even if not fully integrated into the “real world.” They also expressed discomfort with gaining real-world exposure and being creative.

Considering this disconnect, Julie remarked that “school is there for us to do what we want to do and be creative and explore different boundaries and stuff, whereas working is very regimented and is all about the client” (Julie, interviewee, 2019). Q.M., a print and web designer from the Greater Philadelphia metro area, stated that to become proficient in design, students needed to be creative as well as business and marketing savvy since “creative work is useless for most business applications if it doesn’t meet the organization’s marketing goals” (Q.M. survey participant, 2019). Elizabeth, a designer, curator, and educator based in Baltimore and New York City, also identified a disconnect. However, she differentiated further between school and work, recalling that:

There are so many things you just learn from actually working. School is intellectual and exposes you to what the hell design is, what critical theory is, and it’s a kind of realm of ideas. Then, by the time I was working as a designer, everything was different. (Elizabeth, interviewee, 2019)

Learning To Use New Technologies for Real-World Applications

Disconnects between learning to use new digital technologies and applying them to real-world scenarios were also apparent. Given the technology-forward mindset of many study participants, there was a desire to see the gap between theoretical and practical use of technologies solved.

Many research participants viewed learning to use new technologies such as coding and designing websites as a daunting endeavor. S.X, a design educator from Columbus, Ohio, likened learning to code in Java to “learning a new language” (S.X, survey respondent, 2019). In agreement, X.Y., a design student from Olympia,

Washington, had the feeling that learning to code was going to be a lifelong experience:

A challenging experience is learning JavaScript, which I am in the middle of right now. It’s like a foreign language that has to be used precisely for the correct outcome you are trying to achieve—but when it works, it’s so cool! There is a LOT to learn and perfect in the digital design world, and the learning is never done—technology changes constantly and it’s important to not only stay up-to-date but to keep learning, practicing, and honing your craft. It’s a life-long practice.

Study participants also reflected on the fact that designers were now being called upon by industry to meet stringent coding and digital design requirements. QM, a design professional from the Philadelphia region, argued that “most designers should have digital skills first, and print skills as a secondary skill” (QM, survey respondent, 2019). On the other end of the spectrum, Y.F., a graphic designer, viewed himself as “a little handicapped for not fully having these [programming] skills,” and advised design students to “learn how to code websites before anything else” to be more responsive to market demands (Y.F., survey respondent, 2019). Sharon, coming from an economics

background before transitioning into a design and technology major, felt conflicted about machine learning and algorithm design. Sharon (2019) detailed:

I'm not well-prepared at all. I also think that has to do with the fact that I am not sure I want to pursue professional work in machine learning after I graduate, potentially, maybe it could go either way. At the end of the day, I am also realizing that I am not in the computer science program and the program that I am in is an MFA [...] I also think that knowing me and knowing how well I can acquire new skill sets rapidly."

Learning the fundamentals of digital technologies in design was also challenging. I.L., a web designer from the US, noted that while completing a 2-year degree, found it "stressful and difficult" to learn to use native apps on a MacBook, but was able to force himself over the course of a month (I.L., survey respondent). Granted, these problems are not entirely new. As Elizabeth recounted in her interview:

First, there was a switch to digital production for print. That was the early-90s. Then, in the mid-90s, it was the Internet. There were new outcomes [...] and new ways for people to interact with design.

Alan also remarked on some of his issues with wanting to learn to code, noting clear advantages in how it could support his design practice where "diverse" projects called for specific technology needs:

Well, I would always love to be a better programmer. That would be very helpful in my practice. That is one end, and there is a whole story to that as well. Since my work is so diverse, there is always a software or technology I would like to learn more. However, on the other end, I am on this breaking point in my career where I should not be learning software anymore.

These real-world challenges spoke to *pain points* in communication design education. Looking to respond to these challenges, study participants identified various pedagogical practices that can help to address these concerns, looking for nurturing,

collaborative and innovative solutions to responding to a digital transformation in communication design education.

Theme 3: Pedagogical Practices to Support Students in Communication Design Education

Responding to challenges with skills development and real-world learning in communication design education, study participants were asked to consider the practices that would best support students in taking on professional work as designers. Based on word frequencies in the interview and survey data, major themes emerged. Nested within these major thematic areas were thematic codes. The codes represent multiple discrete standards, ideas, and strategies that were related to the learning experiences of communication design students, pointing to specific areas for improvement. In this section, I examine each code with these discrete ideas (e.g. “Examples”) acting much like pedagogical building blocks.

Each emergent code highlights pedagogical approaches, categorized as examples that study participants viewed as integral to learning to be a communication designer sensitive to the complexities of dealing with technological change. Study participants reported on the various educational or pedagogical practices they thought would best support communication design students. These varied codes and related examples spoke to how design professionals, educators, and students can design or *re-design* enriching

experiences to support students whose work should now be responsive to a digital transformation.

Supporting Students Entering the Communication Design Profession

Drawing on the quantitative and qualitative data, this section of the “Results” chapter provided richer insights into this “two-phase data collection” study, serving as a point of integration in this mixed-methods explanatory sequential study design where the codes, or specific ideas or examples, could be merged and interpreted (Creswell & Creswell, 2018, p. 225). These codes pointed to pedagogical practices viewed as the most important to develop in communication design education responsive to a digital transformation. While the descriptive statistics described earlier in this chapter highlighted overall trends, I also explored specific contexts and approaches to learn to use digital technologies in design. Table 16 highlights codes that emerged from participants’

responses. Each code is further explored through a rich description throughout this section.

Table 16. Thematic Codes in Survey and Interview Responses: A Summary of Codes and Examples

Codes (n=11)	<ol style="list-style-type: none"> 1. Flexible learning with digital technologies 2. Conceptual clarity 3. Communication 4. Abstract thinking 5. Free thinking and creativity 6. Mentoring 7. Self-directed learning and continuous learning 8. Teamwork and collaboration 9. Experimentation and play 10. Real-world experience 11. Mental health and well being
Codes	Examples ¹⁰
1. Flexible learning with digital technologies	<ul style="list-style-type: none"> ● Flexibility in learning ● Adaptability in learning ● Agile learning methodologies ● Student-centered ● Acknowledgment and understanding of diverse learning styles
2. Conceptual clarity	<ul style="list-style-type: none"> ● Clarity learning/teacher clarity ● Scaffolded instruction ● Intentional learning
3. Communication	<ul style="list-style-type: none"> ● Verbal communication ● Relationship-building and interpersonal communication ● Networking ● User- and student-centered approaches to communication
4. Abstract thinking	<ul style="list-style-type: none"> ● Ideation ● Problem-solving ● Symbolic thinking ● Pattern detection ● Theoretical thinking and reasoning
5. Free thinking and creativity	<ul style="list-style-type: none"> ● Creativity ● Experimentation ● Play

¹⁰ Pedagogical practices are often approaches to thinking, reasoning, and problem solving in communication design education.

6. Mentoring

- Prototyping
- Role models
- Teacher-mentee pairs
 - Friendship in mentoring
 - Career advice for students
 - Resource allocation
- Teacher mentorship
- Professional mentorship
- 1:1 interaction
- Nurturing educational experiences
- Career development through teacher mentorships
 - Teacher-mentee pairs
 - Career advice
 - Career development
 - Skills development
- Resource Allocation in teacher mentorships
 - Friendship in mentoring
 - Resource allocation
 - Professional support
- A Culture for Mentoring
 - Culture for teacher mentorship
 - Professional development for teachers
 - Resource Allocation for teachers
- Professional mentorship
 - Mentorship programs in the workplace
 - Mentorship from educator/practitioners
 - Mentorship from practitioners working in a variety of design settings

7. Self-directed learning and continuous learning

- Self-education
- Self-initiated learning/ self-learning
- Lifelong learning
- Continuous learning
- Continuous skills development
- Time allocation and planning for self-initiated learning
 - Time allocation for self-learning
 - Self-learning during free time or “downtime”
 - Self-learning during work hours
 - Auto-didacticism and self-motivation
- Time management with continuous learning
 - Habitual learning
 - Time management for constant learning
 - Learning style
 - Self-organization
 - Lifelong learning
- Assessment of constant learning needs in higher education

8. Teamwork and Collaboration

- Assessment of continuous learning needs
 - External university partnerships to address continuous learning (e.g., social media platforms, “influencers”)
 - Constant learning in higher education
 - University culture
 - Workplace culture
 - Inventory assessment and upgrades to support continuous learning environments
- Group learning
- Cross-discipline teams
 - Interdisciplinary
 - Interdepartmental
 - Resource allocation
- Networks
- Communities of like-minded individuals
- Group learning in multidisciplinary teams
 - Cross-discipline teams
 - Student teamwork
 - Professional teamwork
 - Resource systems
 - Shared expertise
 - Collaboration
 - Knowledge-sharing
- Community-building and networking
 - Networks
 - Online and in-person
 - Personal growth
 - Awareness of industry “breakthroughs”
 - Ideation
 - Advisement
 - Community building
 - Information sharing
 - Contact with local communities
 - Professional support
 - Educational support
- Places for Networking
 - Networking locations
 - Online and in-person
 - Local organization chapters
 - After-work events
 - Alumni networks and events

9. Experimentation and play

- Experimentation
 - Experiments
 - Exercises

- Prototyping
- Critical experimentation
- Public presentation
- Entrepreneurship
- Inter-organization partnerships
- Impact measurement
- Play as experimentation
- Playtesting
 - Playtesting
 - Safe spaces
 - Safe place to fail
 - Safe place to make mistakes
 - Sensory exploration
 - Playtesting
- Tools for Experimentation and Play
 - Prototyping
 - Digital and physical
 - Modeling
 - Visualization
 - Prototyping
 - Testing designs
 - Rendering
- Methodologies for Experimentation and Play
 - User needs
 - User-centered
 - Research-first vs. technology-first approaches
- Research-driven prototypes
 - Prototyping outside of a problem-based framework
 - Research-first
 - Conduct background research
 - Research and write about the design challenge
 - Selecting the appropriate technology
- Experimentation and “Playtesting”
 - Playtest components
 - Interactivity/interactive settings
 - Iterative prototyping
 - Group work
 - Group critique
 - Inter-organization partnerships
 - Playtest methodology
 - “Productive failure”
 - Freedom to learn and mistakes
 - Freedom to fail without consequence
 - Preliminary impact measurement and evaluation
 - Public presentation
 - Sensory exploration

10. Real-World Experience

- Methodologies for experimentation with failure
 - Productive failure
 - Safe space to fail
 - Lowering frustration in iterative processes
 - Opportunities for failure
 - Opportunities for feedback
- Entrepreneurship
 - Freedom to experiment
 - Self-motivation
 - Self-starting
 - Self-regulated
 - Creative community

11. Mental health and well being

- Real-world Simulation
 - Boot camps
 - Capstones
 - Role-playing
 - In-class case studies
- Real-world Experience
 - Fieldwork
 - Internships
 - Apprenticeships
 - Job Opportunities
- Mental health issues
 - Distress/ Stress
 - Depression
 - Anxiety
- Dealing with pressure
- Dealing with feelings of failure
- Mental health resources
 - Problem-solving mental health accessibility
 - Assessing student mental health needs
 - Providing access to mental healthcare professionals
 - Counseling and psychotherapy
- Self-care resources
 - Self-care and well-being
 - Stress reduction
 - Sleep routines
 - Healthy eating
 - Meditation
 - Facilitation of self-care and well-being interventions

(Code 1) Flexible Learning with Digital Technologies

Study participants agreed that flexibility and adaptability were key in response to changes in digital technologies in communication design. The respondents were less concerned with flexible curriculum pathways that could be introduced into course requirements. Instead, they were interested in flexibility in terms of being agile learners who could feel confident about coding and doing highly technical work. D.V., a user experience researcher and graphic designer living in Minneapolis, shared, “Technologies are always changing and always evolving. Don’t be discouraged by the fact that you will have to be adaptable” (D.V., survey respondent, 2019). D.V. also concluded that it was counterproductive to deal with technology from a single point-of-view given the diverse learning styles and the fact that “everybody operates differently.” Gian, a director of a virtual reality lab and visual communications lecturer at a public university in Arizona, found that giving his students some flexibility helped to drive motivation, simply by asking them, “What do you want to learn?” (Gian, interviewee, 2019). By investing in his students’ interests and what they wanted to learn to do with design and technology in a lab setting, Gian observed that the students were more likely to become better “self-organizers and critical thinkers.” Sharon, reacting to the variety of technologies available to learn, also emphasized how personal interests can drive or impede adaptability in learning:

I think responding to the changes will definitely have to come from personal interest. If you are not interested and you are forcing yourself to read about this or learn this, it is not going to help (Sharon, interviewee, 2019).

Along with the notion that flexible learning was a priority in learning to use digital technologies in communication design, respondents were also attentive to seeing more conceptual clarity in learning.

(Code 2) Conceptual Clarity

For the study participants interested in learning to code and master technical skills in communication design (at varying proficiency levels), it was crucial to approach learning conceptually clear and unambiguous.¹¹ Respondents noted the importance of methodologies for learning through scaffolded instruction. Q.B., a design engineer living in the US, noted that while there were plenty of interesting things to study, you first “need to understand the learning method.” R.Z, a web designer from Dover, Delaware, reinforced the value of conceptual clarity when being presented with digital design concepts and programming languages like JavaScript, remarking:

I think clear practices should be used in terms of building upon the knowledge already known, such as tying in the new information into previously used concepts as to make them easier to understand, sort of a building block approach. (R.Z., survey respondent, 2019)

¹¹ In pedagogy, this is sometimes referenced as clarity learning and “teacher clarity.” See also Roska (2017).

The need for intentional, conceptual clarity was also evident to Sarah in her long career, doing visual and product design, as well as designing marketing communication graphics:

I am a creative director at a tech company. I design both graphics intended for the screen and (less so) for print. It is valuable to be able to use whatever tools are appropriate to a job, but you need to be able to think clearly about users and their needs. For example, word processing on a computer is efficient and a step forward from using a typewriter or paper, but it does not make you a better writer. (Sarah, interviewee, 2019)

(Code 3) Communication

The study participants perceived *communication* for the purposes of storytelling, socializing, working with other designers, and within the classroom and professional workplace as essential in communication design education. As succinctly stated by J.L., a design educator from Tampa, Florida, “Communicate and [...] never stop learning. There will always be something new that needs to be put into practice” (J.L., survey respondent, 2019). In an increasingly computer-facing profession, respondents upheld that verbal face-to-face communication was a requirement, whether viewed as enjoyable or not. J.S., a design educator living in India, noted that “communicating with clients may not be one of my favorite activities [...] your communication skills can affect your performance” (JS, survey respondent, 2019).

U.U., a website and graphic designer from Oklahoma City, remarked on the fundamentals of interpersonal communication, observing:

I've met a lot of great designers who failed in their ventures because they had no training in the social and financial side of the industry. You could be the best designer in the world, but if you can't hold a conversation, develop a clear picture of what your customer requires, or manage your business, then you will ultimately fail on your own.

Often, the participants viewed these social communication requirements in terms of client relationships, which was arguably mandatory for communication designers to “network with others who had been in the profession for a long time,” to “incorporate user-centered thinking,” and to “achieve a design goal” as a team. This also spoke to teamwork and the importance of collaboration addressed further below. Yet, some reported these types of interactions not just as essential in practice but also difficult. W.D., an analyst from Salem, Oregon, described himself as a “behind the scenes person” who had to overcome the challenge of giving speeches (W.D., survey respondent, 2019). E.F., a front-end web developer from Mattoon, IL, reflecting on the importance of communication as a pedagogical practice, remarked:

While I was in college, I was always working nonstop behind the scenes during my free time. I made a lot of MISTAKES as a young kid. I now know how to do strategy & planning, analytics, and communicate with clients in a way that shows them they can trust my work.

(Code 4) Abstract Thinking

The participants viewed abstract thinking in design as the process by which students intuit design principles through exposure to specific cases. For communication design students, the ability to discern general principles when confronted with a new

problem was an essential part of being able to apply the skills acquired during the course of their studies in their careers. For N.P., developing the skills of abstract thinking through ideation helped a designer to approach nearly any problem.

Design is all about problem-solving; learning abstract thinking helps a great deal. Students should also be in the habit of learning to make small sketches or brainstorming charts when they are given a new problem...

B.S., a design student in North Carolina, explained:

The biggest challenge I see in UX design is not really the technology but understanding the psychology of the audience and then translating intentions to code. I have not really had any psych courses as part of my degree, but I am planning to take some.

Another design student, R.Q., similarly remarked on the importance of a “background of knowledge in sociology and general communications because it would assist designers that are already in the profession to relate designs to the "audience" (general people)” (R.Q., survey respondent, 2019). The link to abstract thinking in sociology and psychology also spoke to a critical aspect of what it meant to be a designer working through a digital transformation of the field, where some parts of the profession were becoming increasingly research-focused. Yet, among these more quantitative and social practices, there was still ultimately a need for thinking freely and creatively.

(Code 5) Free Thinking and Creativity

Some of the study participants pointed to the importance of encouraging individual autonomy and associated free-thinking and creativity as a core goal of

education. This theme could be considered central to design education in giving students the freedom to explore openly, and a number of the participants touched on it. G.K., a design professional and front-end developer, identified the importance of giving young designers “[m]ore opportunities to fail... meaning give a large number of design projects and give heavy feedback. This will give up-and-coming designers a strong sense of the correct approaches to harnessing their skill” (G.K., survey respondent, 2019). For J.L., a design educator and survey respondent, teaching “creativity” is the goal of graphic design education, “I believe the most important practice or skill should be ‘Creativity’ because creativity is one of, if not the most important, skill[s] for graphic designers.” As summed up by C.X., “Our jobs require thick skin, great communication, intelligence, intuition, creativity, and technical skill.” Moreover, J.Y., a design educator, advised, “create conditions for new people to show their creativity so they can be confident in their work” (J.Y., survey respondent, 2019). In some cases, survey respondents noted that digital technologies can provide room for *increased* experimentation, even with older mediums, and that this could be better harnessed in educational settings. F.H., a design professional from El Paso, Texas, remarked on the implications of digital technologies on typography:

I started my career in cold-type, paste-up days—with good photographers and clever design work, you could do a lot, but you were severely limited in available fonts. Being able to play with type is more freeing than you realize. (F.H., survey respondent, 2019)

Table 17. Mentoring

Code: Mentoring	Examples
	<ul style="list-style-type: none"> ● Role Models ● Teacher-mentee pairs <ul style="list-style-type: none"> ○ Friendship in mentoring ○ Career advice for students ○ Resource allocation ● Teacher Mentorship ● Professional mentorship ● 1:1 interaction ● Nurturing educational experiences

(Code 6) Mentoring

Many respondents reported an interest in mentorship, including teachers-mentee partnerships, more mentorship for teachers, and mentorship on the job. In this research, mentorship can mean having a positive role model or having the ability to access resources and additional one-on-one guidance, such as a person or organization that students (as well as educators and professionals) could learn from and look up to throughout education pathways. When asked to identify an enriching experience in the education of becoming communication designers, respondents frequently described the importance of having adequate mentorship. Thirteen survey respondents described compelling mentorship experiences. One respondent conveyed, “I had a good mentor at my first job that helped me prepare for actual real-world design work. He showed me some of his reports and talked me through what his thought process was.” W.X., a survey participant and design student from Terre Haute, Indiana, described having “numerous professors and role models that helped [her] along [her] journey” and looked back to a

time when her professor took her aside to encourage her to major in design (W.X., survey respondent, 2019). This professor went on to work alongside W.X. for a whole academic year, helping her to hone her design skills. In this particular situation, the faculty member reached out to W.X. and offered career guidance, and the teacher and mentee worked together for the entire academic year to accelerate W.X.'s skills development.

Table 18. Career Development through Teacher Mentorships

Subcode: Career development through teacher mentorships	Examples
	<ul style="list-style-type: none"> • Teacher-mentee pairs • Career advice • Career development • Skills development

While mentor/mentee arrangements in communication design education usually occur when students enroll in independent studies in their coursework, there was an argument for informal collaborations with mentors that were facilitated outside of formal accredited design coursework. K.Y. described working in an informal teacher-and-mentee pair where he became friends with a teacher of one of his design classes—who also headed the media design production department at the college K.Y. attended (survey respondent, 2019). The faculty who offered support provided K.Y. with additional access to “high-end computer equipment,” “all kinds of other media production assets,” and additionally stored equipment to use. The faculty member also helped him to make “a music video for a really popular band” and allowed him to use his studio. For K.Y., now a creative director, this was a particularly enriching experience where a combination of friendship in mentoring, resource allocation, and professional support by a faculty member was invaluable. Survey respondents shared similar experiences as W.X. and

K.Y. For example, W.E., a design student from Tallahassee, Florida, found that “bonding with teachers” helped her to learn better (survey respondent, 2019). S.J., working in web design, also noted that her “mentors were always there to help [her] when [she] needed it” and that she was rarely uncertain of what she needed to do (survey respondent, 2019).

