

Promoting Rhetorical Awareness and Perceived Self-Efficacy:
Engineering Undergraduate Students Creating Preparedness
Portfolios About Communication

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Abstract

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Effective communication has been identified in recent years as a crucial competency for practicing engineers by industry professionals, educators, engineering graduates working in the field, and current engineering undergraduate students. In particular, it has been suggested that engineers of the future will face increasingly complex and spatially distributed audiences and contexts, will work with rapidly changing information technologies, and will occupy positions of increasing influence where they have more opportunities to effect societal change. In addition, it has been noted that the increasingly shifting workplace landscape will require engineers to be adaptable and self-regulating, seeing the need, and taking responsibility, for their own life-long learning.

To address the need for students to develop more nuanced understandings of the communication of engineering practice, this dissertation explores engineering undergraduate students' rhetorical awareness and perceived self-efficacy and the potential of a particular pedagogical intervention—preparedness portfolios and portfolio studios (PPPS) (Turns et al. 2012)—for facilitating this exploration. A qualitative, multiple-case study is reported here that engaged ten engineering undergraduate students in the creation of preparedness portfolios in a collaborative studio setting. Students' experiences were captured through multiple survey instruments, individual interviews, as well as through the content of the portfolios that they created.

The PPPS pedagogy, implemented in a Communication Portfolio Studio, created a rhetorical community in which the participants worked collaboratively to create their arguments about their preparedness to communicate as practicing engineers. A three-part analysis was conducted to determine what was *revealed* about the participants' rhetorical awareness through their engagement in the Studio, how the Studio experience *impacted* their rhetorical awareness, and what their *enactment* of rhetorical awareness looked like in the Studio. A two-stage analysis for perceived self-efficacy was conducted: the first stage determined what impacts the Studio experience had on participants' perceived self-efficacy for communicating as practicing engineers; the second stage analyzed their statements of Studio impacts through the framework of Bandura's hypothesized sources of self-efficacy information. Findings suggest that the Communication Portfolio Studio is an effective pedagogical approach for not only revealing, but also enhancing, the state of students' rhetorical awareness and perceived self-efficacy with respect to the communication of engineering practice.

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1. INTRODUCTION

I have always considered myself an excellent communicator in professional and academic environments, but I hadn't given much thought to exactly what that meant or entailed. It was clarifying to think and make statements about why communication is important and what that means in an engineering context. – Molly

Effective communication has been identified in recent years as a crucial competency for practicing engineers – by industry professionals, educators, engineering graduates working in the field, and current engineering undergraduate students. But, what does *effective communication* mean to each of these groups, and how might we, as educators, help students develop into effectively communicating engineers? This dissertation explores engineering undergraduate students' conceptions of the communication of engineering practice, their beliefs about their capabilities for communicating as practicing engineers, and the potential of a particular pedagogical approach for revealing, and enhancing, these conceptions and beliefs. This chapter presents the background and rationale for the study, describes the problem space and purpose, presents the conceptual frameworks and research questions, briefly describes the study design, and overviews the chapters of the dissertation.

Background and Rationale

In the future painted by the National Academy of Engineering (2004) over eight years ago with respect to what engineering and engineering education will look like in 2020, the need for excellent and varied communication skills figures prominently: "We envision a world where communication is enabled by an ability to listen effectively as well as to communicate through oral, visual, and written mechanisms" (NAE, 2004, p. 55). In addition, ABET (2009) lists the "ability to communicate effectively" and the "recognition of the need for, and an ability to engage in life-long learning" as two of the eleven outcomes in their 2010-11 Criteria for Accrediting Engineering Programs (p. 3). Programs seeking and maintaining accreditation must be able to

demonstrate that their students attain these outcomes before graduation. Duderstadt (2009), president emeritus of the University of Michigan and professor of science and engineering, in his argument for a new approach to engineering practice, research, and education, addresses the increasing rate at which knowledge becomes obsolete: “There have long been calls for engineering to take a more formal approach to lifelong learning, much as have other professions such as medicine in which the rapid expansion of the knowledge base has overwhelmed the traditional educational process” (p. 5).

The American Society of Civil Engineers (ASCE 2008), in describing the body of knowledge necessary for engineers of the twenty-first century stated that “the civil engineer must communicate effectively with technical and non-technical individuals and audiences in a variety of settings” (p. 139), and, as such, he or she needs to understand what it means to communicate within engineering practice. NAE (2004) addresses the importance of situating communication within a given audience and context. Specifically, the report calls for students to be prepared to communicate effectively on environmental and political issues of global scale: “The engineering profession recognizes that engineers need to work in teams, communicate with multiple audiences, and immerse themselves in public policy debates and will need to do so more effectively in the future” (NAE, 2004, p. 43). The future that NAE describes places engineers in positions within organizational structures where they have the capacity to effect change: “The increasing imperative for accountability will necessitate an ability to communicate convincingly and to shape the opinions and attitudes of other engineers and the public” (NAE, 2004, p. 55).

NAE and ASCE call for competency with various forms of communication. Specifically, NAE (2004) finds that the global environment of the 2020 engineer, with rapidly changing technologies, will require “effective use of virtual communication tools” (p. 55); and ASCE (2008) calls for competency in communication that includes listening, observing, reading, speaking, writing, and graphics. NAE (2004) also discusses the importance of the ability to self-regulate, which is a component of lifelong learning: “Engineers are going to have to accept responsibility

for their own continual re-education, and engineering schools are going to have to prepare engineers to do so by teaching them how to learn" (p. 24). A survey of 378 working professionals (124 of whom were engineers) revealed, on average, that nearly one-third of working time is spent writing, a significant portion of time is spent communicating orally, audiences and purposes are quite varied, communication is collaborative, and changing technologies affect communicative decisions and practices (Miller, 2004). It was concluded from this study, that working professionals consider activities such as problem-solving, teamwork, creativity, and persuasion to be important components of communication tasks, which are, in turn, integral to their professional work.

Educators describe how changing technologies have expanded the conceptions and practice of effective communication, making it crucial for students to take charge of their own learning in order to keep current with technical skills (Paretti & McNair 2008). Duderstadt (2009) echoes this theme describing the changing times, "We live in a time of great change, an increasingly global society, driven by the exponential growth of new knowledge and knitted together by rapidly evolving information and communication technologies" (p. 2): "The shelf life of education acquired early in one's life, whether K-12 or higher education, is shrinking rapidly. Today's students and tomorrow's graduates are likely to value access to lifelong learning opportunities more highly than job security" (p. 17). Engineering educators have identified a variety of communication skills that are necessary for the design process in today's complex and geographically distributed work environment including oral communication (e.g., formal presentations, debating with colleagues, informing the non-technical public), and written communication (e.g., reports, memos, email, blogs). However, Sheppard et al. (2009) saw that education efforts are prioritizing the development of technical skills over preparing students for engineering practice, and the current curricula are not providing learning experiences early enough in the students' programs that provide problem-solving and collaborative activities similar to those they will encounter in the workplace (p. xxii).

In the Final Report for the Center for the Advancement of Engineering Education, Atman et al., (2010) noted that communication skills were ranked second in importance, behind problem solving, by a 109 seniors in a longitudinal cohort (p. 51). However, these students rated themselves least confident in professional and interpersonal skills as compared to skills in open-ended problem-solving and math and science (p. 53). Recent graduates reported that their engineering coursework in school prepared them well for the formal writing and oral presentation tasks they encountered in the workplace, but cited extra-curricular activities as the place where they learned the informal oral communication skills needed in the workplace for meetings, teamwork, and client negotiations (e.g., Martin et al., 2005).

Paretti and McNair (2008) describe opportunities for further research in their introduction to a special issue of *IEEE Transactions on Professional Communication*. Among these opportunities are exploring “what ‘effective communication’ is in engineering contexts, how engineers understand themselves as communicators, and how they constitute and enact rhetorical practice” (p. 241); and, examining the ways in which students learn to communicate in different media and genres throughout their undergraduate programs and beyond in the workplace. According to Sheppard et al. (2009), “the center of engineering education should be professional practice, integrating technical knowledge and skills of practice through a consistent focus on developing the identity and commitment of the professional engineer” (p. xxii). Miller (2004) calls for an integration of communication with thinking and learning, a return to a focus on effectiveness rather than clarity and to persuasion versus information (p. 46-7). Duderstadt (2009) argues that engineering education should work “to augment education in science and engineering with the broader exposure to the humanities, arts, and social sciences that are absolutely essential to building both the creative skills and cultural awareness necessary to compete in a globally integrated society” (p. 12).

In addition, motivation for this study is drawn from personal experiences teaching engineering undergraduates technical communication, directing an engineering communication

program, and conducting research on the teaching and learning of technical and professional communication. Some particularly salient experiences came from observing differences between students' written work and oral presentations for their disciplinary courses and similar types of work by some students in technical communication courses, not only in terms of skills and competencies demonstrated, but also in terms of students' enthusiasm, confidence, and overall engagement. We, as teachers of technical and professional writing, would benefit from understanding more about students' beliefs in their capabilities as communicators, how those beliefs translate into performances, and what we can do to provide learning environments that foster the development of students' self-confidence.

Problem Space and Purpose

The above background and rationale provided the impetus and framing for this study that (A) explores (i) engineering undergraduate students' *conceptions* of the communication of practicing engineers (e.g., what counts as professional communication for engineers, how audience is understood and addressed, and how the role of persuasion is understood and appreciated) and (ii) their *beliefs* about their capabilities for that communication (how confident they are about communicating successfully as engineers); and, (B) examines the effectiveness of a pedagogical approach for helping us learn about, and potentially enhance, the students' *conceptions* and *beliefs*.

The particular pedagogical approach chosen for this study was the Preparedness Portfolios and Portfolio Studios (PPPS) approach (see Turns, Sattler, Eliot, Kilgore, & Mobernd 2012 for a detailed description of the approach and its goals). This pedagogical approach engages engineering undergraduates in making arguments about their preparedness to engage in engineering activity while being supported in a series of interactive and collaborative studio sessions. Selection of this particular approach was based on multiple factors: successful implementations of the approach to date, the location of the primary author and her research program at the University of Washington (UW), and the theoretical expectations for its

effectiveness when focused on communication in an engineering context, both in terms of students' conceptions of communication and their beliefs in their capabilities to communicate.

Therefore, in light of the problem space defined by the background and rationale from industry and educators, personal motivation, pilot study findings, and in light of the expectations for the effectiveness of the PPPS pedagogical approach focused on communication, the two-fold broad purpose of this study is to:

- Explore engineering undergraduate students' *conceptions* of the communication of practicing engineers and their *beliefs* about their capabilities with respect to that communication
- Examine the effectiveness of the PPPS approach, focused on communication, for exploring these student *conceptions* and *beliefs*.

Articulation of these broad purposes led to the identification of the conceptual frameworks and the statement of the research questions.

Conceptual Frameworks and Research Questions

As noted before, undergraduate students' conceptions of the communication of practicing engineers in this dissertation include what counts as professional communication for engineers, how audience is understood and addressed, and how the role of persuasion is understood and appreciated. With respect to these conceptions of communication, themes emerged from several activities: re-examination of pilot study data, initial exploration of the dataset from the ten participants in this study, writing participant narratives, and constant comparison of themes across the participants by themes, and iterative journeys into the relevant literature. These themes pointed to rhetorical awareness as a promising umbrella term under which to organize the primary analyses. As such, Dorothy Winsor's seminal work that investigated the "rhetorical education" of four novice engineers (1996a) was eventually selected as a conceptual framework for rhetorical awareness. This framework was applied in two ways in this study. First, it was used as an efficient organizing mechanism, because the major themes that

emerged from the participant data mapped well to major components in Winsor's description of a rhetorical education (1996a)¹: (1) "socialization through writers and genres" (corresponding to the theme: what counts as professional communication for engineers); (2) "learning to construct and interact with audience" (corresponding to the theme: how audience is understood and addressed); and (3) "the textual negotiation of corporate 'reality'" (corresponding to the theme: how persuasion is understood and appreciated). In addition, sub-themes that emerged from the data also mapped to topics that Winsor explored within those major components. The second way in which the framework was applied was to map the findings of my study back to the corresponding components of Winsor's findings, highlighting points of alignment and extension to her work. Rationale for selecting Winsor's (1996a) work as a conceptual framework is provided in Chapter 2, along with a description of the ways in which it was applied in the data analyses.

Review of the literature when first identifying self-confidence as a dimension of interest for the pilot study led immediately to the foundational work of Albert Bandura on self-efficacy theory, which he situated within his larger socio-cognitive theory of human functioning (e.g., 1986). It should be noted that self-confidence is a general term that describes a "trait-like self-belief of capability that fails to specify the object of that belief" (Schunk & Pajares 2004, p. 120); and, although self-confidence was used in data collection instruments and in talking with participants, this dissertation adopts the vocabulary of Bandura, using the interchangeable terminology of *perceived self-efficacy*, and *self-efficacy beliefs* or *judgments*. Exploration of the dataset for this study, together with further examination of the literature on self-efficacy and related motivational constructs, led to the identification of Bandura's hypothesized sources of self-efficacy information (e.g., 1986) as the conceptual framework for the students' self-efficacy beliefs related to communicating as practicing engineers. This framework was employed as a theoretical lens for subsequent analyses of participant data that been coded as impacts of the

Communication Portfolio Studio experience on perceived self-efficacy. The sources Bandura

¹ Winsor's phrases that represent chapters in her book were modified slightly for my study, as explained further in Chapter 2.

hypothesized are enactive attainments, vicarious experience, verbal persuasion, and physiological state; they are described in Chapter 2, along with the rationale for their selection as a framework, and the ways in which the framework was applied in the analyses.

With the conceptual frameworks identified, it is possible to further elaborate the expectations for the effectiveness of the PPPS pedagogy, when focused on communication. Note that, throughout the remainder of this dissertation, the PPPS approach as implemented in this study (i.e., focused on communication) will be referred to as the Communication Portfolio Studio. However, original PPPS pedagogy will be revisited and described in detail in Chapter 3 where a thorough discussion of expectations for the effectiveness of the pedagogy, when focused on communication, is presented to shed light on the participants' rhetorical awareness and perceived self-efficacy.

Stated broadly here, the expectations for the effectiveness of the Communication Portfolio Studio for exploring engineering undergraduate students' rhetorical awareness and perceived self-efficacy with respect to the communication of engineering practice include the following:

- The Communication Portfolio Studio was expected to function as a rhetorical community (Miller 1994), convened for the express purpose of helping participants perform the inherently rhetorical task of arguing for their preparedness to communicate in engineering practice, where the participants could be observed as they wrestled with this task from inception through completion. In this way, the Communication Portfolio Studio was expected to *reveal, impact, and provide space for enactment* of the participants' rhetorical awareness.
- The peer interactions and other activities of the Communication Portfolio Studio that support the participants as they develop their preparedness portfolios were expected to impact the participants' self-efficacy judgments about communicating in engineering practice. Of note, the participants' perceived self-efficacy for *making*

arguments about preparedness to communicate as engineers is addressed separately from the more general exploration of the participants' perceived self-efficacy for *communicating as practicing engineers*. In addition, it was hypothesized that the interactions and activities of the Communication Portfolio Studio could potentially serve as sources of self-efficacy information and, thus, contribute to impacts on the participants' perceived self-efficacy for arguing for preparedness and for communicating as practicing engineers.

The identification of the conceptual frameworks for rhetorical awareness (Winsor 1996a) and hypothesized sources of self-efficacy information (Bandura 1986), including refinement of framework terminology, as well as further elaboration of the PPPS pedagogical approach (Turns et al. 2012), as implemented in the Communication Portfolio Studio in this study, led to the development of the following research questions that are addressed in this dissertation:

1. With respect to Socialization through experts and genres (i.e., what counts as professional communication for engineers):
 - A. What is *revealed* about the participants' rhetorical awareness through their engagement in the Communication Portfolio Studio?
 - B. What *impact* does engagement in the Communication Portfolio Studio have on the participants' rhetorical awareness?
 - C. What does the participants' *enactment* of rhetorical awareness in the Communication Portfolio Studio look like?
2. With respect to Learning to Construct and Interact with Audience (i.e., how audience is understood and addressed):
 - A. What is *revealed* about the participants' rhetorical awareness through their engagement in the Communication Portfolio Studio?
 - B. What *impact* does engagement in the Communication Portfolio Studio have on the participants' rhetorical awareness?

- C. What does the participants' *enactment* of rhetorical awareness in the Communication Portfolio Studio look like?
3. With respect to The Negotiation of "Reality" (i.e., how persuasion is understood and appreciated):
 - A. What is *revealed* about the participants' rhetorical awareness through their engagement in the Communication Portfolio Studio?
 - B. What *impact* does engagement in the Communication Portfolio Studio have on the participants' rhetorical awareness?
 - C. What does the participants' *enactment* of rhetorical awareness in the Communication Portfolio Studio look like?
 4. Perceived self-efficacy
 - A. What *impact* does engagement in the Communication Portfolio Studio have on participants' perceived self-efficacy for (i) making arguments about preparedness to communicate as practicing engineers and (ii) communicating as practicing engineers?
 - B. For identified impacts, what *sources of self-efficacy information*, and *pedagogical elements*, if any, are indicated pertaining to perceived self-efficacy for (i) making arguments about preparedness to communicate as practicing engineers and (ii) communicating as practicing engineers?

The next section briefly overviews the study that was conducted to answer these research questions.

Study Overview

This dissertation describes a qualitative study that examined the experiences of ten engineering undergraduate students as they participated in a PPPS implementation focused on communication, with the goal of exploring their conceptions of, and perceived self-efficacy for, engineering communication. As such, multiple-case study was the research genre chosen. Details

of the rationale for the methodology, study design, and analysis and reporting strategies are given in Chapter 4. A brief overview is provided.

In keeping with the case study genre, sampling was purposive – recruitment was restricted to engineering undergraduates. This research study was conducted with the approval of the UW Institutional Review Board. Ten students participated in the study (3 female, 7 male), with pay, representing five engineering departments. The PPS approach, focused on communication, was employed. Briefly, the participants came together in five two-hour sessions, in which they engaged in activities that supported them in the creation of their communication preparedness portfolios: peer review, group discussion, presentation of portfolios, with guidance provided by the facilitator. The creation of the actual portfolios occurred between sessions. This pedagogical approach is described in detail in Chapter 3.

Data were collected in several ways to allow for triangulation. The primary data collection was qualitative, which was complemented by a small quantitative data collection component. The data sources included the following: pre- and post-surveys, interview transcripts; content from the portfolios created by the participants, and open-ended in-session feedback forms. A pilot study confirmed the viability of the initial dimensions of interest. Initial exploration of the data from the ten engineering undergraduate students who participated in this study produced a filtered dataset that served as the basis for initial within-case explorations and narrative writing, as well as constant comparisons across the cases. These initial explorations, as noted before, led to the identification of the conceptual frameworks. Analyses of the data from the ten participants were conducted using these frameworks: the rhetorical awareness analysis was organized around the framework from Winsor's rhetorical education of an engineer (1996a); while the perceived self-efficacy data were analyzed for impacts, which were then examined through Bandura's framework of sources of self-efficacy information.

In terms of data reporting, the findings for the three rhetorical awareness research questions are presented separately in Chapters 5-7 and discussed collectively in Chapter 8.

Findings and discussion for the research question on perceived self-efficacy are presented in Chapter 9. Where data allow, presentation of findings includes a few detailed analyses, followed by complementary examples at a much lesser level of detail, in order to give the reader both depth and breadth in terms of exposure to participant experiences.

Overview of the Dissertation

This dissertation comprises ten chapters (including the present one):

Chapter 1, Introduction: Background and rationale of the study are discussed. The problem space and purpose of the study are presented, followed by the introduction of the conceptual frameworks and research questions, as well as the study overview. The chapter concludes with contributions of the study and an overview of the dissertation.

Chapter 2, Background: Separate sections address rhetorical awareness and perceived self-efficacy. Each section presents theories that form the basis of the study, selected empirical studies related to the work, and the conceptual frameworks.

Chapter 3, The Communication Portfolio Studio: The original Preparedness Portfolios and Portfolio Studios pedagogical approach is described; the Communication Portfolio Studio is introduced; and connections are theorized between the conceptual frameworks for rhetorical awareness and perceived self-efficacy and the pedagogical elements and supporting activities of the Communication Portfolio Studio.

Chapter 4, Methods: The methodology and research design for this study are identified; the study context and participants are introduced; and the approaches for data collection and analysis are described.

Chapter 5, Socialization through experts and genres: Findings for the genre component of the rhetorical awareness framework (Research Question 1) are presented.

Chapter 6, Learning to Construct and Interact with Audience: Findings for the audience component of the rhetorical awareness framework (Research Question 2) are presented.

Chapter 7, The Negotiation of “Reality”: Findings for the persuasion component of the rhetorical awareness framework (Research Question 3) are presented.

Chapter 8, Discussion of Rhetorical Awareness: Findings presented in Chapters 5-7 (Research Questions 1-3) are discussed in light of connections to Winsor and other theoretical and empirical work; links are made to the Communication Portfolio Studio pedagogy.

Chapter 9, Perceived Self-efficacy: Findings for perceived self-efficacy (Research Question 4) are presented and discussed.

Chapter 10, Conclusions: The research questions, initial expectations, and major findings are briefly revisited. Major take-aways for rhetorical awareness and perceived self-efficacy are presented. Contributions of the study and implications for future research and educational practice are given.

2. BACKGROUND

Broadly, this dissertation is interested in engineering undergraduate students' preparedness to communicate in engineering practice. Specifically, it explores students' *conceptions* of the communication of engineering practice, their *beliefs* about their capabilities to communicate as practicing engineers, and the potential of the Communication Portfolio Studio for revealing, and enhancing, these conceptions and beliefs. This chapter includes theoretical and empirical works that support the assumptions that underlie the exploration into these two separate aspects of students' preparedness (e.g., rhetorical awareness and perceived self-efficacy). Expectations for the effectiveness of the approach used in this work are discussed in Chapter 3.

Rhetorical Awareness

As noted earlier, rhetorical awareness was originally identified as a way to encompass and account for three major themes that emerged from the participant data in this study: what counts as professional communication for engineers, how audience is understood and addressed, and how the role of persuasion is understood and appreciated.

Preparing students to communicate effectively as practicing engineers is a complicated business. It is bound up with issues such as genre learning and preconceptions of genre, disciplinary discourse and ways of knowing and doing, concerns for correctness, developing rhetorical audience relationships, and understanding persuasion and appreciating its role in engineering communication.

Relevant theories and empirical work

This dissertation draws on scholarship from the areas of genre learning, academic and workplace writing, community, and writing-to-learn.

Genre learning and teaching

A major debate in teaching writing over the last few decades has involved whether to teach genres explicitly to students. Freedman (1993) and Devitt (2004; 2009). Freedman (1993) in

her oft-cited article, "Show and tell? The role of explicit teaching in the learning of new genres," set against the backdrop of then emerging views of genre as response to recurring situations (e.g., Miller 1984), Freedman asked at that time if explicit teaching of genres, in light of those emergent genre perspectives, was necessary or possible – and, if so, would it be useful or even harmful. Freedman (1993) advanced two hypotheses, which she called her "strong" and "restricted" hypotheses. The former suggested that explicit genre teaching was unnecessary, perhaps not possible, of limited use, and carried a risk of being misapplied. The latter hypothesis made the same suggestions with the caveat that explicit teaching could enhance genre learning but only in certain circumstances and with certain learning styles, one circumstance being proximity to being involved in authentic tasks in the relevant discourse. Freedman (1993) also points out that some explicit teaching may be useful – format, organization, mechanics, usage, composition strategies, revision strategies, or guidelines for audience analysis.

Devitt (e.g., 2004; 2009), on the other hand, asserts that with her pedagogy for critical genre awareness, Freedman's contention that it is not possible to teach genre explicitly because no teacher could not cover all of the features or any of the complexity of context for genres used in the workplace is not relevant. Devitt (2009) acknowledges that genres will likely be taught incompletely, but "students will understand more about it than they would have if we had taught them nothing about it at all" (p. 341). Devitt asserts that the transferability in her approach provides the foundation upon which particular genres can then be acquired. Devitt, citing her own empirical work, finds that "people learn genres every day without being taught them either in school or in the workplace" (p. 194) but she questions what it is they are learning and expresses concerns for students' awareness of the rhetorical purposes and ideologies that underlie genres learned implicitly (p. 195).

Devitt (2004; 2009) proposes teaching genre awareness and antecedent genres. Devitt (2009) describes her use of "genre awareness" as a type of rhetorical awareness, which can "lead to critical awareness and more deliberate action" (p. 337). Devitt (2004) argues that her proposed

genre pedagogy will help students to avoid simply using standard forms with little rhetorical understanding of their underlying purposes and, thus, potentially and unwittingly adopt ideologies reinforced by those genres. Teaching students genre awareness allows them to step back and examine genres and to participate in them (in an enlightened fashion) (2009). Devitt asserts that once a genre is learned, it is hard to step back and examine it critically – that for “full participants in the genre, resistance becomes more difficult (some say futile) and choices become less visible (some say invisible)” (p. 196). Devitt contends that Freedman’s criticism of explicit genre teaching focuses on teaching particular genres that can later be accessed and used again – while her own genre pedagogical approach “combines teaching particular genres, how to use these genres as antecedents, and how to critique and potentially change genres” (2009, p. 346). Genres taught and used in the classroom can “serve as scaffolding for later genre acquisition, as these partially learned genres act as antecedents for other genres” (p. 346).

Artemeva (2008) proposed a unified theory of genre learning, which draws on the fields of rhetorical genre studies, activity theory, and situated learning. She investigated the role that students’ antecedent genre knowledge (AGK) plays in acquiring disciplinary genre competence; understanding AGK is intended to help with the creation of more target curriculum materials and pedagogical strategies. Although students’ previous experiences writing in a genre likely influences their ability to write in that genre, it appears that this previous experience is a necessary – but not sufficient – condition for successful development of genre competence. Understanding students’ AGK early in communication classes is useful in calibrating instructional materials and strategies.

Artemeva and Fox (2010) investigated the prior knowledge students brought to an introductory engineering communication course, using the theoretical constructs of antecedent genre knowledge and disciplinary genre competence. They suggest that, when students enter a new discipline, if their antecedent genre knowledge is relevant for that discipline and they are able to leverage it, their transition into that discipline may be easier; however, if their antecedent

genre knowledge tends to make the transition more difficult, they confidence may be degraded and they might devalue their prior knowledge. The authors argue that “having a better understanding of our students’ antecedent genre knowledge and its role in the development of their disciplinary genre competence will allow us to better support their transition to the discourse of their new discipline” (p. 479).

As writers learn new genres, they tend to look to samples – having genre awareness helps them examine these samples more critically, which help them avoid simply copying the model (Devitt, 2004). Teachers can help students with acquiring new genres by providing multiple samples of assigned genres that demonstrate various approaches within those genres in order to demonstrate different creative choices and discourage “formulaic treatment of them as models, though some students are still likely to treat samples as models” (p. 208). Devitt notes that one could simply not provide samples, in order to reduce the risk of their misuse; but, points out that this creates anxiety for novice writers: “to ask students to write new genres with no samples of those genres is to reduce their learning by increasing their anxiety” (p. 209).

Devitt notes “Freedman’s emphasis on formal features first and contextual origins second are a reversal of what I would recommend” (p. 193); and she further suggests that teaching genres through the use of models (or sample texts) “could lead to rigidly prescriptive conceptions of a genre and to formulaic writing” and, further that it might “encourage treating models as prescriptions and writing assignments as imitations of those models” (p. 193).

A main role for teachers is setting up environments that facilitate learning – e.g., exposure to written discourse, affect (e.g., anxiety), intention (some type of rhetorical exigency); school assignments serve as exigencies. Thus, Freedman claims that school writing is not decontextualized – it has the classroom as a real setting (not the one imagined in some assignments) (p. 239). As Freedman (1995) had noted, academic genres are complex rhetorical transactions that tend to be writer oriented. She notes further that students get less support in a composition than a disciplinary course.

Devitt (2004) noted, in her study of genres used by tax accountants she uses “genre set” to talk about the “interaction of genres within the community and how they together represented the accountants’ work, epistemology, and values” (p. 66). In addition, individual genres work together to carry out the community’s work, framing the appropriate actions for that community: “these interacting and cooperating genres within a single community constitute the community’s genre repertoire” (p. 73). A groups’ genre repertoire is the set of genres through which its members act, within a larger genre set that includes genres read as well as written: “to act through the group’s genre repertoire is to act as a member of the group” (p. 77). Community members can create, but novices do not, generally: “Even less powerful than novices to effect change in the ideology of genres of a group are those who enter the group’s realm only occasionally or who remain on the periphery” (p. 81). What does this mean for students who enter classrooms for short periods of time, particularly when they cross disciplinary boundaries?

Transactional and pseudotransactional writing

Spinuzzi (1996) suggests that genres be taught as collections of habits, emphasizing that these collections are only similar to what the students might encounter in the workplace and are “not templates that writers *universally* follow or that are automatically successful” (p. 303).

Spinuzzi encouraged his students in his courses to engage in workplace practice (e.g., internships, co-ops) in order to learn how to analyze and perform the genres at those workplaces, and to then share their genre analyses and work products from their workplaces with fellow students in the classroom. In this way, students can learn from each other about analyzing and performing real workplace genres, the assignments in the writing class becomes authentic (learning to analyze the shared workplace genres), and teachers can work in their own areas of expertise (teaching about genre analysis and acquisition) (Spinuzzi, 1996, p. 26).

Spinuzzi (1996) defines pseudotransactionality as “writing that is patently designed by a student to meet teacher expectations rather than to perform the ‘real’ function the teacher has

suggested” (p. 295). Petraglia (1995) suggests that inauthentic writing is often promoted in writing courses (p. 19). His definition of transactional writing includes an element of *authenticity*: “transactional writing is that which does not pretend to function in any way other than it does: in this sense its rhetorical aims are transparent; its purported audience and purposes are authentic” (p. 21). Transactional writing has been defined as “writing with the primary purpose of transferring information between reader and writer...to record, report, inform, persuade, instruct, inquire, or bring about any other sort of informational exchange” (Tamor & Bond, 1986, p. 115). Transactional writing is typically motivated by the desire to elicit a response from a particular reader; it could be motivated by a desire to document an event. Tamor and Bond studied instruction and persuasion (two forms of transactional writing). For the persuasion task, students were asked to write to the principal to make one change to improve the school—the principal, school, and student were given fictitious names. The researchers found that the students were confused when they had to create fictitious names and create personae, which “increased the intellectual processing demand of the task as well as making it singularly *pseudotransactional* and anomalous” (p. 121).

Dannels’ (e.g., 2009, 2011, 2003, 2001) work with teaching and learning of oral genres has focused on issues of authenticity and audience construction. For example, her (2003) study of oral design presentations found that “audience and identity contradictions were managed by a primary deference to the academic context, whereas structural contradictions were addressed by invoking both workplace and academic activity systems.

Disciplinary, workplace, and academic writing

According to Bazerman, the popular misconception that “scientific language is simply a transparent transmitter of natural facts is, of course wrong” (p. 14)—finds it amazing that this misconception prevails in the face of successful arguing to the contrary; he points out that the erroneous writing are institutionalized and may shape perceptions about contributions to knowledge. Bazerman (1997) describes the way that discourse shapes activity, that we must

orient writers toward the different communicative environments they must write within; he notes that “[e]very writer who has written competently for more than one venue recognizes that one needs to write differently for different venues, in different frames of mind, with different social motives, with different symbolic tools, and with awareness of different audience interests and knowledge” (p. 302). “Each person entering the discursive complexes of a scientific field must learn to cope with those communicative means and processes that mediate participation with others...each must draw on a common body of resources, cope with the same body of material and symbolic artifacts, master the same tools, and gain legitimacy for any new resources they want to bring into the field” (Bazerman, p. 305). Texts carry out the tasks of disciplinary fields; as such, when novices enter a field they must learn the genres in order to participate: “in this way one learns to think and act as a member of one’s profession or discipline” (Bazerman, 2009, p. 289). Being socialized into a domain is more than a set of social learnings; it can be viewed as cognitive apprenticeship.

Dias (1994), notes that “To argue that induction into the genres of one’s field is primarily a matter of being taught the conventions of those genres is to argue for a reduced definition of genre and to deny its inherently social constructedness” (p. 195). In their book on academic and workplace writing Dias, Freedman, Medway, and Pare (1999) describe writing as the product of a specific situation—specifically of a writer’s understanding of a particular situation As such, a piece of writing does not stand alone, but makes sense only within the context that gives rise to it:

The context is not simply the contingent circumstances within which we happen to switch on the writing motor. Writing is not a module that we bring along and plug into any situation we find ourselves in (p. 17).

Berkenkotter & Huckin (1993) suggest that “Genres are the media through which scholars and scientists communicate with their peers” (p. 476). They note that this knowledge is “transmitted through enculturation as apprentices become socialized to the ways of speaking in particular disciplinary communities” (p. 482) rather than being taught explicitly. They assert that

disciplinary and professional cultures function similarly, requiring knowledge of written genres: “genres are the intellectual scaffolds on which community-based knowledge is constructed” (p. 501) – school assignments are exigencies, and the classroom is a real setting.

Freedman and Adam (1996) found in their four-year study of academic and workplace writing a big difference between learning in school and workplace: “the goal of the writing task in the school context is clearly and explicitly for students to learn”; whereas “the workplace operates as a community of practice whose tasks are focused on material or discursive outcomes and in which participants are often unaware of the learning that occurs” (p. 410). When the students entered the workplace, they often did not realize that they needed to write any differently, and were unaware of how to go about learning in the workplace. In addition, with respect to authenticity, Freedman and Adam (1996) found that a “criterion of success in an internship relates to the degree to which the learner sees the task as authentic – that is, one that has consequences in its context” (p. 411). They found that novices were irritated when given tasks that were perceived as busy work and spoke about a colleague’s work that found a student frustrated even when a supervisor constructed a simulation for him to work on. Freedman and Adam make the statement that “any task in the university context is seen as authentic insofar as the instructor assigns it. From the perspective of the classroom, simulations are as authentic as academic essays, lab reports, or book reviews” (1996, p. 412). Thus, the workplace is a messier, more complex environment than school; the authors asserts that, in school, even when real, historical case studies are used, they are still simplified, “abstracted to facilitate learning...the noise is removed and the task simplified” (p. 414). Tasks in the workplace cannot be simplified – they are embedded in an environment with social and political realities, which can complicate not only execution of a task but the choice of mentor to trust for help. Another areas that the authors take up is evaluation – noting that in addition to any evaluation in the classroom, the institution requires that students be evaluated and ranked: “the instructor’s basic goal is that her students learn, but that goal is limited by the equally pressing need to grade and rank” (p. 416).

Thus the role of mentoring and collaboration is complicated by that fact that the guide must evaluate the learner.

In the workplace, although there are some evaluations, the novice and expert share the main goal of producing good work: “they are working together on a task that will be evaluated by some outsider, usually in terms of its rhetorical or material success – in persuading others, in effecting action” (p. 416). For novices, the prize for success is not grades but increased responsibility. Another big difference between learning in school and in the workplace deals with iteration. In school students, working alone or in teams, complete assignments; they may seek advice periodically from the instructor, but when the assignment is turned in, the students involvement is complete. Freedman, Adam, and Smart (1994) conducted a case study of 25 students to explore the disciplinary discourse of students and professionals in the financial field using a course that focused on actual case histories. They found, first, that the university context shaped and constrained the students’ writing for the case studies, as evidenced

“in the social roles adopted by both teachers and students; in the social motive of the writing; in the shaping context, or socially constructed exigence, which elicited this motive; and in the reading practices and collaborative composing processes associated with this setting and its genres” (p. 202).

Specifically, Freedman et al. found that despite attempts to make the simulations realistic, the students were somewhat uncertain about their roles; “the students’ sense of their own personae, on the one hand, and the nature of their audience, on the other, were clearly shaped by the university context” (p. 203). And, as the authors noted, the real audience for the presenters was the professor. In terms of social motive, the study showed that, despite the fact that the students were to play the role of consultants making recommendation, they never indicated that they believed their writing had any real-world consequences other than as learners and students who needed to demonstrate their knowledge: “the bounds on potential recommendations related not to real-world constraints but rather to the discipline-specific constraints of a particular course within their university program” (p. 205). Closure for the students comes when the grade is

received – many times the papers are discarded or not even picked up: “student writing has a relatively ephemeral existence...In the workplace, however, texts have a continued physical existence (in accessible files within the institution) as well as an ongoing role in the institutional conversation and memory” (p. 209).

Winsor (1996b) explores possibilities for leveraging the tacit knowledge of workplace professionals in classroom teaching. Winsor suggests that it might be fruitful to draw comparisons between writing and technology rather than distancing writing from technology; in particular, she notes that “technology and writing may both be seen as processes involving knowledge about how to function in a given context, rather than as a collection of propositions or products” (p. 160). She implements her idea by comparing the experiences of scientists building a laser with students’ perceptions of how they learned to write in the engineering workplace. One proposition from the laser building dealt with the importance of learning from mentors, or from working with someone experienced in the task. Winsor found a strong, and corresponding, pattern among the co-op engineering students: “they examined a previous example of successful writing, attempted to imitate it, and then received feedback from supervisors of coworkers on whether their imitation was successful” (p. 162). Using models, Winsor found, was not particularly straightforward; and, even with good models, the students had to learn to recognize what made the model good. In addition, the students noted the importance of feedback from experts, which aligned with research showing the importance of scaffolding. Her students pointed to experiential learning being more important than learning from a textbook, and they commented that workplace writing is only learned through experience: “Students downgraded the importance of their freshman technical writing class in their learning to write. Only 14% mentioned it as one of the ways they learned to write for work” (p. 164).

Winsor noted writing is often taught as conformance to static, formal rules, which runs counter to what has been shown to be the dynamic, and socially constructed nature of expertise: “A novice in any area must learn to see the world as other group members do” (p. 164). From her

study, Winsor (1996b) saw that “sometimes the emphasis on effectiveness leads to circularity in describing good writing...work orders that get the job done are well written” (p. 165). Winsor concludes that the students, as the laser buildings, acquired tacit knowledge through social interaction but that both groups “may believe that their activity is “rule-driven and perceive their own departures from this idea as a flaw in their knowledge base” (p. 167). Winsor further concludes that teachers cannot anticipate the activities students will encounter in the workplace – and, further, that “a novice has to learn to perceive and react to the world as expert writers do, and we are not able to tell people how to do that” (p. 168). Winsor suggests that it is not easy, as a writing scholar, to deal with the notion that knowledge is, in part tacit and socially based; and, further, that instructions “may be a fiction we use to reinforce our belief in the rational, knowable nature of reality” (p. 170). Although we may like to see writing well as the result of learning rules, Winsor suggests that acquiring this competence rests on more than rules.

Winsor (1999) explored the ways in which activity theory can contribute to knowledge about how to appreciate the regularity of text and its social context while still allowing for creativity and agency (p. 200). Winsor notes that when people work collaboratively to produce something, tensions arise, and text provides a way to resolve them. She conducted a study of the ways in which text maintains and shapes activity systems by looking at the experiences of four people as they produced common workplace documents. The study extends the work reported in Winsor (1996a), reporting on interviews conducted from 1994-1998. She found that the students talked about documentation with much more regularity – suggesting that perhaps producing documentation “made sense in the activity system of the full-time employee but not in that of the co-op student” (p. 206). In terms of moving others to action – the four students, as new employees, were responsible for getting other individuals to do things, often involving multiple and conflicting interests. Even when the actors were all in the same activity system, with the assumption of shared goals, “it often took a great deal of effort to establish a common object and keep it in everyone’s mind” (p. 211). Collaborative writing them achieve and represent

agreements on future actions – in this way mutual consent was in writing, which was a form with permanence and, hence, strength. Documentation, for the new employees enabled cooperative work by coordinating work roles and dealing with conflicts: “a documentary text becomes a concrete tool around which people orient their participation in the activity system” (p. 216). Winsor concludes that documentation does not just record events – “it shapes the organization’s understanding of both events and of itself” (p. 220). Winsor (2007) concludes from this study that participants used rhetoric and social resources to try to “shape written regulatory regimes to serve their own interests” and, further, that everyone played a power role “to the extent that they could participate in the writing” (p. 18).

Winsor (2006) talks about the four engineers rising to positions of more responsibility and authority than 15 years before--she claims that "the participants gained both a socially structured intent to do something and the socially structured means by which to accomplish it"--hence agency comes not from within oneself but from a position held and its associated power (p. 413). The engineers--at this point in their tenure--"connected authorship with agency and defined *good writing* as that which accomplished goals they derived from their work but felt as their own" (p. 414). One of the engineers connected authorship to agency. Winsor talks about how engineers are or not positioned by structure as agents. One of her study participants claimed agency by virtue of his authorship, but he did not influence the actions of other, so Winsor says that the "reach of his agency is rather short" (p. 418). Another participant claimed that good writing made things happen--so Winsor asks if people are exercising agency if they are carrying out the directives of someone else. Winsor concludes by pointing out that (rhetorical) agency is not an individual characteristic but rather occurs as the intersection of two opportunities--the organization structure gave them the space to have agency (freedom to make things happen) but they had to grab that opportunity and use their skill at rhetoric to make the texts they authored effective at truly giving them agency (p. 427). She claims that in organization writing, "both the

agent's intent and his or her capacity to achieve it are structured by forces outside the individual" (p. 428).

Leydens (2008), picking upon the work of Winsor (e.g., 1996a) looked at changing notions of rhetoric as students enter practice, and their changing rhetorical perspective as they move from apprentices to become insiders with leadership positions and mentorship roles with apprentices (p. 244). Leydens found that his participants' views on rhetoric in engineering writing in school and workplace settings varied, and he posited a continuum of rhetorical awareness based on several *factors* (e.g., importance of rhetoric, writer and reader roles, writer identity, career stage/role, and objectivity) – his spectrum went from denial of rhetoric to acceptance, to belief in the necessity of rhetoric to engineering. Leydens found that these *factors* were highly connected, with rhetorical awareness/importance of rhetoric at the center and the other elements surrounding and overlapping around it. Leydens claimed that his study confirmed and extended the notion of denial: as students moved into the workplace, their rhetorical denial seemed to come from a conflicted understanding of rhetoric – participants with more work experience had less conflicted understandings. Leydens suggested that denying the role of rhetoric in engineering communication may continue, but rhetorical awareness/importance of rhetoric may increase as one is socialized into the workplace--especially in leadership roles. He found, as did Winsor, that as the engineers become immersed in actual professional practice (and less in idealized professional ideology and epistemology)--they take an increasingly rhetorical view of knowledge (p. 261). Leydens claimed that his findings pointed to the importance of finding innovative ways to encourage reflection on rhetorical thinking, to teach students skills, methods of inquiry, and ways of knowing that are valued by the disciplinary communities they are in, or will join. He also suggested that rhetoric should be emphasized in the engineering curriculum: "Teaching rhetoric well in technical contexts is to "humanize the making of scientific and engineering knowledge" (p. 261).

Communities

As noted earlier, the Communication Portfolio Studio is characterized as a rhetorical community, following Miller's (1994) description of a rhetorical community as a: "virtual entity, a discursive projection, a rhetorical construct. It is the community as invoked, represented, presupposed, or developed in rhetorical discourse" (p. 73) – distinct from other types of communities, such as discourse, speech, or political communities. A rhetorical community, to Miller, is one that comes to together to get things done, partially through genres but also through the interaction of sameness and difference of the participants, "for rhetoric in essence requires both agreement and dissent, shared understandings and novelty" (p. 74). In addition, Swales (1990) contrasts discourse communities to speech communities, that "discourse communities are centrifugal (they tend to separate people into occupational or specialty interest groups)" (p. 24). In addition, the seminal work of Swales (1990) has relevance for consideration of socialization processes that engineering students go through as they move from school into new discourse communities in the engineering workplace, communities that engage members in sustained relationships as opposed to the temporally constrained rhetorical communities

Writing to learn, reflection, and the development of expertise

As of 2001, writing-to-learn literature has experienced significant growth and there is a need to discover "what kind of writing might enhance learning and what kind of learning can be pursued through writing" (Tynjala, Mason, and Lonka, 2001, p. 8). Bereiter and Scardamalia (1987) proposed the developmental model of writing, which also focused on problem solving. Under this model, knowledge telling involves generating and writing down ideas relevant for the topic, and knowledge transforming involves generating ideas and adapting them to the rhetorical goals (i.e., the effect on the reader) of the writer. Thus, "the dialog between content problems (what to write) and rhetorical problems (how to write) seems to bring about novel thoughts and a deeper understanding of the topic" (p. 10). The socio-interactive approach sees composition as "a dialogue between the writer and the reader made possible by socially shared knowledge. The

meaning of a text is a social construct that is negotiated between the reader and the writer through the medium of text" (p. 11). Motivation has been shown to be important – both through studies of writing and self-efficacy and studies of interest in producing expository texts. Writing has been considered as a thinking activity, which has led to using writing as a tool for learning. Writing to learn is regarded now as "a means of fostering students' knowledge construction and transformation processes through cognitive stimulation and social participation of the kind that different writing tasks may provide" (p. 14). Research has shown that writing as a learning tool should be used in conjunction with other forms of learning – reading, classroom discourse, and group discussions. "Combining forms of discourse is an authentic way to learn because it is the way in which we work in real life...we do not learn only contents but also modes of action and social and cultural practices" (p. 14). Feedback is crucial, and knowledge telling can be the beginning of knowledge transforming with respect to writing to learn instruction.

Students moving into the professional workplace after graduation need, in addition to domain-specific knowledge, transferable skills such as problem solving, critical and abstract thinking, and an ability to use and produce information; in addition, they must have "teamwork and co-operation skills, communication skills including those of oral presentation and report writing, an ability to reflect on one's own practice, technical skills such as use of communications technology, and, above all, lifelong learning skills" (Tynjala et al., 2001, p. 37). However, academic practices are very different from those required in life after school, including those professional environments for which students are being prepared. For example, "experts engage in knowledge transforming; students engage in knowledge telling" (p. 38); and, further, experts work in teams while students typically (at the time of this writing) work individually.

Research has shown that writing is an effective tool for reflection and analysis as well as for making implicit beliefs explicit. Tynjala et al. (2001) examined different forms of writing that students in higher education perform and concluded that they involve various activities and thinking processes, which results in different kinds of learning; further, each has different

benefits the development of expertise (p. 54). Collaborative writing fosters the development of (in addition to writing skills) oral communication and collaboration skills. Tynjala also suggests that, rather than dealing with examinations, students would benefit from developing a personal portfolio of relevant domain knowledge in various forms (e.g., reports, slide decks, videos) that they could take with them. Although, the content may become outdated, “the processes involved in making them will probably last as lifelong transferable skills” (p. 56).

Bereiter and Scardamalia (1987) propose a model of the reflective processes used in writing, one in which writing (composition planning) is envisioned to take place in two separate spaces: the content space (knowledge states, or beliefs) and the rhetorical space (mental text representations). “In the content space, problems of belief and knowledge are worked out. In the rhetorical space, problems of achieving goals of the composition are dealt with” (p. 11). The two spaces are connected reciprocally – the output from each serving as input for the other, and “this interaction between the two problem spaces constitutes the essence of reflection in writing” (p. 302). Under this model, knowledge telling involves generating and writing down ideas relevant for the topic, and knowledge transforming involves generating ideas and adapting them to the rhetorical goals (i.e., the effect on the reader) of the writer. Working back and forth between content problems (what to write) and rhetorical problems (how to write) elicits new ideas and deeper understanding. Bryson et al. (1991) take up these topics again: “Problems arise in the ‘rhetorical space’ are often translated into problems requiring solutions in the ‘content space.’ New decisions arrived at in the content space create new problems in the rhetorical space, and so on in a dialectical fashion” (p. 71). Novices engage in knowledge telling, which involves a simpler one-way process of retrieving content knowledge and discourse knowledge needed to relay the knowledge. Experts also engage in knowledge transforming, which “only develops through efforts to cope with significant problems of content on the one hand...and significant problems of communication on the other” (p. 76).