Table 19. Resource Allocation in Teacher Mentorships

Subcode: Resource Allocation in Teacher Mentorships	Approaches
	<ul style="list-style-type: none"> ● Friendship in mentoring <ul style="list-style-type: none"> ○ Resource allocation ○ Professional support

Arguably, in the teacher/mentee pairs described, the faculty members provided a great deal of their personal time, office hours, and resources to support one-on-one work with a design student, and this may not always be possible for faculty depending on their workload and other administrative responsibilities. Yet this also spoke to the issue of whether faculty members and professionals had adequate time to gain valuable mentoring experiences themselves. Organizations like the Association for Supervision and Curriculum Development have noted that teachers require mentorship for their own development (ASCD, 2019). Similarly, the AIGA launched a design teaching “peer-populated online platform” in 2019 to advocate and “support educators teaching in new areas of the discipline” (Design Educators Community, 2019). Still, many of the resources that educators identified in this study in terms of mentoring education and community support were practical, mainly coming from bottom-up institutional practices that could be more easily integrated into everyday processes and conventions. I.H., a

design educator and creative director from Lincoln, Nebraska, offered that “professional development for teachers should be analogous to professional development for other professionals.” E.S., a design educator living in New Jersey, noted that “practicing is as important as teaching [students]” (survey respondent, 2019). On a practical note, in alignment with K.Y. and coming from an educator’s view, Q.N., a design educator living in the US, stressed the need for “easy access to studios appropriately equipped for teaching, learning, and work” (survey participant 2019).

Table 20. A Culture for Mentoring

Subcode: A Culture for Mentoring	Examples
	<ul style="list-style-type: none"> • Culture for teacher mentorship • Professional development for teachers • Resource Allocation for teachers

Design professionals also remarked on the need for continuing support and mentorship. As a front-end developer who was mostly self-taught and working independently, Grant saw that he had missed out on years of working with more advanced professionals. Grant described that he would have “benefited from [...] spending a few years working in a shop with more advanced developers that have been around for a while, that have dealt with issues” and that it would have been helpful to see how design professionals such as front-end developers and web designers “approach things” (interviewee, 2019). Specifically, Grant also remarked that given the rapid pace of new technologies, a framework to learn and study under other experienced

professionals was critical. He was also mindful of the fact that many competing pedagogical practices can exist, and this also needed consideration in the learning process (interviewee, 2019).

Several other survey respondents who were working as design professionals also found mentorship from experienced professionals useful. Z.H., a designer in a lead position working in Las Vegas, Nevada, reported the value of learning from somebody with ample experience working in “large firms” (survey respondent, 2019). X.I., a user experience designer from Omaha, Nebraska, had an opportunity to work with a professor who “primarily focused on web and user experience” and had “been in a design agency for more than three decades” and found this to be a supportive experience (survey respondent, 2019). Likewise, K.M., a self-trained front-end developer from Portland, Oregon, had gained mentorship from an experienced user experience and user interface designer at Microsoft (survey respondent, 2019).

Table 21. Professional Mentorship

Subcode: Professional Mentorship	Examples
	<ul style="list-style-type: none"> • Mentorship programs in the workplace • Mentorship from educator/practitioners • Mentorship from practitioners working in a variety of design settings

This theme covered a broad spectrum of how design students could gain support, and also spoke to how the faculty teaching them could get the support they need to nurture their students with learning experiences overall. It was also evident that

mentorship needs did not stop in coursework; they were also important in the workplace. Mentorship also played a significant role in learning to navigate rapidly changing technologies in design, which is related to the next pedagogical practice: self-directed learning.

(Code 7) Pedagogies for Self-Directed Learning and Continuous Learning

Self-directed learning¹² and continuous learning¹³ were two of the most remarked upon topics, emanating from the expanding requirements associated with the shift towards digital technology use in communication design education, and the digital transformation of the profession.

Table 22. Self-directed Learning and Continuous Learning

Code: Self-directed learning and continuous learning	Examples
	<ul style="list-style-type: none"> • Self-education • Self-initiated learning/self-learning • Lifelong learning • Continuous learning • Continuous skills development

Looking back at some of the earlier descriptive statistics in this study, 78.4% of survey respondents and 89% of interviewees cited the importance of developing educational practices related to digital design, and 47.1% (n=91) of survey respondents

¹² Also referred to as self-learning or auto-didactic learning.

¹³ Also referred to as constant learning.

mentioned using digital resources for learning. A modest 12% of survey respondents (n=23) preferred to stay up to date using face-to-face means, so the majority of the respondents using digital resources for learning were also likely to do so in a self-directed fashion. However, there was a distinction here that the participants often, or primarily, viewed self-directed learning as a means to stay up-to-date and not as a replacement of their preferences to gain more pragmatic face-to-face real-world experiences. In terms of limitations in this research, it is unknown where and at what time of the day most of the self-directed learning (primarily on digital interfaces) took place (e.g., home, school, throughout the day). However, when asked what could be better developed in communication design education, the respondents often saw this as an area for improvement and further development, and they identified it as a practice more suitable for the outside of work or as a “downtime” activity.

In some ways, self-directed learning or self-learning in communication design education was a survival tactic to keep up with the rapidly changing technologies in the field. Given the perceived speed of changing technologies, there was a need for pedagogical practices to address continuous learning or life-long learning. To an extent, causation appeared to exist between these “events,” meaning technology adoption drove the need for practices to address self-directed learning, and given the rapid adoption of technologies, much self-directed learning was also a function of the need for continuous learning. Likewise, the need for continuous learning also meant the learning of new digital technologies would largely be self-directed. Participants mainly conducted self-directed learning online where they could easily find the most up-to-date resources for learning.

Yet, despite the high level of accessibility of online learning resources, self-directed learning was not always easy; it required planning and time allocation. F.H., a newspaper page designer and copy editor from El Paso, Texas, found it “tough for someone working full time to get away for a seminar.” Therefore, “online continuing education is going to be vital” and a requirement to stay “afloat” (survey respondent, 2019). U.U., a web and graphic designer, found himself likely to “check out the latest trends, tools, and software and implement new tricks and tools and educate myself further when I have downtime” (survey respondent, 2019). For both F.H. and U.U., time allocation was important, as finding the time to self-learn was not always built into an individual’s natural working schedule. Some, like X.Y., a second-year design student from Washington State who self-identified as an “autodidact” and someone for whom self-education was central, observed:

I am very much an autodidact, so I just learned those skills on my own at home. I did not go to conferences; I did not go to a Boot camp. I wanted to build something, so I learned how to build it and taught myself those skills. Then, I got hired as a designer in the house design department for an organization...

Table 23. Time Allocation and Planning for Self-directed Learning

Subcode: Time allocation and planning for self-directed learning	Examples
	<ul style="list-style-type: none"> ● Time allocation for self-learning ● Self-learning during free time or “downtime” ● Self-learning during work hours ● Auto-didactism and self-motivation

For X.Y., self-learning was an ideal. X.Y. was also very self-motivated. For F.H., self-initiated learning was simply a way to stay “afloat” (survey respondent, 2019). The allocation of personal time for self-initiated learning was as *essential* as the ability to time-manage the act of continuous or constant learning, depending on their needs. Respondents in this research did not necessarily have an equivalent amount of free time, and there was not a precise amount of time understood for optimal self-initiated learning. There was also no exact measurable quantity (e.g., hours, minutes, frequency) for self-learning or self-initiated online learning to qualify this act as *continuous* or *constant*. Essentially, we all have different speeds at which we absorb new information, especially given diverse learning styles. However, it can be argued that today, working environments often value speed and productivity. For example, B.O., a design student from Irvine, California, observed that “I would say that educators should help the students to learn new or faster techniques for creating their designs” (survey respondent, 2019).

About time management, B.O. also reflected, “I think young designers struggle with time management. I would like to see more guidance on how to balance your time at work appropriately” (survey respondent, 2019). In terms of managing, some participants felt the need to update themselves daily or regularly, while others reported making a specific amount of time for self-initiated learning. W.Z., a survey respondent and design student living in the US who described a keen interest in digital design and app design, remarked, “I constantly look for new information online. I try to update my knowledge at least 2-3 times a week.” O.B., a design engineer from the southern Indian state of Tamil Nadu discussed needing additional training daily. Thinking more in terms of an on-

demand or as-needed basis, O.E., a motion graphics designer from Winter Park, Florida, observed, “Every time there is an update to your program, you need to go to lynda.com to learn it all over again” (survey respondent, 2019). W.X. summarized, “The learning never stops. You have to stay up-to-date and educated with current practices” (survey respondent, 2019).

Table 24. Time Management with Continuous Learning

Subcode: Time management with continuous learning	Examples
	<ul style="list-style-type: none"> • Habitual learning • Time management for constant learning • Learning style • Self-organization • Lifelong learning

The interviewees’ ability to self-organize to engage in continuous or constant learning also varied. Interviewees Sharon and Grant (2019) also saw the need to learn constantly and to “keep re-educating yourself almost every day.” Sharon (2019) noted on the topic,

Oh, constant training. Constant training, constant learning, constant knowledge, sharing within the community or even outside of the community because everything is happening so quickly that it is nearly impossible for one person to do all this research and do all this learning...A lot of knowledge sharing would be beneficial; I would say [...] I think the more one learns, the more one realizes that there is still more to learn. That being said, I don’t think I can say that I am an expert in any of them, and I am still constantly working on them every day. (interviewee, 2019)

Grant (2019) described a similar sentiment but also pointed out the fact that self-learning in itself could be laborious, remarking, “You have to keep re-educating yourself almost

every day. I think that is just keeping up with all of that is a lot of work. It feels like a job in itself sometimes” (interviewee, 2019).

Continuous learning was linked to lifelong learning, where thinking of education in the era of a digital transformation in communication design did not stop with graduation but was inevitably indefinite. V.H., a web designer from Kennewick, Washington, advised, “Keep learning and exploring as learning never stops after college. It is lifelong.”

Importantly, Y.Q., a designer and survey respondent from Kenosha, Wisconsin, observed that the move toward constant learning was particularly challenging for universities to accommodate. Y.Q. stated that “shifting toward ongoing education is a challenge for the university system. I think the collaboration with design influencers and the use of newer platforms like YouTube [...] could help” (survey respondent, 2019). Like many respondents, Y.Q. heavily focused on digital technology implementation in design, saw that “more and more platforms are almost solely digital now,” and described “almost exclusively using digital technology in my day-to-day work” (survey respondent, 2019). Y.Q. was not alone in his suggestion that universities should assess their ability to cope with ongoing or continuous learning needs through partnerships or other means. J.L., coming from a design educator’s viewpoint, noted the changing requirements for universities, suggesting:

Universities need mobile applications that keep track of current programs and relevance of current software. The programs are currently changing and upgrading throughout the year, and I had issues with using the programs at home then going to the university, and nothing was updated. (J.L., survey respondent, 2019)

Table 25. Assessment of Continuous Learning Needs in Higher Education

Code: Assessment of continuous learning needs in higher education	Examples
	<ul style="list-style-type: none"> ● Assessment of continuous learning needs ● External university partnerships to address continuous learning (e.g., social media platforms, “influencers”) ● Constant learning in higher education <ul style="list-style-type: none"> ○ university culture ○ workplace culture ● Inventory assessment and upgrades to support continuous learning environments

Eva agreed with a more formalized university workplace culture for finding an adequate amount of time to pursue additional training to meet the technical requirements of work and advance her coding skills for artificial intelligence applications. She reflected on better time management in university research assistantship work, pointing out:

I think I have been motivating myself, but I would feel better if my employers would let me allocate some time to learn this. I have seen this in other companies where you have data analysts, workshops, and all that stuff. They have workshops. Workshops to code and to try and advance your skill set.

While practices related to self-education and constant learning had a lot to do with time allocation, time management, and finding additional support within universities, they did not necessarily correlate with a respondent’s interest in working alone. Just as the need for face-to-face interaction was evident in the mentorship practices, this was also highly apparent in the identification of practices related to “Teamwork and

Collaboration,” “Experimentation and Play,” “Real World Simulation and Experience,” and, finally, “Self-care” pedagogies.

(Code 8) Teamwork and Collaboration

Teamwork and collaboration was aligned with being within a flat organizational working arrangement where communication design educators, professionals, and students could access each other as supportive like-minded individuals. There was an emphasis on community-building and being part of a greater network where designers could learn together.

Table 26. Teamwork and Collaboration

Code: Teamwork and Collaboration	Examples
	<ul style="list-style-type: none"> ● Group learning ● Cross-discipline teams <ul style="list-style-type: none"> ○ Interdisciplinary/Interdepartmental Resource allocation ● Networks <ul style="list-style-type: none"> ○ Communities of like-minded individuals

The study participants touched on a meaningful pedagogical practice—the experience of group work and the importance of learning how to work in a team—particularly in cross- or multi-disciplinary settings, expanding well beyond groups

exclusive to communication design education. G.K., a front-end developer from Lafayette, Louisiana, described his experience as a designer working “on a cross-discipline team to produce a 3-D video game” where he was able to work in a “challenging environment where artists, designers, programmers, and musicians came together to produce a working product.” B.V. was also interested in learning more about “how to better work in teams and use information that would come from different departments of a company to help create content and design for products or services that would be most beneficial to the consumer,” looking to better utilize resources within an organization group (survey respondent, 2019).

Interviewee Gian also shared his insights on working in interdisciplinary settings, an area in which he held specific expertise. In an inter-department, cross-disciplinary university project to design a virtual geology tool—one of five large projects he was currently designing and leading—Gian saw the value in team members coming from all divisions of his university. On this collaboration, Gian (2019) described,

We’ll collaborate with a researcher and put four people around them. For example, right now, we are going to write a grant. It is a PSTAR grant for NASA, and they want us to come up with a virtual geology tool. We collaborate across maybe four or five disciplines—engineering, astronomy, computer science, ourselves, and one other group.

Table 27. Group Learning in Multidisciplinary Teams

Subcode: Group learning in multidisciplinary teams	Examples
	<ul style="list-style-type: none"> ● Cross-discipline teams <ul style="list-style-type: none"> ○ Student teamwork ○ Professional teamwork ○ Resource systems ○ Shared expertise ● Collaboration ● Knowledge-sharing

Sharon also identified learning in a cross-disciplinary group itself, rather than working individually, as an important part of the multidisciplinary pedagogical experience, seeing the need for shared expertise where not all team members could act as subject matter experts, and, therefore, needed to rely on one another. Sharon (2019) reflected that:

I think that some of the more powerful and impactful projects I have seen have been created by a collective—like an entire studio with input from different practitioners in different fields rather than one individual. Because it is nearly impossible to be an expert in everything because you are going to exert yourself too thin (Sharon, interviewee, 2019).

Some respondents further identified belonging to a “network” as a crucial aspect to prepare to enter the workplace and to stay connected to one another. Respondents touched on developing community building practices, seeing that the growth of sustainable community networks was a critical component of communication design education.

Many respondents valued being a part of a community either in-person or online. X.I. reported, “I am part of several design groups and user experience design teams” (survey respondent, 2019). W.I., a design student from Clarion, Pennsylvania, shared, “I try to network and be involved in the online graphic design community through social media” (survey respondent, 2019).

The rationale for being grounded in a network of some kind was quite varied. H.Z., a graphic designer from Chicago, Illinois, imparted that it was useful to “have a network of other design professionals and being able to share ideas is ideal for growth”

(survey respondent, 2019). According to K.M., networking enabled the design community to “stay in touch” and “discuss current and ongoing breakthroughs in the industry” (survey respondent, 2019). Alan, a creative director interviewee, noted the importance of networking and community building, not just with close team members within one’s organization but more broadly with the community of professionals working on similar problems. He remarked:

I think networking is important because [design] is such a dispersed field with lots of people that work on their own, and building a community might be helpful to at least make sure people know that they are working in the same field, having the same struggles, and they can help each other out — those types of things... (Alan, interviewee, 2019)

Another survey participant had particularly incisive views on networking. F.I., a design professional and magazine editor from Cartersville, Georgia, described networking as “vital” and as a means to find advice:

Learning how to network, make new connections, and build your prospects is vital. [...] Professionals should network and build a base of resources. Having a solid network of people that can show you new trends, tricks, and designs is super helpful. It helps to have people in the same field that you can contact for advice, especially if you are struggling ... (survey respondent, 2019)

Table 28. Community-building and Networking

Subcode: Community-building and networking	Examples
	<ul style="list-style-type: none"> • Networks • Online and in-person • Personal growth • Awareness of industry “breakthroughs” • Ideation • Advisement • Community building • Information sharing • Contact with local communities <ul style="list-style-type: none"> ○ Professional support ○ Educational support

Research participants provided specific suggestions on settings where networking could take place. However, this did not necessarily mean that communication design educators, students, and professionals in this sample population were actively engaged in such networks, as many respondents found themselves immersed in strictly online environments to stay-up-date, suggesting a renewed importance of face-to-face venues for information exchange and building relationships. V.N., a front-end developer from Tucson, Arizona, suggested, “I think professionals should engage in their local chapters. This will help with networking and getting ideas from other professionals” (survey respondent, 2019). B.V. also suggested:

They should develop a network where working professionals can get together via an after-work workshop and share skills and come together to share design ideas, strategies and ways of using different techniques to help them achieve a design goal and have altogether a communication across different design mediums.

Gian also shared his ideas for more alumni-centric events, citing the fact that designers “go out and they can’t find a job; they don’t know whom to ask, they don’t have a network, and they don’t know how to keep moving forward in their professional direction, and that is what those alumni chapters do often” (interviewee, 2019).

Table 29. Places for Networking

Subcode: Places for Networking	Examples
	<ul style="list-style-type: none"> • Networking locations • Online and in-person • Local organization chapters • After-work events <ul style="list-style-type: none"> ○ Alumni networks and events

The study participants expressed interest in networking across modalities, whether face-to-face or online. There was also a genuine interest to be innovative, engaging in practices like free-thinking and abstract thinking; they reported less explicitly on these practices compared to hard or technical skills. Creativity and free-thinking found a more practical application in practices identified that were related to experimentation, play, simulation, and “real-world.” Despite all intentions to foster “free” or “playful” approaches, the respondents also needed to find a balance between refining and advancing their technical and digital abilities while having free agency and the motivation to explore innovative project ideas and applications openly.

Table 30. Experimentation and Play

Code: Experimentation and play	Examples
	<ul style="list-style-type: none"> • Experimentation <ul style="list-style-type: none"> ○ Experiments ○ Exercises ○ Prototyping ○ Critical experimentation ○ Public Presentation ○ Entrepreneurship ○ Inter-organization partnerships ○ Impact measurement • Play as experimentation <ul style="list-style-type: none"> ○ Playtesting ○ Safe spaces ○ Safe place to fail ○ Safe place to make mistakes ○ Sensory exploration ○ Playtesting

(Code 9) Experimentation and Play

A common theme across respondents was providing students and emerging designers with opportunities for experimentation and play. A modest number of respondents reported “free-thinking and creativity” as a significant pedagogy that gives design students a *safe space for experimentation and play* to learn to be more innovative.

First, it is worth noting that respondents had multiple definitions for experimentation in their reports. The majority of the respondents cited prototyping as the most common form of experimentation in communication design education. They also regarded experimentation in design through “visual processing,” curiosity, and learning

to be open-minded and “experiment[ing] with different styles” (N.O., survey respondent, 2019). Design professional E.F. observed the importance of an approach that would “help students think more outside of the box; even though this is something hard to teach, it can be done” (survey respondent, 2019). For N.O., a graphic designer living in Los Angeles, the most critical quality for designers who had entered the profession was “learning to be open-minded and experiment with different styles. Unless you’ve found your niche in a certain style and it works for you very well—even then, I’d still say to keep your mind open” (N.O., survey respondent, 2019).

Generally, many of these approaches to experimentation are recognized in the education and professional workflow embedded in the design process, which is undergoing digital transformation. H.K., a designer from Cheltenham in the United Kingdom pointed out that in his personal experience, “building models, prototypes, [and] testing designs is done digitally” (survey respondent, 2019). For Z.R., a designer from Scottsboro, Alabama, prototypes were often created in renderings (survey respondent, 2019). R.Q., a senior user experience designer from San Diego, California, said, “I like the ability to use prototypes like Flinto to see in real-time what the changes and workflows look like” (survey respondent, 2019).

Table 31. Methodologies for Experimentation and Play

Subcode: Tools for experimentation and play	Examples
	<ul style="list-style-type: none"> • Prototyping <ul style="list-style-type: none"> ○ Digital and physical ○ Modeling ○ Visualization ○ Prototyping ○ Testing Designs • Rendering

Table 32. Methodologies for Experimentation and Play

Subcode: Methodologies for Experimentation and Play	Examples
	<ul style="list-style-type: none"> • User needs <ul style="list-style-type: none"> ○ User-centered • Research-first vs. technology-first approaches

Yet, having all the needed prototyping tools did not necessarily ensure better or more innovative coursework or project work. The results suggested that there was also a need for pedagogical practices to address a more standard prototyping approach. This went back to what Sarah described:

It is valuable to be able to use whatever tools are appropriate to a job, but you need to be able to think clearly about users and their needs. For example, word processing on a computer is efficient and a step forward from using a typewriter or paper, but it does not make you a better writer (interviewee, 2019).

For Julie, this also meant being more critical of a technology-first approach during the ideation and prototyping phase of a project. For Julie, it was important for designers to take a more research-first approach before selecting the appropriate technology with which to develop a project.

In what Julie envisioned as a more critical approach to experimentation and prototyping, designers would take more time to write and research about the problem at hand before committing to solving the problem. In Julie’s view, there was too much “rhetoric” in design about “designers always saying that they are problem-solving,” and this overcommitment could be particularly problematic (interviewee, 2019). Julie’s

practice was mainly about asking the right questions, and stepped away from a more typical problem-based approach commonly used as a practice in design:

Start with the idea or concept first. Write about your interests first and ask a lot of questions [...] what makes a compelling project is when the project is not solving something, but it is asking more questions.

Table 33. Research-driven Prototyping

Subcode: Research-driven prototyping	Examples
	<ul style="list-style-type: none"> • Prototyping outside of a problem-based framework • Research first <ul style="list-style-type: none"> ○ Conduct background research ○ Research and write about the design challenge ○ Selecting the appropriate technology

Julie also recalled an interaction with a classmate who, in selecting technology with which to prototype a project before understanding the research background or aligned research questions, was unable to articulate aspects of the project:

My classmate wanted to make an augmented reality shopping experience where you can pick and choose whatever you are about to buy—to see what it looks like on you. I guess my main critique for her was that she was too focused on the technology—I asked her why she wanted to do this, why she was interested in this. She could not answer the question because she probably did not think about it. She wanted to do AR.

For Julie, experimentation was very much grounded in a framework for research and in taking a more critical approach to reasoning why a designer in communication design education should incorporate a “technology-first” approach. Survey responses

showed that prototyping was an essential part of experimentation, but it was also critical to think more deeply about how to approach prototyping as a research process.

Correspondingly, interviewees spoke of other ways to expand practices for experimentation and prototyping. Play emerged in the study data as a notable aspect of experimentation.

Interviewee Candice identified the importance of “playtesting.” For Candice, “playtesting” was deeply ingrained in her teaching philosophy and approach to work as a designer—whether she was involved in “testing some play-based experiences” with the Red Cross, on a project abroad in Uganda, working with the U.S. Holocaust Memorial Museum, or teaching her students in New York City. In decades practicing and teaching as a designer and educator, Candice has identified multiple “critical” levels that are important for playtesting as a teaching practice—disregarding the geographical location, or whether this takes place in an education- or industry-type environment.

Playtesting can take place in many interactive settings, which incorporate group work, group critique, and inter-organizational partnerships. Yet, the freedom to learn and *make mistakes* has been a part of the playtest methodology that Candice views as imperative.

Table 34. Experimentation and “Playtesting”

Subcode: Experimentation and “Playtesting”	Examples
	Playtest components Interactivity/interactive settings Iterative prototyping Group work Group critique Inter-organization partnerships Playtest methodology “Productive failure” Freedom to learn and mistakes Freedom to fail without consequence Preliminary impact measurement and evaluation Public presentation Sensory exploration

In Candice’s view, one determining factor of successful experimentation through playtesting is a designer’s or design student’s willingness to make mistakes and to sensitively interpret and understand the impact the design can have on others:

I would say everyone makes mistakes. Try to make your mistakes early, so prototype and test. Make something and put it in front of people and see what they do. If you don’t do that, you are designing without eyes; you cannot see what it is that you’re making and what kind of impact it has on people. Everything has externalities. Everything you make has an impact.

Students—as well as educators and professional designers—could view making something iteratively and presenting a prototype to get constructive feedback and critical insights as a daunting task. Candice noted that it requires students to be “vulnerable” and to “accept failure” so that “it will be integrated into your practice.” She also observed that as part of this process, it was essential to integrate empathy, remarking that “aside from seeing and hearing and touching and all of these other things that designers might use in

their practice, is empathy.” Specifically on failure and being vulnerable in the playtesting process, Candice (2019) described:

Knowing how what you make impacts others, and playtesting is good for figuring that out. One of the things that I try to encourage students to do because oftentimes, they don’t really—playtesting is really scary; you’re vulnerable. It puts you in a position of vulnerability, as a designer, to see what you’ve made possibly fail, it will probably fail the first few times. You just need to take a deep breath and realize that that’s part of the process. There’s a famous moment; someone told me about Buckminster Fuller—who designed the geodesic dome and a bunch of other things—was building a geodesic dome (H. Martin, 2016) and it is on live television and it started to buckle, and it fell, and it collapsed. Instead of freaking out, he said, “Oh! I get it, eureka!” He understood by seeing something fail. It was like a flashlight was turned on and he saw exactly why that happened. His design was better afterward. So, just accept failure and it will be integrated into your practice. Be humble and don’t be fooled if somebody says they like something. Look at their expression. Look at their body language; that will tell you more than actually what people will say because they always want to make you happy.

It was clear that having the freedom to make mistakes and fail also required creating a safe space for design students to productively fail within. Manu Kapur (2011) referred to this type of pedagogical practice as “productive failure.” Much like Candice’s insights on making mistakes and failing as part of the design process, Kapur (2011) says that productive failure supports students in “working on complex problems that challenge but do not frustrate” and helps to create a “safe space for students to explore and generate.” Multiple survey respondents also viewed failure as a purposeful step in the design process. O.C., a design student from Tampa, Florida, reflected that she is “hands-on ... I try and fail until I get it right” (survey respondent, 2019). G.K., an over-8-years expert in digital design and front-end development, noted that more opportunities to fail and get feedback would be a practice that would support students beginning communication design professionally.

Table 35. Productive Failure

Subcode: Productive failure	Examples
	<ul style="list-style-type: none"> • Productive failure (see Kapur & Bielaczyc, 2012) <ul style="list-style-type: none"> ○ Safe space to fail ○ Lowering frustration in iterative processes ○ Opportunities for failure ○ Opportunities for feedback

Gian also viewed experimentation in terms of entrepreneurial pedagogy. Thinking back to his undergraduate experience, Gian “managed to have a very large studio” to work and experiment within; and worked near his peers who were a “plethora of thinkers and artists and designers” (interviewee, 2019). As part of working and studying in this network of university-managed studios, metal, and electronics shops, Gian had the “free ability to do whatever [he] wanted.” This experience taught him to be entrepreneurial, having the freedom to invent while also working in a creative community with other motivated individuals, also speaking to the importance of collaboration. Gian recalled:

Every semester, I used to build a very large installation piece and design... this is what I used to do. It really taught us how to become entrepreneurial. Oftentimes, we have to be entrepreneurs as self-starting, self-motivated, and self-regulated.”

Table 36. Entrepreneurship

Subcode: Entrepreneurship	Examples
	<ul style="list-style-type: none"> ● Freedom to experiment ● Self-motivation ● Self-starting ● Self-regulated ● Creative community

For Gian, Candice, and Elizabeth, experimentation was central to the design process. This manifested through the research lens undertaken and whether to take a technology- or research-first approach, how to incorporate play and failure in the prototyping and testing process, and how to embrace entrepreneurship in design work. Practices in which the study participants engaged were not only related to reasoning and thinking but were also action-oriented interventions. These types of action-oriented interventions were also central to communication design education and are next explored through the teaching practices incorporated into real-world experiences.

Table 37. Real World Experience

Code: Real World Experience	Examples
	<ul style="list-style-type: none"> ● Real-World Simulation ● Boot camps ● Capstones ● Role-playing ● In-class case studies ● Real-World Experience ● Fieldwork ● Internships ● Apprenticeships ● Job Opportunities

(Code 10) Real-World Experience

The challenge of designing for the real world is a fundamental issue throughout the results to the extent that an entire section of this chapter focused on a sample of the pedagogical challenges in designing for the “real-world” in communication design education. Among the study participants, 96.5% identified a challenge in studying to enter the communication design profession, with only $n=7$ participants reporting that they had not encountered any issue in their education as communication designers. Some respondents touched on the importance of exposure to the “real world” as an essential learning experience. Respondents cited a disconnect between their education and entering the workforce—in some reports seeing that using digital applications in real-life situations could be both demanding and confusing, especially when it came to learning to code or using advanced digital design techniques. The participants were interested in opportunities to get more hands-on work experience before graduating; although the reports were diverse, focus was on internships and real-world simulations. To delve deeper into a sample of the pedagogical solutions that the research participants identified, this section first examines simulation-based learning as a solution, then examines more formalized pathways for gaining real-world, hands-on experience. The more formalized “experience” of the real world included anything from fieldwork and internships to job opportunities provided while studying or in an apprenticeship at one’s first job.

Real-world simulation. Real-world simulations ranged from things like 2-day in-person or online boot camp classes intended to explain how acquired skills can apply to business-place problems, to capstone classes as part of their degree experience, to the

study of case studies in class, to role-playing assignments. These different types of pedagogical approaches stop just short of actual workplace experience. One of the interviewees, Colleen, noted that she embraced the “vocationality of design schools” where students are learning:

I think that design schools are doing this better than a lot of other schools... You're learning how to do things. I embrace the vocationality of design school. I think that there's a tendency sometimes – I see at certain schools, where people are removed from the actual craft skills a little bit (Colleen, interviewee, 2019).

Gian identified excess research focus (relative to practical training) as presenting students with challenges. Students did not necessarily see the value, and it did not play to their skills:

At RISD, they wanted to treat the educational experience like a scholarly experience. They tried to; at first, I objected, and I thought, ‘Well, why do we have to do this really in art or applied arts education?’ They taught us the basics for research paper and doing all that work and research for that, which I don't think artists are very good at...They were not nice to us, and they screamed at people and people were having breakdowns. If I hadn't had professional experience before, I would have had a tough time with it. (Gian, interviewee, 2019)

Some of the survey respondents pointed to in-class case studies as meaningful instructional experiences:

I am taking UX design courses at my university. One of our professors...presents us with several case studies in the relevant market, and forces us to think about how factors other than technical affect the emotions of the user. One such study was when we were asked to design a couple of webpages for a charity...so I had to think how I can make it more involved for the user. It was a really good experience. (B.S., survey respondent, 2019)

Another survey respondent, a professional working in strategic design, identified exposure to the business context as an important experience since it taught him the importance of designing for the data consumer.

... I took a course which was about visualization of data and learned about... techniques that aid ... digestion of data by stakeholders. This was a business-focused course but really helped me understand some basic design principles and reminded me that a good communication designer always keeps his/her stakeholders as the core tenet of their work. (N.D., survey respondent, 2019)

N.D. also highlighted a group assignment based on real-life public relations challenge, describing,

We had to put ourselves in a particular role and deal with the issue. There were curveballs thrown into the scenario along the way, forcing us to adapt and change... This motivated me to do similar techniques in my classes and really made education exciting to me. (survey respondent, 2019)

K.M. also identified *real-world scenarios* as key, urging “practical use as soon as possible and using real-world scenarios. Teaching how to work with and communicate with technical minds (programmers)” (survey respondent, 2019).

Some respondents also identified the value of bringing people with “real world” experience into class. R.N., a design professional from Ohio who noted that exposing students to professionals and their business problems can be a useful exercise, observed, “take what you can from the professionals. Have them come in to teach your students if you can. Real-World experience is very important for the students” (R.N., survey respondent, 2019).

Real-world experience – fieldwork, internships, apprenticeships, and job opportunities. Beyond simulated real-world experiences, some respondents remarked on the importance of experience itself. One digital design professional even relayed that he

worked on a pro bono basis to establish a reputation and learn to communicate with clients more clearly:

In the first few months, I did a lot of work for free just to get my reputation built. It allowed me to take more time learning how to properly communicate design ideas back and forth to clients without having to worry about them thinking that I'm taking too long for what they're paying for. (U.U., survey respondent, 2019)

Another survey respondent, a 28-year old digital design professional in the field, testified that his experience freelancing in college was particularly rewarding; felt he genuinely had the opportunity to fail and learn, "I believe that since I dove headfirst into the tech scene by freelancing during my free time in college, it helped me plan better since I made a lot of MISTAKES as [a] young kid" (E.F., survey respondent, 2019). E.B., a graphic designer from Virginia, also argued that professional exposure was a vital experience, observing that "working with actual designers for Disney and Sonny allowed me to know exactly what skills were going to be needed to succeed" (survey respondent, 2019). OG, a digital design professional working in Detroit, also pointed to internships as an important component of his education,

My internship with a local web development company helped me to prepare for real-world projects. I had to report to my academic advisor regarding my progress during the internship. In the end, I had to turn in a paper. Overall, it showed me what I was lacking and how I should prepare for the future. (OG, survey respondent, 2019)

Students recognized professional exposure as a critical component of feeling prepared to face the workplace. They pinpointed internships as a crucial tool, "I'm still a student, but my internships have given me valuable experience with my desired field that make me feel prepared for the days following my graduation" (DQ, survey respondent).

Grant identified the possible missing experience in his post-school design education as a period of apprenticeship.

I think what I missed and might have benefited from was spending maybe a few years working in a shop with more advanced developers that have been around for a while, that have dealt with this issue and other issues and just see how they approach things. Certainly, I wish that I had had that (Grant, interviewee, 2019).

For Alan, the most important pedagogical framework for approaching design instruction was still design as a visual language, and the best way to develop an understanding of the language of design was through a modern take on apprenticeships.

I have always been a fan of Fabrica...where there's almost some kind of apprenticeship program or traineeship? I don't like the word trainee, but some kind of apprenticeship program, which is in between art school and practice...this is a terrible way to look at students, but if you look at them as an asset for your design practice, you want to keep their young new idea skills. Those are very important and interesting, but you also want to be able to apply those into reality... I think maybe an apprenticeship could be an in-between way where they can both be kept and you can teach them and also learn yourself how to apply both skill sets into reality. (Alan, interviewee, 2019)

This came from Alan's broader philosophy on pedagogical practices, which is that as technology makes design more accessible, the need for training in design as visual language becomes more important. Alan noted:

If technology makes design more accessible and design is easily created, [then] you have to teach the designer to be able to curate these outcomes or ideas better and to enable young designers or students to curate... So my theory is designers should have more knowledge about design, about the field of design, about visual language, about how structures work, how you can articulate through design to be able to curate when...technology takes over and your in-design book is being designed for you and 10 or 15 years from now... (Alan, interviewee, 2019)

Table 38. Mental Health and Well Being

Code: Mental Health and Well Being	Examples
	<ul style="list-style-type: none"> • Mental health issues <ul style="list-style-type: none"> ○ Distress/ Stress ○ Depression ○ Anxiety • Dealing with pressure • Dealing with feelings of failure

(Code 11) Mental Health and Well-Being

A serious pedagogical issue that emerged in the study was the importance of students' mental health and well-being. The study's sample population (N=202) and a review of extant literature are enough evidence of the requirements of a communication design career pathway. Survey respondents frequently reported feeling pressured or worried about dealing with competition. K.M. identified "constant pressure of being top in the class" while Y.D., a senior designer from Dallas Texas, noted "a lot of competition" in the communication design field and that "good communication" and "good technology" were vital (survey respondents, 2019). Others described communication design coursework and job market preparation as "tough to get through" with "too many projects assigned" each semester (B.W.survey respondent, 2019).

Other survey respondents recounted grappling anxiety, isolation, and depression in the experience of becoming a designer. V.J., a design student living in the US,

remarked that she was “pretty nervous when I started. I got discouraged because a lot of people’s designs were better than mine. I stopped going to class because I felt like I was a failure but once I started putting my heart back in it, I overcame it” (survey respondent, 2019). Y.S., a design educator living in India recalled, “The most challenging experience is to have given up my social life, having nights full of work” (survey respondent, 2019). Having experienced challenges with mental health issues to a higher degree, N.O., a graphic designer from Los Angeles, California—who had completed a 4-year degree—conveyed:

Honestly, the greatest challenge was personal issues and depression. Having to do work when I’ve barely gotten enough sleep and dealing with depression is the hardest thing. I’m not my most efficient and have to work with such little. But it taught me how to overcome adversity and stick things through. (survey respondent, 2019)

The discussion of mental health issues also emerged in Gian and Elizabeth’s interviews. Gian recalled feeling stressed out by the amount of work he was assigned during his undergraduate studies, so much that he raised the issue with the director of his school:

They thought the priority was doing all this stuff and then compromising people’s health...I gave them a doctor’s note, and I said, from the first week we started, they were asking us to stay up and awake three to four nights a week, all night because they gave us that much work. I told them I am not doing that (interviewee, 2019).

In alignment with Gian’s experience, Elizabeth—coming from her extensive background working with students and managing a Master of Fine Arts program—also touched on students’ mental health, noting the stress placed on students by high tuition, and the shortage of adequate mental health services (2019):

I think [tuition] that’s a source of anxiety for students, which gets in the way of learning. Anxiety also gets in the way. You are probably familiar with

epidemic levels of mental health distress among students worldwide...in the ideal world, they would have more access to high-quality psychotherapy; that's just true—nothing to do with art school or the visual arts—it is just something that people need where the demand outstrips the supply of available care. I think that's something that art schools, in particular, can solve, but it is a big source of stress for our students (interviewee, 2019).

While these issues may seem fairly common or even appear as expected among college students coming from any discipline, research has suggested a significant increase in reports on mental health issues in higher education settings.¹⁴ The findings of a 2017 report by the American Psychiatric Association indicated that as much as “34 percent of students are being treated for some sort of mental health issue, compared with 19 percent of students in 2007” (Bauer-Wolf, 2019).

What was clear from the study was the need for more resources and systems in communication design education to address mental health issues and related wellness concerns. Elizabeth, in her analysis of mental healthcare accessibility, specifically named the need for more overall attention and problem-solving toward tackling these issues, including resourcing better mental health services for students. In Elizabeth's recommendation, in the most “ideal” situation, students suffering from anxiety, depression, and other issues would have access to counseling and psychotherapy. On the part of a program or school, this also implied that there was a need for further assessment to enable these types of supports and interventions.

¹⁴ This data does not apply to experiences of respondents who came from outside of the US in the United Kingdom, India, and Canada.

Table 39. Mental Health Resources

Subcode: Mental health resources	Examples
	<ul style="list-style-type: none"> • Problem-solving mental health accessibility • Assessing student mental health needs • Providing access to mental healthcare professionals • Counseling and psychotherapy

Gian, N.O., and Y.S. described multiple reports of sleep deprivation, which pointed toward the need to develop self-care, health, and wellness resources for design students, therefore also providing more adequate preventative healthcare measures. Fostering well-being among design students could take different approaches, from developing tactics for stress reduction to designing how the facilitation of self-care and well-being interventions might work in communication design in higher education.

Table 40. Self-care Resources

Subcode: Self-care Resources	Examples
	<ul style="list-style-type: none"> • Self-care and well-being <ul style="list-style-type: none"> ○ Stress reduction <ul style="list-style-type: none"> ▪ Sleep routines ▪ Healthy eating ▪ Meditation • Facilitation of self-care and well-being interventions

Besides the under-addressed problem of mental health for design students, respondents also touched on the importance of broadening communication design

education and making it more accessible to a broader spectrum of students. H.Z. remarked,

I think that making design education accessible to all, regardless of socioeconomic status is the biggest hurdle to help students entering the profession. I also think being aware of the most current design trends and designers is important to connect with students. (H.Z., survey respondent, 2019).

Chapter IV Summary

The study results in Chapter IV portrayed research participants' views of quickly changing environments for work along with new contexts for learning in communication design education — where digital technologies “now mediate much of our communications” with a digital transformation ultimately reshaping design processes and the roles that designers take on (Dubberly & Pangaro, 2019). Ultimately, the digital transformation of communication design and design education demonstrated a significant effect on the educational and professional requirements of communication design educators, professionals, and students. The qualitative and quantitative data collected in this study answered the central research question and sub-questions, providing insights on central tendencies in changing practices and digital skills development in design, and highlighting some challenges specific to real-world dilemmas while taking stock of practices that can potentially support students. Overall, the sample population (N=202) was relatively balanced in terms of gender, fairly diverse in terms of race and ethnicity, with approximately half of participants identifying as design professionals, and about two quarters identifying as educators and students.

The industry requirements now set forth have greatly emphasized digital skills requirements, at times placing these job requirements before adequately addressing what supportive pedagogical practices can support learning with new and emerging technologies (Davis, 2019). A designer's ability to rapidly master a highly specific technical skill or skill set to create digital media or design larger systems is largely a functional approach; however, narrow subject matter expertise can be vulnerable to becoming obsolete. Amidst this digital "paradigm shift" (Davis, 2019) where "technology presents a novel set of challenges beyond the traditional concerns of production," the participants in this study (N=202) were deeply invested, excited, concerned, and imaginative about their current set of challenges and preparedness, and what practices in their dealings with technology in their design education as students, educators, and professionals should be addressed.

The study participants were highly attentive to the digital transformation of communication design education practices and largely decisive about their level of preparedness on learning to use new and emerging technologies—from learning to design and code applications and digital products, understand analytics, to more advanced techniques in algorithm design, to name a few. Most participants had a highly favorable view of digital technologies in design, but many felt that they could improve their digital skills. Study participants had a strong reliance on digital technologies, and their everyday work and professional practices involved the use of new digital technologies. None of the research participants reported issues in gaining access to digital resources, and respondents reported staying up to date by accessing digital media platforms, search engines, and open-source online courses.

The fact that 78.4% of respondents had a favorable view of digital technologies in design and 89% of participants reported wanting to develop digital technical skills like coding confirmed the primary study hypothesis of the importance of a digital transformation of design on design education.

Less than half of the sample population saw themselves as being proficient or adequately prepared to work with digital technologies, confirming that the role of digital technologies and an overall transformation of practices was significant. In the current work and educational climate, participants saw the need for more attention toward computer science education in design, also stressing the importance of design thinking and the ability to conduct research—largely breaking from a traditional focus in the conceptualization and production of print media. When research participants were asked to identify and rank educational practices for further development in design, they pinpointed digital technology, coding and web development, and design thinking as the top three priorities were. They saw learning to code as growing not only as a job requirement, but also as a necessary means to be more directly involved and highly knowledgeable about the design of products, services, strategies, and ideas they were responsible for creating.