According to constructivist epistemology, “knowledge is actively constructed as the knower interprets new information and data through his/her prior conceptions and beliefs” (Boscolo & Mason, 2001, p. 83); as such, writing could play a major role in learning as knowledge is continuously constructed and re-constructed. Boscolo and Mason (2001) explored writing as a meaningful activity across different content domains for elementary school students. Writing to learn, which has been a part of the writing across the curriculum (WAC) movement, engages students in cognitive activity that promotes higher order thinking skills for learning (p. 84). Scholars have shown that, among other things, writing facilitates integration of ideas, promotes engagement, provides feedback, shapes thinking, and affect learning in different ways. Writing provides opportunities for students to “manipulate, integrate, and re-structure knowledge by using and reflecting on, their existing conceptions and beliefs in a continuous process of developing meaningful understanding” (p. 85). With respect to transfer in writing instruction, one traditional view sees writing as a set of general skills that can be learned and then used in various domains and tasks. Another view sees writing as a highly contextualized activity with different functions in specific settings, rather than as a general ability. Findings from their study showed that writing can be effectively used to support higher-order thinking processes that produced understanding, across the curriculum. Writing activities helped students engage on a deeper level. Further, the authors suggest that teaching should reflect frequently on students’ perceptions of their learning experiences in order to create increasingly more effective environments for students’ construction of knowledge (Boscolo & Mason 2001).

Bazerman’s (2009) suggests that engaging with a writing task that requires synthesis of *familiar* ideas into new configurations may lead to the development of new *perspectives* on those familiar ideas: “the reconfiguration of the familiar helped us to put the pieces in a new relation and think new thoughts” (p. 279). Further, according to Bazerman, gathering *new* ideas may move thinking to a new level that includes not only new details, but a new way of seeing old ideas. In other words, revisiting previously written text may lead to a deeper understanding of

that text, as well as new perspectives developed as a result of writing that text: “Not only am I learning as I write, I learn from what I have written as the formulations I made rattle around in my mind and change the way I look at things afterward” (p. 279-280). Bazerman et al. (2005) “Writing to Learn is based on the observation that students’ thought and understanding can grow and clarify through the process of writing” (p. 57).

Conceptual framework

This dissertation explores ten engineering undergraduate students’ rhetorical awareness for the communication of engineering practice. As articulated in the rationale and in the research questions, this interest is focused on the breadth of students’ thinking about what constitutes the genres of practice, students’ ability to attend to multiple and complex audiences and situations, and their ability to understand the persuasive possibilities that effective communication brings.

Rationale for selection of the Winsor conceptual framework

Winsor’s (1996a) book, *Writing Like an Engineer: A Rhetorical Education* was selected as a conceptual framework for the analysis of rhetorical awareness for several reasons. One important reason is the influential place that this groundbreaking empirical work, and this author, has occupied in the scholarly literature pertaining to the transition from academic to workplace writing for over 25 years. For example, a Google Scholar search on December 11, 2012 revealed that 244 scholars had cited this 1996a book in their published works. Further, Winsor’s distinguished career has produced many publications that have been well cited by others in the field of professional communication for nearly three decades. Another reason for the selection of Winsor as a conceptual framework for rhetorical awareness is that her work is situated at the intersection of the fields of workplace writing, the teaching and learning of professional and technical writing, and engineering education.

In addition, Winsor’s book was selected because it represents a synthesis of concepts pertaining to rhetorical awareness that are of interest in this study, making it possible to have a single conceptual framework for the rhetorical awareness analyses. Many other scholars have

made significant theoretical and empirical contributions that could have served as a conceptual framework for one portion of the rhetorical awareness construct. For example, Devitt has written extensively on genre learning theory (e.g., 2004; 2009); Dannels has focused on the teaching and learning of oral genres (e.g., 2009; 2011); Artemeva has suggested a unified social theory of genre learning that draws from rhetorical genre studies, communities of practice, and activity theory (2008), as did the earlier work of Dias et al. (1999); Spinuzzi (1996), Petraglia (1995), and Dannels (e.g., 2001, 2003) have addressed pseudotransactionality; Freedman & Medway have written and edited several works that deal with genre learning and academic and workplace writing (e.g., 1994). Berkenkotter & Huckin (1993) proposed a sociocognitive theory of genre; Bazerman has written extensively on the social and cultural aspects of disciplinary discourse (e.g., 1988, 1992, 1994, 1997); Leydens developed a spectrum of rhetorical awareness (2008); Swales described the basic components of a discourse community (e.g., 1990); and Miller published seminal works on genre as social action (1984) and on rhetorical communities (1994).

Although it would have been possible to use one framework for genre learning and another for persuasion, Winsor has pulled these concepts together into a single empirical framework that she used to examine the issues of interest to my study.

In her review of Winsor's (1996a) book, Rachel Spilka (1997) praises Winsor's work, commenting on two particular strengths, the longitudinal nature of the study and the fact that she explored four individual case studies, allowing her to analyze data within and across the cases. Spilka also notes that Winsor's study is one of the few that explores the socialization of novice writers into professional discourse communities. Spilka comments on the intimate and detailed way in which Winsor shares the experiences of the students in her study with her readers, making it possible for them to see "what it is like to learn how to write like an engineer and in so doing, how to receive a rhetorical education" (p. 2). However, Spilka criticizes several aspects of the study, most stemming from the book's brevity given the space that Winsor carves out to address. Spilka indicates she would like to have had more continuity (rather than the

yearly spacing of the interviews), and more reactions by the audiences of the students' writing to see if they are meeting rhetorical objectives. Although Spilka goes so far as to suggest the Winsor's research design may be flawed, she highly recommends the book as a model of qualitative research on workplace writing. Spilka does comment positively on Winsor's habits of continuing to raise questions – again, however, she finds that readers may be looking for more closure.

Summary of components of Winsor (1996a)

Winsor is interested in the tension between engineering ways of knowing (i.e., epistemologies) and engineering ways of doing with respect to rhetoric – writing, in particular. Her work is predicated on the assumption that knowledge is generated through rhetorical interactions within a community, “formed in interpersonal negotiation over interpretations of evidence” (p. 5); thus, what counts as knowledge for a community is the shared vision of “reality” that has been negotiated through persuasive interactions. Winsor argues that because engineering is about technology, and technology is designed for use by humans, the use shapes the actions of humans and, thus, engineering work is persuasive. Winsor also suggests that modern culture and academia often present a less rhetorical view of the communication of scientific and technical information, one that centers on commitment to facts and objectivity; and, therefore, students rarely become aware of the need for persuasion in the communication of engineering work until they are engaged in authentic tasks in professional settings.

Winsor describes stages that novice engineers go through as they become socialized into their disciplinary discourse in the workplace. The stages are not always discrete or sequential; however, for the most part, they build upon one another to create a pathway through which she describes the rhetorical education of her co-op students. The first stage, which she titles “socialization through writers and genres,” (p. 19) occupies the largest portion of her story and, at time, subsumes portions of the other stages. Stages two and three, “learning to construct and interact with an audience,” (p. 45) and “the textual negotiation of corporate ‘reality’” (p. 69),

share a focus on the dynamics of the relationship between a writer and his or her audience and progress from being aware of an audience, to knowing how to address an audience, to anticipating audience reaction, moving an audience persuasively to action.

Socialization through experts and genres²

Winsor works from the premise that engineering is a social practice that involves knowledge-making and, as such, it is a communal practice and a community of practice where novices must learn the community's particular ways of knowledge-making in order to become accepted as members (p. 19). She describes her students' socialization into this practice through the concept of legitimate peripheral participation: they learned to write at work by participating in authentic tasks. The authentic tasks were provided by their employers, who also provided support in the form of opportunities to interact with experienced engineers and to the documents that they produced (p. 21). Winsor suggests that the students needed to work on authentic tasks in the workplace, to supplement classroom instruction, because workplace tasks are more complicated, more embedded in the social and political realities of the workplace than tasks we can create in school (p. 21). Further, Winsor found that her students perceived writing struggles on the job from a document-centered perspective rather than the audience-centered perspective of their supervisors and mentors: the students were concerned about issues of grammar and word choice; they expected their work to be evaluated on correctness, looking at their supervisors as teachers (p. 25). As Winsor notes, her students may have rarely written for audiences other than teachers. She notes that it was hard for them to shed these views and to understand that writing at work does not serve as a basis for evaluation of correctness, as it often does in school; but, rather, that writing produced at work serves the actual intended use and must fit into a set of beliefs and activities rather than being viewed in isolation (p. 26-27).

² The wording has been changed from the original "writers and genres" to "genres" to reflect not only the inclusion of oral genres in my study, but also to simplify by subsuming the mentoring aspect of socialization into the disciplinary discourse into learning the genres. the mentors and guides in the workplace from whom the novices learn the ways of doing.

A tenet that Winsor leans on in her study is that novices learn more than language patterns when they write from models; novices learn about the community's goals and ways of thinking through repeatedly using a form (i.e., form leading purpose) (p. 27). Winsor found that her students, upon entering the workplace, could write using the standard models they encountered before they understood the underlying purposes, suggesting, as scholars have theorized, her students learned about the goals and ways of thinking in their fields, and at their specific workplaces, by repeatedly using the forms. Winsor found that her students did not describe the reports they wrote in terms of persuasive construction of knowledge, but as claims from data that simply stated self-evident facts (p. 32). Winsor notes that engineering education focuses on the importance of data and, as such, her students struggled with the notion that "in addition to being part of what makes engineering powerful, data are also part of [what] makes engineering persuasive" (p. 32). Although, as Winsor explains, in practice, data are used rhetorically by engineers to persuade each other that their view of reality is the right one (p. 32).

Winsor notes that her students' views of data may have been influenced differently by their interactions with the model texts than by their interactions with experienced colleagues and supervisors. Specifically, the texts were likely perceived as presenting data as a given reality; while the experienced engineers demonstrated the need for persuasion. Winsor further suggests that her students' beliefs about data likely come from school and popular culture, where knowledge is often treated as arhetorical, and not from practicing engineers who like "experts in any area are usually aware of the hard argumentative labor by which knowledge is constructed and maintained" (p. 35).

Learning to construct and interact with audience

Winsor worked from the perspective that writers need to appreciate that knowledge is negotiated between people, not passed from one to another, that they must consider audience as an active interpreter of their texts, a partner in the negotiation. Winsor found that the students in her study struggled with this view; they focused on being clear, not persuasive, following the

traditional notion of informative versus persuasive discourse. However, Winsor points out that when writers consider readers' reactions to their text, writers are actually engaging in rhetoric because they are attempting to get the reader to see their point of view or to act in some way. Winsor points out that clarity depends not on some general standards for good writing alone, but also on characteristics of the writer and reader in a particular situation. Winsor found that her students initially had trouble thinking about audience; however, as they wrote more in the workplace, they became aware of not only who their audience was, but also how their audiences would react to their writing. They began to see writing as a reciprocal process in which writer and audience are shaped by one another. Winsor attributed her students' developing awareness, in part, to the social nature of workplace writing with its opportunities for face-to-face, ongoing interactions with audience.

Winsor found that this consideration of audience was one of the ways in which the students were socialized into the workplace community. She suggests that the students established their ethos as engineers and as employees at their workplaces through learning to use the language of engineering – through imitating the conventions of the community. Winsor found that her students attended to certain audiences more than others, audiences with higher positions and greater expertise appeared to be more visible or relevant for the students; this dynamics changed over time. Winsor also found that all of the students attended to audience on some level and that the amount of attention to audience for the students varied over time, and, further, that genre and audience proximity encouraged attention. Only one of Winsor's students talked consistently in terms of persuasion. The other three focused on being clear and what the audience might view as appropriate, as well as on holding a commitment to meaning as data determined and that they, as writers, are passing on the obvious meaning of the data. Still, these three did come to see audience as local and flexible – some thought deeply about audience reactions, some leaned on general rules of writing that would apply to all rather than on making decisions that would be appropriate for a very specific audience. Finally, Winsor also saw the self

emerge as an important audience for her students. They wrote to themselves mostly to reflect on, and manage, their own actions (i.e., to self-regulate), but also as a means of recording their ideas, performing some pre-writing, and of stimulating their thinking (i.e., writing-to-learn).

The negotiation of “reality”³

Winsor notes that a rhetorical view of knowledge implies that “knowledge is created both in an interplay between physical reality and knowers and in persuasive interaction among knowers themselves” (p. 69). Further, she suggests that this process is affected by the power relationship in which it takes place, power that, within hierarchical, multidisciplinary organizations, derives from one’s position in the organization or by one’s expertise. Winsor notes that research has shown that shared visions of reality are negotiated during the process of creating documents because the process is an interaction between writer and audience that shapes both document and audience. Thus it has been shown that texts can challenge existing power structures and existing ways of doing – they can change the way people think and act. Winsor suggests that this process of changing how people think and act can be thought of as persuasion if one can let go of traditional views of persuasion and see it as “interactive, multidirectional, and ongoing rather than a force that is exercised on one person by another in a single discrete encounter” (p. 70).

Winsor examines the interrelationship between power, persuasion, and knowledge through the writing of the only student in her study who viewed persuasion as necessary. This student had acknowledged persuasion from the start and developed into seeing it as a primary requirement for his writing. Winsor concluded that his experiences with the documents he wrote demonstrated that “writing is part of a process by which a common reality is negotiated” (p. 71). Winsor suggested that viewing corporate reality as interpreted and negotiated could raise questions of ethics – honesty and accuracy, the effect of language choices, realities imposed from

³ The wording has been changed from the original “the textual negotiation of corporate ‘reality’” to “the negotiation of ‘reality’” to reflect the extension beyond textual to other media and beyond corporate settings to school and other lifewide organizations.

the top of the hierarchy, lack of voice for those with little power, and choosing from among different views of reality.

Wrapping up writing like an engineer

Winsor found that “after 5 years of co-oping, the four students tended to see engineers’ writing as arhetorical and answerable only to data and to the corporate hierarchy.” Her students made four claims about engineering writing: (1) engineers’ writing is boring and rather ineptly done, based mostly on the belief that trying to engage the audience implies distorting reality; (2) persuasion is used by managers, not by engineers (who rely on data rather than persuasive language); (3) engineers write to other engineers, and when they do write to non-engineers, they do not consider it to really be engineering writing; and (4) appropriate standards for engineers’ writing are those used in the workplace, with workplace standards taking precedence.

Winsor found that work was not the place to practice or apply what was learned in the classroom; rather, students are socialized into work and school separately: “the students seemed to experience school and work as two parallel and only loosely related universes” (p. 97). Further, she found that at least one of the students came to believe that they did not really learn much in school and that what you learn in school is how to learn.

Winsor suggests that her students’ arhetorical views of engineers’ writing reflected their views of their engineering disciplines as being driven by data. Winsor questions whether their views will change as they become experienced practitioners or if this tension in which engineers let facts speak for themselves and managers have the power of persuasion is beneficial to the field: “engineers may believe they let the facts speak for themselves and abstain from obvious persuasion because that is a useful fiction in the world of engineering” (p. 99). Winsor suggests that educators need to present rhetoric within the context of meaningful, shared activities and promote a recursive, interactive, and ongoing view to audience in order to prepare students for the complicated and dynamic environment in which they will write as engineers.

Application of Winsor's work as a conceptual framework

As noted before, the conceptual framework drawn from Winsor (1996a) was employed in two ways in this study: as an efficient organizing mechanism for the data analyses, and as a frame of reference to which the findings from this study could be connected – noting points of alignment, extension, and departure. While Winsor's study focused primarily on the rhetorical education of novice engineers as they joined and become socialized into disciplinary discourse in the workplace, Winsor's assumptions and conclusions are grounded in her experiences teaching engineering students to write. My study is primarily interested in the rhetorical education that engineering undergraduate students receive in school pertaining to the communication of practicing engineers and how that education is experienced differentially by those with and without workplace experience.

The components of the rhetorical awareness framework, at the major component level are (a) socialization through experts and genres, (b) learning to construct and interact with audience, and (c) the negotiation of "reality." As in Winsor's study, the topics addressed under the different components of the framework are not mutually exclusive, but rather build upon one another to reveal a story of the students' rhetorical education.

For each of these major components in the conceptual framework, I also identified sub-themes that emerged from the participant data and connected them to key points that Winsor made within the corresponding component in her findings. Thus, a second level of the framework emerged as an intersection of themes from my data and Winsor's study. As such, data analyses and reporting of findings of my study are organized around this two-level structure, as follows:

- Chapter 5: Socialization through experts and genres
 - Recognizing and learning the genres of practice
 - Performing the genres of practice
 - Communicating as an engineer
- Chapter 6: Learning to construct and interact with audience

- Conceptualizing audience
- Addressing audience
- Self as audience
- Chapter 7: The negotiation of “reality”
 - Conceptualizing persuasion
 - Gaining a voice
 - Shaping the practice

Within each of the second-level components of the structure shown above, findings are reported for each of the different types of analyses articulated in the research questions: what is *revealed* about the participants’ rhetorical awareness, how is their rhetorical awareness *impacted*, and what does *enactment* of their rhetorical awareness look like?

The remainder of this chapter is devoted to perceived self-efficacy.

Perceived Self-efficacy

"Among the mechanisms of personal agency, none is more central or pervasive than people’s beliefs in their capability to exercise some measure of control over their own functioning and over environmental events" (Bandura 2001, p. 10).

The second aspects of students’ preparedness explored in this dissertation is perceived self-efficacy. Initial journeys into the literature pertaining to self-confidence led immediately to self-efficacy theory and the work of Albert Bandura. Bandura’s groundbreaking and comprehensive work on self-efficacy was advanced in 1977 and most notably explicated in his 1986 book, *Social Foundations of Thought and Action*. This seminal work from the field of psychology has served as a theoretical base for many scholars who have explored self-efficacy, as well as other related constructs, such achievement outcomes, attribution theory, competence, expectancy-value theory; motivation, self-regulation, achievement (e.g., Pajares 2008, 2003; Schunk & Pajares 2002, 2005; Schunk 1994; Zimmerman & Bandura 1994; Weiner 2005). A search in Google Scholar on December 12, 2012 showed that Bandura’s 1986 book had been cited 34,276 times. Deeper reading of self-efficacy theory and related empirical studies, in light of my

participant data, led to the decision to use Bandura's hypothesized sources of self-efficacy information as the conceptual framework for my study. Specifically, decades of research have confirmed the critical role that perceived self-efficacy plays in learning and achievement; in recent years, attention has turned to investigating the possible sources of perceived self-efficacy with an eye toward helping educators create environments and activities that can enhance students' perceived self-efficacy and, in turn, their learning and achievement (Usher & Pajares 2006).

In the remainder of this chapter, the self-efficacy construct is introduced and its importance in education is briefly discussed; self-efficacy is situated within social cognitive theory and distinguished from other motivational and self-regulatory constructs; the specific rationale is presented for the selection of Bandura's hypothesized sources of self-efficacy information as an appropriate conceptual framework for this study; Bandura's hypothesized sources of self-efficacy information are described in detail; selected theoretical and empirical works relevant for this study are discussed; and the ways in which the framework was employed as a conceptual framework in this dissertation is presented.

The educational significance of perceived self-efficacy

Perceived self-efficacy is a central component of Bandura's social cognitive theory (SCT) (1986), which looks at human nature and causality. According to SCT, individuals are seen as proactive, self-managing, and self-regulating rather than as passive and reactive organisms shaped by their environment or inner impulses. Thus, humans are seen as having agency: their self-beliefs enable them to have control over their thoughts and feelings, as well as their actions.

Specifically, perceived self-efficacy is defined and explained by Bandura as "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances" (p. 391). Basically, through self-reflection individuals make sense of their own experiences, evaluate themselves, regulate their own behaviors based on those evaluations, and then form judgments about their capabilities to perform. Concerning self-

reflection, Bandura asserts: "If there is any characteristic that is distinctively human, it is the capability for reflective self-consciousness. This enables people to analyze their experiences and to think about their own thought processes" (1986, p. 21). Being able to accurately appraise one's own capabilities is important because taking on tasks that are beyond one's capabilities can lead to failure, and underestimating one's capabilities can limit exposure to situations and activities that would help one develop their potential.

Perceived self-efficacy is "concerned not with the skills one has but with judgments of what one can do with whatever skills one possesses" (1986, p. 391). As such, perceived self-efficacy is not the only factor contributing to achievement; skills and knowledge, outcome expectancies, and value ascribed to the task all contribute: "Assuming that students possess adequate skills, believe that positive outcomes will result, and value what they are learning, self-efficacy is hypothesized to influence the choice and direction of much achievement behavior" (Schunk 1994, p. 80). While perceived self-efficacy deals with beliefs about capabilities to perform or learn at certain levels, outcome expectancies deal with judgments about the outcomes that are likely to result from a particular performance.

Educators care about perceived self-efficacy because beliefs about one's capabilities have important and wide-ranging implications. Perceived self-efficacy is highly related to motivation; it influences the choices individuals make about tasks and activities, the amount of effort they are willing to expend, the nature of the goals they set, their persistence, their resilience in the face of failure, and their achievement (e.g., Bandura 1986; Pajares 2003, 2008). For example, individuals' self-efficacy beliefs influence life decisions (e.g., what school to attend, what major to select, what career to choose) and reactions to adversity and stress (Bandura 1994, p. 81). Individuals with strong perceived self-efficacy tend to face difficult tasks as "challenges to be mastered rather than as threats to be avoided" (Pajares 2008, p. 113); they typically set challenging goals and remain committed to them; they tend to be less stressed when confronting difficult activities; and they, therefore, tend to attain higher levels of achievement than those with weaker beliefs in their self-

efficacy. Bandura (2001) suggests that self-regulation is becoming increasingly important in the workplace, where rapid changes in technology drive career changes, making it necessary for people take charge of their own learning and development. Self-regulation has been found to be particularly difficult when it comes to writing, which is often solitary task that involves time management and sustained creative effort (Zimmerman & Bandura 1994).

Bandura's hypothesized sources of self-efficacy information

As noted earlier, Bandura's four hypothesized sources self-efficacy were selected (e.g., enactive attainment, vicarious experience, verbal persuasion, and physiological state) as the conceptual framework through which to explore the ways in which engagement in the PPPS pedagogy has the potential to reveal and enhance participants' perceived self-efficacy with respect to the communication of practicing engineers.

Bandura hypothesized that individuals base self-efficacy judgments on information from four different sources: enactive attainments, vicarious experiences, verbal persuasion, and physiological states (1986). Further, he asserted that information gained from these sources is not helpful in its raw state – rather, it is processed cognitively, and then weighted and integrated in order to form judgments of self-efficacy. Each of the sources as well as the factors that are involved in cognitively processing information from that source are summarized in Table 2.1. The content in this section is drawn from Bandura (1986); as such, it is written with a tone of certainty that Bandura uses and there are but few citations to Bandura.

Table 2.1. The conceptual framework for perceived self-efficacy, as drawn from Bandura's (1986) hypothesized sources of self-efficacy information.

Information source	Definitions of the sources	Interpretation Factors
Enactive attainments	Evaluation of one's own performances	Task difficulty, effort expended, external assistance received, circumstance, and past record
Vicarious experience	Observation of the performances of others; modeled strategies and additional information	Similarity of the model, performance assessment criteria, social comparison
Verbal persuasion	Persuasive information from others, or self, about one's capability to perform	Perception of the persuader's credibility, authority, and task familiarity
Physiological state	Interpretation of one's physiological state or emotional arousal just before performing	Source of arousal, level of activation, past responses and their associated performances

Enactive attainments (from Bandura 1986)

Defined: Enactive attainments, also referred to as mastery experiences, "provide the most influential source of efficacy information because it is based on authentic mastery experiences" (p. 399). When individuals believe that their performances have been successful, their beliefs in their capabilities with respect to similar or related performances in the future is increased. On the other hand, when they believe that their performances have not been successful, their self-efficacy beliefs for similar or related performances may decrease. Occasional failures often tend to be attributed to lack of effort or difficult situations and, thus, do not have much effect on perceived self-efficacy; in fact, overcoming failure through great effort may lead to stronger self-efficacy beliefs. Once established, high self-efficacy beliefs may generalize to other settings; this could, then, improve performance across different activities, especially those that are most similar to the activity responsible for the increase in perceived self-efficacy. Enactive attainments in a domain have long-lasting effects on perceived self-efficacy.

Interpreted: The interpretation an individual makes of his or her own performances is "an inferential process in which the relative contribution of ability and nonability factors to performance successes and failures must be weighted" (p. 401). Factors that play a role in formation of perceived self-efficacy include task difficulty, amount of effort expended, external

assistance received, situational factors, and past record of successes and failures. For example, succeeding on more difficult tasks may enhance perceived self-efficacy more readily than succeeding on easier tasks; and, if little effort was invested on the difficult task, perceived self-efficacy may be increased more than if high effort were invested. In addition, successful performance may have little effect on perceived self-efficacy if individuals attribute the success to any help received and not to their own capabilities. Likewise, failures that occur under adverse conditions may be attributed to those conditions rather than lack of capability and, thus, have less impact on perceived self-efficacy. In addition, perceived self-efficacy may be raised for those individuals who tend to recall the positive performances more than the negative ones; and, conversely, recalling more negative performances will likely lower self-efficacy beliefs – Bandura refers to this as “faulty attentional and memory processes, rather than in the inferential judgments made about the causes of one’s successes and failures” (p. 402).

Vicarious experiences

Defined: Self-efficacy beliefs are also developed through the vicarious experience of observing others perform. Specifically, watching successful performances, especially by models who are perceived to be similar to the observer, can raise the observer’s beliefs in his or her capability to master comparable activities, by persuading themselves “that if others can do it, they should be able to achieve at least some improvement in performance” (p. 399). Seeing similar others fail in a performance despite strong effort can lower the observer's self-efficacy judgment. Vicarious information is most influential when individuals are uncertain about their own capabilities and have had little experience with the task in question. The ability of vicarious information to influence perceived self-efficacy depends on the criteria by which performance is assessed: some tasks can be readily evaluated on a factual basis (e.g., number of push-ups done), while others require additional information (e.g., test scores of classmates provide comparisons) before they can contribute to perceived self-efficacy. Vicarious experiences are typically less influential than enactive attainments as sources of self-efficacy information, but they can produce

long lasting changes because when individuals become convinced of their ability to succeed or not, they will exhibit behaviors (e.g., more effort, or avoidance) that bring the anticipated result to fruition.

Interpreted: Vicarious experiences are interpreted in light of certain factors related to the observed performance, such as perceived similarity of the modeler. When an individual believes a model to be similar to him or herself, that model's performance is considered more relevant for forming perceived self-efficacy. Models who are perceived to have the same or slightly high abilities provide the most informative comparisons: "Neither outperforming those of much lesser ability, nor being surpassed by the greatly superior convey much information about one's own level of competence" (p. 403). Similarity may refer to record of past performances—in other words, if a particular model has performed similarly to the observer on a past task, the observer may use that model's performance on a new task as a basis on perceived self-efficacy of that new task. Similarity may also refer to "personal characteristics that are assumed to be predictive of performance capabilities" (p. 404)—these assumptions, however, may be based on cultural stereotyping and generalizations from a few personal experiences. In addition to influencing perceived self-efficacy through social comparison, vicarious experiences can include models teaching effective coping strategies and providing additional information about the tasks and any associated challenges. Observing a capable person fail because of poor strategies can increase the perceived self-efficacy of observers who believe they have better strategies to try; while observing a similar person nearly fail although they employ clever strategies can cause observers to consider the task more difficult than originally thought.

Verbal persuasion

Defined: Verbal persuasion relates to the encouragement that is frequently given to individuals regarding their capability to achieve a particular goal. When individuals need to look beyond their own self-assessment of performances, they look for the evaluations of others. Although verbal persuasion, by itself, does not typically bring about long-lasting increases in

perceived self-efficacy, “it can contribute to successful performance if the heightened appraisal is within realistic bounds” (p. 400). Verbal persuasion often leads to sustained effort, which can, in turn, promote skills, and, thus perceptions of self-efficacy. However, if the persuasory information is unrealistic, it can bring about failures, discredit the persuader, and undermine the perceived self-efficacy of the individual being persuaded. Producing long-lasting increases in self-efficacy beliefs through verbal persuasion is likely more difficult than producing long-lasting decreases because increased self-efficacy beliefs based on unrealistic persuasory information is disconfirmed quickly through actions, but decreased self-efficacy beliefs based on persuasory information may lead to behaviors (e.g., lack of persistence, avoiding challenges) that confirm the lowered perceptions.

Interpreted: In turning to the evaluation of others, individuals look to those they perceive to be capable of providing useful evaluation. Individuals do not always believe the verbal persuasion they receive; they become skeptical when experiences do not align with the persuasions of others. On the other hand, sometimes individuals are persuaded to take on tasks they would typically avoid, and end up succeeding. Experiences with persuasory information are very uneven – the motivation of the persuaders varies (e.g., some attempt to flatter, some want to manipulate, some are sincere). Therefore, persuasory information must be weighted using factors such as the credibility and authority of the persuader, and the familiarity of the persuader with the task being performed. Persuaders need to be more than skilled at the task in question; they need to be experienced at evaluating performances and knowledgeable about the particular task demands. The more confidence an individual has in the persuader, based on these factors, the more likely that individual is to change their perceived self-efficacy. Realistic persuasory information can result in the investment of extra effort and subsequent enhanced performance, thus, raising perceived self-efficacy; unrealistic persuasory information can lead to failed performances, and, hence, to loss of credibility for the persuader.

Physiological state

Defined: Physiological state is another source of information that individuals rely on when making self-efficacy judgments – states such as arousal, anxiety, stress, and fatigue. Stressful and difficult situations often bring about physiological arousal that individuals may interpret as a sign of inability to perform. Because states of high arousal tend to degrade performance, the anticipation of self-arousal and, thus, failure, can become a self-fulfilling prophecy: "people are more inclined to expect success when they are not beset by aversive arousal than if they are tense and viscerally agitated" (p. 401). When emotional arousal is eliminated, perceived self-efficacy is enhanced, leading to more successful performances.

Interpreted: Information that is conveyed to individuals from their physiological arousal is interpreted through a judgment process, involving a variety of factors "the sources of arousal, the level of activation, the circumstances under which arousal is elicited, and past experiences on how arousal affects one's performances" (p. 406). The impact of the arousal information on perceived self-efficacy depends on the interpretation of factors such as these. For example, different individuals may attribute a similar physiological state, such as sweating, to different factors – the temperature in the room, or stress from thoughts of failure. Past experiences with the effects of arousal on performance influence the way individuals interpret physiological arousal: those who tend to experience arousal as enhancing performance (e.g., shaking as an adrenaline rush) will interpret arousal differently than those who tend to experience arousal as debilitating (e.g., shaking as indicator of fear). Interpreting arousal also involves the level of the arousal: "it is not arousal *per se* but rather its level that carries the greater weight in judging operative capabilities" (p. 407). Typically, high levels of arousal disrupt performance, while moderate levels can facilitate performance, especially for complex activities. Individuals who see arousal as a sign of their own inadequacy, are more likely to lower their self-efficacy beliefs than those who see arousal as "a common transitory reaction that even the most competent people experience" (p. 407). Mood states can also affect the way individuals process and recall their experiences,

which can affect perceived self-efficacy. For example, if an individual is sad, they may recall past failures first, lowering self-efficacy beliefs; happy individuals may recall their accomplishments, which raises their self-efficacy beliefs.

The next section presents a brief description of the ways in which the information from the four sources are integrated to form a basis for the development of perceived self-efficacy.

Integration of information from the sources

In addition to interpreting information from each of the four sources of self-efficacy information, individuals must weigh and integrate this information to form their perceived self-efficacy. The weights given to the information from these different sources may also depend upon the domain in which the activity occurred. Few studies have explored the ways in which individuals integrate efficacy information from multiple sources; although it is expected that they likely follow a common judgmental process as they form their efficacy judgments. Some studies have shown that individuals struggle with this integration task, and, therefore tend to follow some simple judgmental rules, often ignoring or misweighing relevant information.

In summary, this section has presented Bandura's (1986) hypothesized sources of self-efficacy information, along with their interpretation factors, and briefly pointed out the difficulties inherent in integration. As noted earlier, the statements in the preceding section reflect the definite spirit of Bandura's text. In the next section, I present selected theoretical and empirical works that are relevant for understanding this study.

Relevant theoretical and empirical work

This section is organized as follows: (1) empirical and theoretical work on perceived self-efficacy in general; (2) quantitative research on perceived self-efficacy and communication competence; (3) empirical and theoretical work on perceived self-efficacy for writing and oral communication; and (4) empirical and theoretical work on the sources of self-efficacy information.

Empirical and theoretical work on perceived self-efficacy

Research over the past 30 years has confirmed the relationship that Bandura posited between students' perceptions of self-efficacy and motivational, affective, and behavioral outcomes across various domains (e.g., Pajares 2008, Usher & Pajares 2008, Joet, 2011). Pajares (2008) indicated that, in general, self-efficacy was attracting increasing attention in educational research, especially in work on motivation. Pajares (2003) concludes that "Two decades of research on the influence of self-efficacy beliefs in academic functioning have strengthened Bandura's (1986) claim that self-efficacy beliefs play an influential role in human agency" (p. 153). Pajares suggests that because it has been shown that students' perceptions of their competence may better predict their motivation and academic choices, teachers would gain insights from assessing their students' self-efficacy beliefs.

Quantitative research on perceived self-efficacy and communication competence

With respect to assessing perceived self-efficacy, Bandura notes that "the efficacy belief system is not a global trait, but a differentiated set of self-beliefs linked to distinct realms of functioning" (Bandura 2006, p. 307); and, as such, instruments used to measure self-efficacy should be sensitive to the specific domain of interest. He notes that items on a self-efficacy scale should ask about what one can, rather than will do: "Can is a judgment of capability; will is a statement of intention. Perceived self-efficacy is a major determinant of intention, but the two constructs are conceptually and empirically separable" (p. 308).

Research on self-efficacy has typically employed quantitative methods to compare different conditions in short-term studies; however, as Schunk (1994) indicated, longitudinal studies would be valuable for capturing change over time, studies such as case studies and ethnographies. Although fewer participants would be involved in such studies, the data yielded would be rich: "Self-efficacy assessment might be broadened from reliance on numerical scales to include qualitative indexes" (Schunk 1994, p. 91).

Pajares concludes that "Two decades of research on the influence of self-efficacy beliefs in academic functioning have strengthened Bandura's (1986) claim that self-efficacy beliefs play an influential role in human agency" (p. 153). Pajares suggests that because it has been shown that students' perceptions of their competence may better predict their motivation and academic choices, teachers would gain insights from assessing their students' self-efficacy beliefs.

Empirical and theoretical work on perceived self-efficacy for writing and oral communication

Pajares reviewed the research that looked at the contributions of Bandura's self-efficacy theory (1986) to the study of academic writing (2003), noting that there have been only a small number of studies looking at self-efficacy for writing by composition or self-efficacy scholars. Metrics traditionally used include: confidence that a student possess skills or can display specific skills related to writing, confidence to complete a writing task; and confidence about earning a particular grade in (Pajares 2003). Research has shown that perceived self-efficacy for writing is related to writing performance. Early studies with mostly college students showed the relationship between efficacy beliefs and essay scores, anxiety, grade goals, depth of processing, and expected outcomes (Pajares 2003, p. 145). Later studies support these findings, and new analyses have revealed that "writing self-efficacy makes an independent contribution to the prediction of writing outcomes and plays the mediational role that social cognitive theorists hypothesize" (p. 145). Research regarding developmental impacts on writing self-efficacy has shown confidence in language arts skills decreases during middle school, which is likely due to lack of nurturing of writing skills, which as Pajares notes, is "particularly ironic because the vast majority of students begin school *believing* that they can write" (p. 152).

Pajares et al. (2007) note that it is well established that students' beliefs in academic capabilities and in self-regulatory strategies strongly influence academic choices and outcomes; they suggest that less is known about how the self-beliefs are developed and get established. They suggest, therefore, that it would be logical for motivation researchers to pursue the ways in which students "interpret and evaluate their academic experiences, the import they give to the

messages they receive, and the role played by the physiological conditions they undergo as they engage writing tasks and activities” (Pajares 2007, p. 117).

Empirical and theoretical work on the sources of self-efficacy information

It has been noted by Zeldin and Pajares (2000) that many studies on efficacy source information have employed force-choice survey scales that provide no opportunities for elaboration and cannot accommodate situations where it was necessary to understand how multiple sources of self-efficacy information might work together or separately (p. 217). In addition, because mastery experiences are more readily remembered, it is possible that when the surveys were taken, those experiences came to mind first.

Usher & Pajares (2006), indicate that it has been well documented in the research, how students select and attend to models, and what modeling practices likely impact student learning the most positively; “but little research is available on how social persuasions influence self-efficacy beliefs (p. 139). Usher and Pajares (2006) also call for more research on vicarious influences on self-efficacy – especially using scales that separate out peers from adults as models- -suggesting that unless that is done, “the influence of vicarious experiences on self-efficacy beliefs will not be properly documented” (p. 139).

Sources of self-efficacy rating scales are described in Usher & Pajares’ (2008) review of the literature on sources of self-efficacy information in school. With respect to measuring mastery experience, typically the items ask students to rate their past and current performance in the academic subject area under investigation (p. 755). Usher and Pajares (2008) have noted problems because some researchers have used the students’ objective performance as a mastery experience measure, and this goes against Bandura’s original description of mastery experiences as “the interpretations individuals make of experienced events rather than as the objective performances themselves. Hence, the impact of academic performance attainments on efficacy beliefs depends on what students make of their performances” (p. 755-756). Items that are typically used to

measure vicarious experience ask students to rate “the degree to which they are exposed to peer or adult models who demonstrate competence in the academic subject of interest” (p. 757) – often asking students how they “perceive the academic skills of career role models, close friends in class, parents, teachers, or older students” (p. 757). It has been documented that peers and adults influence students differently at different developmental stages; Bandura asserted the peer versus adult models are more likely to influence students’ self-efficacy beliefs (p. 757). Thus, those researchers who have blended peer and adult models in the same analysis may be missing some information. For verbal persuasion, researchers typically “ask students to rate whether they received encouraging messages about their academic capabilities from significant others, such as peers, parents, teachers, and other adults” (p. 757). Most studies have found moderate to strong reliabilities for social persuasion scales (p. 758). Other items that have been used that do not align with Bandura’s theoretical guidelines for assessing verbal persuasion are those that ask students to report what they think others expect of them (e.g., go to college), or that ask students to rate the extent to which an instructor provides prompt and regular feedback (e.g., this does not address the evaluative nature of the feedback). Usher & Pajares (2008) note that student trust in the capabilities of the persuader and in his or her knowledge about the task and what it takes to succeed with it are important factors in interpreting verbal persuasion. However, researchers have not yet queried students about their trust, and they have not looked at influential messages from their cultural setting (e.g., media, schools) or parsed out verbal persuasion by peers from those of adults, and, as such: “Current measures of social persuasions that assess only the feedback students receive about their academic competencies without attending to these factors offer an incomplete picture of this source” (p. 758). Assessing physiological arousal has typically involved measuring anxiety for a particular academic subject; however, researchers have also measured how much a student likes a subject, if thinking of a subject makes them sick or depressed, or about how school influences their physiological functioning (User & Pajares 2008, p. 758).

A number of qualitative methods have been used – interview has been the most popular (Usher & Pajares 2008). They found that few studies have been done with students; they cite two on teacher self-efficacy. Some have questioned the participants about a particular source (Zeldin & Pajares 2000), and note that “unlike self-report items that fail to capture the development of an individual’s academic self-perceptions, a semi-structured interview format invites participants to elaborate on those experiences that have been most salient to them over time” (Usher & Pajares 2008, p. 760). Other studies have not asked about specific sources, but rather have asked about things like self-efficacy to make a certain grade in a certain course and to rank factors they thought about when judging their mathematics capabilities; another asked engineering students to list factor contributed to their beliefs that could succeed in an introductory engineering course. Usher & Pajares (2008, p. 760) call the questions in these studies, “thought-listing” methods and suggest relying on students’ memories of the contributions to the efficacy judgments may not present the whole picture because individuals may underestimate or overestimate factors.

Pajares suggests there are various ways that teachers can raise students’ perceived self-efficacy, in order to motivate engagement in self-regulatory practices that facilitate learning and achievement, and that one way to look at these ways is through the informational sources that students use to form their efficacy judgments: “One lens through which to examine these ways is to think about the sources students use to inform their self-efficacy beliefs” (p. 126). Pajares suggested that having students write reflections in daily or weekly journals on their successes, as well as the strategies they used to achieve them (e.g., effort expended, resources used) would help students not forget or minimize their past successes.

Usher and Pajares (2008) reviewed the literature on sources of self-efficacy in school. Self-efficacy sources have been measured in very different ways, such as quantitative measures with varying types of items and different scales; some researchers have used qualitative methods. (p. 755). They cite four qualitative studies of efficacy source information conducted by Zeldin, Pajares, and colleagues, which used cross-case analysis to look at interview transcripts of college-

aged and adult populations; and a study by Hutchinson et al. (2006), employing a phenomenographical focus on data from a thought-listing analysis of college freshman, and another (Lent and others) that used a similar approach. The authors report on results of the studies in their review, expressing some caveats first. Some issues involved mismatches between the levels of specificity of the self-beliefs assessed and the outcomes compared; the efficacy sources assessed do not match the self-efficacy measures compared (p. 763).

Looking at the relationship between the hypothesized sources of academic self-efficacy, Pajares (2008) notes that mastery experiences, within a domain, may have long-lasting effects on individuals: "Students who have earned top marks in science throughout school will likely believe themselves capable in this area for years to come" (p. 115). While academic successes can determine future choices of activities and attitudes that are brought to those activities, Pajares point out that individuals need to interpret the results of their mastery experiences, as well as the actions of others, the messages and persuasion of other, and their physiological states and moods (2008).

Research on the sources of efficacy has produced inconsistent findings (Usher & Pajares 2006). Most have found that each of the four hypothesized sources have correlated with self-efficacy – although some have not for vicarious and physiological state not correlated with mathematics self-efficacy and other studies found only mastery and vicarious correlated with self-efficacy for learning. Bandura posited mastery experience as the most influential sources – this has been supported by empirical evidence (Usher & Pajares 2006). Except for mastery experiences being the strongest predictor for self-efficacy, previous studies have yielded inconsistent results. Researchers having operationalized mastery experience in terms of indexes of previous performance, e.g., grades obtained, which can be a problem, as Bandura cautioned "experienced events such as previous performance serve to inform self-efficacy beliefs only when these events are cognitively appraised" (p. 128). Although Bandura asserts that "mastery

experience is the most powerful source of efficacy-building information, he makes no claims about the relative contribution of the other three sources" (Usher & Pajares 2006, p. 128; 2008).

Joet et al. (2011) examined the influence of Bandura's hypothesized sources of self-efficacy information on the academic and self-regulatory efficacy beliefs of elementary students in France. Mastery experience and verbal persuasion were predictors for mathematic and French self-efficacy beliefs. All four sources predicted self-efficacy for self-regulated learning in mathematics; all but vicarious predicted for French. Girls reported fewer mastery experiences and verbal persuasions for mathematics and experienced more anxiety. No source differences were found between girls and boys for French. That mastery experience is strong across domains supports Bandura's theory (1986, 1997) and empirical work by researchers. Of note, the authors suggest that "Future efforts should be aimed at examining the mechanisms by which classroom- or school-level factors affect students' efficacy beliefs" (p. 659).

Usher and Pajares (2006) suggest that in order to look at the way different individuals interpret efficacy-relevant information, we need qualitative studies: "We believe that qualitative studies would provide a phenomenological lens through which to view the development of students' efficacy beliefs and address some of the limitations of our study" (p. 139). Although the traditionally quantitative research on sources of self-efficacy information has produced many findings, "quantitative methods do not provide the opportunity for rich description available through narrative. Self-efficacy theorists have argued that deeper insights must come from qualitative research." (p. 219) and that qualitative studies could explore how efficacy beliefs are developed, and the ways in which students consider their impact on their performance and on pathways chosen (Zeldin & Pajares 2000).

Zeldin and Pajares (2000) explored the personal stories of women who were working in mathematics, science, or technical fields to try to determine the role that self-efficacy beliefs played in their successes. The authors wanted to better understand the contributions that the sources of self-efficacy information made to their judgments of self-efficacy for mathematics and,

in turn, the contribution of their levels of self-efficacy to their mathematics-related competence. The stories of their participants revealed that vicarious experience and verbal persuasions were important sources for their perceived self-efficacy. The authors claims that their work suggests that women in male-dominated fields may perceive these vicarious and verbal sources as more important than for women in more traditional domains (p. 215).

Application of Bandura's framework

As noted before, Bandura's (1986) hypothesized sources of self-efficacy information were chosen as the theoretical framework through which to analyze *impacts* to the participants' perceived self-efficacy for communicating in engineering practice. The inquiry is divided into two domains: perceived self-efficacy for making arguments about preparedness to communicate as practicing engineers; and perceived self-efficacy for communicating as practicing engineers.

The application of Bandura's framework pertains only to Research Question 4B, which explores the potential sources of identified impacts of the Communication Portfolio Studio on perceived self-efficacy. Findings are reported in Chapter 8 for this research question, first, by the domain (as specified above), and then by Bandura's sources, as follows:

- Perceived self-efficacy for making preparedness arguments
 - Enactive attainments
 - Vicarious experience
 - Verbal persuasion
 - Physiological state

- Perceived self-efficacy for communicating as practicing engineers
 - Enactive attainments
 - Vicarious experience
 - Verbal persuasion
 - Physiological state

Research Question 4B addresses the sources of self-efficacy information and potential connections to pedagogical elements of the Communication Portfolio Studio.

Having discussed the conceptual frameworks and their application, we move to the description of the Communication Portfolio Studio.

3. THE COMMUNICATION PORTFOLIO STUDIO

This dissertation explores the ways in which the pedagogical approach, Preparedness Portfolios and Portfolio Studios (PPPS) (Turns et al. 2012), has the potential, when focused on communication, to reveal and impact the rhetorical awareness and perceived self-efficacy of engineering undergraduate students with respect to the communication of engineering practice. In this chapter, I describe the pedagogy of the PPPS approach and the Communication Portfolio Studio.

The Pedagogy of the PPPS Approach

PPPS is an innovative pedagogical approach developed by Turns and her colleagues that aims to address broad educational goals, such as experiential learning, metacognition, and knowledge integration. A detailed description of the approach may be found in a recent article published in the *International Journal of ePortfolio* (Turns et al. 2012). Unless otherwise noted, the content in this discussion of the PPPS pedagogy is drawn specifically from this article; as such, attributions are somewhat abbreviated, and direct citations to the article do not repeatedly give the year of publication.

The pedagogical approach of PPPS, as articulated by Turns et al., includes two major components: (1) inviting engineering undergraduate students to create online portfolios in which they make “arguments about the ways in which they are prepared to engage in engineering activity” (p. 3) and, (2) supporting students in a collaborative studio environment as they “work through the activities involved in constructing a preparedness portfolio” (p. 8). The first component (i.e., creating preparedness portfolios) has a longer history, with the second component (i.e., portfolio studios) being added and refined as the overall pedagogy evolved. Turns et al. identified six pedagogical elements to which the PPPS approach is committed – three for each of the two major components, as shown in Table 3.1.

Table 3.1. The major components and pedagogical elements of the PPS approach.

Component	Pedagogical element
Preparedness portfolios	Preparedness
	Preparedness arguments
	Professional statements and annotated artifacts
Portfolio studios	Sessions
	Student progress
	Student reactions

Preparedness portfolios

The PPS pedagogy invites students to make arguments about their preparedness to engage in engineering activity⁴ and to instantiate these arguments in online portfolios. More specifically, as stated by Turns et al., students are asked to write a *professional statement* in which they make claims about their preparedness; collect *artifacts* (products or by-products of their past experiences), which serve as evidence for their claims; and write annotations for each artifact that explain the ways in which the artifact supports claims made in their professional statement, as shown in Figure 3.1. The pedagogical elements associated with the preparedness portfolio component of the PPS pedagogy (i.e., preparedness, preparedness arguments, and professional statements and annotated artifacts) are discussed.