In total, 54 respondents from across the groups reported wanting to learn to code. However, many participants in this study conveyed that it was stressful or challenging to master digital and digital design skills, with 96.3% of them reporting a challenging experience while studying to become a communication designer. In search of expanding digital design skills, particularly in coding, participants reported wanting to learn everything from user-interface design and programming, animation, user-experience,

sensory design, and more, but it was not always apparent among participants on the best way to obtain these skills. In praise of the digital assets and learning resources now widely available, Candice noted that “there’s an incredible generosity out there [...]”—from “tutorials on YouTube” that assist with solving design problems, such as searching and finding out more about “a piece of code” (Candice, interviewee, 2019).

Collectively, the participants in this research viewed the endeavor to learn to use digital technologies in communication design and in their education as a real-world concern. They believed that connecting the practices learned in the classroom to real-world situations and challenges, particularly technology-focused, was stressful. These reports spoke to several deliberations on how students, educators, and professionals could better connect to real-world situations, both in retrospect and in preparation to enter the workforce, indicating that further analysis of and development of pedagogical practices responsive to a digital transformation in communication design could be a key measure for long-term sustainability. Doing so would not only prepare students to secure an internship or job immediately but also support them adequately to improve their overall learning experience, helping them to prepare to meet their longer-term goals and have wholly fulfilling career paths, beyond filling short-term skills gaps or struggling with self-doubt about their overall preparedness to use and shape emerging technologies. The practices that the research participants deemed necessary to navigate a digital transformation and a digital economy were varied and responsive to the study research questions and study hypothesis.

When the study participants were asked to talk about the pedagogical practices in communication design that could improve, they saw the need for more attention to

processes that support flexible learning with more conceptual clarity, where there was more transparency toward developing digital technical skills. In essence, it should not be more complicated than it already is, and the idea is to support learners to gain important fundamental domain knowledge without the constant anxiety of competing to have the best design.

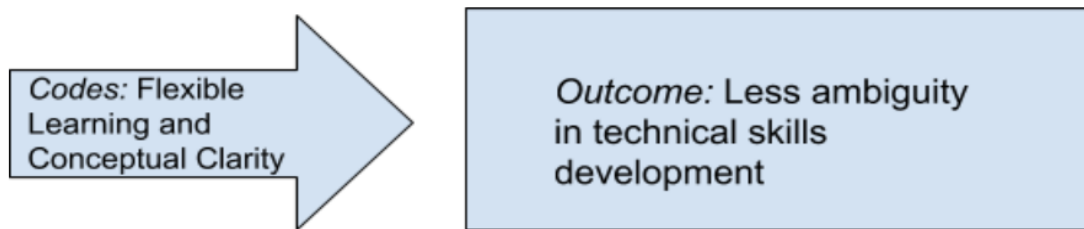


Figure 9. Desired Outcomes of Flexible Learning and Conceptual Clarity

This student-centered approach understands that students have diverse learning styles. Learning to design and modify computer-based products and services requires one to learn unique logic and syntax. Research participants related this to learning a foreign language. And in the quest to learn sophisticated technology-related skills, the participants evidently self-initiated this part or made it part of a self-learning regiment for continuous skills development.

This also spoke to a critical point about the presentation of materials on complex digital topics, like learning to code or understanding how to conduct research or utilize analytics in design. Among the participants, there was a need for less ambiguity on dense technology topics. According to some participants, with more flexible university and institutional assessment and interventions related to teaching students to be self-learners and to engage with continuous learning, this too could help reduce the need for

mandatory and continuous self-learning (see Figure 10). This does not mean that self-learning was seen as a negative experience but given a level of self-discipline and a person's ability to access education materials on-demand is required; it was seen as an area that could be improved upon.

Study participants frequently viewed it daunting to find the time to devote to becoming a habitual, life-long learner responsible for constantly updating oneself to the latest, groundbreaking trends in technology developments, from basic coding and sketching digitally, to more advanced developments in algorithm design. These continuous or constant learning needs were viewed as requiring more integration in university and work culture, so that not all the additional training and learning had to take place after hours, outside of a student's normal work and study time.

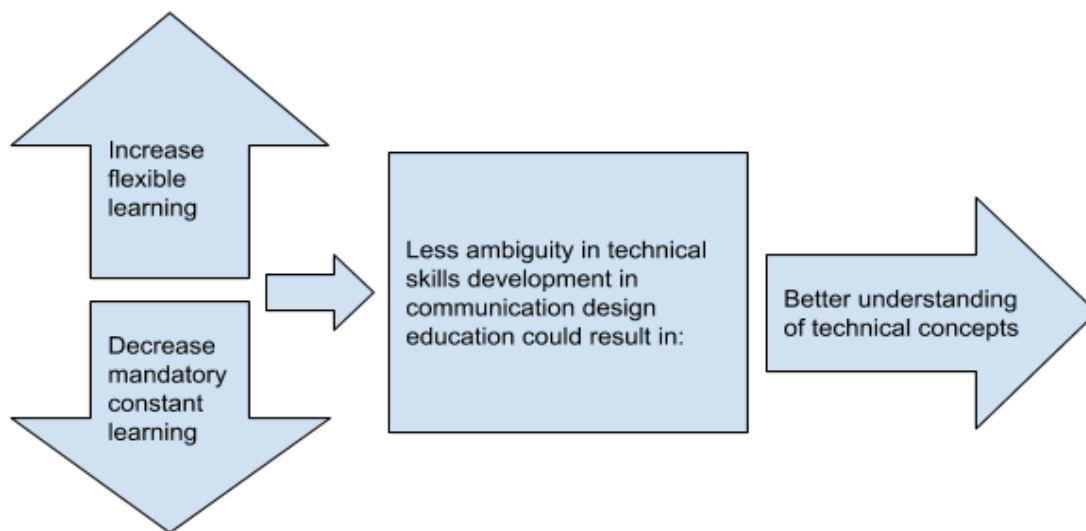


Figure 10. Desired Outcomes of Increased Flexible Learning Options

Participants desiring meaningful ways to clarify and reinforce STEAM-related learning also reported interest in more outlets to *productively fail* in the design process.

Among the study participants, having room to productively fail was negated by the fact that making mistakes and failing as part of the design process wasn't necessarily fully understood or widely acceptable in contemporary design processes. Failure was not necessarily built into most course rubrics or all studio or apprenticeship models that value accuracy. The need for accuracy was also particularly stringent either in earlier design systems, such as in scriptoriums or in traditional printing studios—where making mistakes was typically costly financially and in terms of time. With opportunities for more flexible learning and safe educational spaces to fail, the study participants implied that there could be more room for experimentation and play.

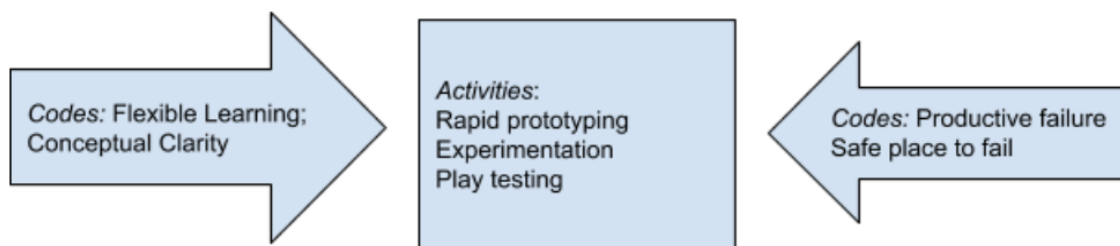


Figure 11. Activities Providing Opportunity for Productive Failure

An area of this research study where the results were particularly weak or underreported on was in terms of free-thinking and creativity. Only 4% of study participants reported this as a practice to be developed in communication design education. Among the survey participants, print design, formal concepts, writing, and typography were given the lowest rankings as practices to be developed. Drilling down further, design professionals ranked the development of formal concepts in design 10% lower than students and 7% lower than educators did. Despite this worrisome trend—given that creativity is traditionally viewed as central to communication design—there

was an interest in experimentation and play. There was also keen interest in gaining additional real-world experience.

Study participants saw a persisting disconnect with gaining real-world experience before entering the workforce, even for those with previous internship experience. Learning to code and master the use of sophisticated digital technologies was a pain point for many participants who desired to see their skills in communication design connect with the computer sciences.

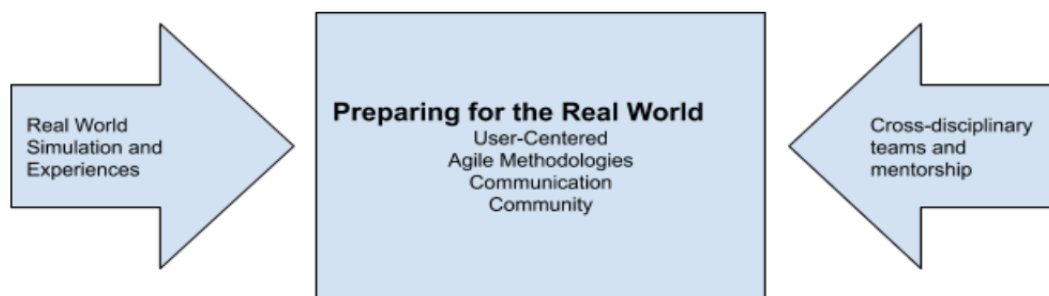


Figure 12. Experiences and Teamwork for Preparing for the Real-World

Exposure to the real world and new technologies pointed to becoming more interdisciplinary and finding new ways to connect with colleagues across departments and organizations. Cross-discipline teams that integrated designers more thoughtfully could lead to the growth of communities for learning, collaboration, and teamwork (see Figure 12). While participants favored online learning resources, forums, and tutorials as great assets, they desired to see more opportunities to gain support from university and alumni networks, design organizations, and networking in after-work events. The demands of learning to use technologies did not downplay the need for human contact and having nurturing real world experiences.

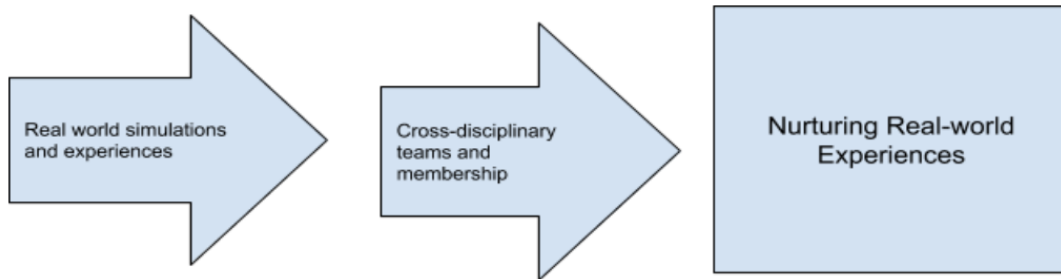


Figure 13. Expanding and Nurturing Real-World Experiences

The respondents also reported interest in seeing more real-world simulations in addition to having real-world experiences gained from fieldwork and research in design. Interest in more simulated experiences were notable as they offered more low-stake opportunities for students to role-play and work on in-class case studies related to highly technical subject matter that a relatively large number of student participants had reported feeling less prepared to deal with. Identifying other possible real-world-oriented practices, respondents also remarked on seeing more cross-disciplinary teams and in having more mentorship. This also spoke to having more nurturing education experiences overall (see Figure 13).

Participants saw the importance of strong verbal communication skills, the ability to build relationships, and networking as essential components of maintaining positive business-oriented or client-facing relationships. Having solid soft-skills such as exemplary interpersonal skills were pedagogical practices that were more closely oriented to traditional studio and corporate pedagogical approaches used in communication design education since industrialization. Yet, reports among the participants also pointed to the need for redesigned modes of communication, which led to another salient point for further discussion: what does a supportive team in communication design education look

like in a digital transformation and how can these types of networks benefit students (see Figure 14)?

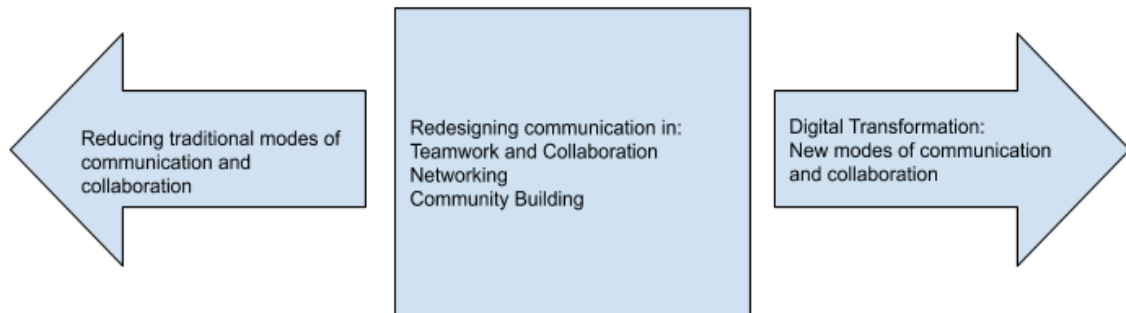


Figure 14. Desired Practices of Communication to Improve Teamwork and Collaboration

Given the strenuous requirements of mastering new technologies in communication design education, a collective theme pointed to wanting to feel more nurtured and supported overall. This also spoke to the growing mental health crisis in higher education and the workplace, where research participants reported feelings of distress, anxiety, and being under constant pressure. Living, learning, and “participating in the always-on lifestyle” that is “perpetually connected to people and information through a series of devices and social media channels” (Boyd, 2014, p. 72) could be partly to blame for this. Another factor to blame is the high cost of tuition in the US and the pressure to compete to fulfill highly demanding job-market requirements that often required students to compete for having the best portfolio of work against their other peers. For many research participants, there was immense value in developing better self-care practices in design that supported healthier routines and better access to healthcare professionals during busy and highly stressful times.

In summary, the results spoke to the need for the development of comprehensive and integrated pedagogical practices for addressing digital transformation. All in all, participants looked to future employment prospects and digital technology change through a positive and open-minded view, but also held the understanding that with these changes, they would need to be better supported to make the best of this transition.

Chapter V

DISCUSSION

In this study, there was no singular pedagogical practice to address a digital transformation. The practices described by the study participants could not be simplified into a “manifesto” or an approach. The nuanced findings, expressed through descriptive statistics, themes, and as a series of codes were interpreted as adaptable practices that study participants viewed as supportive of communication design students in their learning processes. It was clear that a digital transformation of communication design education proved to be an unpredictable, exciting, and “difficult process” for the participants, where many traditional practices and processes in design are being “dismantled” and built again to be more sensitive to digital technology change (Davis, 2019; Economic Times, 2019; Peterson et al., 2019).

Study Reflection

During the time in which the study data was collected, the debate on how to address a digital transformation in higher education schools and programs, and also more widely across institutions and organizations, continued to grow. In a survey conducted by the global consulting firm Protiviti (Tabrizi, Lam, Girard, & Irvin, 2019), it was found

that a digital transformation was a primary concern among respondents coming from varied business backgrounds, where “70% of all digital transformation initiatives [did] not reach their goals.” In a McKinsey Global Institute report, Manyika (2017) stated that “Almost 75 million youth are officially unemployed” (globally, as of 2017) with “many employers saying they cannot find enough workers” with the technical and soft skills needed. Reflecting on an earlier report by the Pew Research Center, Anderson et al. (2012) argued that a “technological transformation” should take place in higher education to accommodate a “changeover to new methods” that could lead to frustrations on how universities will “adopt new pedagogical approaches, while retaining traditional methods.”

Design educators and professionals have initiated plans to address the digital transformation of education and work in communication design. The AIGA published its “AIGA Design Futures” research project (Davis, 2019a). Several design-focused conferences and symposia have been planned with a focus on a digital transformation in design, including the New Age Education Symposium (2020), AI World Conference (2020), the Digital Workplace Conference (2020), and Adobe’s Digital Experience Conference (2020), to name a few. Considering the future of work in design, *Eye on Design* founder Perrin Drum (2019) described that the design workplace is in a “state of transition” where work is “ever-changing” therefore frequently calling on designers to be versatile as “generalists” who can solve varied, technology-driven challenges.

Several organizations and academic institutions have risen to the task of addressing a digital transformation, with Google publishing their report on the “Future of the Classroom” (2019), and CUNY professor Cathy Davidson taking the role of Director

of The Futures Initiative, which “advocates greater equity and innovation in higher education at every level of the university” (“About the Futures Initiative,” 2019) Columbia University and MIT have developed respective courses and certifications with a focus in digital transformation, touching on topics related to communication design. In partnership, the Alliance for Excellent Education and the U.S. Department of Education have developed a Future Ready Schools (FRS) initiative to maximize digital learning opportunities and help school districts move quickly toward preparing students for success in college, a career, and citizenship (Alliance for Excellent Education, 2020). As noted by Manyika (2017),

Clearly, we are still in the early stages of how sectors and companies use digital technologies, and there is considerable unevenness. From country to country, too, there are significant divergences. Overall, for example, we estimate that the United States has captured only 18 percent of its potential from digital technologies, while Europe has captured only 12 percent.

Amidst this urgent call to see more coordinated efforts to respond to a digital transformation in work and higher education, there is also a positive outlook for a digital future. A 2019 Pew Research survey of “technology pioneers, innovators, developers, business and policy leaders, researchers and activists” (N=530) indicated “hope that in the next 50 years, digital advances will lead to longer lifespans, greater leisure, more equitable distributions of wealth and power and other possibilities to enhance human well-being” (Stansberry, Anderson, & Rainie, 2019). The researchers at Pew Research concluded that “Digital life will continue to be what people make of it. For a better future, humans must make responsible decisions about their partnership with technology” (Stansberry et al., 2019).

While the study participants represented a relatively small sample (N=202), much of their concerns resonate through contemporary discussions taking place. The findings illustrated fairly complex views on how communication design educators, professionals, and students have engaged with changing practices and skills development, how they cope with challenges in designing for the real world, and what pedagogical practices they viewed as relevant for further development to confront digital transformation in communication design education.

In terms of the primary study hypothesis, this research found that pedagogical practices responsive to a digital transformation of communication design and design education have had a significant effect on the educational and professional requirements of students. Support for the overall findings was both quantitative (in the surveys) and qualitative (through the interview responses). Regardless of the participants' position in this study (specializations were generally equally distributed),¹ they viewed digital technologies as a crucial area of focus for communication design education. Indeed, 89% of the study participants reported digital skills they wanted to develop further, and 78.4% reported favorable views of digital technologies in design.

The study questions asked what pedagogical practices in communication design education can be developed and integrated into existing practices to support design students entering the profession to better prepare them to respond to digital transformation. This research also asked how well-prepared students considered

¹ The respondents in this study held design positions in the following areas: digital design (45.2%), print design (18.2%), strategic design or design management (15.2%), UX research (10.3%), and social impact design (8.8%).

themselves to use digital technologies; and what specific pedagogical practices design educators, professionals, and students might adopt to respond to these changes.

With these developments in mind, this chapter considers a number of points for further discussion. In a digital transformation, where design students are “wedged between corporate cultures, ever-changing skill sets, and constant self-reinvention,” with the guidance of educators and professionals, they might navigate, adapt to, and essentially learn to advance, re-imagine, and *design* new cultures, environments, processes, and practices for learning with digital technologies.

The study participants had a strong reliance on digital technologies, but they lacked preparedness to use these technologies. This spoke to the fact that pedagogical practices to support learning to use new technologies required a more in-depth assessment. In a digital transformation, how can communication design students obtain the digital skills they need, and on a more holistic level, embrace the pedagogies needed to prepare them for a lifetime where digital technologies will play a tantamount role? While the concept of preparing for a lifetime career involving digital technology may seem daunting, this is also confounded by a debate on "the concept of obsolescence" in design (Heller, 2019). In Heller's (2009) interview with Allan Chochinov, Founding Chair of the MFA in Products of Design graduate program at the School of Visual Arts, Chochinov observed that many designers are pressured to create prototypes and artifacts that might be "quickly thrown away." With this in mind, there is not only an urgency to prepare for the continuous use of technologies, but also constantly weight relevance, and navigate the issues of expanding skills sets.

Jones (2017) described that contemporary practices in design do not address the “the complex continuous problems our institutions have sustained” sufficiently to solve “twenty-first-century challenges in human societies, settlements, and economies” (p. 157-162). Davis (2019) noted that these challenges with digital technology use in communication in design and education are “not a short-term question” and argues that “designers must not only develop methods appropriate to an expanded scope of work, but also address the velocity of change.” It is important to acknowledge some of the paradoxical situations that the participants in this study faced in learning to become digitally proficient in communication design.

In his book, *The Programmer's Paradox*, writer Paul W. Homer (2013) described how software can have a longer “lifespan” than “the original programmer thought it would” (p. x). While communications designers are not always programmers, they, too, are often limited by such short-term demands to design or create a digital product, process, service, or interface that may live beyond their tenure. Furthermore, Homer (2013) argues that “good software is worth putting work into” as it saves more time than having to rebuild the code and start all over again reactively. Embracing a longer-term vision on digital technology use requires a more comprehensive and supportive approach, where professionals and educators are more invested in “a mix of astute, forward-looking management, a spirit of innovation, skills, with technology playing a supporting role” (McKendrick, 2015)

Despite the existence of plentiful free and open-source tools available to the design community, this access did not necessarily correlate with a feeling of being prepared. Digital technologies provided many benefits, but it was a hindrance at times. In

line with Bonini's paradox, as a model becomes more *accurate* of the real thing—in this case learning to be more responsive to a digital transformation occurring in the communication design disciplines—it can become more difficult to understand. Also, in line with Solow's paradox, following investment in digital information technologies, one may initially see productivity declines rather than increases. It is not as simple as more use and exposure to digital technologies will produce more productive and forward-thinking designers. These two paradoxes illustrate that the impacts may not be straightforward and that there is much to be considered about how educators and professionals design their approaches to emerging digital technologies before concluding precisely how to use them.