Preparedness

The central focus on *preparedness* in the PPS pedagogy aligns with a commitment to engineering undergraduate education, which focuses on preparing students for professional practice. The PPS pedagogy addresses preparedness by asking students to think not only about *whether* they are prepared for practice, but also about the *ways in which* they are prepared. Turns et al. noted that this question sets PPS apart from other pedagogies that only implicitly address preparedness and that rarely provide students with opportunities to contemplate these issues explicitly. It is further suggested that when students think about the ways in which they are prepared, they are confronted with thinking deeply about what it *means* to be prepared.

⁴ Preparedness portfolios may vary in terms of the focus of preparedness (e.g., for engineering activity in general, for a competency of one's choosing, such as design or adaptability).

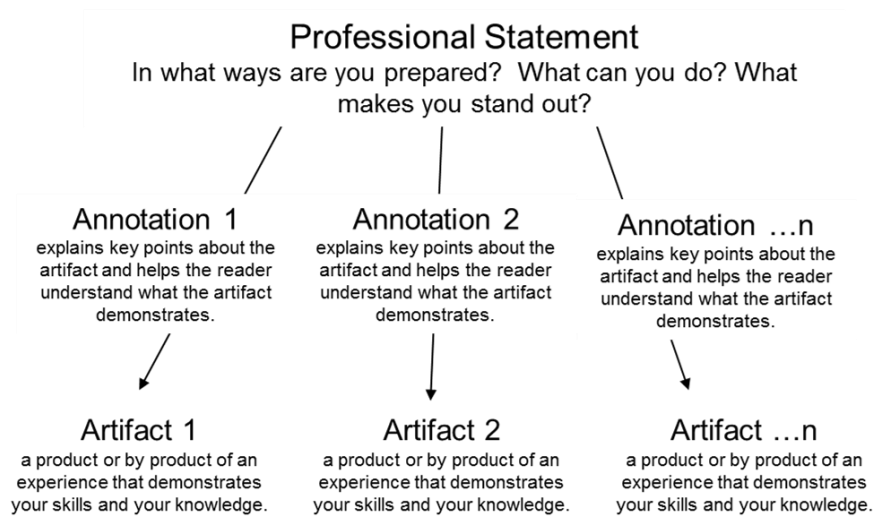


Figure 3.1 Architecture of a preparedness portfolio.

Preparedness arguments

The focus on making *arguments* about preparedness, which aligns with a commitment to engineering undergraduate education, “provides a specific and coherent vocabulary for talking about the e-Portfolio activity, a language that seems to be comfortable for engineering students” (p. 3). Using this argumentation vocabulary, students are asked to provide evidence for their claims by drawing from past experiences. In this way, the PPS pedagogy is able to elicit reflection without explicitly asking student to reflect, reflecting being a concept that Turns et al. suggest engineering students may find uncomfortable. In addition, the focus on *preparedness arguments* forces students to think explicitly about an audience other than the traditional model in school of teacher as implied audience. In other words, as students create portfolios that they can actually use in seeking employment or applying to graduate school, for example, they target an actual person as their audience or envision a plausible representation of the type of audience they plan to target. Further, it was hypothesized by Turns et al. that when students revisit past experiences, they often discover or re-remember what they know, and how that knowledge makes them prepared, which can “lead to increased confidence and self-efficacy” (p. 5).

Professional statements and annotated artifacts

The pedagogy focuses on *professional statements* and *annotated artifacts* as the basic building blocks of the preparedness portfolios. Further, students are asked to implement the portfolios as simple web sites using a UW-based tool (or a comparable tool, such as Google Sites™), in which the professional statement can serve as the home page, and the annotations, with their linked artifacts, as secondary pages of the online portfolios, as shown in Figure 3.2. In addition, students are given suggested word counts and shown a few examples of online portfolios. The above-noted guidelines provide enough scaffolding for the students to get started on their portfolios; however, within these few guidelines, students are in complete control of the content they choose to put in their portfolios. This pedagogical approach, according to Turns et al., achieves a balance between “supporting students in their creation of the preparedness argument and not undermining any of the potential learning opportunities” (p. 6).

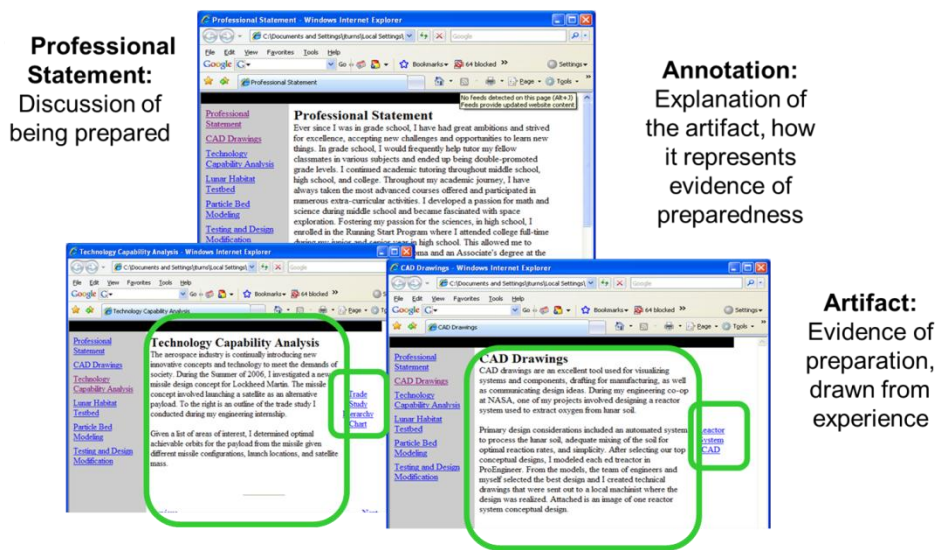


Figure 3.2. Building blocks of a preparedness portfolio, implemented as a simple website.

Portfolio studios

Portfolio studios are a critical component of the PPPS pedagogy: they support students in their portfolio development, engaging them in activities in a student-driven environment in

which “peer review, community membership, camaraderie, and accountability are significant components” (p. 8). As noted before, the studio component evolved over time, in response to observations of past implementations of the approach and feedback from participants in those implementations, to become a centerpiece of the PPPS pedagogy. As Turns noted, the peer interaction in the portfolio studio distinguishes this approach from other portfolio pedagogies in which students make portfolios with no collaborative supporting activities. As such, the PPPS pedagogy, which was used in this study, was believed by Turns et al. to be a particularly effective configuration that has “significant potential to help us realize the educational value of e-Portfolios” (p. 7-8).

According to the pedagogy, each session has the same basic organization, described through the facilitator’s tasks, as follows:

- Provide agenda
- Review past sessions
- Recap student feedback on previous session
- Facilitate session activities
- Provide session wrap-up
- Describe the next tasks for students

The PPPS sessions are supported, in part, through the use of slide displays. Each session has a set of starting slides; students’ input during brainstorming and other activities are entered into the deck by the facilitator during the sessions, and students’ reactions on feedback forms are synthesized and entered into the slide deck before the following session. The activities that occur in each of the five sessions are described in Table 3.2.

Table 3.2 Activities associated with the five sessions of the PPS.

Time Period	Activities
Session 1	Introduce the concept/terminology of e-Portfolio as preparedness argument. Show example portfolios and example preparedness portfolios. Students brainstorm benefits of having a preparedness portfolio. Discuss the claims pool and deciding on which claims to use Prepare for upcoming task: writing first draft of professional statement (~500 words)
Session 2	Students share experiences writing professional statement: taking-the-pulse exercise. Students brainstorm about effective peer reviews and implement in peer reviews. Prepare for upcoming task: finding and annotating one artifact. Bring list of potential artifacts (scavenger hunt); write annotation for \geq artifact; upload. Discuss difficulty of finding/annotating artifacts; examine sample portfolios.
Session 3	Students and facilitator check in on current state of portfolios. Discuss the reviews of some as a group. Students peer review each other's draft artifact/annotation; discuss as group. Prepare for upcoming task: populate portfolios with ≥ 3 more artifacts and annotations. Share scavenger lists and brainstorm selections.
Session 4	Students engage in a thinking-aloud exercise while interacting with a peer's portfolio. Debrief in group discussion. Students select one portfolio element for peer review session; group discussion. Prepare for upcoming task: finish population portfolios; create a 2-3 min elevator pitch Think-pair-share features of good presentations and elements still needed in portfolios.
Session 5	Prepare for oral presentations of portfolios; set up scenario. Brainstorm how to listen to and give feedback on oral presentations. Students present their e-Portfolios to peers and facilitator. Discuss portfolio presentations and feedback from peers. Revisit overall experience.

Many of the activities listed in Table 3.2 are session-specific; however, some recur throughout the studio, and those are called out separately in Table 3.3.

Table 3.3. Recurring PPS session activities.

Activity	Description
Brainstorming	Occurs in most sessions – prepares students for upcoming work (e.g., peer review, writing statements or annotation, reviewing peers' oral presentations).
Peer review	Peer reviews occur in three sessions – students work in groups of 2 or 3 to give and receive feedback on the professional statement, first artifact and annotation pair, and portfolio element of choice.
Reacting on feedback forms	Occurs typically at beginning and end of all sessions (all but beginning of session one) – students react in writing to rewarding, frustrating, and surprising experiences working on portfolios (both in and out of session).
Recap by facilitator	Occurs typically at beginning and end of all sessions – students hear recaps of previous sessions, syntheses of feedback forms and discussions, and recaps of studio activities of the current session.

The three pedagogical elements associated with the portfolio studio component of the overall PPPS pedagogy (e.g., sessions, student progress, and student reactions) are discussed.

Sessions

The commitment to *sessions* sits at the core of the PPPS pedagogy. As noted before, it is the activities in the studio that set this particular portfolio approach apart from others. Deciding on the most effective number of sessions for the approach was an important part of the studio evolution. After experimenting with different configurations, Turns settled on five two-hour sessions as the most effective, noting that this configuration provided enough meeting time to accommodate all of the activities believed to be essential for portfolio development, while honoring the time demands of the typically overcrowded schedules of engineering undergraduate students. It was further suggested by Turns et al. that distributing the work of creating preparedness portfolios over these *five sessions* helps students remain engaged with the activities and helps them continue to make progress.

Student progress on portfolio development

The emphasis on *student progress* in the PPPS pedagogy is supported, in part, by the many opportunities that are provided for students to give and receive feedback. For example, the *thinking-aloud exercise* provides opportunities for students to watch as a peers walks through their portfolios while reacting out loud to the experience. This exercise provides students with information about the ways in which others perceive the effectiveness of their work, which brings focus to the work that remains to be done. In a similar fashion, the *peer reviews* of various portfolio elements throughout the approach provide feedback that keeps the students supported and moving forward. In addition, discussions, brainstorming, and other check-in activities, create and maintain a motivating environment, in which peers interact in respectful ways, and opportunities are provided for everyone to contribute, which also encourages continued engagement. As Turns has noted, the PPPS pedagogical focus on peer interaction and

collaboration (e.g., *peer reviews* and *brainstorming*), sets this approach apart from other pedagogies that, for example, use meeting times to provide instruction to students and show examples.

Student reactions to the activities

The emphasis on *student reactions* to the activities of the PPPS pedagogy is facilitated through the many opportunities for students to react explicitly; and, in addition, for students to hear and see the reactions of others. For example, in the *taking-the-pulse exercise*, students reflect on their experiences writing the professional statement, comment on the state of that statement, indicating something they like about it and something they would like help on. Activities like this, Turns et al. suggested, can foster connections between the students and, in turn, provide motivation for the portfolio work, work that may be unfamiliar to engineering students (p. 10). The focus on *student reactions* is also supported by the use of *feedback forms* during each session, in which students react to experiences they found rewarding, frustrating, and surprising. When reactions are synthesized and presented back to the group, students can see patterns of reactions across the group, which according to Turns et al., may help them understand their own reactions relative to those patterns. For example, seeing others struggle with a specific task may mitigate the negative impact for struggling with that same task. In addition, Turns et al. suggested that asking students questions that cause them to confront their assumptions (e.g., what they found surprising), can promote “deep and profound” learning and elicit critical reflection” (p. 10).

PPPS pedagogy as focused on communication and used in this study is described.

The Communication Portfolio Studio

As noted before, past implementations of the PPPS approach focused on different aspects of preparedness; this dissertation reports on the first PPPS implementation to focus on one specific competency, communication. As such, this study engaged ten engineering undergraduate students in making arguments about their preparedness to communicate as practicing engineers, in the form of online portfolios, through participation in a collaborative studio environment.

The Communication Portfolio Studio followed the overall PPPS pedagogy articulated by Turns et al. (2012). The portfolio building blocks and overall goal of the communication preparedness portfolios built by the participants in this study were the same as those depicted in Figure 3.1 for the PPPS. Minor modifications were made to the PPPS session materials (e.g., guidelines for writing professional statements and artifact annotations, and the starting slide sets for session facilitation) to emphasize the focus on communication. The organization of the sessions, and the activities associated with those sessions, remained the same as those for the PPPS implementations described above and summarized in Tables 3.2 and 3.3.

Broadly speaking, having the participants create arguments about their preparedness to communicate as practicing engineers, within a collaborative studio setting, was expected to be an effective approach for exploring the participants' rhetorical awareness and perceived self-efficacy for that communication, as follows:

- The Communication Portfolio Studio was expected to *reveal*, and possibly *enhance*, the participants' rhetorical awareness (i.e., notions of genre, audience, and persuasion). Further, as a rhetorical community, it was expected to function as a microcosm in which the participants could *enact* their rhetorical awareness as they worked through the inherently rhetorical task of arguing for preparedness to communicate in engineering practice.
- The Communication Portfolio Studio was also expected to *reveal*, and possibly *impact* the participants' perceived self-efficacy for communicating as practicing engineers, and for the more specific activity of making arguments about preparedness for that communication. Further, it was expected that this approach had the potential to identify the sources of self-efficacy information that contributed to those impacts – and, in addition, possibly connect those sources to the pedagogical elements and supporting activities associated with making the sources visible.

In the following sections, these broad assumptions are made more concrete, by describing specific connections between the conceptual frameworks for rhetorical awareness and perceived self-efficacy and the PPPS pedagogical elements and supporting activities of the Communication Portfolio Studio.

Connecting rhetorical awareness to the PPPS pedagogy

A complete mapping between the conceptual framework for rhetorical awareness and the PPPS pedagogy as implemented in the Communication Portfolio Studio is beyond the purposes here. The goal here, rather, is to present convincing evidence that the Communication Portfolio Studio has the potential to be a valuable site for exploring rhetorical awareness. To accomplish this, one concept from each major component of the framework is identified and a few particularly salient connections to the pedagogical elements and supporting activities in the Communication Portfolio Studio are made.

It is useful at this point to revisit the research questions about rhetorical awareness in an abbreviated manner (see Chapter 1 for the complete question text). For each of the three Winsor components, the same basic question was asked: With respect to X (i.e., one of the components), (a) What is *revealed* about rhetorical awareness through engagement in the Communication Portfolio Studio? (b) What *impact*, if any, does engagement have on rhetorical awareness? and (c) What does *enactment* of rhetorical awareness in the Communication Portfolio Studio look like?

Given the nested nature of the rhetorical awareness exploration (examining rhetorical awareness by having the participants perform a rhetorical task), it is expected that the Communication Portfolio Studio will yield information about the participants' rhetorical awareness pertaining to the communication of engineering practice in general and pertaining to their rhetorical awareness with respect to making preparedness arguments about communicating as practicing engineers. In the discussions that follow, these situations are addressed in the order described above, moving from the more general communication topic to that of preparedness arguments, more specifically. For each framework component, one Winsor finding is identified,

its relevance for this discussion is noted, and connections to the PPPS pedagogy applied in the Communication Portfolio Studio are hypothesized.

Learning about genre

Winsor finding. Winsor found that the students in her study learned to write at work by participating in authentic tasks, which were often different – and more complicated (e.g., embedded in social and political realities) than the isolated writing tasks they encountered in their courses. She noted that the students were socialized into work and school separately.

Relevance. This finding relates to an interest in the potential of the Communication Portfolio Studio to (a) reveal the participants' conceptions of the genres of engineering practice, (b) provide opportunities for cross-pollination of those conceptions between the participants with and without workplace experience, and (c) provide space in which to observe the participants as they acquire and perform the genres associated with the primary tasks of the Studio.

Hypothesizing connections to the pedagogy. With respect to the genres of engineering practice, the focus on *preparedness* is expected to engage the participants in thinking about what preparedness means in terms of communicating in the engineering workplace; for example, what genres might they encounter and be required to perform, and how might those genres differ from those learned in school. The *brainstorming* session on the benefits of having a communication preparedness portfolio is expected to provide opportunities for the cross pollination of ideas about what it means to communicate as practicing engineers. In supporting the pedagogical focus on making *preparedness arguments*, the *artifact scavenger hunt* activity is expected to engage the participants in revisiting past experiences to identify potential artifacts that could serve as evidence for their preparedness claims and brainstorming with peers about which artifacts on the lists seem most promising as evidence. Again, this activity, is expected to provides opportunities for the participants to share their ideas about what counts as evidence (e.g., what genres will be favored, what types of experiences and skills will be showcased); and, in the process, influence each other's perspectives. With a focus on *artifact annotations*, participants select and describe

their evidence in their portfolios; it is expected that the choices they make will also reveal something about their notions of what constitutes the genres of professional practice.

With respect to the genres of the preparedness portfolio and associated activities, the participants are expected to be novices in this newly formed rhetorical community. Through the pedagogical focus on *professional statements* and *artifact annotations* as portfolio building blocks, the participants are introduced to these genres and supported in acquiring them by receiving guidelines and seeing a few models. As noted before, the participants will also engage in several activities, such as the *taking-the-pulse* and *thinking-aloud exercises*, *oral presentation*, and *various peer reviews*, that are expected to provide them with feedback on their performance of newly acquired genres, such as the professional statement, the online portfolio, and the two-minute elevator pitch. Distributing the work over five *sessions* should provide sufficient opportunities for genre learning, performance, and feedback, which is expected to help the participants gain a sense of connectedness to peers, and, in line with the pedagogical emphasis on *student progress*, maintain engagement with the tasks over time. In addition, when the participants have opportunities to comment in the moment on *feedback forms* about their experiences learning to develop and present communication preparedness portfolios, learning is expected to be reinforced; and, further, when synthesized reactions are shared back to the group, learning is expected to be reinforced further, or contextualized, as participants compare their reactions to those of their peers.

Seeing audience rhetorically

Winsor finding. Winsor found that the students in her study came to view audience more rhetorically over time, seeing their audiences as active participants in the creation of information rather than as passive receptors of completed information. She notes that this transition to more rhetorical views happened as the students were exposed to authentic audiences and interactive writing tasks in the workplace.

Relevance. This finding relates to an interest in the potential of the Communication Portfolio Studio to (a) reveal the rhetorical nature of the participants' views about audience,

including differences in views of participants with and without workplace experience, (b) provide opportunities for the participants to influence one another's views of audience, and (c) provide a space in which to observe the participants as they wrestle with issues of audience related to construction of their preparedness portfolios.

Hypothesizing connections to the pedagogy. With respect to issues of audience in communicating in engineering practice, the focus on *preparedness arguments*, as noted before, will prompt the participants to revisit their past work for evidence of preparedness and grapple together with peers about the effectiveness of the past work in terms of the ways in which audience was considered (e.g., the *scavenger hunt*). These discussions, and other activities that support the commitment to *student progress* and to *student reactions*, are expected to raise issues of audience relative to the artifacts they are considering, and, potentially, challenge some participants' existing views and lead to new (and potentially more rhetorical) ways of thinking about audience. For example, two of the *brainstorming* activities – one on how to conduct an effective peer review and another on how to give an effective oral presentation – should provide fertile ground for the participants to share, and possibly influence each other's, conceptions about how to effectively address audience. Interacting with peers, and revising work accordingly and iteratively, over time in the five *sessions*, is expected to provide significantly different experiences with audience interactions than those experiences typically encountered in the participants' engineering coursework. The commitment to *student reactions* is expected to provide information in support of this hypothesis.

Turning to audience interactions that are specific to the development of communication preparedness portfolios, one of the participants' first tasks was to think about audience(s) for their *preparedness arguments*, and to think about this with their peers in the studio. In providing a real-world task, the pedagogy associated with making *preparedness arguments* it expected to encourage the participants to think of audience in tangible terms, potentially providing an alternative to the traditional model of teacher as audience. The *oral presentation* of portfolios is

expected to bring complexity to considerations of audience. While participants may have undertaken the portfolio task as transactional (i.e., they may have plans to use it in the near future), and they may have an actual person in mind as their audience, they will be asked to present their portfolios to studio peers while envisioning a default scenario in which other studio participants become potential employers. Further, the *question-and-answer* session that follows the presentations extends the scenario to include audience interactions. These experiences are expected to provide opportunities for the participants to work on, and react to, reconciling authentic and inauthentic audiences and situations, as, for example, described by Dannels (2003) in her study of students' design presentations. With a commitment to *student reactions*, participants have opportunities in each session to react on *feedback forms*, identifying experiences that were rewarding, frustrating, or surprising about developing their portfolios, including grappling with issues of audience for their preparedness arguments. When these reactions are synthesized and shared back to the group, the participants are expected to be exposed to more new ideas from peers, which were not shared during the other exercises.

Accepting persuasion

Winsor finding. Winsor found that the students in her study retained the view that engineering writing is boring and rather poorly done, in large part, because they believed that any attempt to write in ways that would capture the reader's interest, was misleading and distorted the facts. Winsor noted that, in order to help students accept the appropriateness and necessity of persuasion in engineering work, we, as educators, need to dispel negative connotations of persuasion that are often promoted in engineering curricula and by the popular culture.

Relevance. This Winsor finding relates to an interest in the potential of the Communication Portfolio Studio to (a) reveal the participants' understanding of the role of persuasion in the communication of engineering practice, (b) provide opportunities for developing shared visions of appropriate uses of persuasion, and (c) provide opportunities to

observe the participants using persuasion as they construct and present their communication preparedness portfolios.

Hypothesizing connections to the pedagogy. With respect to notions of persuasion in communicating as an engineer, the pedagogical commitment to *preparedness arguments* and *professional statements*, engaged the participants in thinking individually and collectively about how to argue compellingly for their preparedness to communicate as practicing engineers. For example, the participants *brainstorm* together about how to write a professional statement, individually write a draft, and return to the studio to engage in two activities that provide opportunities for the participants to discuss their notions of what a successful statement of claims looks like (i.e., *taking-the-pulse exercise* and *peer review*). While these exercises are expected to reinforce learning the *professional statement* genre (as discussed in an earlier section), they are also expected to reveal the participants' notions of how to be persuasive, including any biases they have against persuasion in this professional engineering context. In addition, the pedagogical commitment to *student reactions* is supported by the *feedback forms* and other group activities. For example, in the *taking-the-pulse exercise*, the participants share their reactions to their experiences making claims in the professional statement about their readiness to communicate in the engineering workplace, and have a chance to see their reactions against the backdrop of the self-evaluations of the other participants in the studio. This exchange of ideas can lead to shared visions of the appropriateness and use of persuasion.

With respect to notions of persuasion specific to the development of communication preparedness portfolios, the pedagogical commitment to *preparedness arguments*, as noted before, engaged the participants in considering past work products and experiences as potential evidence for preparedness claims (e.g., activities such as *the artifact scavenger hunt* and subsequent *brainstorming* activities). The peer interactions associated with these activities are expected to provide opportunities for the participants to share ideas about how to build compelling arguments, as demonstrated through the decisions they made about which artifacts to include.