Having every tool at a designer's disposal did not necessarily mean that the study participants could operate them well, creatively, or critically. Lupton and Phillips (2008) described that having the correct tools and equipment does not necessarily correspond with creative thinking, while Resnick (2002) argued that there is a need for a deeper assessment of the creative capabilities of new digital technologies.² To this point, an interviewee saw value in being able to use whatever tools are appropriate to a job but observed that designers need to be able to think clearly about users and their needs. For example, “word processing on a computer is efficient and a step forward from using a typewriter or paper, but it does not make you a better writer” (Sarah, interviewee, 2019).

² Clement (2019) found that “in 2018, the United States had close to 275 million internet users.” While a digital divide still persists in the US and in much of the world, a shrinking digital divide and greater access to mobile Internet suggests positive implications about the optimal utilization of digital resources available to communication design students (Kende, 2015). So, while adequate access to digital resources has improved, some actions might be taken to make the most of these resources.

For the study participants, an aspect of being digitally proficient also meant having to use digital technologies continuously without necessarily achieving their goals to create innovative work. Technological resources available could also be overwhelming to make sense of, and while fun and stimulating to use, it was clear that excessive use of available digital resources didn't lead to a mastery in use (see Gardner & Davis, 2013; Turkle, 2012; Turkle, 2015). This challenge with learning preparedness in terms of technology use can also be related to researcher and educator Paulo Blikstein's (2016) description of the "keychain syndrome." This is where "fast, scripted, perpetually 'introductory' workshops" that teach complex technology and STEM topics in education might teach students to learn more about producing "trivial objects" with limited use, yet students wouldn't necessarily advance to learning to create more "complex projects" (p. 67).

We now live in a world with a vast array of digital tools and technologies at our disposal, many of which are either free or relatively affordable for designers to use. The availability of these tools should encourage design students to experiment playfully and freely, welcoming a digital transformation in their work, education, and in their personal lives through innovative practices, moving beyond simplified conceptualizations. Communication design students, as well as educators and professionals, may feel obliged to settle for short-term solutions to longer-term problems with learning to learn to use new technologies, taking an easier but less fulfilling educational pathway to solving complex digital problems (Blikstein & Worsley, 2016, p. 68).

Study results showed that 69.6% of design professionals and 64% of design educators felt prepared or extremely prepared to work with digital technologies, while

only 40% of students felt the same way. This difference between the groups was statistically significant, with a calculated χ^2 test with a p-value of 0.00. Here, there was a significant difference in the way design professionals and educators perceived digital proficiency compared to students. An oversimplification of design processes responsive to a digital transformation also potentially disempowers schools and organizations from being innovative and leading-edge as “the landscape of professional practice [...] bears little resemblance to the work for which many faculty were educated” (Blikstein & Worsley, 2016; Davis, 2019a).

Some study participants also cited inadequate resources at their universities, leading to preferences for free, open-source online digital resources. Some resources were not available in a traditional face-to-face classroom setting, but they could be found online. Although looking for help online did not negate the need for in-person contact and face-to-face instruction, many participants desired more in-person time for community building and networking that was more common in traditional studio-based settings, where much of what was learned existed in face-to-face interactions. Therefore, the data that emerged also spoke to participants’ conflicted views on making value-judgments on the importance of both face-to-face and online interactions for learning to use digital technologies, while studying and working in a digital economy that, as described by Mervi Rajahonka and Kaija Villman (2019), has “grown much faster than the rest of the economy” (p. 14). Rajahonka and Villman (2019) explain that “digital technologies have led to work becoming more flexible, in general, and have blurred the borders between work and free time” (p. 16). Faced with digital transformation challenges, many schools and organizations have also struggled to understand how best

to utilize digital technologies (McKinsey Digital, 2018). This may be because organizational responsiveness to a digital transformation cannot be truly accelerated until organizations and schools take leadership in teaching their educators, professionals, and students to engage in the difficult learning processes to make the best use of emerging digital technologies.

Looking further into this dilemma of design students having adequate institutional support to learn to use a new digital technology (not exclusively solved by a YouTube tutorial alone or a coding boot camp in isolation), many students felt the need to supplement their higher education learning through boot camps and learning intensives where they can accelerate their technical skills, namely coding. Coding boot camps have existed from as early as the 1990s, beginning with intensive courses held at schools such as The Starter League, and in 2018, there were “more than 300 coding schools worldwide” (Wengrow, 2018). Without a doubt, there is immense added-value in online tutorials on YouTube and LinkedIn Learning (formerly lynda.com)—with 700 design courses available, and with short-format intensive design classes in visual design, front-end development, and user-experience design offered by a for-profit education organization. However, there were no reports among the participants (N=202) that boot camps or learning intensives should replace what higher education can offer over a sustained period; it could only augment it.

Although the job placement success of academic and coding boot camps has not always been transparent, they continue to see a “boon” in response to digital skills shortages highlighting a relevant point to how higher education institutions can co-exist with for-profit education organizations offering intensive courses, or what design

programs and schools could learn from them (Wengrow, 2018). This is not to say that there are no auto-didactic learners who are a fit for intensive learning scenarios and could benefit from this more than a 2- or 4-year degree, or none at all. Yet, as described by Stinson (2019) “people aren’t computer chips.” A more systematic approach to developing pedagogical practices to address deficits and “embrace a digital revolution” in communication design education will be beneficial. Additionally, study participants found that pedagogical practices to address these deficits need to be nurturing, supportive, and “real-world practice-oriented” (Creswell & Creswell, 2018; Moody, 2019). Although 14 years have now passed, what Johnson, Lenartowicz, and Apud (2006) argued remains accurate, “Technological developments and the market penetration of digital devices have accelerated faster than any accompanying educational or pedagogical change.” Given pervasive digital transformation challenges in design education, the discussion above has also emphasized that it is also necessary to further examine organizational contexts and accountability.

Daniel Newman, a principal analyst and writer, remarking on a digital transformation in education, noted, “Our world is becoming a place where we can rapidly learn anything, and in many fields our experience is only a small part of our ability to learn and achieve. The future of education is exciting and scary” (Newman, 2019). In terms of services, respondents expressed concerns about inadequate infrastructure for face-to-face learning scenarios. Given the pace of digital transformation in the workplace, organizational constraints were a concern for participants on multiple levels from being finance- and infrastructure-focused to the delivery of content on online platforms and in-person—with both of these feasibility concerns proving to be valid and concerning. Can a

small organization provide the same digital resources and training to designers that corporations like Google and Amazon can? Many educators and researchers conclude that equity gaps persist and the cost of support to implement the infrastructure and hire employees to support an organization's digital transformation can as much as triple the cost of operations (American Council on Education, 2019). This presents a point for further discussion on technical feasibility, stressing that organizations work collectively to confront fiscal and infrastructural challenges.

Granted, there is a finite amount of time in a semester, for communication design students to take on internships and extra-curricular activities. The research participants were conscious of these limitations and were concerned about being left behind in light of digital technology advances. Some study participants only had a moderate grasp on using digital resources, tools, and products available to them. This is an issue that has been underscored in several studies published recently. Peterson et al. (2018), Coldwell Neilson (2017), and Henderson et al. (2016) have all argued that digital work practices and approaches to use available resources effectively should be improved in higher education. Arguably, this could also alleviate some of the heavy reliance on academic boot camps and online learning tools that augment, enhance, and support the work that communication design students do to achieve an academic degree and feel prepared to begin professional work. With a better grasp on effectively using available resources, study participants might play and experiment with them more actively. Indeed, play and experimentation emerged as an important component for higher education to incorporate.

In the history of communication design, from the printing press to desktop printing, learning to use new technologies was never a straightforward path for designers.

It required a great deal of experimentation and change where designers worked in apprenticeships and studio workshops, where the constraints of designing cutting-edge print media became less restrictive over time and designers were given more privileges to experiment (Ainley & Rainbird, 2014; Meggs & Purvis, 1998; Snooks, 1996). Different styles of apprenticeships and design studio settings took centuries to develop and refine, yet the frantic speed of industrialization called for larger educational interventions, leading to the formation of academies, vocational schools, and later, the Bauhaus (Efland, 1983, p. 152; Ledsome, 2011, p. 136). This does not mean that a digital transformation, multi-level apprenticeship models, and earlier schools of design can be easily compared and analogized. Rather, it means that it required a great deal of thinking and learning to respond to earlier industrialization and we should expect the same now.

What also emerged from this data was a deep level of thinking and consideration of what types of nurturing and supportive educational experiences could support them in their journey to master new technologies in their work contemporaneously, with considerations on how this could become a lifelong practice. To reiterate, much of this had to do with thinking about learning problem-solving for issues that do not have an exact *look-alike* scenario to draw on.

In his book, *Thinking Fast and Slow*, psychologist and economist Daniel Kahneman (2013) described that when a learner solves a problem, such as a simple multiplication problem, they proceed through a “sequence of steps” to figure out the answer (p. 20). This could be considered a “prototype” for “slow thinking,” where to alleviate “the burden of holding much material in memory,” learners will engage with the problem by taking a “deliberate” and “orderly” approach to solving the problem.

Kahneman (2013) also details that many activities central to our lives, and also our education—from checking the “validity of a complex argument” to “searching memory for a surprising sound”—encourage people to be mindful of the “limited capacity of attention” that one has (p. 22). In today’s digitally infused culture, driven by speed and the notion of optimization, there is a demand to learn quickly. And for many participants in this study, there was a deep interest in being more deliberate by being more agile and flexible. Yet being more flexible wasn’t indicative of sheer speed. Participants reported their interest in seeing more adaptability in learning to approach new technologies, seeking more acknowledgment and understanding of their diverse learning styles, while also desiring more conceptual clarity on the complex topics they were presented with.

In the views of the respondents in this study, changing digitally-driven pedagogies meant that there was a need for reimagined approaches to flexible and continuous learning requirements, which, for example, could require the development of community spaces to engage in a discourse on a digital transformation in communication design, with better ways to connect with mentors and peers overall, and with more attention paid to their overall health and well-being to accomplish the demanding task of becoming digitally fluent, savvy communication designers. Powell et al. (2018) observed that “inclusive classroom learning environments [are] an essential yet underdeveloped” to respond to industry demands. Sharples (2019) described contemporary pedagogies responsive to a digital transformation call for educators adapting to “learner’s knowledge and actions” where “pedagogies are adopted in new ways for a digital age.”

For the participants, adopting more continuous, flexible, and adaptable learning approaches meant having more room to fail in personal explorations with new

technologies. Overall, participants saw it as a requirement to be constantly training and learning at all times. Therefore, to be more flexible and agile, the participants also needed more permission to fail or to productively fail in their experiments (see Kapur & Bielaczyc, 2012). If a design student, an intern, or even a junior designer could productively fail without the threat of losing their jobs, there can be room for more experimentation. While some companies build in time for experimentation and entrepreneurship, it is not a widely accepted function of a job protocol. Nevertheless, the ability to rapidly prototype, play, and critically experiment with designing products and services that are highly usable, creative, and innovative is a 21st-century attribute that many organizations and businesses have repeatedly claimed to value the most.

Resnick (2002) argued for more attention toward seeing the full creative capabilities of new digital technologies in design (p. 33), while Lupton and Phillips (2008) argued that being technologically well-equipped did not necessarily translate into “creative thinking” pointing to a significant deficit in the data reported. A focus on creativity was lacking in a profession that typically prides itself on being creative.

This begged the question of whether the contemporary designer working in relatively new roles as front-end developers, researchers, and user experience and user interface designers believe that they are maximizing their creative potential, and whether this sentiment among the study participants is generalizable. It is not clear from this research if a decline in print media production and consumption and a decline in interest in formal foundational concepts in design are generalizable. However, given the emergent data, it can be hypothesized that the identification of digital design and coding as an area of improvement could speak to a potential roadblock toward free-thinking and

creativity. In pedagogical practices where experimentation and play are being fostered substantially, it might also be assumed that there is more room for creative, free, and abstract thinking.

Experiential, real-world-oriented learning can help communication design students to gain practical experience before entering the profession (Creswell & Creswell, 2018; Moody, 2019). The study participants identified the need for real-world-oriented practice, teamwork, and collaboration. They viewed communication design as a “dispersed field” where many communications could now, for the most part, take place online. Despite an overall tendency to prefer digital modalities, the need for human contact and support was not lost. A pedagogical practice worth noting in this chapter was more attention to communication design students’ challenges with mental health and well-being. Respondents reported issues with stress, depression, and anxiety, and working under duress where they experienced sleep deprivation while working on design projects. In communication design, in the workplace and many university settings, this is sometimes considered normal. However, as many as 34% of college students in the United States report mental health issues, up from 19% in 2007. This highlights the need for more attention to well-being and self-care pedagogies in communication design education.

Chapter V Summary

The discussion chapter explored the pedagogical practices that the study participants identified as supportive of communication design students in their learning during a digital transformation. Reflecting on the data collected in this research, the practices suggested that there was no single system, approach or theory to solve the layered and nuanced problems triggered by a digital transformation. It was also apparent that deliberations were increasingly being made widely to confront challenges related to a digital transformation in communication design education and in higher education (“About the Futures Initiative,” 2019; Davis, 2019a; Google for Education, 2019), as well as broadly across sectors in organizational contexts (Manyika, 2017; Rajahonka & Villman, 2019; Stansberry et al., 2019; Tabrizi et al., 2019). This points to a tense dilemma at hand, urgently capturing the attention of schools and businesses alike. In the period in which this study was conducted, a greater consensus had emerged that more needed to be done to support students to not only function in a digital economy but also thrive. For the participants in this research, there was a keen awareness that communication design education would need to reassess its short- and long-term capabilities for nurturing students to withstand an “expanded scope of work” (Davis, 2019).

The study participants, possessing a self-awareness on the need for the development of new and revised pedagogical practices to meet the changing educational and professional demands related to a digital transformation, acknowledged that digital technologies were constantly evolving and maturing, and saw that this could be

overwhelming to make sense of. In an examination of this dilemma, it was apparent that skills development and training might only serve as a reactive, temporary, and superficial solution to a larger problem. It was viewed that changing the way we think, learn, and use digital technologies in a more “forward-looking” way could mean embracing a deeper and more self-aware “spirit of innovation” (McKendrick, 2015), engaging with a more in-depth of assessment of the vast creative use for digital technologies (Resnick, 2002), and recognizing that having access to more digital tools and more training doesn’t automatically translate to being critical or inventive. Through this narrow view, it could also be seen that communication design educators and professionals were at a greater risk of trivializing digital resources, grounded in perpetual introductory-level engagement to using new technologies (Blikstein & Worsley, 2016; Gardner & Davis, 2013).

On further reflection of the study results and this predicament, it became clear that there wasn’t nearly enough room for designers to play, experiment, and fail in the process of experimentation (see Kapur & Bielaczyc, 2012). Having a safe place for experimentation was particularly critical to support designers in gaining more real-world experience (Moody, 2019) and learning to utilize the available digital resources better (Henderson et al., 2016; Peterson et al., 2018). However, some limitations were also evident, as it was clear that adapting to a digital transformation could be costly (American Council on Education, 2019). Thus, presented with feasibility issues, it was also clear that higher education institutions were accountable to solve complex infrastructure and budget-related challenges, which frequently have led design students to augment their skills through online boot camps and tutorials (Wengrow, 2018). While the participants viewed online resources as extensively useful, it was seen that higher

education programs and schools might also look to develop additional interventions to support communication design students in becoming flexible and agile learner who readily seize the opportunity to work with new technologies and become leaders, entrepreneurs, and innovators despite the hardships with digital transformation challenges, where as little as “18 percent of [...] potential from digital technologies” has been captured (Manyika, 2017).

In summary, it is an exciting time to see through the potential uses of digital technologies in communication design education, but a great deal of collaboration is needed to make this actionable. In order to be sensitive to a digital transformation, there is a need for safe, nurturing, and perhaps less competitive practices—which move beyond traditional apprenticeships and internships, and, instead, are reconceived in vibrant and imaginative ways, where students are not only skilled, but also highly educated, agile, and inspired. In the view of study participants, this might look not only like a conventional coding boot camp or an online tutorial, but more like a cross-disciplinary team that incorporates approaches which are playful, leadership-driven, and less resistant to change.

Chapter VI

CONCLUSION AND IMPLICATIONS FOR FURTHER RESEARCH

At the heart of this study was the question about how to support design students entering the communication design profession in the midst of a digital transformation. Whatever role a communication design student takes on in the contemporary workplace, they will likely need to understand how to use and design digital media, have an understanding of website development and coding, with an understanding of how to use and visualize data, while also having expertise in several niche areas from digital marketing, working with e-commerce and web production, to working with visual, interaction and motion design. The job requirements vary and are demanding, leading many educators and professionals to be conflicted about how to guide design students to perfect their skill sets and have the best, and most polished design portfolio. Yet, what emerged from this study and its participants was not so linear.

Much deliberation should take place and actions might be taken to refine, enhance, and innovate existing practices and to develop new practices to meet the needs of students facing complex 21st-century challenges in learning to use new and emerging technologies. There is an urgent need for designers to be “designing” new, emergent technologies, communication, and information systems—and this challenges pedagogies that communication design schools, organizations, studios, and independent design practices have largely embraced since industrialization, often drawing on pedagogical

models incorporated in vocational schools, academies, and apprenticeships. While design educators and professionals can learn from centuries of development in design pedagogies, my research has suggested that these practices should be slightly adjusted, and emphases changed for a digital transformation of education and work.

Existing pedagogies may not always be best suited to accommodate disruptive technological changes. As design students, educators, and professionals are all presented with unprecedented challenges to actively engage with digital technologies and continuous changes and enhancements to these technologies, the study has explored ways in which they can be exposed to practices that will encourage adaptability in learning, more conceptual clarity on complex topics on digital technology use, with a greater emphasis on developing a better understanding of self-directed learning and continuous learning practices, experimentation with new technologies, providing design students with safe places to fail. Also, they must find more ways to simulate real-world experiences without the expectation of making demands of students that can lead to burn out. The current approach, whereby communication design students often supplement class with long hours spent on YouTube or in online instruction, can be improved (or at least better directed).

Digital transformation impacts education and professional organizations broadly, and it will require a great deal of problem-solving to form alliances and cross-sector collaborations to step outside of a reactive context and take a mindful approach to learning to use new and emerging digital technologies. While many programs and schools in communication design education are making strides for solving the issue, organizations are still struggling to cope with change overall (Bloomberg, 2018; Raman,

2016). With students' ability to use "technologies rapidly and smartly" [...] "learning a tool once and for all" is no longer a viable option (Raman, 2016, p. 10). Within months of mastering programming or technical skill, to creatively interpret a complex problem, or in learning to implement a specific strategy or management technique, there is a possibility that these requirements quickly become obsolete. While YouTube tutorials are relevant today, TikTok could be more appropriate in six months from now. While Photoshop and InDesign—cornerstone applications in design—are crucial in design practices today, Sketch or other open-source tools may become more relevant tomorrow.

The notion of obsolescence also speaks to a more significant concern. With only so many hours in a day to take accredited courses in a university program, in a boot camp, or that a student can study independently during their personal "downtime," it becomes more urgent to ensure that a student is prepared adequately not only to pursue a job but also to have the practices in place to tackle "wicked design" problems that digital technological acceleration presents. Some researchers argue that we are fundamentally grappling with the equivalent of a "Digital Dark Age" where the "dark side of high tech" is radically disrupting all facets of social and economic life (Weinglass, 2018). In this view, designers—particularly communication design students—who are studying to interpret some of society's most pressing technological and mass communication-related challenges—are especially vulnerable to the digital transformation, while also having the unique advantage of becoming leading critical interpreters and innovators with their design-led subject matter expertise. Arguably, this could increasingly propel communication design students into leadership roles in education and in businesses

where designers' insights become more impactful and far-reaching, and they should be encouraged to take on these critical roles.

What guides these students to become these leaders, well-versed technically, creatively, and strategically is not a reactive set of pedagogical practices that promotes the mining and milling of skills to quickly and thoughtlessly churn out the graphics, the data visualizations, and the product and services urgently needed on-demand by organizations, businesses, as well as schools. In fact, the pitfalls of such a condition are both demoralizing and might be considered inhumane pedagogically. This is reminiscent of the monastic systems and factory work settings that designers struggled to work within in the peak of early industrialization. Then, a dated conception of the master-apprentice model was economically and socially acceptable.

Instead, what the study participants suggest is that for designers to feel prepared for a rapidly changing structure of work they need to feel a sense of agency, confidence, and clarity—guided through the support of mentors, sophisticated social networks, design ethics, and critical experimentation.

Communication design is moving toward becoming something altogether new and now is the time for further institutional debate and discussion. The study participants' varying responses illustrated that digital pedagogies that nurture communication design students grappling with the need to accelerate their technological proficiencies are not well defined. The paradox of learning alone versus learning together is a significant concern; new pedagogical practices call for new modes and methods of collaboration and learning with technology. However, some clear themes emerged from the data leading me to the following educational implications and recommendations.

Educational Implications and Recommendations

Several educational implications and recommendations emerged in response to the data collected and analyzed from the sample population of the study participants.