Further, the pedagogical focus on *annotated artifacts* is expected to promote thinking about the persuasive value of the annotations in which the participants are asked to contextualize the artifacts and explain how they provide evidence for claims made. For example, for a CAD drawing as an artifact, in the professional statement, the student asserts that he or she is skilled at producing CAD drawings; in the annotation, the student briefly describes the particular CAD drawing and persuasively argues for the drawing's ability to support the claim in the professional statement with respect to facility with CAD tools. This students' understanding of the persuasive potential of the annotation will likely be revealed through *brainstorming* activities and *feedback forms* that support the commitments to *studio sessions* and *student reactions*. The final *oral presentation* of portfolios will engage the participants in the persuasive task of selecting from a large amount of information those few points that can be made in the two-minute time frame. This activity, supported by a *brainstorming* exercise about what makes an effective presentation, is expected to reveal something about the participants' facility with, and acceptance of, persuasion. The *question-and-answer* session following the presentations should provide another opportunity to reveal individual notions of persuasion and facilitate the creation of shared visions regarding the task of presenting one's preparedness to others.

In the following section, connections are made between the sources of efficacy information framework and the PPPS pedagogical elements and supporting activities of the Communication Portfolio Studio.

Connecting sources of self-efficacy information to the PPPS pedagogy

It is useful to note that this discussion pertains only to the second part of the research questions that deal with perceived self-efficacy (see Chapter 1 for the full text of the research questions), Question 4B: "For those impacts identified by the participants, what *sources of self-efficacy information*, and *pedagogical elements*, if any, are indicated?"

As with rhetorical awareness, a complete mapping between the hypothesized sources of self-efficacy information and the PPPS pedagogy as implemented in the Communication

Portfolio Studio is beyond the purposes here. Thus, the goal again is to present compelling evidence that the Communication Portfolio Studio has the potential to be a valuable site for exploring sources of self-efficacy information by connecting each source to pedagogies of the Communication Portfolio Studio. In addition, it is useful to note that the research questions on perceived self-efficacy focus on different capabilities: the first is specific to making preparedness arguments; the second pertains, more generally, to communicating as practicing engineers. An attempt will be made to identify which case is most relevant for the connections being made; some connections deal with both general and specific cases and will be noted as such.

In the discussions that follow, for each source of efficacy information (e.g., enactive attainment, vicarious experience, verbal persuasion, and physiological state), the source and hypothesized connections to the PPPS pedagogical elements in the Communication Portfolio Studio will be described. When possible, perceived self-efficacy for communicating practicing engineers will be discussed before the more specific perceived self-efficacy for making arguments about preparedness to communicate as practicing engineers, in order to align with the order used in the rhetorical awareness section.

Enactive attainment

Description. Interpretation of one's own performances is thought to be the most powerful source of efficacy information that individuals use in forming self-efficacy judgments. This source is interpreted in terms of factors such as task difficulty, effort expended, external help available, and circumstance.

Hypothesizing connections to the pedagogy. Regarding the more general perceived self-efficacy for communicating as an engineer, the pedagogical commitment to *annotated artifacts* and *preparedness arguments*, supported in part by the *artifact scavenger hunt*, is expected to provide opportunities for participants to reflect on past communicative performances – otherwise known as enactive attainments – and, thus, contribute to forming or modifying perceived self-efficacy about communicating as practicing engineers. It is possible, that through *brainstorming* associated

with reflecting on past performances and through comments on *feedback forms* (supporting commitment to *student reactions*), participants may allude to the difficulty of revisiting past work, the amount of time they invested, or help received, which would shed light on the way that they interpret the information obtained through enactive attainment. Of note, this example, which I consider most relevant for perceived self-efficacy in the more general sense, could also pertain to the formation of perceived self-efficacy about one's capability to make preparedness arguments.

Along similar lines, but likely having more application to the specific case of making preparedness arguments, the pedagogical commitment to *professional statements* and to *preparedness arguments* is expected to engage students in performing the professional statement genre and having the first draft exposed indirectly to the whole peer group (through shared self-evaluations and requests for help) and directly to another participant in the *peer review* session. When participants evaluate their own work, the work becomes a source of information (i.e., an enactive attainment) on which to base self-efficacy judgments. With the pedagogical commitment to *student reactions*, the participants complete *feedback forms* at each session, reacting to rewarding, frustrating, and surprising aspects of their experiences developing their communication preparedness portfolios. It is possible that, as with reflecting on experiences to find evidence, these reactions could also include comments about the difficulties encountered and level of effort invested – information about the possible ways in which the professional statement, as an enactive attainment, is interpreted for use in forming or modifying self-efficacy judgments.

Vicarious experience

Description. Observing the performances of others, including making social comparisons to others and learning coping strategies, is another important source of efficacy information used in the formation of self-efficacy judgments. This source is interpreted in light of the similarity of the modeler to the person observing.

Hypothesizing connections to the pedagogy. Of note, several things might be said about the potential of this pedagogy to provide access to efficacy information through vicarious experience

that pertain to both the general case of self-efficacy judgments about communicating as practicing engineers and the specific case of making arguments for preparedness. For example, the pedagogical commitment to studio *sessions* is what makes it possible for participants to have many opportunities to observe the performances of others and, in this way, to contribute to self-efficacy judgments through vicarious experience. Many of the activities in the studio provide opportunities for this observation; for example, the multiple *peer reviews* and *brainstorming* activities, as well as the *thinking-aloud* and *scavenger hunt exercises*. In each of these cases, the participants see the work of their peers and have opportunities to make comparisons between that work and their own, which may affect their self-efficacy judgments – positively or negatively.

With respect to the more general case for self-efficacy judgments, the pedagogical commitments to *sessions*, *preparedness arguments*, and *student progress* are all supported through activities such as *brainstorming* about what claims to use in the professional statement, and the group discussion on the difficulty of finding and annotating artifacts. In both of these activities the participants hear their peers' talk about their past accomplishments and experiences; and, in the case of the artifact list, they may see some of the accomplishments. These activities have the potential to provide vicarious experiences that could bolster a participant's perceived self-efficacy or deflate it when they compare their lists of accomplishments with peers. The focus on *student reactions*, again, makes it likely *feedback forms* and discussions may provide information about how the vicarious experience information will be interpreted.

Regarding the more specific case of making preparedness arguments, acknowledging this distinction is blurry, the pedagogical commitment to *preparedness arguments* is supported by the final *oral presentation*, which, as noted, is a *two-minute elevator pitch* that the participants will deliver – basically, simulating a portfolio walk-through in the time it would take to ride an elevator several floors. Observing peers present their portfolio provides efficacy information, through vicarious experience, that can be used by the observers in their formation or

modification of self-efficacy judgments for presenting one's preparedness to others. For example, when the participants watch others perform successfully, they may have stronger beliefs in their capabilities to do the same. In addition, it is possible that this vicarious experience will also provide additional enhancements to self-efficacy judgments if the performer (i.e., modeler), demonstrates new coping strategies that the observers find promising. In addition, it is also possible, perhaps through the brainstorming about a successful oral presentation or through the question-and-answer session after the presentation, that the participants may learn something about the presenter (e.g., year in school, discipline, past successful performances) that would contribute to the way they interpret and incorporate the vicarious experience into their self-efficacy judgments, given that similarity to modeler is the main interpretation factor for vicarious experience.

Verbal persuasion

Description. Receiving encouragement from others regarding one's capability to achieve a particular goal or perform at a designated level is a common, albeit somewhat unstable, source of efficacy information that individuals use in forming self-efficacy judgments. This source is interpreted in light of the credibility of the persuader, his or her familiarity with the demands of the task in question, and his or her skill at evaluating performances with this type of task, as perceived by the individual being persuaded.

Hypothesizing connections to the pedagogy. As with vicarious experience, some observations can be made about the potential of the pedagogy to provide access to verbal persuasion that pertain to both the general case of self-efficacy judgments about communicating as practicing engineers and the specific case of making arguments for preparedness. The pedagogical commitment to studio *sessions* provides multiple opportunities, over time, for participants to be verbally persuaded of their capabilities to perform, either positively or negatively, by peers or by the facilitator, through activities such as *peer review*, *brainstorming*, or *feedback on oral presentations*, which would then contribute to the formation or modification of self-efficacy judgments. As

noted above, the way in which verbal persuasion is interpreted is through the perceived credibility of the persuader and his or her familiarity with the task. It is assumed unlikely that any explicit statements would be made about the perceived credibility or task familiarity of the persuader either in discussions or on feedback forms. However, it is possible, particularly in the case of *peer review*, that a participant may make it known that they do not value the appraisals of peers and that they would prefer to be evaluated by a teacher or other expert.

With respect to the more general case for self-efficacy judgments about communicating as practicing engineers, the pedagogical commitments to *preparedness arguments* and *artifact annotations* are supported through activities such as *the artifact scavenger hunt*, *brainstorming* and *peer reviewing* professional statements, and the *taking the pulse* exercise. These activities have the potential to provide opportunities for participants to verbally persuade one another about their capabilities with respect to communicating in practice – for example, such a dialog seems plausible for the session in which they go over each other's *artifact scavenger* lists or during the peer review of the first artifact and annotation pair. In addition, it is possible that the performance of the genre of *peer review*, which is a key part of the commitment to *sessions* and to *student progress*, could also be an area in which a participant may be persuaded about his or her capabilities, which could then contribute to that participant's perceived self-efficacy for peer reviewing the work of others, a skill that has high transfer value.

Regarding the most specific case of making preparedness arguments, the pedagogical focus on peer interactions, including *peer reviews*, *brainstorming*, *thinking-aloud exercise*, and other activities, provides multiple opportunities for participants to be persuaded about their abilities to successfully write a professional statement, give an oral presentation – essentially perform the genres of the Communication Portfolio Studio. For example, it seems somewhat likely that a participant, upon completion of the *thinking-aloud exercise*, having experienced a peer's portfolio, may make encouraging and supportive statements about that peer's capability to complete the portfolio successfully. In addition, it seems very likely that, at the completion of the *oral*

presentation when the peers are asked to react to the presentation (e.g., focus on *student reactions* and *student progress*), they may make statements that go beyond evaluation and that seem more like verbal persuasion—in other words, rather than just stating that the presenter has strong oral presentation skills, the persuader indicates belief in the presenter's capability to employ those skills again in the future. Again, of note, it would be difficult to know how the presenter will interpret the persuasory information, because it is somewhat doubtful that he or she would speak to the credibility of the persuader, even on a *feedback form*.

Physiological state

Description. An individual's interpretation of their physiological state prior to or during a performance can also contribute to self-efficacy judgments. Physiological changes are interpreted in terms of factors such as the source, level, and circumstance of arousal, as well as past experiences with arousal affecting performance.

Hypothesizing connections to the pedagogy. This discussion will focus on the more specific case of perceived self-efficacy for making preparedness arguments, as this is the area in which physiological arousal is considered most likely to surface. The pedagogical commitment to studio *sessions*, *student reactions*, and *student progress* are expected to provide opportunities for affecting the participants' physiological state and, hence, contributing to formation of, or changes to, self-efficacy judgments. For example, the *taking-the-pulse* exercise involves sharing reactions about the state of one's own draft professional statement with the group. As the first work produced in the studio, participants may feel anxious about sharing; however, seeing peers' reservations about their own drafts has the potential to reduce that anxiety and, possibly mitigate any decreases to self-efficacy judgments that might be formed based on anxiety. The commitment to multiple *sessions* could also reduce the impact of anxiety on perceived self-efficacy as the participants have repeated practice with activities, which can increase performance level, and, in turn, increase self-efficacy. Through the commitment to *student progress* and the supporting activities such as *peer review of artifact and annotation pair*, and *thinking-aloud* exercise, it is anticipated that participants

may become increasingly comfortable with being reviewed and with sharing ideas, and they may see that they are not alone in any of their struggles, which can reduce anxiety and enhance self-efficacy judgments. In addition, it is expected that the *final oral presentation* could bring about physiological arousal, such as sweating, heart racing, or flushing, which could lower perceived self-efficacy if the changes are viewed as an indication of inability to perform successfully. With the commitment to *student reactions*, and the *feedback forms* that support it, it is possible that participants may share information, such as how much they were aroused, the circumstances under which they were aroused, that would reveal something about the way in which the physiological changes may contribute to forming or modifying self-efficacy judgments.

The discussion in this chapter focused on what *could* happen in the Communication Portfolio Studio, based on theories of rhetorical awareness and self-efficacy, and on the theoretical underpinnings of the PPPS pedagogy. The study reported in this dissertation represents an attempt to see what *did* happen. A challenging aspect of this type of research is figuring out how to make visible the phenomena of interest—a topic of the next chapter.

4. METHODS

This chapter presents the following: rationale for the methodology, research design, study context and participants, approaches for data collection and data analysis, and trustworthiness.

Rationale for Methodology

Qualitative multiple-case study was chosen as the methodology for the exploration of students' rhetorical awareness and perceived self-efficacy for the communication of engineering practice and the examination of the PPPS pedagogy focused on communication to facilitate that exploration. Qualitative researchers are "*interested in understanding the meaning people have constructed, that is, how they make sense of their world and the experiences they have in the world*" (Merriam, 1998, p. 6). As such, this methodology is well suited to my study, which

focuses on understanding the experiences of ten engineering undergraduates as they created preparedness portfolios in a collaborative studio setting. Qualitative research seeks to understand phenomena of interest from the participants' perspectives, although the primary instrument for data collection and analysis is the researcher (Merriam, 1998). Understanding the experiences of the participants involves interpretation guided by my own beliefs and ways of thinking about the world (Denzin and Lincoln, 2008). In striving to understand participants' experiences, I am looking not to causes (as in quantitative research), but to happenings—I am attempting to “establish an empathetic understanding for the reader, through description, sometimes *thick description*, conveying to the reader what experience itself would convey” (Stake, 1995, p. 39). In embarking on a qualitative research study, I am engaging in a methodology in which “subjectivity is not seen as a failing needing to be eliminated but an essential element of understanding” (Stake, 1995, p. 45)—a methodology in which it takes the researcher a long time to understand what is going on.

Research Design

As noted, the study reported in this dissertation sought to understand the experiences of ten engineering undergraduate students as they participate in a Communication Portfolio Studio; as such, case study is the research genre chosen—specifically, multiple case study, as I am considering the experiences of each of my ten participants to be a single case, “a phenomenon of some sort occurring in a bounded context” (Miles & Huberman, 1994, p. 25). I am interested in the experiences of each participant as a separate case, and not the studio as a case comprising the collective experiences. Further, the primary interest is in understanding these particular ten cases; as Stake (1995) notes, case study involves the “study of the particularity and complexity of a single case, coming to understand its activity within important circumstances” (p. xi). As typical of case study research, I am interested in the unique characteristics of each case, as well as commonalities among them, I am looking for patterns and consistencies in the data; as Stake (1995) notes, the “qualitative case researcher tries to preserve the *multiple realities*, the different

and even contradictory views of what is happening (p. 12). My study includes ten individual cases and produced a large and rich dataset. Miles and Huberman (1994) suggest that the number of cases that can be handled well in a multiple-case study depends on the richness and complexity of the data for each of the cases and that “a study with more than 15 cases or so can become unwieldy” (p. 30). In keeping with the spirit of case study research, with an emphasis on understanding as much as possible about the case(s), the research questions were refined throughout the duration of the study; further, a central focus is providing thick descriptions of the participants’ experiences in order to “establish an empathetic understanding” of these experiences (Stake, 1995, p. 39).

Context and Participants

This study explores engineering undergraduates’ rhetorical awareness and perceived self-efficacy for communicating as practicing engineers, in the context of creating preparedness portfolios in a collaborative setting. With approval from the UW Institutional Review Board, a recruitment email was sent to all engineering undergraduates enrolled in any of nine departments in the College of Engineering inviting students to take a pre-screening survey for possible selection to participate in a paid research study that involved creating a communication portfolio in a studio setting. This sampling was purposive (i.e., the population and processes of interest were selected for); in addition, it was also intended that sampling would have a theoretical component (i.e., one based on relevance to the research questions: professional experience and communication coursework completed) (Merriam, 1998). The number of actual student responses to recruitment did not allow for the demographic desired. Participant demographics and other personal information are summarized in Table 4.1.

Table 4.1 Participant data table.

	Joan	Greg	Tony	Nate	Lori	Sean	Ryan	Craig	Molly	Neil
Demographics										
Department	ME	CEE	Pre	EE	Pre	CEE	ME	EE	MSE	CEE
Gender	F	M	M	M	F	M	M	M	F	M
Family engr.	N	N	N	N	Y	N	N	Y	N	N
School/Work Experience										
Year in school	Sr	Jr	Jr	Sr	So	Sr	Jr	Jr	Jr	Jr
Comm. courses	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Engr. work exp.	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	No
Informing Factors										
Conf. writing ⁵	C	C	C	VC	C	C	VC	C	VC	VC
Conf. speaking	SC	VC	NC	VC	SC	C	NC	SC	C	VC
Import. comm. ⁶	VI	VI	VI	VI	VI	VI	I	VI	VI	VI

My study engaged ten engineering undergraduates, in a five-week study, who were at varying points in their engineering coursework and who had varying amounts of professional workplace experience. Specifically, six of my ten participants reported having held internships, co-ops, or regular employment in a field related to their course of study, ranging from a single co-op experience, to summer internships held for one or multiple years, to ongoing part-time employment. Of the ten participants, seven had already taken introductory technical communication, one had not, and two were taking it the same quarter as the studio. No students had taken an advanced technical communication course in HCDE, two had taken alternatives offered within their own department, and one was taking the advanced course from HCDE the same quarter as the portfolio studio. And, finally, two of the ten participants indicated that English was not their first language – one of these was born in this country, and the other moved here while young. The study was conducted in a small conference room on campus at UW, in which four groupings of work tables were clustered tightly into the room, facilitating group interaction but providing a rather compressed environment. Presentation slides provided a backdrop for some of the discussions and peer interactions. The facilitator and I were the only

⁵ Four-point scale: NC=not confident, SC=somewhat confident, C=confident, VC=very confident.

⁶ Four-point scale: NI=not important, SI=somewhat important, I=important, VI=very important

people in the room in addition to the ten participants. Two participants only were absent from two sessions.

In terms of the differences between Winsor's study demographics and mine, Winsor followed four engineering undergraduates through their five-year programs that included two quarters of study alternating with two quarters of co-op experience throughout the program; and, in addition, included an introductory technical communication course in the freshman year and an advanced one in their senior year.

Data Collection

In order to address the purpose and research questions, this study sought to collect stories told by the participants, in their own words, about their experiences in the Communication Portfolio Studio and about their perceptions of the communication of engineering practice and their perceived self-efficacy for that communication. Information was collected in the form of responses to survey items, reactions offered on feedback forms, and interview transcripts. In addition, the participants' portfolios were collected for analysis: the text of the professional statements and artifact annotations were analyzed, and the artifacts were categorized in terms of the source (workplace, school, and other lifewide experiences) and in terms of their mode or medium (see Table 5.2 in Chapter 5).

Data collection instruments used in this study included pre- and post-surveys, session feedback forms, and interview protocol; participant generated portfolio content provide another data source.

Surveys included both closed- and open-ended items. Closed-ended items intended to get uniform responses from all participants, while open-ended items were intended to provide space for more detailed statements (Creswell 2005). As new understandings came to light, the design of the study evolved; in particular, the role of the quantitative data collection changed. Pre- and post-surveys were administered: some items were matched on both, some only on the pre-survey, and some only on the post-survey. Of the matched items, three standardized

instruments, which had been validated and widely used were employed in this study: (a) the Zimmerman & Bandura (1994) instrument that measures perceived self-regulatory efficacy for writing; (b) the public speaking component of McCroskey's (1982) Personal Report of Communication Apprehension (PRCA-24) (Beatty et al. 1986); and (c) the Communication competence Self Report (CCSR), from the Communication Competency Assessment Instrument (CCAI) (Rubin, 1982). A major portion of the post-survey consisted of the same type of open-ended, impression questions asked in the interview about the studio experience. In addition, both surveys included open-ended items and scaled items about the participants' conceptions of communication.

Feedback forms provided space for the participants to make in-the-moment reflections about their experiences since the last session and during the current session. Four prompts were provided on the form: What did you find rewarding about your experiences? What did you find frustrating? Surprising? Aha moments? Confined writing space encouraged good response rate and brief responses.

Individual one-hour interviews were conducted with all ten participants. As Stake (1995) notes, "The interview is the main road to multiple realities" (p. 64). Interviews were tape-recorded and transcribed verbatim in order to obtain an accurate record. The interviews followed a mostly structured format; the interview protocol with 37 questions – three of which were provisional depending on the timing. Some probes were pre-written on the protocol for obtaining more information from the participant – the intent was to explore answers in more depth (elaboration) or to ask for a more detailed explanation of an answer (clarification) (Creswell 2005). At times, depending on the way the interviews unfolded, not all 37 questions were asked.

Data Analysis

A small pilot study was conducted in order to test my assumptions about the viability of the original dimensions of interest, using a small dataset produced from a prior implementation

of the PPPS pedagogy. Viability was confirmed, and the results of the pilot study were reported in Mobrand & Turns (2011).

The full set of participant data from the six types of data collection were explored using the six dimensions of initial interest: situatedness, empowerment, breadth, self-efficacy, motivation, and studio impacts. These dimensions served as my provisional start list (Miles & Huberman, 1994) for first-pass coding, or filtering. I developed code books for self-efficacy, motivation, and studio impacts and revised the preliminary codebooks that were created for situatedness, empowerment and breadth for the pilot study, based on what I learned from that study. The entire first-pass coding was done with two independent coders: an individual with a literary theory background and experience in higher education working with the same student population as the participants – i.e., engineering undergraduate students coded with me. The code books included operational definitions that ensured that the codes were applied consistently over time (Miles & Huberman, 1994, p. 63). The second coder was trained on the use of the codebooks prior to independent coding, and periodic, brief check-ins helped us keep the interpretation of coding rules consistent (Miles & Huberman, 1994). After first-pass coding of all of the data for the dimensions, we met to record the independent coding, calculate inter-rater reliability (over 90% on average), and negotiate to agreement on those units of analysis where differences occurred.

Unit of analyses were as follows: response to survey item, response to feedback-form prompt, professional statement, artifact annotation, and turn-taking event (for the interviews) (Miles & Huberman, 1994). Agreement calculations and negotiations took place at these levels. Later, it was decided that a more realistic picture of the interview data would be presented if the unit of analysis were the question rather than a turn-taking event, due to the variability in the response styles of the participants. Inter-rater reliability remained above 90% and coding was re-negotiated to agreement. First-level coding summarizes segments of data; pattern coding groups the summaries into a smaller number of themes, or constructs: “for multi-case studies, it lays the

groundwork for cross-case analysis by surfacing common themes and directional processes” (Miles & Huberman, 1994, p. 69); the pattern coding is still considered to be part of first-level coding.

Following the first-tier coding and pattern coding, I began (almost concurrently) a thematic analysis using the constant comparison technique and a within-case analysis exercise for which I wrote brief narratives for the purpose of familiarizing myself more deeply with each participant (Merriam 1988). Miles and Huberman (1994) suggest that it is important to understand the dynamics of each case before embarking on cross-case explanations, to keep the analyses from being at a superficial level (p. 207). I worked back and forth between the narrative exercise and the constant comparison of the participants until I reached a saturation point and no more new themes were emerging from the data (Miles & Huberman, 1994).

It took several months to firm up the major themes and identify the rhetorical awareness construct, locate Winsor as a conceptual framework, and plan for the logistics of applying the framework in the primary three-part analysis for rhetorical awareness, as articulated in the research questions. Thus three separate analyses were conducted. The first analysis looked at what was revealed about rhetorical awareness through participation in the Communication Portfolio Studio casting widely through the entire filtered data (all data sources), excluding direct impact questions. The second analysis looked at the impacts of the Communication Portfolio Studio on rhetorical awareness; and, as such, the analyses examined only three of the data sources (i.e., feedback forms, post-surveys, and exit interviews). The analysis looked first to the direct impact questions, then to those questions that asked about impacts implicitly, and then to those grand tour questions that simply asked for major take-aways. The third analysis looked at the enactment of rhetorical awareness in the Communication Portfolio Studio. Again, as with the first analysis, all data sources were examined, excluding direct impact questions.