“Capacity Building” For a Digital Transformation

Considering a digital transformation, communication designer educators, professionals, students and the organizations that they work with must collaborate for capacity-building. Capacity-building can mean several things including having the correct software, tools, and infrastructure to use new digital technologies. Capacity-building also requires financial planning and identification of talent shortages. An organization that is sensitive to the ever-changing demands of digital technology use also recognizes that educators and professional designers need ongoing training, too. Organizations from design studios to in-house design departments, start-ups, marketing, web, and product teams, must work together to consider the following aspects of capacity building.

Resource allocation. Organizations should consider how to use and share their digital resources efficiently, working together. More robust digital libraries, archives, and repositories should be accessible and available for use across universities and in the workplace, and they should be tailored to particular organizations’ needs. This is

particularly crucial for under-resourced organizations, schools, and universities. There is a need to re-imagine resources like the World Digital Library, Project Gutenberg, Data Camp, GitHub, and Creative Commons, and find ways to personalize these repositories for specific groups' needs. Education should support learners to be independent, self-directed learners who are sensitive to digital transformation challenges, and continued change.

Self-directed learning. With many students in need of foundational coding skills, as well as advanced technical and quantitative skills, they look to online tutorials, as reported by some study participants. The participants reported varied needs, suggesting that there is too much material to incorporate into the curriculum, and programs relevant today may be less so tomorrow. The question then becomes how educators and educational institutions can provide students with the ability to learn continuously and acquire some of these skills in a self-directed way. My study suggested therefore, that there is a need for additional training to support learners to be self-directed. Self-directed learning abilities are an important competency that can be aided by the creation of self-paced learning plans and by implementing additional interventions to engage in reflective learning, where communication design students are given the space to look back on past learning experiences. Self-directed learning also calls upon students to be agile and flexible in learning digital technologies.

Agile learning and flexible learning methodologies. The study participants saw the need for the development of more flexible learning pathways in communication design education, seeking practices that help to support designers to be more adaptable and agile, in response to digital technology change. In practice, learning to be an agile

learner is largely a student-centered approach where there is an understanding of diverse learning styles, and teams work closely together—often intending to learn to build a model or a digital or software prototype. These processes can be gamified, where communication designers learn to work together in chaotic or difficult situations. Students might have the option of engaging in learning sprints where they learn to develop strategies to solve technology problems in short periods. These types of interventions associated with agile learning may mimic hackathons or brainstorming sessions and may also serve as nurturing activities that support design students to engage in play and experimentation (which a number of study participants identified as an important aspect of better communication design education).

In theory, it may sound relatively simple to develop practices where educational play is fully incorporated; however, this requires that, first, there is more teacher clarity and conceptual clarity, and, second, that there exists a pact, an understanding or an agreement between a student and their teacher or a student and their employer that they can experiment with agile methodologies without feeling threatened by their own failure.

Conceptual clarity and teacher clarity. Many participants in this research reported struggling with some of the educational content on digital technologies. Often, there are “learning objectives that require students to operate exclusively at depth of knowledge” (Stubbs, 2019). Study participants reported that many employers similarly expect subject-matter expertise before they hire a designer to carry out the specified task. This could, in fact, trigger talent shortages, rather than allowing students to develop their learning intentions and then gain more support to carry out these tasks. For example, many design students may be familiar with JavaScript or special effects software and

have some of the basic knowledge to use it. Rather than test a student for the gaps in the knowledge, using teacher clarity as a pedagogical approach, educators, as well as professionals, can work with students to “transfer ownership of learning by partnering with students” and “co-construct success criteria” (Ainsworth, 2018). It’s important that the implementation of teacher clarity in learning—or “visible learning”—is not a punitive measure. Instead, it should help educators and professionals hire students “to find out how to seek and provide appropriate feedback that helps students getting forward” (see Hattie, 2019). Organizations, particularly those who are risk-averse, may not be as open-minded to the approach of supporting students to this great extent, and this pedagogical approach, if consequential, could also echo an apprenticeship model. As part of this agile methodology, there must be a spoken or contractual agreement that enables true productive failure.

Productive failure. In many classrooms, the ability to fail without consequence may feel or appear disingenuous, when in fact many organizations will terminate a student for continuously failing and receiving poor grades or put them on probation for not meeting a set of educational criteria. Many associate failures with being a moderate to weak performer. In an internship or a high-pressure job, it can also lead to probation or termination. When presented with the possibility of engaging play, experimentation, and the ability to freely prototype, students have a safe space to engage with new and emerging technologies creatively. Some schools and companies have gained recognition for fostering cultures of experimentation, with examples such as the MIT Media Lab and Google Labs. In a culture where experimentation is permitted, communication design students can tinker and learn to problem-solve and test out their hypotheses creatively.

This is also largely a research-led way of framing an educational experience.

Nevertheless, there is a need for larger measures and policies to ensure that having a safe place to fail is, in fact, a safe place to fail. This can be carried out by allocating time for research and experimentation. The use of defined practices may also help to provide more assurance that it is okay to fail when using new technologies. By eliminating threats associated with failure in schools, internships, and in the workplace, there is more space for innovative practices overall (The Interaction Design Foundation, n.d.; U.S. Department of Health & Human Services, 2017). These measures to privilege pedagogical practices over success rates also speak to the nature of collaboration and teamwork (Gruessner, 2019), finding additional ways to gain support, and for students to let organizations and schools know when these new learning situations are creating large amounts of stress.

21st-century teamwork and collaboration. An important theme emphasized by study participants was that a digital transformation requires design educators, professionals, and students to work closely in teams. Team-building is vital to 21st-century pedagogical practice, where work is increasingly cross-disciplinary and collaborative. Students could benefit from the incorporation of community and community building in design pedagogies. These changes might mean that educators should look for opportunities to offer more “blended, open, and flexible courses,” and students are forced to collaborate to define goals and divide tasks to achieve a common goal. Presented with digital transformation challenges, literature on 21st-century teamwork stresses soft skills like interpersonal communications, team leadership and the ability to support and nurture teammates, virtual and remote work, and cross-disciplinary

thinking. In contemporary work, communication designers are largely free from working in factories or heavily managed workshop settings in a strictly hierarchical organization structure. Many communication design programs, schools, and jobs still continue, however, to appear to follow some of these vertical organizations, where a hierarchical authority prescribes a lot of what a communication design student may be allowed to do.

Traditionally, communication design students create much of their professional portfolio or a showcase of their best design work on their own. Due to the changing management practices and the quick advancements of digital technologies, many programs and schools must reconceive how they manage students' work requirements. Study participants suggested that 21st-century teamwork calls for a reconceptualization of these work processes, not the traditional portfolio made solely by one design student on their own. Discussion with the participants suggested that the traditional portfolio could be augmented with team-based work that simulates real-world situations.

Real-World Pedagogies

The participants in this study had distinct concerns about gaining enough real-world experience. This seemed somewhat puzzling given that the average participant had held one or two internships. While internships are traditionally seen as an ideal setting for communication design students to gain real-world exposure, for many research participants, this wasn't fulfilling. Many internships do not expose students to advanced digital techniques where they can experiment with immersive technologies, code creatively, or learn about artificial intelligence and machine learning. Participants

suggested that ideal preparatory experience would expose students to more real-world simulations, where they can actively engage in working on university- and instructor-led research projects, fieldwork, in-class case studies, and in capstone projects, for example.

Yet, not all of these tasks have to be simulated. Guiding students to work on real-world challenges can also mean that students are working more closely with their communities, families, and volunteer organizations. While design programs and schools have widely embraced these sorts of practices, many communication design disciplines engage with vocational models that look to traditional internships. Each design program will have a unique student body, and my research suggests that because of how important real-world experience is becoming, schools and programs look carefully for alternatives to internships that might not be beneficial to a student's educational development, and instead look to provide more guidance to students to find the simulated activities and community-integrated work that also enhances their digital skills. Many faculty and instructors may have limitations in providing this extensive guidance, and it is also important that programs and schools develop more robust mentorship programs (Angevine, 2019; Digital Promise, n.d.; National Education Association, n.d.).

Mentorship

Regardless of the changes being wrought by the digital transformation of design, study respondents have still reported mentoring has proven to be effective in supporting students who are developing their interests, seeking to gain job advice, and looking for additional personal support. In this research, many participants had an interest in working

more closely with a mentor. By receiving more one-on-one guidance, students felt more confident about their own work and guided through the formation of their design practice. This can help students to engage with more sophisticated technology use. In addition to the types of mentoring models named, programs and schools should consider e-mentoring, where convenient interactions can take place online (Wuetherick, 2017), along with other virtual mentoring alternatives through text and social media. Another alternative is micro-mentoring (Buchholz, 2016) where communication design students can receive support at networking events, school-facilitated social events, and at events at work or on an internship.

Looking at a more traditional model, faculty mentoring can be incentivized (see Columbia University Office of the Provost, 2016), where a faculty mentor can be brought on for a more specific task of mentoring a group of students, even bringing particular technical subject-matter expertise to students seeking to improve their knowledge of wide-ranging topics from data visualization and sentiment analysis, to social media design, visual effects, and website development.

Mental Health and Well-Being

Mental health concerns are a growing issue for students. The accounts of study participants suggested that the available mental health interventions and on-campus mental health services need to see radical improvement, and that counselors, staffing, and funding do not always address the immediate concerns of students. Many students suffer from depression, anxiety, as well as suicidal ideations. As many as “34 percent of

students” “in the US are being treated for some sort of mental health issue as of 2017 “compared with 19 percent of students in 2007” (Bauer-Wolf, 2019). For many design programs and schools, this is still an emerging consideration, with a rising crisis at hand, and more interventions are needed to provide students with advisors and counselors who are qualified to deal with these situations. Mandatory events like student orientation and welcome week events could be used to reach out to students to let them know there are services available to them on campus.

Some of the mental health concerns faced by communication design students may be unique to this group. Communication design students face the stress of producing creative work, working for long hours in isolation, and some of this can be alleviated by peer-to-peer mentoring and finding ways for students to work on more team-based projects. By having a mentor, or even a micro-mentor, students may find ways to alleviate the stress of constant digital use and the stress of being continuously connected to their devices as they learn to do digital work. Educators should have access to additional training, such as training to use the Youth Mental Health First Aid (MHFA) that teaches educators more about “common mental health challenges for youth,” how communication design students might be impacted by “anxiety, depression, substance use, disorders in which psychosis may occur, disruptive behavior disorders (including AD/HD), and eating disorders” (Evergreen Youth Mental Health Framework n.d.; Youth Mental Health First Aid, 2019; World Health Organization, 2013).

Other preventative wellness interventions could be introduced to students throughout their communication design education and into their stressful senior year where they begin to look for permanent professional work. Students could be guided to

engage in physical activity, meditation, and to be thoughtful of their health and nutrition as they work through stressful periods.

Epilogue

There are numerous possibilities to improve the education of the new generation of communication design students. By teaching students to confront a digital transformation fearlessly, they can not only cultivate the necessary technical skills but also embrace new pedagogical practices that foster creativity and flexibility in solving complex digital technology problems. Yet, design students cannot do this on their own. While professional practices require today's design students to be agile at self-learning and open to continuous learning, there have to be genuinely supportive networks and approaches to teaching students to work with relatively new and complicated technology mediums, from visualizing data to making sense of entire computer networks. Communication design education responsive to a digital transformation can no longer be constrained by traditional pedagogical models and hierarchies, where collaboration and mentorship play a key role in sustaining design students' ability to learn and simultaneously exercise self-care. A digital transformation of education and work disrupts traditional design practices, and refashions education requirements, and radically redesigns the workplace and the types of jobs that are available. It is an exciting time to become a designer who experiments and wrangles with code, innovates and creates new products and services that can improve our lives, and steps up to be leaders across sectors, from technology, retail, and marketing to work in education, social, innovation—the outcomes are limitless. Nevertheless, as the views of students, educators, and

professionals in this study have shown, much is needed to nurture students through this transition period, where design educators and professionals must evolve with the students they teach and work together to confront a digital transformation in communication design.

REFERENCES

- Aagaard, T., & Lund, A. (2019). *Digital agency in higher education: Transforming teaching and learning*. Routledge.
- Academy Xi. (2017, December 4). *Don't let the design talent shortage affect your business: Up-skill your own designers*. Medium. <https://medium.com/@academyxi/dont-let-the-design-talent-shortage-affect-your-business-up-skill-your-own-designers-ac68969edb41>
- Adweek Staff. (2017, September 30). *Brand execs say digital transformation requires a cultural shift, not just a technological one*. Adweek. <https://www.adweek.com/digital/brand-exec-say-digital-transformation-requires-a-cultural-shift-not-just-a-technological-one>
- Ahearn, A. (2017, February 22). *The flip side of Abysmal MOOC completion rates? Discovering the Most Tenacious Learners - EdSurge News*. EdSurge. <https://www.edsurge.com/news/2017-02-22-the-flip-side-of-abysmal-mooc-completion-rates-discovering-the-most-tenacious-learners>
- AIGA. (n.d.-a). *Diversity & Inclusion Initiative*. AIGA. <https://www.aiga.org/diversity-and-inclusion-initiative>
- AIGA. (n.d.-b). *Diversity & Inclusion learning basics*. AIGA. <https://www.aiga.org/diversity-inclusion-learning-basics>
- AIGA. (2015a). *AIGA Survey of Design Salaries*. AIGA. <https://www.aiga.org/salary-survey>
- AIGA. (2015b). *Defining the Designer of 2015*. AIGA. <https://aigaaix0m5kinte.azurewebsites.net/designer-of-2015>
- AIGA. (2017). *Design for Good*. AIGA. <https://www.aiga.org/design-for-good>

- AIGA, & Google. (2016). *Design Census 2016*. <http://designcensus2016.aiga.org/#!/section/gallery>
- AIGA, & NASAD. (2016). *Technology thresholds in graphic design programs*. NASAD. https://nasad.arts-accredit.org/wp-content/uploads/sites/3/2016/03/AIGA_NASAD_technology.pdf
- Ainamo, A. (2009). Building the Innovation Factory: The People Dimension. *Knowledge, Technology & Policy*, 22(4), 259–264. <https://doi.org/10.1007/s12130-009-9092-x>
- Ainley, P., & Rainbird, H. (Eds.). (2014). *Apprenticeship: Towards a New Paradigm of Learning*. Routledge.
- Ainsworth, L. (2018, January 8). *What is Teacher Clarity?* Corwin. <https://us.corwin.com/en-us/nam/what-is-teacher-clarity>
- Aldis, H. G. (2011). *The printed book* (2nd ed.). Cambridge University Press.
- American Council on Education (2019) *Digital Transformation and the Future of Higher Education Leadership*. ACE2019, <https://www.higheredtoday.org/2019/03/15/ace2019-digital-transformation-future-higher-education-leadership/>
- American Printing History Association. (n.d.). *History of Printing Timeline*. American Printing History Association. <https://printinghistory.org/timeline/>
- Anderson, C. (2013). *Makers*. Nieuw Amsterdam.
- Anderson, M., & Kumar M (2019). *Digital divide persists even as lower-income Americans make gains in tech adoption*. Pew Research. <https://www.pewresearch.org/fact-tank/2019/05/07/digital-divide-persists-even-as-lower-income-americans-make-gains-in-tech-adoption/>
- Angevine, C. (2019, October 17). *New tools for real world learning*. Digital Promise. <https://digitalpromise.org/2019/10/17/new-tools-for-real-world-learning>

- Babich, N. (2017, January 10). *The Evolution of UI/UX Designers into Product Designers*. Adobe Blog. <https://theblog.adobe.com/the-evolution-of-uiux-designers-into-product-designers>
- Barnes, D. R. (1971). *For court, manor, and church: Education in Medieval Europe*. Burgess Pub. Co.
- Bauer-Wolf, J. (2019, August 12). *Study: College Presidents Prioritizing Student Mental Health*. Inside Higher Ed. <https://www.insidehighered.com/news/2019/08/12/college-presidents-prioritizing-mental-health-more-previous-years-new-study-finds>
- Beetham, H., & Sharpe, R. (2013). *Rethinking pedagogy for a digital age: Designing for 21st century learning* (2nd ed.). Routledge.
- Behrens, R. R. (1998). Art, design and Gestalt theory. *Leonardo*, 31(4), 299–303. JSTOR. <https://doi.org/10.2307/1576669>
- Beller, S. (2017). *What does it take to be a successful graphic designer: A phenomenological study on graphic design curriculum* [Doctoral Dissertation, University of South Dakota]. <http://eduproxy.tc.library.org/?url=/docview/1964252413?accountid=14258>
- Bierut, M. (Design Educator). (2019, March 23). *Michael Bierut on Luck* [Audio podcast]. Thisis Design. www.thisisdesign.school/michael-bierut
- Biesta, G. J. (2009). How to use pragmatism pragmatically: Suggestions for the 21st century. In J. Garrison & A. G. Rud (Eds.), *John Dewey at 150: Reflections for a new century* (pp. 30–39). Purdue University Press.
- Blikstein, P., & Worsley, M. (2016). Children are not hackers: Building a culture of powerful ideas, deep learning, and equity in the maker movement. In K. Peppler, E. R. Halverson, & Y. B. Kafai (Eds.), *Makeology: Makers as learners* (pp. 78–94). Routledge.
- Bonsiepe, G. (1994). A step towards the reinvention of graphic design. *Design Issues*, 10(1), 47–52. JSTOR. <https://doi.org/10.2307/1511655>

- Boyd, D. (2014). *Participating in the Always-On Lifestyle*. Leann Hunter. <http://www.leeannhunter.com/digital/wp-content/uploads/2014/08/boydParticipatingAlwaysOn.pdf>
- Boyd, D., & Crawford, K. (2012). Critical questions for big data: Provocations for a cultural, technological, and scholarly phenomenon. *Information, Communication & Society*, 15(5), 662–679. <https://doi.org/10.1080/1369118X.2012.678878>
- Bridges, A. W. (2012). *Identification of perceived 21st century graphic design skills, content knowledge, and tools needed in an effective university-level graphic design program* [Doctoral Dissertation]. Gardner-Webb University.
- Brokaw, C. (2007). Book history in premodern China: The state of the discipline I. *Book History*, 10, 253–290. <https://doi.org/10.2307/30227406>
- Broome, J. (2013). Survey research in Buffington. In M. L. Buffington & S. W. McKay (Eds.), *Practice theory: Seeing the power of art teacher researchers* (pp. 71–76). National Art Education Association.
- Bughin, J., Manyika, J., & Catlin, T. (2019, May). *Ten insights to get your digitization strategy right*. McKinsey Global Institute. www.mckinsey.com/business-functions/mckinsey-digital/our-insights/twenty-five-years-of-digitization-ten-insights-into-how-to-play-it-right
- Butler, J. E. (1995). *A process for effective graphic design curriculum development*. University of Wisconsin.
- Cambridge Dictionary. (n.d.). Pedagogy. In *Cambridge English Dictionary [Online]*. Retrieved December 22, 2019, from <https://dictionary.cambridge.org/dictionary/english/pedagogy>
- Carroll, A. (2014, July 1). *Diversity & Inclusion in Design: Why Do They Matter?* AIGA. <https://www.aiga.org/diversity-and-inclusion-in-design-why-do-they-matter>
- Carroll, J. (2014). *Tools for teaching in an educationally mobile world*. Routledge.

- Cartwright, J. (2016, September 23). *What Today's Students are taught about Design's Shifting Landscape*. Eye on Design. <https://eyeondesign.aiga.org/what-todays-students-are-taught-about-designs-shifting-landscape>
- Castañeda, C. E. (1940, January 6). The first printing press in Mexico. *Publishers Weekly*, 137, 50–52.
- Celaschi, F. (2017). Advanced design-driven approaches for an Industry 4.0 framework: The human-centred dimension of the digital industrial revolution. *Strategic Design Research Journal*, 10(2), 97–104. <https://doi.org/10.4013/sdrj.2017.102.02>
- Cezzar, J. (2015, August 15). *Designers at work*. AIGA. <https://aigaaix0m5kinte.azurewebsites.net/guide-designersatwork>
- Cezzar, J. (2017a). *The AIGA Guide to Careers in Graphic and Communication Design*. Bloomsbury Academic.
- Cezzar, J. (2017b, October 5). *What is graphic design?* AIGA. <https://aigaaix0m5kinte.azurewebsites.net/guide-whatisgraphicdesign>
- Chalmers, F. G. (1985). South Kensington and the colonies: David Blair of New Zealand and Canada. *Studies in Art Education*, 26(2), 69–74. <https://doi.org/10.1080/00393541.1985.11650402>
- Clarke, R., & Keeley, B. (2016). *OECD yearbook 2016: Productive economies, inclusive societies*. OECD.
- Clement, J. (2019). *United States: number of internet users 2017-2023*. Statista. <https://www.statista.com/statistics/325645/usa-number-of-internet-users/>
- College Board. (2015). *AP 2-D Art and Design*. <https://apstudents.collegeboard.org/courses/ap-2-d-art-and-design>

- Collin, J., Hiekkanen, K., Korhonen, J. J., Halen, M., Itälä, T., & Helenius, M. (2015). *IT Leadership in transition—The impact of digitalization on Finnish organizations*. Aalto University. [https://research.aalto.fi/en/publications/it-leadership-in-transition--the-impact-of-digitalization-on-finnish-organizations\(e4fefc63-f447-4129-9f49-404b61641ec3\).html](https://research.aalto.fi/en/publications/it-leadership-in-transition--the-impact-of-digitalization-on-finnish-organizations(e4fefc63-f447-4129-9f49-404b61641ec3).html)
- Columbia University Office of the Provost (2016). *Guide to best practices in faculty mentoring*. Columbia University. <https://provost.columbia.edu/sites/default/files/content/MentoringBestPractices.pdf>
- Computer History Museum. (n.d.). *The Babbage Engine*. Computer History Museum. <https://www.computerhistory.org/babbage/>
- Cornell University Center for Teaching and Learning. (n.d.). *Problem-Based Learning*. Cornell Center for Teaching Innovation. <https://teaching.cornell.edu/teaching-resources/engaging-students/problem-based-learning>
- Creswell, J. W. (2007). *Qualitative inquiry and research design: Choosing among five approaches* (2nd ed.). SAGE Publications, Inc.
- Creswell, J. W. (2012). *Qualitative inquiry and research design: Choosing among five approaches* (3rd ed.). SAGE Publications, Inc.
- Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications, Inc.
- Cross, N. (2001). Designerly ways of knowing: Design discipline versus design science. *Design Issues*, 17(3), 49–55. JSTOR. www.jstor.org/stable/1511801
- Cummings, M. (2017, August 4). *What is UX?* UX Design. <http://uxdesign.com/about-user-experience-design/article/what-is-ux/4>
- Davis, M. (2016). *The design studio of the future must be anticipatory*. AIGA. <http://www.aiga.org/the-design-studio-of-the-future-must-be-anticipatory>

Davis, M. (2019a). *Introduction to Design Futures*. AIGA. <https://www.aiga.org/aiga-design-futures/introduction-to-design-futures/>

Davis, M. (2019b). *Trend 1: Complex Problems*. AIGA. <https://www.aiga.org/aiga-design-futures/complex-problems/>

Davis, M. (2019c). *Trend 4: Core Values Matter*. AIGA. <https://www.aiga.org/aiga-design-futures/core-values-matter/>

Deakin, F. (2017). *Paradigm shifts in the design industry*. DEFSA. <https://www.defsa.org.za/articles/paradigm-shifts-design>

Design Educators Community. (2019, April 5). *It's finally here! The Design Teaching Resource*. AIGA Design Educators Community. <https://educators.aiga.org/its-finally-here-the-design-teaching-resource/>

Dewey, J. (1908). What does pragmatism mean by practical? *The Journal of Philosophy, Psychology and Scientific Methods*, 5(4), 85–99. JSTOR. <https://doi.org/10.2307/2011894>

Dewey, J. (1997). *Experience and education*. Free Press.