It took less time to arrive at Bandura’s sources of self-efficacy information for the conceptual framework for the perceived self-efficacy analyses and plan the application. The

primary analysis for perceived self-efficacy was conducted in two phases. The first phase looked for acknowledged impacts of the Communication Portfolio on perceived self-efficacy for making preparedness arguments and for communicating as practicing engineers. This phase focused on the same data sources as those examined for the impact analysis for rhetorical awareness. Within those sources, this analyses focused on direct impacts questions pertaining to perceived self-efficacy, implied impact questions, and grand take-aways. The second phase was the primary analysis and it employed the framework of Bandura's sources of self-efficacy information. The data set examined was the dataset that was identified in the first phase of the analysis.

Data reporting

Given the richness of the data in this study, and the multiple analyses conducted, data reporting in the dissertation was complicated. In order to give the reader a sense for what portion of the total datasets were represented in the findings in the different areas, I used a variety of strategies depending on the data and the context. In some places, I provide quotes from two participants who are representative of the group in a given area and indicate to the reader that many of the other participants expressed similar perspectives. In other places, I present one or two participants who are very different from larger group (i.e., outliers); in which case, I indicate to the reader that they are not representative of the larger group, but they are included because they provide an interesting perspectives. On occasion, I might include one or two participants who are interesting from a within-case perspective – in other words, they exhibit a range of characteristics or perspectives that were interesting to consider; and, finally, I might describe two participants who have very different perspectives that allow for a contrast and comparison. In places where I thought it would be most effective, I conducted a mini-analysis for a particular perspective that included all participants and then reported the results of that (e.g., half of the participants spoke about oral communication; only a few participants had workplace artifacts).

Methodological Considerations and Trustworthiness

It is important to acknowledge problems inherent in the methodology. The very things that make qualitative research so powerful, also provide challenges. One of the challenges that is particularly relevant for my study is that of self-report. When you rely on the statement of the participants, it is important to keep in mind that some participants *don't know* what to say, some *don't want* to say what they know, some say what *they think the researcher wants* to hear, and some *have trouble articulating*. The other notable challenge for the type of study I have done is the research bias. Qualitative researchers must admit up front that their subjective notions are part of the study; basically, as a researcher, I am an instrument of the study, and my own interpretations of things becomes part of the story. However, there are specific ways that we can strengthen the trustworthiness of our work. I have attempted to address several of these.

Triangulation is one of the ways we can increase the probability that our work will produce credible findings (Lincoln & Guba, 1985). I have used triangulating throughout the analyses, between the different data sources (e.g., survey responses, interview transcripts, portfolio content) (what is often referred to as different methods). Triangulation is a way to get corroboration or, if conflicting data emerge, it is a way to “push us into a more complex, context-respecting set of explanations” (Miles & Huberman, 1994, p. 267). Triangulating within cases allowed me to look at the different ways that a given participant responds under different data collection circumstances, different settings, and different times. In particular, data collection between responses to survey and interview questions and the portfolio content that the participants wrote, provides different types of perspectives, different audiences for the participants writing the text. Peer review is another method for increasing credibility (Lincoln & Guba, 1985). I have engaged in this strategy on numerous occasion when I have discussed my various analyses with colleagues and with my supervisory chair. I have also brought my second coder back in to provide reactions to subsequent analyses I have done.

In terms of transferability, I have attempted to provide thick rich descriptions of the experiences of my participants, to provide as much data as possible about the their experiences and the events that gave rise to “enable someone interested in making a transfer to reach a conclusion about whether transfer can be contemplated as a possibility” (Lincoln & Guba, 1985, p. 316).

For confirmability, I have kept an extensive audit trail of raw data, records of analyses undertaken, extensive memoing, and notes on instrument development. For example, as noted before, two independent coders did the first pass filtering, with negotiation. Skeptical review occurred through frequent conversations with Turns, and the second coder reviewed portions of the second and third level analyses and met on other occasions to review and discuss findings. In addition, I have used the strategy of memoing extensive throughout the project (e.g., Miles & Huberman, 1994), most heavily during the first year and a half (e.g., data collection, first-tier coding, negotiating, narrative writing, thematic analyses, early reporting). The purpose of the memos was to break up the time spent coding data, to provide moments of reflection, ideas for new codes or cross-case pattern, “sunlit moment of clarity of insight – little conceptual epiphanies” (Miles & Huberman, 1994, p 74).

I have also made my assumptions as a research transparent, as well as revealing the assumptions of the facilitator, Turns, who created the pedagogy in use in this study. At the time of the study, I was employed as a research assistant in the UW Center for Engineering Learning and Teaching (CELT). I bring to the inquiry a wide range of practical experiences as a working professional in the UW Engineering Communication Program (ECP), where I taught and subsequently served as the Director – a position that afforded opportunities to train and mentor instructors, develop curriculum, and conduct educational research. As such, I bring insights that could add value to the study. I also acknowledge that my experiences could potentially introduce biases with regard to decisions about research design and interpretation of findings. I have worked to make my assumptions explicit and to critically reflect throughout the entire process

through writing memos and having discussions with my supervisory committee members and other colleagues. I have also worked to overcome issues of subjectivity and to strengthen credibility by engaging a second coder and by triangulating data sources and methods. In addition, Turns, who developed the PPPS approach, served as the facilitator for the communication portfolio studio. Her familiarity with the approach and her skill at facilitation provided numerous benefits for the participants and lent strength to the execution of this study. I acknowledge that Turns' involvement could potentially have introduced biases into the process; however, we worked to overcome this potentiality dividing the duties of the facilitator and researcher carefully. As facilitator, Turns guided the participants through the PPPS activities, following the standard procedures in the PPPS facilitator's guide; as researcher, I handled all of the interactions with the participants that dealt with the engagement in a research study — recruitment, study introduction and consent process, survey administration, interviewing, and compensation.

5. SOCIALIZATION THROUGH EXPERTS AND GENRES

This chapter presents the findings for the analyses of rhetorical awareness that addressed Research Question 1: With respect to socialization through experts and genres (i.e., what counts as professional communication for engineers):

- A. What is *revealed* about the participants' rhetorical awareness through their engagement in the Communication Portfolio Studio?
- B. What *impact* does engagement in the Communication Portfolio Studio have on the participants' rhetorical awareness?
- C. What does the participants' *enactment* of rhetorical awareness in the Communication Portfolio Studio look like?

Findings for Research Question 1 are presented according to the sub-themes of the socialization component of the rhetorical awareness framework: (1) Recognizing and Learning the Genres of Practice, (2) Performing the Genres of Practice, and (3) Communicating as Engineers. As noted in Chapter 2, these sub-themes emerged from the participant data and were used because they aligned with key points in Winsor's discussion of socialization through experts and genres. Within each sub-theme, findings are presented for each of the three analyses: (A) revealed, (B) impacted, and (C) enacted.

Of note, participant quotes provided in this chapter include citations to data sources (see also Chapter 4).⁷ In addition, a list of participants' workplace experience and communication courses they have taken is provided here for reference in reading the findings (see Table 4.1 in Chapter 4 for a full summary of participant demographics):

- Engineering-related workplace experience
 - Yes: Joan, Greg, Tony, Nate, Sean, Craig
 - No: Lori, Ryan, Molly, Neil

⁷ AA=artifact annotation, I=interview, FF=feedback form, PoS=post-survey, PrS=pre-survey, and PS=professional statement.

- Engineering-related communication coursework
 - Within the discipline: Greg, Sean, Neil (CEE)
 - Outside the discipline (e.g., HCDE 231): all but Molly

Key findings for each of the major sub-themes, and types of analyses within each, are overviewed in Table 5.1.

Table 5.1 Overview of findings for Research Question 1, socialization through experts and genres, by sub-theme and analysis (i.e., revealed, impacted, and enacted).

Recognizing and Learning the Genres of Practice	
<i>Revealed</i> : Genre learning in different worlds	<ul style="list-style-type: none"> • Similarities and differences between workplace and school genre learning • Influences of workplace/lifewide experience and individual differences
<i>Impacted</i> : Expanded notions of genre	<ul style="list-style-type: none"> • Conceptions of genre were expanded through peer interactions • Mediated by workplace/lifewide experience
<i>Enacted</i> : Working with studio genres	<ul style="list-style-type: none"> • Conflicts with genre expectations for preparedness portfolios • Challenges/successes with genre learning, experiences varied
Performing the Genres of Practice	
<i>Revealed</i> : Measures of performance	<ul style="list-style-type: none"> • Ways of measuring success of genre performance vary • Mediated by workplace/lifewide experience and rhetorical setting
<i>Impacted</i> : Re-thinking performance	<ul style="list-style-type: none"> • Re-thinking original purpose and measures of performance of prior work • Recognizing new value and use in prior work
<i>Enacted</i> : Liberated performance	<ul style="list-style-type: none"> • Freedom from grades and detailed guidelines; flexibility appreciated • Some concerns for correctness persisted despite flexibility and lack of grades
Communicating as Engineers	
<i>Revealed</i> : Stereotypes and disconnects	<ul style="list-style-type: none"> • Concerns for stereotypes about engineers as communicators • Disconnects between engineering and communication
<i>Impacted</i> : Increased awareness	<ul style="list-style-type: none"> • Increased awareness of the importance of communication skills in practice • Thinking more deeply about what it means to be a communicating engineer
<i>Enacted</i> : Representing self as communicator	<ul style="list-style-type: none"> • Role of communication in practice, visions of self as communicator • Enacting beliefs through artifact selection; problems with access

Recognizing and Learning the Genres of Practice

Findings are presented, categorized by the three analyses, as follows: (a) genre learning in different worlds (*revealed*); (b) expanded notions of genre (*impacted*); and (c) working with studio genres (*enacted*).

REVEALED: Genre learning in different worlds

Participants shared stories and made statements that revealed differences and similarities between genre learning experiences in the workplace and in school. Their statements suggest that

workplace and lifewide experiences, as well as individual differences, may have influenced their genre learning experiences in school.

Joan and Greg provided the most detailed accounts of their entry into the workplace as interns and were the only participants of the five with workplace experience who commented specifically on their reactions to learning the discourse and ways of practice at their workplaces. As such, their stories are highlighted here.

With respect to socialization into the workplace through genre learning, Joan recalled her first summer at the naval shipyard and how intimidated she felt being surrounded by experienced engineers. As she recalled the challenges, she also recalled the support she received:

I felt very intimidated to suddenly be placed in a group of experienced engineers that had been through school and had many years of experience on the job. However, I was assigned a mentor who I could talk to each day and come to him with any questions I had. Here I learned how to talk to people who were from a technical background [PS].

Joan also specifically described the different jargon she had to learn in order to participate in the conversations: “a lot of the people you work with are ex-Navy, too, so they have a lot of like their own--all their acronyms and stuff, so you have to learn that to communicate with those guys.” Joan also described various forms and associated protocols she had to learn: “I think other firms would have the blank forms they use, too, and you have to learn how to cite their sources instead of—like the shipyard has their own database, you have to learn how to find the documents and cite the protocol” [I15].

Greg described his entry into the workplace as an intern at a city public works office, noting how rapidly he realized the difficulties he faced as well as how slowly he perceived the learning process to be. “I quickly learned the hard way what it was like to have to communicate inside of the engineering world” [PS]. Greg, like Joan, recalled having to learn the forms, vocabularies, and protocols in order to accomplish his assigned tasks:

Slowly and painfully learning the reasoning behind numerous requirements, standards, and policies taught me the value of acquiring knowledge in order to communicate valid information. As I learned the answers to the hundreds of questions I had to answer, I also had to learn the correct way to communicate them. This experience was much like learning a second language through total emersion [PS].

Nate, on the other hand, did not speak much about his initial entry into the workplace; however, he did share one initial reaction to his internship with a major airplane manufacturing company, a reaction that reflected the differences he experienced between being socialized into engineering practice in school versus the workplace. Specifically, Nate described being surprised when he learned that the engineers at his internship spent a large portion of their time attending meetings, reading and answering email, preparing oral presentations, and writing standard documentation. He commented that these activities were very different from the technically-focused engineering activities he had been engaged with in school: “I really thought that engineering was about, um, doing calculations and everything, but, you know, just having that exposure, I, you know, actually understand what engineers do” [I15].

Craig, like Nate, did not describe his initial entry into his internship as a software engineer; he did, however, share more than other participants about his specific work products and role in interoffice communication. For example, he noted that he wrote design proposals, prepared business charts for the CEO, wrote collaboratively, and communicated regularly with co-workers across the company: “sending e-mail is prime...like a major mode of communication” [I15]. Craig also made a statement about how he had learned, through trial-and-error, the best way to communicate with his supervisor:

talking to my supervisor at work about a few things, sometimes...every once in a while I kind of just like to acknowledge, dump, or whatever, and sometimes that comes off not that well, when I've kind of improved...keeping things down to bite-sized chunks, we need to do this, we need to do this, we need to do this [I9].

With respect to learning the genres of engineering practice in school, it is important to note that participants' stories here are drawn from different environments – courses from within

their respective engineering disciplines, from other related scientific or technical courses, and from stand-alone professional communication courses. Stories from Sean and Neil are highlighted first because they both described experiences with the same junior-level laboratory writing course taught in their engineering discipline (CEE). Their stories reveal two very different perspectives on genre learning in school: one appeared to embrace the challenges and see the school assignments as representative of the genres he would encounter in the workplace, while the other cast a doubtful eye on the usefulness of the few genres they were learning.

Sean described his initial struggles with the CEE course, the ways in which he obtained help, and his resultant self-confidence in writing as an engineer:

In the beginning, I had trouble developing well-organized lab reports. I eventually sought help from classmates, faculties and even the ASCE writing center. Now I have fully adapted into the system, and feel extremely confident with my writing abilities as an engineer [PS].

Neil's description of his experience with the same CEE laboratory course and, more broadly, with the CEE curriculum is quite different from that provided by Sean. Neil spoke about the rather unbalanced way in which students are socialized into engineering writing: "We really don't do too much writing, with the exception of lab reports, which are like obscene amounts of writing" [14]. In addition, Neil indicated that the minimal feedback students receive on their writing is provided at the same time they receive their grades, noting that

by then you're already done with it, so sometimes you don't have as much motivation to look over the feedback, whereas if you still have grading that's going to come up after the feedback process, you're generally more attentive to it [14].

Sean indicated on several occasions that he felt confident about his abilities to communicate as an engineer, that he felt he had been conditioned into the proper way to do things for engineering practice. However, he also pondered whether the standard genres they were writing in class provided the right preparation for communicating in the workplace, or whether there was something more profound to learn:

the assignments are based on the type of assignments that we're going to do after graduation, so if we're doing a report right now, we're going to have to write reports as engineers, right? But that's really a fundamental aspect...and everybody knows that, as engineers you have to write reports, and it doesn't really help the deeper level of communication that's required [I19].

Sean also described other ways that his department tried to teach the students about communicating as engineers—specifically, by inviting practicing engineering to come and talk about their work. Sean noted that the speakers typically touched only generally on communication: “they don’t really elaborate, they’re just saying, okay, communication is important...so we don’t get many opportunities to learn about it” [I19]. In addition, Neil, remarked on more than one occasion that communication could not be learned in formal educational settings—that it was a natural talent strengthened through experience: “I feel like communication is learned through being thrust into experiences and adapting, as opposed to discussing it or reading about it” [PoS26].

With respect to genre learning experiences from a science course outside his own department, Ryan spoke about a laboratory writing course in biology and the way in which the instructor used grades to enforce compliance with the notion that reports should include only facts. The following statement, alongside many other similar examples from other data sources, suggests that Ryan may have internalized the instructor’s belief system and carried it into his other coursework—both disciplinary and technical communication:

I feel like for your average lab report, teachers will cut you points in like any class if you put anything persuasive in there...it really comes into a matter of fact versus opinion, so when you look at information in a science essay or a report or just a simple lab write-up, it's supposed to be very factual [I21].

In addition to specific stories from his university years, Ryan made more general statements about being indoctrinated into his thinking about communication, even from an early age: “And so for the past 18 years I've been conditioned to believe that that's what communication is, that you communicate via writing and via speeches” [I16].

Participants also shared stories about learning the genres of engineering practice in stand-alone technical and professional communication courses. For example, Ryan commented that many of the artifacts he included in his portfolio were from HCDE 231 and that he found them particularly relevant for his preparedness argument: “they do a lot of things like that, the memo, the instructions, the research projects, PowerPoint presentations, things like that. So it was extremely relevant in that context” [I4]. Ryan’s statement suggests that he believes the genres they are learning in the technical communication class are representative of those that he will encounter in the professional workplace—a view that was shared on occasion by Lori, who also had no engineering workplace experience and who had not yet taken many disciplinary courses. For example, Lori noted that her introductory technical communication course was one of the primary pieces of supporting evidence that “help show my effective communication skills as a practicing engineer” [PS]. Tony provided a glimpse into genre learning in his technical communication course when he spoke about the different ways that he approached writing depending on the genre he was performing. For most of the genres he discussed (e.g., English essay, e-mail, journaling), he explained that he just jumps in (with e-mail he does a lot of re-reading); but for technical reports, he adopts another approach: “but if it's like a research paper, like I have to do for HCDE, I'll definitely like read the sources, like find quotes, and then start writing before I just jump in” [I11]. Tony’s statement suggests that he not only socialized into the particular ways of doing in his technical communication course, but also that he may transfer these practices to other situations (e.g., “if it’s like a research paper”).

When participants were asked whether learning the proper format for a particular genre (e.g., proposal, technical report) in school will be useful in the engineering workplace,⁸ all agreed or strongly agreed. In addition, when asked if their college coursework had prepared them to communicate effectively as a practicing engineer, nine of ten agreed or strongly agreed.

⁸ On a four-point agreement scale (1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree).

In addition, when asked in an open-ended question about school providing opportunities for the participants to produce work that could be leveraged as artifacts for their communication portfolios, Joan spoke about the laboratory reports that she had written: “the analytical thinking, like the appendices that I have had to make like explaining all my calculations, paragraphs, basically, so I think that helps” [I19]. Nate mentioned his HCDE class in passing, focused on the laboratory reports that they had to write in electrical engineering:

“We would, you know, write lab reports. They can vary from, you know, a few pages long to, um, 50, 60 pages. You know, that happens, you know, when we have to, you know, include a lot of schematics and diagrams, tables. It adds up really quickly... Yeah, there's a wide range of different lengths of lab reports, yeah” [I19].

Ryan indicated that his education (specifically, English courses) had provided some specific communication experiences, but that he was lacking in many areas: “I've got just essays and just a few videos of oral presentations, but other than that, I don't have anything else” [I19]. Genre learning experiences are also highlighted in the following section, which provides participant statements about the impact of the Communication Portfolio Studio on their notions of the genres of engineering practice. Sean indicated that, although he believed that the reports they learned in the CEE laboratory writing course would be similar to those encountered in the workplace, the preparation they are getting “doesn't really help the deeper level of communication that's required [in the workplace]” [I19]. Molly spoke about having significant writing experiences from her coursework in the humanities before switching her focus to engineering, but that she did not have experience with other forms of communicating. She explained that her recent coursework was providing her with opportunities to create work products that she could use to show that she was ready to communicate as a practicing engineer: “I had never made a PowerPoint before like last summer... But I've already made, I don't know, five PowerPoints since I've been at the U-Dub... so like we'll make a lot of that here” [I19].

IMPACTED: Expanded notions of genre

Most participants indicated that their conceptions of genres of engineering practice had been expanded by their experiences in the Communication Portfolio Studio. The number and strength of impact statements appeared to be mediated by workplace and lifewide experience.

As might be expected, those participants with little or no engineering-related professional workplace experience (i.e., Lori, Sean, Ryan, Molly, and Neil) made several statements about having their conceptions of engineering communication expanded. Further, the participants with significant lifewide experiences, such as leadership and other organizational activities, returning to college after other life experiences, or changes in major (e.g., Neil and Molly), tended to express milder impacts than participants who began college at a more traditional age or who had few organizational communication experiences.

In terms of participants with little or no workplace experience, Ryan and Molly's stories are highlighted here to show similarities and differences in terms of impacts of the Communication Portfolio Studio on their notions of the genres of engineering practice. It is useful to recall that both Molly and Ryan had no engineering workplace experience but did have other employment experience. Specifically, Molly was a non-traditional aged returning student with other life experiences, and she was relatively new to engineering and had taken no technical communication courses. Ryan was in his junior year in MSE and taken had introductory technical communication.

Ryan commented on a number of different occasions that exposure to the ideas of other participants, through discussions and peer reviews, had challenged his prior notions of the genres of engineering practice that he had acquired in school (many of these notions were discussed in the previous section): "[it] really opened my eyes in terms of what can be considered communication" [I10] and, on another occasion, Ryan made this observation:

[Lori] had a picture of her in a group at her church, and I had never really thought that photographs were communication, but after kind of looking at that, I realized that really I

mean anything can be communication if it's really a representation of an idea or a concept that kind of relays some form of information to another person looking at it [I16].

Ryan spoke about being conditioned to believe that communication was essentially writing and making presentations and that the Communication Portfolio Studio had helped him see otherwise: “there are many forms of communication and that the writing and speaking that students perform in school is really only a very small piece of effective communication” [PoS21]. In addition, Ryan spoke not only about having his views of genre expanded, but also his basic conceptions of the nature of communication: “I think that it [the studio experience] really helped me to identify what communication was and what artifacts would be relevant” [I22] and “I felt like I never considered communication before” [I30].

Molly indicated that the Communication Portfolio Studio had expanded her notions of the genres of engineering practice, by sharing, as did Ryan, some of her prior conceptions: “It [the studio experience] also encouraged me to think about how many different types of communication there are, since I usually think of just writing and speaking” [PoS15] and, similarly, on another occasion: “I had to keep reminding myself just, okay, it's not just writing...as much as I have that...I'm good at it, it's not the only thing... So seeing what people came up with was helpful to think about ways to get out of the writing box” [I4]. Although Molly did acknowledge on several occasions that her conceptions about communicating as an engineer had been expanded through interacting with peers in the Communication Portfolio Studio, she also shared stories that indicated that she did not always change her ways of thinking based on her experiences in the Communication Portfolio Studio:

I did even see things in other people's portfolios that I was like, that doesn't count as communication. Why would you put that in there? That doesn't have anything to do with it. Or maybe it does, but I wouldn't put that in there. So I tried not to be too judgmental ...it's an exercise in judgment of what's included... [I16].

It is possible that Molly’s adult life-wide experiences made her less likely to be influenced by peers’ views than some of the other participants. And, finally, Molly described ways in which the

experience had helped her to see communication in a new light: “it's made me think about it a lot more, especially in relation to engineering in particular...you have to be able to communicate as an engineer...we hear this but never really thought about what it means” [I30].

Statements from Sean, Neil, and Lori provide a brief look at the perspectives of the other participants with little or no engineering-related workplace experience. For example, Sean indicated that the Communication Portfolio Studio had had a large impact on his understanding of communication, noting that perhaps others with more communication experience may not have benefitted as much:

Personally, I learned a lot...for somebody who has a really deep background in the communication and they're already a really good communicator, they probably wouldn't learn as much. But it's really good for people like me who have a limited opportunity to learn about communication in the past [I6].

As noted before, Neil indicated many times that he believed communication was learned through life experiences and could not be taught in school or even in the workplace. However, Neil did comment at times that seeing the portfolios of other participants had helped expand his views of what counts as communication for engineers. For example, he made the following statement about blogging: “I wouldn't have necessarily associated that with communication, but it really is...it's overlooked, I think, because it's just a common thing that you'll see in our culture today” [I10]. Along similar lines, Lori indicated “I guess before I came here, I didn't really think about certain things like a PowerPoint being a way to communicate” [I16]. Lori also spoke about how the Communication Portfolio Studio experience not only helped her to see the importance of giving presentation, but also provided opportunities for practice that led to a new desire to take a speaking course: “after this and after just knowing how important it is...I mean to engineering specifically, but it can also be applied to other aspects in my life, I think. So, yeah, I definitely do feel more motivated. Like I said I like wanted to go and take COM 220” [I29].