Digital Promise. (n.d.). Challenge based learning. Retrieved March 28, 2020, from Digital Promise website: <https://cbl.digitalpromise.org/>

Dilnot, C. (2015). The matter of design. *Design Philosophy Papers*, 13(2), 115–123. <https://doi.org/10.1080/14487136.2015.1133137>

Dittmar, J. E. (2011). Information technology and economic change: the impact of the printing press. *The Quarterly Journal of Economics*, 126(3), 1133–1172. <https://doi.org/10.1093/qje/qjr035>

Domeyer, D. (2015, August 28). The Creative Team of the Future. *Graphic Design USA*. <http://gdsa.com/news/surveys/the-creative-team-of-the-future-2>

- Dorst, K. (2015). *Frame innovation: Create new thinking by design*. The MIT Press.
- Droste, M. (2016). *Bauhaus*. TASCHEN.
- Drucker, J. (2010). *Graphesis: Visual forms of knowledge production*. Harvard University Press.
- Drumm, P. (2019). *What Will the Future of Work Look Like in 2019? We Make Some Predictions*. Eye on Design. <https://eyeondesign.aiga.org/what-to-do-after-graduating-from-design-school-refinery29s-art-director-isabel-castillo-guijarro-has-some-advice>
- Dubberly, H. & Pangaro P. (2019). *Trend 6: Making Sense in the Data Economy*. AIGA. <https://www.aiga.org/aiga-design-futures/making-sense-in-the-data-economy/>
- Duncum, P. (2018). Responding to big data in the art education classroom: Affordances and problematics. *International Journal of Art & Design Education*, 37(2), 325–332. <https://doi.org/10.1111/jade.12129>
- Dwiggins, W. A. (1992). *New kind of printing calls for new design*. Firefly Press.
- Economic Times (2019). *Digital transformation is unpredictable but shying from it is worse*. Economic Times. <https://cio.economictimes.indiatimes.com/news/strategy-and-management/digital-transformation-is-unpredictable-but-shying-from-it-is-worse/69535924>
- Efland, A. (1983). School art and its social origins. *Studies in Art Education*, 24(3), 149–157. <https://doi.org/10.1080/00393541.1983.11650336>
- Efland, A. (1990). *A history of art education: Intellectual and social currents in teaching the visual arts*. Teachers College Press.
- Eisner, E. W. (1990). *Qualitative inquiry in education: The continuing debate* (A. Peshkin, Ed.). Teachers College Press.

- Ellul, J. (2001). Remarks on technology and art. *Bulletin of Science, Technology & Society*, 2(1), 26–37. JSTOR. <https://doi.org/10.1177/027046760102100105>
- Encyclopedia Britannica. (n.d.). *Vocational education*. Encyclopedia Britannica. <https://www.britannica.com/topic/vocational-education>
- Eskilson, S. J. (2007). *Graphic design: A new history*. Laurence King Publishing.
- Evergreen (n.d.). *Youth Mental Health Framework*. Teen Mental Health. <http://teenmentalhealth.org/new-initiatives-posts/evergreen-youth-mental-health-framework/>
- Fielding, N. G., & Fielding, J. L. (1985). *Linking data*. SAGE Publications.
- Finck, N. (2000, November 14). *Joshua Davis*. Digital Web. http://www.digital-web.com/articles/joshua_davis
- Findeli, A. (2001). Rethinking design education for the 21st century: Theoretical, methodological, and ethical discussion. *Design Issues*, 17(1), 5–17. <https://doi.org/10.1162/07479360152103796>
- Fitzgerald, D. (2017, February 17). *4 talent trends shaping the digital design workplace in 2017*. Creative Bloq. <https://www.creativebloq.com/features/4-talent-trends-shaping-the-digital-design-workplace-in-2017>
- Fleischmann, K. (2013). Big Bang technology: What’s next in design education, radical innovation or incremental change? *Journal of Learning Design*, 6(3), 1–17. <https://doi.org/10.5204/jld.v6i3.144>
- Fleischmann, K. (2014). Design futures-future designers: Give me a “T”? *Studies in Material Thinking*, 11(3), 1–23.
- Fleischmann, K. (2015). After the big bang: What’s next in design education? Time to relax? *Journal of Learning Design*, 8(3), 123–142. <https://eric.ed.gov/?id=EJ1083813>

- Freyermuth, S. S. (2016). Coding as craft: evolving standards in graphic design teaching and practice. *Plot(s) Journal of Design Studies*, 3, 58–71.
- The Futures Initiative (2019). *About the Futures Initiative: Our Mission*. The Futures Initiative. <https://futuresinitiative.org/about/>
- Gardner, H., & Davis, K. (2013). *The app generation: How today's youth navigate identity, intimacy, and imagination in a digital world*. Yale University Press.
- Garland, K. (1999). First Things First Manifesto 2000. *Eye Magazine*, 33(9). <http://www.eyemagazine.com/feature/article/first-things-first-manifesto-2000>
- Giloi, S., & Toit, P. du. (2013). Current approaches to the assessment of graphic design in a higher education context. *International Journal of Art & Design Education*, 32(2), 256–268. <https://doi.org/10.1111/j.1476-8070.2013.01758.x>
- Glaser, B. G. (Ed.). (1994). *More grounded theory methodology: A reader*. Sociology Pr.
- Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for qualitative research*. Aldine.
- Gosling, E. (2016a, September 6). *Art School Lessons for Professional Design Practice*. Eye on Design. <https://eyeondesign.aiga.org/art-school-learnings-for-professional-design-practise>
- Gosling, E. (2016b, September 23). *Can Digital Designers Make Up for a Lack of Tactility—And Diversity?* Eye on Design. <https://eyeondesign.aiga.org/can-digital-designers-make-up-for-a-lack-of-tactility-and-lack-of-diversity/>
- The Graduate Center, CUNY (2019). The Futures Initiative: Advancing Equity and Innovation in Higher Education. <https://www.gc.cuny.edu/Page-Elements/Academics-Research-Centers-Initiatives/Initiatives-and-Committees/The-Futures-Initiative>
- Grefe, R. (2012, August 16). *Evolving expectations for design education*. AIGA. <https://www.aiga.org/evolving-expectations-for-design-education>

- Grefe, R. (2013). *A vision for AIGA in 2020*. AIGA. <http://www.aiga.org/aiga/content/about-aiga/insight/a-vision-for-aiga-in-2020>
- Grossman, R. (2016, March 21). *The Industries That Are Being Disrupted the Most by Digital*. Harvard Business Review. <https://hbr.org/2016/03/the-industries-that-are-being-disrupted-the-most-by-digital>
- Gruessner, V. (2019, January 30). *Culture of Experimentation: Examples and How It Works*. Runrun.it. <https://blog.runrun.it/en/culture-of-experimentation/>
- Grycz, C. J. (1991). Everything you need to know about technology. *Publishing Research Quarterly*, 7(4), 3–12. <https://doi.org/10.1007/BF02678328>
- Gunaratne, S. A. (2001). Paper, printing and the printing press: A horizontally integrative macrohistory Analysis. *Gazette (Leiden, Netherlands)*, 63(6), 459–479. <https://doi.org/10.1177/0016549201063006001>
- Hara, K. (2007). *Designing design*. Lars Muller.
- Hardy, J. (2019, June). How the design of social technology fails rural America. In *Companion Publication of the 2019 on Designing Interactive Systems Conference 2019 Companion* (pp. 189-193).
- Hayles, N. K. (2001). *How we became posthuman: Virtual bodies in cybernetics, literature, and informatics*. University of Chicago Press.
- Hayles, N. K. (2012). *How we think: Digital media and contemporary technogenesis*. University of Chicago Press.
- Heller, S. (2005). *The education of a graphic designer* (2nd ed.). Allworth.
- Heller, S. (2006, November 13). *Interview with Steven Heller*. Ico-D. <https://www.ico-d.org/connect/features/post/156.php>

- Heller, S. (2009, December 9). *The Decade of Dirty Design*. AIGA. <https://www.aiga.org/the-decade-of-dirty-design>
- Heller, S. (2009) *To Design or Not to Design: A Conversation with Allan Chochinov*. AIGA. <https://www.aiga.org/to-design-or-not-to-design-a-conversation-with-allan-chochinov>
- Heller, S., & Vienne, V. (2015). *Becoming a graphic and digital designer: A guide to careers in design* (5th ed.). Wiley.
- Heller, S., & Womack, D. (2011). *Becoming a digital designer: A guide to careers in web, video, broadcast, game and animation design*. Wiley.
- Henderson, M., Finger, G., & Selwyn, N. (2016). What's used and what's useful? Exploring digital technology use(s) among taught postgraduate students. *Active Learning in Higher Education*, 17(3), 235–247. <https://doi.org/10.1177/1469787416654798>
- Herbert, L. (2017). *Digital transformation: Build your organization's future for the innovation age*. Bloomsbury Business.
- Heskett, J. (2001). Past, present, and future in design for industry. *Design Issues*, 17(1), 18–26. JSTOR. www.jstor.org/stable/1511906
- Hollis, R. (2006). *Swiss graphic design: The origins and growth of an international style, 1920-1965*. Yale University Press.
- Huk, A. (2017, October 19). *The Design Professions' Digital Transformation*. Medium. <https://uxdesign.cc/digital-transformation-in-design-6b292b410760>
- IDEO (2020). *Design Kit: The Human-centered Design Toolkit*. IDEO. <https://www.ideo.com/post/design-kit>
- Interaction Design Foundation. (n.d.). *What is User Centered Design?* The Interaction Design Foundation website: <https://www.interaction-design.org/literature/topics/user-centered-design>

- James, W. (1907). *Pragmatism: A new name for some old ways of thinking*. Longmans, Green and Co. <https://doi.org/10.1037/10851-000>
- Jandrić, P., & Boras, D. (Eds.). (2015). *Critical learning in digital networks*. Springer. <https://doi.org/10.1007/978-3-319-13752-0>
- Jonassen, D. H. (1999). Designing constructivist learning environments. In C. M. Reigeluth (Ed.), *Instructional-design theories and models: A new paradigm of instructional theory, volume II* (pp. 215–239). Lawrence Erlbaum Associates.
- Johnson, J., Chapman, C., & Dyer, J. (2006). Pedagogy and innovation in education with digital technologies. *Current Developments in Technology-Assisted Education*, 135-139.
- Jones, P. (2017). The systemic turn: Leverage for world changing. *She Ji: The Journal of Design, Economics, and Innovation*, 3(3), 157-163.
- Jury, D. (2012). *Graphic design before graphic designers: The printer as designer and craftsman: 1700-1914*. Thames & Hudson.
- Jussim, E. (1989). Changing technology changes design. In M. S. Friedman, J. Giovannini, S. Heller, & Walker Art Center (Eds.), *Graphic design in America: A visual language history* (pp. 104–125). Walker Art Center ; Abrams.
- Kahneman, D. (2013). *Thinking, fast and slow* (1st ed.). New York: FSG Adult.
- Kantawala, A. (2012). Art education in colonial India: Implementation and imposition. *Studies in Art Education*, 53(3), 208–222. <https://doi.org/10.1080/00393541.2012.11518864>
- Kapur, M. (2011). *Productive Failure (PF), Learning Design, Four Core Mechanisms*. Manu Kapur. <https://www.manukapur.com/productive-failure/>
- Kapur, M., & Bielaczyc, K. (2012). Designing for productive failure. *Journal of the Learning Sciences*, 21(1), 45–83. <https://doi.org/10.1080/10508406.2011.591717>

- Keating, E. M. (2004). *The design process and user focused digital spaces*. Technological University Dublin.
- Keedy, S. (1998). *Emigre Essays Graphic Design in the Postmodern Era*. Emigre. <https://www.emigre.com/Essays/Magazine/GraphicDesigninthePostmodernEra>
- Kende, M. (2015). *The Shrinking Digital Divide*. Tech Crunch. <https://techcrunch.com/2015/07/12/the-shrinking-digital-divide/>
- Khan, S. (2016). *Leadership in the digital age – A study on the effects of digitalisation on top management leadership* [Master's Thesis]. Stockholm University.
- King, M. (2015). Why Higher-Ed and Business Need to Work Together. <https://hbr.org/2015/07/why-higher-ed-and-business-need-to-work-together>
- Klee, P. (1968). *Pedagogical sketchbook* (S. Moholy-Nagy, Trans.). Prager. <http://archive.org/details/KleePaulPedagogicalSketchbook1960>
- Knobel, M. (2008). *Digital literacies: Concepts, policies and practices* (C. Lankshear, Ed.). Peter Lang Inc., International Academic Publishers.
- Kotamraju, N. P. (2002). Keeping up: web design skill and the reinvented worker. *Information, Communication & Society*, 5(1), 1–26. <https://doi.org/10.1080/13691180110117631>
- Kristof, N. D., & WuDunn, S. (2001). *Thunder from the East: Portrait of a rising Asia*. Vintage.
- Kumar, R. S. (2019, April 10). *Rooting Out the Digital Skills Crisis*. CIO. www.cio.com/article/3388636/rooting-out-the-digital-skills-crisis.html
- Kvale, S. (1996). *Interviews: An introduction to qualitative research interviewing*. SAGE.

- Ledsome, C. (2011). The Elephant in the Design Office. *E&PDE 2011*. The 13th International Conference on Engineering and Product Design Education, London, UK.
- Lessig, L. (2002). The Architecture of Innovation. *Duke Law Journal*, 51(6), 1783–1801. <https://scholarship.law.duke.edu/dlj/vol51/iss6/2>
- Lessig, L. (2009). *Remix: Making art and commerce thrive in the hybrid economy*. Penguin Books.
- Levy, M. (2007). Culture, culture learning and new technologies: Towards a pedagogical framework. *Language Learning and Technology*, 11(2), 104–127.
- Lewrick, M., Link, P., & Leifer, L. (2018). *The design thinking playbook: Mindful digital transformation of teams, products, services, businesses and ecosystems*. Wiley.
- Logan, C. D. (2006). Circles of practice: Educational and professional graphic design. *Journal of Workplace Learning*, 18(6), 331–343. <https://doi.org/10.1108/13665620610682062>
- Lopez, A. (2016, November 28). *A Visual Tour of Some of the Most Impressive Design Studios in San Diego*. AIGA San Diego. <https://sandiego.aiga.org/a-visual-tour-of-san-diegos-most-impressive-design-studios/>
- Lozner, R. (2013). *Where is design in K-12 curriculum?* AIGA. <https://www.aiga.org/where-is-design-in-the-k12-curriculum>
- Luminant Design. (n.d.). *A Definition of Communication Design*. Luminant Design. <http://www.luminantdesign.com/definitions/communicationdesign.html>
- Lupton, E., & Miller, A. J. (Eds.). (1991). *The ABC's of Bauhaus*. Princeton Architectural Press.
- Lupton, E., & Phillips, J. C. (2008). *Graphic design: The new basics*. Princeton Architectural Press.

- MacArthur, I. (2019, February 11). The digital skills shortage just got serious, says Sagittarius. *The Drum*. <https://www.thedrum.com/opinion/2019/02/11/the-digital-skills-shortage-just-got-serious-says-sagittarius>
- Maeda, J. (2001). *Design by numbers*. The MIT Press.
- Maeda, J. (2006). *The laws of simplicity*. The MIT Press.
- Maeda, J. (2013). *The art of critical making: Rhode Island School of Design on creative practice* (R. Somerson & M. Hermano, Eds.; 1st edition). Wiley.
- Maeda, J. (2019). *How to speak machines: Computational thinking for the rest of us*. Penguin Random House.
- Manyika, J. (2017, May). *Technology, jobs, and the future of work*. McKinsey Global Institute <https://www.mckinsey.com/featured-insights/employment-and-growth/technology-jobs-and-the-future-of-work>
- Margolin, V. (Ed.). (1989). *Design discourse: History, theory, criticism*. University of Chicago Press.
- Martin, C. (2018). *Digital transformation 3.0: The new business-to-consumer connections of the internet of things*. CreateSpace Independent Publishing Platform.
- Martin, H. (2016, February 13). *Buckminster Fuller's Geodesic Dome and Other Forward-Looking Architecture*. Architectural Digest. www.architecturaldigest.com/gallery/buckminster-fuller-architecture
- Maxwell, J. A. (2013). *Qualitative research design: An interactive approach* (3rd ed.). SAGE.
- McKendrick, J. (2015, March 25). *Digital Business Paradox: All Technology, But Ultimately Not About Technology*. Forbes. <https://www.forbes.com/sites/joemckendrick/2015/03/22/digital-business-paradox-all-technology-but-ultimately-not-about-technology/>

- McLuhan, M. (1964). *Understanding media: The extensions of man*. The MIT Press.
- Meggs, P. B., & Purvis, A. W. (2006). *A history of graphic design* (4th ed.). Wiley.
- Meikle, J. L. (2005). *Design in the USA*. Oxford University Press.
- Merriam, S. B. (1998). *Qualitative research and case study applications in education* (2nd ed.). Jossey-Bass.
- Merriam Webster. (n.d.). *Definition of PEDAGOGY*. Merriam-Webster Online Dictionary. <https://www.merriam-webster.com/dictionary/pedagogy>
- Milbrandt, M. K. (2014). Descriptive survey research: Demographics and beyond. In K. M. Miraglia & C. Smilan (Eds.), *Inquiry in Action: Paradigms, Methodologies, and Perspectives in Art Education Research* (pp. 115–123). National Art Education Association.
- Milbrandt, M. K., & Klein, S. R. (2008). Survey of art teacher educators: Qualifications, identity, and practice. *Studies in Art Education*, 49(4), 343–357. JSTOR. <https://doi.org/10.2307/25475874>
- Mitcham, C. (1994). *Thinking through technology: The path between engineering and philosophy*. University of Chicago Press.
- Mokyr, J. (2006). Long-term economic growth and the history of technology. In P. Aghion & S. Durlauf (Eds.), *Handbook of economic growth, volume 1B* (pp. 1113–1180). North Holland.
- Mokyr, J. (2013). Human capital, useful knowledge, and long-term economic growth. *Economia Politica*, 30(3), 251–272. <https://doi.org/10.1428/75293>
- Moll-Murata, C. (2013). Guilds and apprenticeship in China and Europe: The ceramics industries of Jingdezhen and Delft. In M. Prak (Ed.), *Technology, Skills and the Pre-Modern Economy in the East and the West, Vol. 10* (pp. 225–226). BRILL.

- Moody, J. (2019, April 25). *What to Know About Experiential Learning in College*. US News & World Report. <https://www.usnews.com/education/best-colleges/articles/2019-04-25/what-you-should-know-about-experiential-learning-in-college>
- Mumford, L. (1934). *Technics and civilization*. Harcourt, Brace and Co.
- NAEA. (2016). *2008 NAEA Research Needs Assessment Findings, Interpretation and Implications*. NAEA. <https://www.arteducators.org/research/articles/93-2008-naea-research-needs-assessment-findings-interpretation-and-implications>
- National Academy of Design. (n.d.). *Education + School*. National Academy of Design. <https://www.nationalacademy.org/education-school>
- National Association of Schools of Art and Design (NASAD). (2006). *Handbook 2005-2006*. NASAD. https://nasad.arts-accredit.org/wp-content/uploads/sites/3/2015/11/NASAD_HANDBOOK_2005-06.pdf
- National Association of Schools of Art and Design (NASAD). (2017). *Handbook 2017-18*. NASAD. <https://nasad.arts-accredit.org/wp-content/uploads/sites/3/2017/12/AD-Handbook-2017-2018.pdf>
- National Education Association. (n.d.). *Micro-credential Guidance*. NEA. <http://www.nea.org//home/microcredentials.html>
- Needham, J., & Tsuen-Hsui, T. (1985). *Science and civilisation in China: Volume 5, chemistry and chemical technology, part 1, paper and printing*. Cambridge University Press.
- Newman, D. (2019, August 1). *Top 5 Digital Transformation Trends in Education For 2020*. Forbes. www.forbes.com/sites/danielnewman/2019/08/01/top-5-digital-transformation-trends-in-education-for-2020
- Nuvolari, A. (2004). Collective invention during the British industrial revolution: The case of the Cornish pumping engine. *Cambridge Journal of Economics*, 28(3), 347–363. <https://doi.org/10.1093/cje/28.3.347>

- Otis College of Art and Design. (2017). *A glimpse of the past*. Otis College of Art and Design. <https://www.otis.edu/history-timeline>
- Palacio, B. G., & Vit, A. (2011). *Graphic design, referenced: A visual guide to the language, applications, and history of graphic design*. Rockport Publishers.
- Pannafino, J. (2015). *Thoughts on communication design and UX education*. HOW Design. www.howdesign.com/web-design-resources-technology/thoughts-communication-design-ux-education
- Parsons School of Design. (n.d.). *Communication Design Major: Get Your BFA*. The New School. www.newschool.edu/parsons/bfa-communication-design
- Peirce, C. S. (1992). *Reasoning and the logic of things: The Cambridge conferences lectures of 1898*. Harvard University Press.
- Perkin, N., & Abraham, P. (2017). *Building the agile business through digital transformation*. Kogan Page.
- Perrin, A., & Duggan, M. (2015, June 26). *Americans Internet Access: Percent of Adults 2000-2015*. Pew Research Center. <https://www.pewresearch.org/internet/2015/06/26/americans-internet-access-2000-2015/>
- Peterson, F., Jollands, M., McKay, E., Pond, P., Rogers, I., & Heath, D. (2018). *Digital work practices: where are the jobs, what are they, and how prepared are graduates?* Australian Technology Network of Universities. <https://www.atn.edu.au/siteassets/industry-collaboration/atn-final-report-fiona-peterson-9-july-2018.pdf>
- Pew Research Center (2014, March 11). *Web History Timeline*. Pew Research Center. <https://www.pewresearch.org/internet/2014/03/11/world-wide-web-timeline/>
- Postman, N. (1993). *Technopoly: The surrender of culture to technology*. Vintage.

- Powell, A., Nielsen, N., Butler, M., Buxton, C., Johnson, O., Ketterlin-Geller, L., & McCulloch, C. (2018). *Creating inclusive preK–12 STEM learning environments*. Education Development Center. <http://cadrek12.org/resources/broadening-participation-policy-practice-brief>
- Rajahonka, M., & Villman, K. (2019). Women managers and entrepreneurs and digitalization: on the verge of a new era or a nervous breakdown? *Technology Innovation Management Review*, 9(6), 14–24. <https://doi.org/10.22215/timreview/1246>
- Raman, S. (2016). *Emerging Trends in Higher Education Pedagogy*. WOU Press.
- Rainie, L. (2018). *Skills Requirements for future jobs*. Pew Research Center. <https://www.pewresearch.org/internet/2018/06/19/skill-requirements-for-future-jobs-10-facts/>
- Redström, J. (2017). *Making design theory*. The MIT Press.
- Remington, R., & Bodenstedt, L. (2003). *American modernism: Graphic design, 1920 to 1960*. Yale University Press.
- Resnick, M. (2002). Rethinking Learning in the Digital Age. In G. Kirkman, P. Cornelius, J. Sachs, K. Schawb, & W. Forum (Eds.), *The global information technology report: Readiness for the networked world* (pp. 32–37). Massachusetts Institute of Technology.
- Richards, L. (2012). *README FIRST for a user's guide to qualitative Methods* (3rd ed.). SAGE Publications, Inc.
- Rogers, D. (2016). *The digital transformation playbook: Rethink your business for the digital age*. Columbia Business School Publishing.
- Rogers, P. (2000). Barriers to adopting emerging technologies in education. *Journal of Educational Computing Research*, 22(4), 455–472. <https://doi.org/10.2190/4UJE-B6VW-A30N-MCE5>

- Rosner, D. K. (2018). *Critical fabulations: Reworking the methods and margins of design*. The MIT Press.
- Rushkoff, D. (2011). *Program or be programmed: Ten commands for a digital age*. Soft Skull Press.
- Sacolick, I. (2017). *Driving digital: The leader's guide to business transformation through technology*. AMACOM.
- Scharff, R. C., & Dusek, V. (Eds.). (2003). *Philosophy of technology: The technological condition - An anthology*. Wiley-Blackwell.
- Scherling, L. (2015). How mapmaking informs placemaking practices in Detroit organizations. *11th EAD Proceedings*. 11th International Conference of the European Academy of Design, Paris. <https://ead.yasar.edu.tr/wp-content/uploads/2017/02/3.15.15-Scherling-HowMapmakingInformsPlacemakingInDetroitOrganizations-EAD11.pdf?csrt=14073101486370797131>
- Scherling, L. (2017). Design pedagogy: Developments in art and design education, edited by Mike Tovey. *Design and Culture*, 9(1), 115–116. <https://doi.org/10.1080/17547075.2017.1280290>
- Scherling, L., & DeRosa, A. (Eds.). (2020). *Ethics in design and communication: Critical perspectives*. Bloomsbury Visual Arts.
- Schneider, C. (2008). *Gutenberg's life and work*. Gutenberg-Museum Mainz. <http://www.gutenberg-museum.de/117.0.html>
- School of Visual Arts. (n.d.). *BFA Design*. School of Visual Arts. <https://sva.edu/undefined>
- Schwartz, J. (2020). *About*. General Assembly. <https://generalassemb.ly/about>
- Sharples, M. (2019). *Practical pedagogy: 40 new ways to teach and learn* (1st ed.). Routledge.

- Shirky, C. (2009). *Here comes everybody: The power of organizing without organizations*. Penguin Books.
- Skinner, B. F. (1953). *Science and human behavior*. Macmillan.
- Snooks, G. (1996). *The dynamic society. Exploring the sources of global change*. Psychology Press. <https://doi.org/10.4324/9780203284889>
- Special Collections & Archives Research Center. (n.d.). *Treasures of the McDonald Collection*. Special Collections & Archives Research Center. <http://scarc.library.oregonstate.edu/omeka/exhibits/show/mcdonald>
- Spivey, J. (2015, February 5). *Making Connections for Collaborative, Multidisciplinary Research*. AIGA Design Educators Community. <https://educators.aiga.org/making-connections-for-collaborative-multidisciplinary-research/>
- Stankiewicz, M. A. (1992). From the aesthetic movement to the arts and crafts movement. *Studies in Art Education*, 33(3), 165–173. <https://doi.org/10.1080/00393541.1992.11651872>.
- Stansberry, K., Anderson, J., & Rainie, L. (2019, October 28). *Experts Optimistic About the Next 50 Years of Digital Life*. Pew Research Center. <https://www.pewresearch.org/internet/2019/10/28/experts-optimistic-about-the-next-50-years-of-digital-life/>
- Stinson, L. (2019). *Designers, This Is How to Speak “Computer” While Still Speaking “Human.”* Eye on Design. <https://eyeondesign.aiga.org/designers-this-is-how-to-speak-computer-while-still-speaking-human/>
- Stommel, J. (2015, April 28). *Learning is Not a Mechanism*. Hybrid Pedagogy. <https://hybridpedagogy.org/learning-not-mechanism/>
- Strauss, A. L., & Corbin, J. (1990). *Basics of qualitative research: Grounded theory procedures and techniques*. SAGE.

- Stubbs, P. (2019, August 21). *Teacher Clarity: Finding the 'Why.'* EdTech Digest. <https://edtechdigest.com/2019/08/21/teacher-clarity-finding-the-why/>
- Sweeny, R. W. (Ed.). (2010). *Inter/Actions/Inter/Sections: Art Education in a Digital Visual Culture*. National Art Education Association.
- Tabrizi, B., Lam, E., Girard, K., & Irvin, V. (2019, March 13). *Digital Transformation Is Not About Technology*. Harvard Business Review. <https://hbr.org/2019/03/digital-transformation-is-not-about-technology>
- Tes Editorial. (2018, December 10). *What is pedagogy?* Tes. <https://www.tes.com/news/what-is-pedagogy-definition>
- Therrell, J., & Dunneback, S. (2015). Millennial perspectives and priorities. *Journal of the Scholarship of Teaching and Learning*, 15(5), 49–63. <https://doi.org/10.14434/josotl.v15i5.19068>
- Thorndike, E. L. (1911). *Animal intelligence*. Macmillan.
- Tobin, J. (2001). Designer Susan Kare '75 gives pixels personality. *MHC Vista*, 6(1). <https://www.mtholyoke.edu/offices/comm/vista/0106/kare.shtml>
- Tucker, E. (2015, March 18). *A New Generation of Designers is Escaping Their Computer Screens...to Paint Signs*. Eye on Design. <https://eyeondesign.aiga.org/a-new-generation-of-designers-are-escaping-their-computer-screens-to-paint-signs/>
- Turkle, S. (2012). *Alone together: Why we expect more from technology and less from each other*. Basic Books.
- Turkle, S. (2015). *Reclaiming conversation: The power of talk in a digital age*. Penguin Books.
- University of Toronto. (n.d.). *Innovative Pedagogical Approaches to Access and Mental Health*. Teaching Assistants' Training Program. <https://tstp.utoronto.ca/teaching-toolkit/effective-strategies/access-mental-health/>

- United Nations Secretary General (2019). *The Age of Digital Interdependence*. United Nations Secretary General. <https://www.un.org/en/pdfs/DigitalCooperation-report-for%20web.pdf>
- U.S. Bureau of Labor Statistics. (2016a). *Graphic designers: Occupational outlook handbook*. U.S. Bureau of Labor Statistics. <https://www.bls.gov/ooh/arts-and-design/graphic-designers.htm#tab-6>
- U.S. Bureau of Labor Statistics. (2016b). *Software developers: Occupational outlook handbook*. U.S. Bureau of Labor Statistics. <https://www.bls.gov/ooh/computer-and-information-technology/software-developers.htm#tab-6>
- U.S. Department of Health & Human Services. (2017, April 3). *User-Centered Design Basics*. Usability.gov. <https://www.usability.gov/what-and-why/user-centered-design.html>
- Vizard, L. (2017). *Technology and the evolution of the designer's role*. Adobe. <https://theblog.adobe.com/technology-and-the-evolution-of-the-designers-role/>
- Victoria and Albert Museum. (2013, July 17). *A History of Computer Art*. Victoria and Albert Museum. <http://www.vam.ac.uk/content/articles/a/computer-art-history/>
- Warwick, C., Terras, M., & Nyhan, J. (Eds.). (2012). *Digital humanities in practice*. Facet Publishing.
- Weber, N. F. (2009). *The Bauhaus group: Six masters of modernism*. Yale University Press.
- Weinglass, S. (2018, October 25). *Is digital technology leading us into a new dark age?* The Times of Israel. <https://www.timesofisrael.com/is-digital-technology-leading-us-into-a-new-dark-age/>
- Wengrow, J. (2018). *The State of Coding Boot camps in 2018*. LinkedIn. <https://www.linkedin.com/pulse/state-coding-boot-camps-2018-jay-wengrow/>

- Westerman, G., Bonnet, D., & McAfee, A. (2014). *Leading digital*. Harvard Business Review Press.
- Wheelwright, S. C. (1992). *Revolutionizing product development: Quantum leaps in speed, efficiency, and quality*. Free Press.
- Wiersma, W., & Jurs, S. G. (2005). *Research methods in education: An introduction* (8th ed.). Pearson.
- Wirtz, B. W., Schilke, O., & Ullrich, S. (2010). Strategic development of business models: Implications of the Web 2.0 for creating value on the Internet. *Long Range Planning*, 43(2), 272–290. <https://doi.org/10.1016/j.lrp.2010.01.005>
- Wright, E., & Osman, R. (2018). What is critical for transforming higher education? The transformative potential of pedagogical framework of phenomenography and variation theory of learning for higher education. *Journal of Human Behavior in the Social Environment*, 28(3), 257–270. <https://doi.org/10.1080/10911359.2017.1419898>
- World Health Organization. (2013). *The European Mental Health Action Plan 2013–2020*. Retrieved from WHO website: http://www.euro.who.int/__data/assets/pdf_file/0020/280604/WHO-Europe-Mental-Health-Action-Plan-2013-2020.pdf
- Yee, F. L.-W. (1983). *The historical geography of book markets in China: A case study of Liulichang*. University of British Columbia.
- Youth Mental Health First Aid. (2019, June 16). Retrieved March 28, 2020, from Mental Health First Aid website: <https://www.mentalhealthfirstaid.org/population-focused-modules/youth/>.

Appendix A

Survey Protocol¹

Quantitative data was collected using the following survey instrument (see also Table 5). Results of 193 responses are discussed in the findings and analysis in this dissertation.

Survey Instructions

Principal Investigator:

Laura Scherling, Columbia University, Teachers College

lss2165@tc.columbia.edu

IRB number: 18-392

INTRODUCTION

You are invited to participate in the study “LEARNING DURING A DIGITAL TRANSFORMATION.” **You may qualify to take part in this research study because you are a communication design educator, professional, or student and you are over 18 years old.** If you are an educator or professional, and you have experience for a minimum of 3 years in communication design or a related sub-discipline of communication design. The survey will take approximately 12 minutes to complete. Examples of jobs that communication designers hold: print designers, web designers,

¹ The survey contents were imported from Qualtrics.

visual designers, graphic designers, interactive designers, UX/UI designers, art directors, creative directors, design directors, motion graphics designers, marketing designers, brand designers, product designers, production designers, front-end developers, information architects, multimedia designers, educators.

WHY IS THIS STUDY BEING DONE? This study is being done to investigate what educational practices are in development in communication design education, with a digital transformation of design work taking place.

WHAT WILL I BE ASKED TO DO IF I AGREE TO TAKE PART IN THIS STUDY?

During the survey you will be asked to discuss your experiences and practices as a communication design educator, professional, or student. The survey will be recorded on Qualtrics. Any description of the contents of the survey will refer to you by your pseudonym.

WHAT POSSIBLE RISKS OR DISCOMFORTS CAN I EXPECT FROM TAKING PART IN THIS STUDY?

This is a minimal risk study, which means the harms or discomforts that you may experience are not greater than you would ordinarily encounter in daily life while taking routine physical or psychological examinations or tests. However, there are some risks to consider. You might feel embarrassed to discuss problems that you experienced with work or your education in communication design or design education. **You can stop participating in the study at any time without penalty, however you will not be remunerated for this study unless the survey is complete.** The principal investigator is taking precautions to keep your information confidential and prevent anyone from

discovering or guessing your identity, such as using a pseudonym instead of your name and keeping all information in a two-factor password protected Dropbox folder.

WHAT POSSIBLE BENEFITS CAN I EXPECT FROM TAKING PART IN THIS STUDY?

There is no direct benefit to you for participating in this study. However, participation may benefit communication design education as a practice.

WILL I BE PAID FOR BEING IN THIS STUDY?

You will receive \$3.00 for participating in this study. The survey takes approximately 12 minutes to complete, and therefore pays \$15.00/hour.

WHEN IS THE STUDY OVER? CAN I LEAVE THE STUDY BEFORE IT ENDS?

The study is over when you have completed the survey. However, you can leave the study at any time even if you haven't finished.

Click "agree" if you would like to participate in this study.

Agree

Q1. Which of the following roles do you currently fulfill in communication design?

Please check all that apply.

- Design Educator
- Design Professional
- Design student

Q2 Specifically, what position do you hold in communication design?

Q3 What region do you currently work in?

Please reply to one answer.

- I live in the United States | Specify the town/city and state
- _____
I live in Canada | Specify the municipality and province
- _____
I do not live in the US or Canada | Please specify your city and province
- _____

Q4. What is your gender?

- Female
- Male
- Other _____

Q5. Please specify your race and/ or ethnicity. Check all that apply.

- White
- Black or African American
- Hispanic or Latino/a
- Asian
- American Indigenous or Alaska Native
- Hawaiian or Pacific Islander
- Other. Please specify. _____

Q6 How long have you been working or studying in the field?

- 0-2 years
- 3-5 years
- 6-8 years
- More than 8 years

Q7 How much college-level education have you received in communication design?

Please check all that apply.

- 2-year degree
- 4-year degree
- Master's degree
- Doctorate
- Certificate
- Self-trained

Q8 Have you held a design internship? If “yes,” specify the total amount of internships you have held.

- Yes | Total _____
 No

Q9. What sub-discipline in communication design best describes your work in communication design? Check all that apply.

- Print Design
 Digital Design
 Strategic Design or Design Management
 User experience research (UX, qualitative, quantitative)
 Social Impact Design
 Other. Please specify.
-

Q10 If you work as a professional, how well prepared did you view yourself to work professionally in communication design after graduation?

- Not proficient
 Somewhat proficient
 Prepared
 Extremely prepared
 N/A - I'm not a professional

Q11 If you are still a student, how well prepared do you feel you think you will be to begin professional work?

- Not proficient
 Somewhat proficient
 Prepared
 Extremely prepared
 Other. Please describe
-

- N/A - I'm not a student

Q12 Describe an enriching educational experience that helped you prepare to be a communication designer.

Q13 Describe a challenging educational experience you have encountered in studying to become a communication designer.

Q14 Describe how you stay up-to-date with practices in design.

Q15 How do you view the development of digital technologies in the design field?

- Not favorable
- Somewhat favorable
- Neutral
- Favorable
- Highly favorable

Q16 How do you view your proficiency with the use of current digital technologies in communication design?

- Not proficient
- Somewhat proficient
- Adequately prepared
- Prepared
- Extremely prepared

Q17 Are there areas that benefit more than others in the design field from the use of digital technologies? _____

Q18 Describe your current professional practices in design (such as strategies and processes) in terms of digital technology use. _____

Q19 In which part of your design practice do you rely on digital technologies? Check all that apply.

- Print design
 - Digital design
 - Strategic design and design management
 - User experience (UX, qualitative, quantitative)
 - Social impact design
 - Other. Please specify
-

Q20 Describe the digital skills you would still like to acquire.

Q21. What areas of communication design do you interact with on a daily basis?

- Print design
 - Digital design
 - Strategic design and design management
 - User experience (UX, qualitative, quantitative)
 - Social impact design
 - Other. Please specify
-

Q22. What educational practices should communication design educators and professionals develop to help students **entering the profession**? Please be as specific as possible _____

Q23. What educational practices should communication design educators and professionals develop to help designers **who have already entered the profession**? Please be as specific as possible _____

Q24. What educational practices should communication design educators and professionals develop to support designers' use of digital technologies? Please rank the following (0 is the least helpful and 100 is the most helpful):

Print design & print production	0-100
Digital design	0-100
Management	0-100
Coding/ Web Development	0-100
Design Theory	0-100
Research (Qualitative)	0-100
Research (Quantitative)	0-100
Design Thinking	0-100
Typography	0-100
Writing	0-100
Formal Concepts	0-100

Q25 What day of the week is it today?

Please specify. (1) _____

Appendix B

Semi-Structured Interview Protocol

In addition to the survey questions as outlined in Table 5 and Appendix A were the qualitative interview questions, guided by the quantitative data. Those interviewed constituted a convenience sample in that most of the professionals, educators, and students (n=9) came from the NYC Metro Area. Interviews were held at Teachers College, in the library, or via Skype. The prompts support the open-ended responses (see also Table 6).

1. Can you tell me about your work as a communication design [educator/ professional/ student]?

Prompts

- Currently, what position do you hold in communication design?
- How long have you been [working/studying] in the field?
- What do you do on a day-to-day basis?
- How do you stay up-to-date with practices in design?
- What digital skills do you miss in your role as ...? What skills would you still like to acquire? What steps are you taking to acquire those skills?
- For educators/professionals: When you first began working in communication design after graduation, how well prepared did you find yourself?

- For students: How well prepared do you think you are to begin professional work?

2. How do you respond to the digital transformation of design and design education?

Prompts

- How do you view the development of digital technologies in the design field?
- In which part of your design practice do you rely on digital technologies? How has this been changing during your career?
- What advice would you want to give to students to respond to these changes?
- What methods or pedagogical practices do you think are working well in response to these changes? (Can provide a definition if prompted)
- What specific processes/ practices have you implemented in your [classroom/studio/studies] to help you navigate the rapid technological changes in communication design education?
- How do you overcome challenges resulting from technology change in your practices?

3. Looking back, can you describe an enriching educational experience that helped you prepare to be a communication designer?

Prompts

- What about a challenging experience?

- What's been missing from your educational/professional development? School can't necessarily cover everything that you need in your career, but what are the one or two things you wish you could (had) learn(t)?

4. A lot of designers I have spoken with consider real-world experience as essential to developing the pedagogical practices needed to excel in the profession.

Prompts

- Do you think schools prepare students adequately for what awaits them in their profession?
- How can we help students entering the profession? Can you share an example?
- How can we better support designers after they have entered the profession?