With respect to participants with significant amounts of engineering workplace experience, whether internships, coops, or regular employment (i.e., Joan, Nate, Tony, Greg, and

Craig), fewer or subtler impacts from the Communication Portfolio Studio were noted regarding their notions of the genres of engineering practice. For example, Joan stated that her ideas about the communication of engineering practice had been well formed through her years in school and at her internship in the naval shipyard: “the portfolio project just kinda helped reinforce what I already knew, I think” [I10] and “I already knew what to expect from working as an intern” [PoS21]. Perhaps conversely, Joan (on a separate occasion) expressed one of the most startled responses to the ideas of her peers in the studio session: “Relationship can be used to stand apart from the crowd. It's a bit shocking” [FF:Aha]. This reaction on her in-session form was in response to Neil’s comment about using his ability to communicate successfully in a long-term relationship with his fiancé as evidence of his preparedness to communicate professionally.

Likewise, Nate indicated that his views on genre had not been influenced much by the Communication Portfolio Studio experience, but that he was surprised by the range of artifacts that his peers came up with, “Lots of variety of artifacts can be used” [FF:Surp]. He also commented that he had seen artifacts in his peers’ portfolios that he would not have thought of before and that he thought worked effectively as evidence for their preparedness arguments [I4]. Tony had suggested including an email from work as evidence in his portfolio, commenting that he was not sure if it would be appropriate or not. He received positive feedback from the facilitator and other participants on this idea, “I learned the value of email, instant messaging, and phone calls in the workplace” [FF:Rew], which then prompted him to consider other forms of digital communication, such as texting or instant messaging. Tony indicated on a feedback form at the end of the first session that his “Aha” moment was “why communication in the workplace like email and IM was a valuable skill I never knew I possessed.” Other participants indicated they were influenced by Tony’s ideas (e.g., Neil’s comment about blogging).

Greg typically indicated that his notions of communication were not affected by the Communication Portfolio Studio experience; however, his description of learning to create a

preparedness portfolio suggests that his previous notions of genres were expanded to include the portfolio genre:

I can't think of anything that I really learned. I mean it got me to think. I like to think. So I didn't really learn anything new, I just kind of thought more about it, about the process. I guess I learned the process, because I had to think about the process as I was actively going through it... [132].

Craig, like Joan, noted that his notions of the genres of engineering practice had been mostly formed during his internship; however, like Molly, he also indicated that the Communication Portfolio Studio had prompted him to think more deeply about what communication actually means, especially in an engineering context. In the following statement, Craig focused on the ways in which the studio helped to make an abstract concept, like communication, more concrete—something that he could engineer:

I don't know, kind of--and before all that it was--communication was kind of a, I don't know, a vague concept, because then as we get to making the portfolio, you kind of see you have your visual, your textual, like you actually can--it was actually kind of a science behind communication rather than just like, oh, you're good at communicating or, you know, kind of thing, it's something you can actually structure rather than kind of just go with the flow [116].

Craig's statement suggests that, by promoting his communication skills and experiences within his preparedness portfolio, he was forced to think critically about the nature of those skills and experiences relative to the communication tasks he envisioned encountering in his future career as a practicing engineer.

ENACTED: Working with studio genres

The participants' statements about, and experiences in, the Communication Portfolio Studio revealed conflicts with genre expectations for preparedness portfolios, as well as challenges and successes with learning the various genres that made up the genres sets learned in the rhetorical community that convened for the purposes of making preparedness portfolios

(Devitt, 2004; Miller, 1994). Stories and discussion suggest that genre learning was experienced unevenly by the participants.

Despite the challenges, all participants acknowledged, on one occasion or another, having learned to make a preparedness portfolio; all participants did, in fact, not only learn to create a portfolio, but in five weeks' time, they completed, uploaded, and orally presented their portfolios to their peers in the Communication Portfolio Studio. The written and oral genres that made up the genre sets that the participants learned include the preparedness portfolio, two-minute elevator pitch, feedback forms, and assorted genres associated with supporting activities (e.g., thinking-aloud exercise, peer review). The genre sets that the participants perform as they carry out the work of the Communication Portfolio Studio in an organized way, constitute a genre system (Bazerman 2004). The preparedness portfolio, as a single genre, is made up of three elements: the professional statement, artifacts, and artifact annotations.

While only one participant had made an online portfolio before, many participants came to the Communication Portfolio Studio with pre-conceived notions about portfolios that were challenged by the preparedness portfolio task they were asked to do. For example, Greg (highlighted here because he was one of the most vocal about his challenges) expressed surprise that he was asked to include a professional statement in his portfolio: "when I think of portfolio, I've always thought of kind of like an artist portfolio, something you basically fold out and here is "Exhibit A, Exhibit B, Exhibit C" and something you walk somebody through" [I1]. Greg also described being surprised that the portfolios were to be implemented as a website:

the biggest surprise was when we first started finding out that the portfolio was going to be something that was done on line and not something that was hard copy, because in my mind, I don't know why, I've always viewed portfolios as something that you take with you to an interview [I1].

Sean also expressed surprise that the portfolios were to be implemented online: "one other thing really surprised me, and that's the website, making the website...I didn't expect that" [I1]. As with his genre learning in school, Sean was proactive. He was one of two students who stayed

after the first studio session to have the facilitator walk him through the Catalyst website tool, and he listened attentively during sessions to anything that was offered up in terms of help with that tool:

the first time you guys give us the introduction how to use it, it was really helpful...I wanted to make sure I know how to use it exactly. I didn't want to make any mistake on that...I'm not really a technical person. I'm an engineering student, but ironically I'm not really...that technical about those kind of making websites and stuff [I2].

Ryan was also surprised that the portfolios were to be implemented online and expressed frustration that he was asked to make a website. Across all data sources and time, Ryan made statements that suggested his experience in the Communication Portfolio Studio was occasionally negative due to his unfamiliarity with technology. For example, Ryan indicated that it would have been very helpful, in terms of alleviating some anxiety surrounding learning the professional statement element of the preparedness portfolio genre,

if there was some kind of tutorial...so that people who are kind of technologically inept like me would have some kind of template...it was just stressful for me trying to figure out how to make it work...make sure that my professional statement was uploaded [I2].

An additional statement from Ryan shows not only his struggles with the actual tools, but a concern for privacy:

I spent easily three or four hours just trying to find Common View...I had to figure out how I was supposed to open it up...I wanted the portfolio development group to be able to read it, but at the same time I didn't want it to be wide open so anybody out there could go copy my engineering application essay or engineering tool [I32].

Lori also discussed technology, commenting on her struggles incorporating as much of a video clip as she wanted to in her portfolio: "The most frustration I had was trying to upload a video but the limit was only 20 MB and so I had to find an excerpt" [FF:Frust].

Participants made statements indicating appreciation of the collaborative environment in which they became familiar with portfolios in preparation for learning the particular genres. In

particular, Lori commented that it was rewarding “Getting to listen to everyone else's ideas and learning about what a portfolio is and what it can do” [FF:Rew].

As noted before, the preparedness portfolio (made up of the professional statement and the artifact annotation elements) was one of the genres that participants learned in the Communication Portfolio Studio. Participants were given a handout describing professional statements and another describing annotations and artifacts. The handouts briefly provided the purpose of the two elements and gave simple guidelines for their form (e.g., suggested word counts) (see Chapter 4). Participants were not given samples to use as models, although the facilitator showed a few examples of preparedness portfolios onscreen during one of the studio sessions. Learning these portfolio elements was experienced in a variety of ways by the participants.

In terms of learning the professional statement elements, a few participants ran into conflicts between the expectations of the portfolio genre (e.g., the annotations and associated artifacts should support the claims in the professional statement) and their ability to make the preparedness arguments they wanted to make (e.g., the artifacts that they needed to support the claims they wanted to make were unavailable due to confidentiality concerns or lack of access; or, the artifacts that were available did not support the skills they wanted to highlight in the professional statement).

Greg solved this conflict by breaking with the expectations of the portfolio genre and writing the professional statement that he wanted to write even though he was not able to access the work products he needed to support the claims in the statement. He reflected later about the frustration that this mismatch caused him: “I hate my professional statement. My professional statement by itself is good, but it doesn't relate to my artifacts very well... it's kind of disappointing.” [PoS6]. Molly solved the problem of matching artifacts to claims by approaching the professional statement elements in reverse order, locating the artifacts she wanted to use and then making claims that the artifacts could speak to: “I didn't really write it [the professional

statement] until after I had put all my artifacts together” [I17]. Similarly, Tony’s genre learning experience with the professional statement lead him to conclude that he would approach the portfolio genre differently next time: “I would revise my professional statement to reflect and tie in my artifacts. When I wrote this portfolio, I wrote my professional statement first. However, in future portfolios, I would add artifacts first, THEN write my professional statement” [PoS7]. Despite Tony’s observation above, he commented that the portfolio creation experience was easy and enjoyable: “I could locate artifacts quickly without much hassle. Also, I could annotate them very easily as well because I knew everything there was to know about them (because I am the chief author and owner of all of them)” [PoS3]. Joan explained that a challenge for her was “wording my personal statement in a way I didn't sound conceited” [I2].

In addition to the professional statement, Ryan experienced challenges learning to write artifact annotations, and he indicated that he would have appreciated more explicit guidance: “I was confused in terms of whether or not it was an explanation of what the artifact was or whether or not it was effectively a synopsis of what our personal artifacts were... I wasn't entirely sure what exactly to write” [I2]. Ryan appeared to have overcome his difficulties, on some level, about the annotation writing, as indicated by a statement at his exit interview:

I just felt like writing the artifacts was easy, writing the personal statement was easy. I mean I feel like in general I'm a pretty decent writer and that I do have the material, it's just a matter of uploading it correctly that was really a hassle for me [I4].

Ryan’s use of the word “artifacts” in the above quote, rather than “annotations” is likely just a slip of the tongue.

Neil wrestled with the way the terms *artifact* and *annotation* were used in the Communication Portfolio Studio. Neil spoke about his frustration during the studio session, noting that he did not see how the annotations, as described by the facilitator and in the brief guidelines received, could accommodate the leadership experiences that he wanted to include as evidence in his portfolio: “the biggest challenge was just the terminology that we used with the annotations and artifacts...artifacts, that to me sounded more like the document or a physical

thing, and I wanted to do--kinda branch it out a little bit to... positions and stuff" [I2]. Neil's statement, like Greg's, seems to suggest that he experienced a conflict between his desire to follow the guidelines given for annotations and his desire to include particular content in his preparedness portfolio. Through iterative drafting, receiving feedback, and revising, Neil appeared to have resolved the conflict and produced annotations for all of his artifacts – written documents and life experiences alike. In fact, the annotations that Neil wrote for his leadership and teaching experiences were detailed and made compelling arguments about why the associated artifacts supported an argument of preparedness to communicate as a practicing engineer: "The responsibilities presented challenges, but the process has stretched me to become more comfortable communicating from a leadership role" [AA1]. In contrast, the annotations he wrote for the two written reports that he included in his portfolio were very short and relatively lifeless: "I created a poster explaining an accelerating expanding universe, which showcases my capability to convey information clearly in a visual format" [AA5]. Few participants other than Ryan and Neil commented explicitly on struggling with the annotation genre. Molly indicated that "Although writing the annotations wasn't hard, it was hard to know when they gave enough information to be thorough and helpful" [PoS4]. Many participants found that writing annotations was rewarding or helpful (e.g., Sean, Joan).

Participants spoke about their experiences learning other genres in the Communication Portfolio Studio genre set (e.g., the two-minute elevator pitch, thinking-aloud exercise, feedback forms, and peer review). The thinking-aloud exercise was an unfamiliar genre for nearly all of the participants; some found this exercise to be rewarding and helpful, while others found it awkward, difficult, or rushed. Molly found it hard to refrain from talking directly to her partner:

The talking aloud thing, we--I hadn't done that before... Yeah. I felt very much like I had to talk to the person, which was not the idea, but like just our social customs are so powerful... I don't have any option. I'm compelled to talk to you, can't just talk near you [I4].

Molly's story reveals the frustration she felt when trying to resolve what appears to have been a conflict between performing the new thinking-aloud exercise, as modeled by the facilitator, and her existing expectations for genres of interpersonal communication. Sean also commented on the challenging nature of the thinking-aloud exercise: "The "read-aloud," it's hard to say exactly what's on my mind" [FF:Frust].

Craig described how he customized the elements of the artifact annotation to establish an organizational scheme for each annotation, standardizing the logic he used when supporting the claims in the professional statement, which enabled him to write the annotations more efficiently and to produce a portfolio with a consistent look:

Once the statement was constructed it was fairly easy to add artifacts here and there and use the same formatting/strategy in presenting them. I really got into a flow once I figured out what I wanted to show about myself through each of the artifacts [I3].

This statement suggests Craig is aware of the inter-relatedness of the professional statement and artifact annotation elements of the preparedness portfolio genre and, perhaps, that he understands that they do not operate in isolation, but, rather, that they work together, with one influencing the other.

Performing the Genres of Practice

Findings are presented, categorized by the three analyses, as follows: (a) measures of performance (revealed); (b) re-thinking performance (impacted); and (c) liberated performance (enacted).

REVEALED: Measures of performance

Participants' statements and stories indicated that they measured the success of their genre performances in a variety of ways: some relied on external evaluations (e.g., grades, accolades); some on internal evaluations (e.g., perceptions of adherence to rules and conventions, perceptions of meeting the specifications of the assignment or other communicative exigence, perceptions of expertise and/or effort expended); and some on the observed outcomes of their

communicative performances (e.g., change in behavior or state, attainment of a particular achievement). Participants' statements reflect concerns for correctness – doing things the *right* way, whether that be inferred from external assessment, internal assessment, or observations of state. Further, the criteria chosen by participants for measuring their communicative success appear to be related to the rhetorical setting, as well as the participants' workplace and other lifewide experiences.

Stories from Ryan are highlighted first, as he made the most statements that addressed measures of performance – far more than any other participant. An analysis of participant data that included trigger words (e.g., *correct, right, should, supposed to, grades*), when used in reference to their own work, found the following: 15 occurrences in Ryan's statements, and only 1 to 3 occurrences for each of the other nine participants. Note that participants' statements were offered up when describing the effectiveness of their work, or when responding to open questions about their communication experiences (in school, in the Communication Portfolio Studio, or in life).

For example, Ryan's attention to correctness is characterized by his statement about typical motivators: "Usually I'm under the gun trying to get a grade or trying to meet certain criteria" [I4]. In describing why he included a particular artifact in his portfolio, Ryan explained "It represented what I thought was a really solid speech. I received a really high grade on that, and it really represented my knowledge about human genetic engineering and how that's influencing future" [I17]. This statement reveals Ryan's reliance on grades, as well as his perception of his own domain knowledge, in evaluating his own work. In another artifact annotation, Ryan leveraged the praise of others in making his argument that he was prepared to communicate in practice: "I was told by numerous people that my organization was great and that I had written a very strong essay" [AA5].

The next two examples provide a comparison between Ryan and Craig's methods of measuring their successes. Specifically, Ryan included a set of instructions that he had written for

a technical communication class as an artifact in his portfolio. In the annotation for this artifact, Ryan devoted more space to talking about the grades and accolades from peers than about his writing and use of graphics:

My instructions earned a 3.8 and also received numerous accolades from my peers during the revision phase. This assignment is unique in that it demonstrates not only my capacity to write efficiently, but also to effectively use graphics to help explain a complicated process... This assignment was a resounding success and everyone who read this assignment was thoroughly impressed [AA3].

Craig's annotation for the source code tutorial that he included as an artifact in his portfolio provides a contrasting picture. Craig, like Ryan, described using conventions of writing to address a particular audience and situation. However, unlike Ryan, Craig did not mention grades or other forms of external evaluation. Rather, he argued for the success of the tutorial based on the document's ability to serve the purpose for which it was intended – and, more importantly he tested it himself to ensure that it worked:

This tutorial was an in-house document/memo targeted towards a general audience (technical or non-technical) so that basically anyone could read, follow, and perform the steps outlined. Clear and concise steps and useful and accurate information are both important. I performed the steps as if I were the person going through my tutorial to ensure that it was effective in its purpose [AA3].

These annotations written by Ryan (with no professional workplace experience) and Craig (a software engineering intern) for similar types of artifacts (instructions and tutorial) support the notion that professional workplace experience mediates the ways in which the individual participants measure their communicative successes.

In terms of concerns for correctness based on internal measures of success, Lori spoke, on multiple occasions, about her communicative acts as successful in terms of adhering to rules and conventions of writing and speaking. For example, Lori described her strengths as a writer in this way: "I guess an example would be my tech writing, technical instructions that I did, I guess just being able to utilize like white spaces or like making the headings bigger so people can find it

quickly” [I23]. On another occasion, Lori described feeling effective during an oral presentation, “If I’m like well prepared, then I will speak loudly so everyone can hear me, I’ll look around and make eye contact with everyone and keep them engaged in my conversation” [I24].

Tony and Sean also commented explicitly about writing to teachers as audience. Tony spoke about writing to the teacher for the purpose of earning a high grade: “I know for my English class right now I write for my teacher, she grades it, and same with my other technical communication class” [I11]. Sean also spoke about writing to the teacher; however, he did not focus on grades, but on being understood (which could result in high grades, but also represents a different and perhaps more transferable goal). In addition, Sean’s statements made explicit his awareness of being conditioned; and, further, that other students were conditioned as well: “I’ve been here four years, and all the assignments I did are pretty much geared toward--yeah, trying to make the instructor understand what you’re trying to say... I’m pretty sure a lot of people are conditioned” [I11].

Further exploration of measures of performance used by the participants is provided by an analysis of responses to one interview question in which they were asked to think about a time when they felt they had communicated effectively. In generating these stories, the participants were encouraged to think of communication in an engineering or other professional situation, but, in the end, they were not constrained to these situations. Participants drew their examples as follows: five from lifewide experiences, three from courses in college, and two from the professional workplace. All of the participant stories described communicative acts for which the measure of performance was, for the most part, tied to the actual purpose of the act and not to an evaluation of the performance of the genre involved in the act. In addition, all experiences chosen were oral communicative acts.

Lifewide experiences were chosen by Neil, Nate, Molly, Greg, and Ryan. Of these, two had professional workplace experience. Nate was moved on several occasions to talk about a transformational communicative moment from his youth rather than his current workplace acts.

Greg typically focused on persuasion and manipulation when talking about effective communication, which may explain choice of interpersonal conversation rather than workplace communicative acts – Greg’s statements about manipulation are highlighted in Chapter 7.

The discussion of lifewide experiences begins with those participants who provided the most detailed, compelling accounts and tightly linked measures of success. Neil spoke about his experience, as recruitment chair for the UW College of Engineering (CoE) concrete canoe team, going into classrooms and trying to generate interest in signing up for the team. He described the reasons why he believed he communicated effectively:

You can generally tell by the look on their faces how interested they are...you can kind of gauge it based on questions... and they come up be like, oh, yeah, so I was looking to get involved, I'm going to get on that...that means that I got the point across and there's some people that responded [I9].

Nate recalled a campaign speech that he gave to the student body in high school when running for class president “that was like one of the main transition points, I think, where I started to... feel more confident about speaking” [I9]. His rationale for selecting this time as an effective communicative moment was that he won the election – and, further, was reelected the following year. Along similar lines, Molly spoke about a time when she was interviewed by a large group of people who would decide whether she was to be accepted into a housing co-op. Her measure of success was that she was voted in unanimously: “I actually wasn't sure, you know, how well I had done explaining myself there, but everybody voted for me, I got unanimous votes, so I guess I did pretty well there” [I9]. Greg chose to talk about his successful communicative efforts to get his girlfriend to see his point of view. He spoke about using persistence and comparisons to “things like Disney movies” [I9], noting that he knew he was effective when she finally understood him. Lastly, Ryan’s effective communication story came from his experiences as a team leader in a Daily Vacation Bible School program teaching scripture to young children. Ryan noted that he felt effective in his teaching when a young child in the group started leading a

prayer without being prompted: “something like that really spoke to me that I had managed to in some way, shape, or form influence them” [I9].

Effective communication stories drawn from school experiences were told by Sean, Lori, and Joan. Sean described giving a presentation in class in which he was able to say everything he had wanted to say; he measured his success by the number of questions from the audience, noting that “Even the instructor asking questions. Yeah, usually that means they understood what you had to say” [I9]. Lori also spoke about a class presentation, noting that she felt very prepared in terms of content and delivery; like Sean, she based her measure of success on “being able to get everything that I wanted to say to everyone and explain it effectively and have everyone engaged in my speech” [I9]. Joan misinterpreted the question and spoke about a peer who she felt communicated effectively by breaking down the project and assigning tasks, which alleviated the problem the team faced of being overloaded with so much information [I9].

Workplace stories of effective communication were provided by Craig and Tony. Craig described interactions with his supervisor, noting that he knew he was communicating successfully when he was not asked about things that he thought he had just explained and when his supervisor’s face indicated that he had been understood: “you just kind of feel the idea that actually hit, and you can actually feel it hit the other person...they get exactly what I'm saying, and especially if they kind of regurgitate it back at you” [I9]. Tony provided a textual example similar to the story told by Craig, involving an email interchange at work with a client he had been helping. Tony noted that he felt that he was effective in his communication because the clients replied that they were satisfied with the help they received from him and did not need to ask for more clarification [I9].

IMPACTED: Re-thinking performance

A few participants indicated that reflecting on their prior work prompted them to re-think their original purpose and measures of performance for the prior work; and, perhaps, recognize or discover new value and uses for prior work. Of note, the majority of the findings

regarding participant reflection on past work is covered in Chapter 6. Reflections on past work in this section deal specifically with purpose, measures of performance and potential use; and, as such, the underlying dataset was relatively small. Related findings emerged from the perceived self-efficacy analysis and are reported in Chapter 9.

For example, Ryan reflected about the way in which he had (prior to the studio experience) typically focused on grades and on meeting specified assignment criteria when he produced work and indicating that this focus was so strong that he was prevented from thinking about his work as communicating ideas to an audience:

I've never really thought about communication prior to the portfolio... I was always trying to meet criteria, a grading rubric... It's always been to express information I know and to make sure that all the information is there and that anybody reading it would understand it...it's never really occurred to me that it's really communication between me and the person reading it, be that the teacher, the TA, or whoever is grading it [I26].

Ryan's statement seems to suggest that his confusion here is not merely reflective of the typical student problem of addressing two often competing audiences (i.e., teacher versus the audience identified in the assignment) and purpose (i.e., demonstrate mastery in order to earn a high grade versus meet the purpose specified in the assignment description). Rather, it suggests that he is having trouble conceptualizing communication at a very basic level. As noted in the previous section on genre learning, the Communication Portfolio Studio had an impact on Ryan's notions of the genres of engineering practice; but, beyond that, on the way in which he conceives of communication in the abstract.

Joan described how it was difficult, when looking back through old emails, to find an example of a well-written one to use in her portfolio; she noted that this experience helped her to realize that she should focus on being more professional in all of her communications in the future:

Yeah, it made me realize I should probably do it a little bit more elegantly instead of just like a one-word response or, I don't know, just so I could -- it's more professional, I

guess, like it's more important to be professional, even doesn't matter how small the communication was [I14].

Tony also came to realize, in evaluating his past work as potential artifacts, that it was valuable to have a store of quality work to draw upon to show as evidence of his capabilities, and that he should work harder on his homework assignments so that they become something he would like to share with potential employers:

in the back of your mind you're saying, okay, I could show this to an employer one day, I should really take it seriously... just having these, you know, literally artifacts that you can just have collected in your bank, I guess, and be able to distribute them to your employers, something valuable I learned, I guess [35].

In addition to using the finished product to show off his skills, Tony indicated that it was rewarding to learn that effort provides practice that leads to skill development:

it's not just about, you know, grades and work experience, it's also a lot about soft skills such as communication, and so, you know, practicing your communication skills and developing them, that would be very important for me in the future [I3].

Ryan also described the potential for future benefit from work done well, using a slightly different perspective:

Prior to this experience, I would have thought that all of the proposals and technical reports were just school assignments with no real importance. However, I now realize just how significant some of these examples can be in 'real life' [PoS17].

Ryan's statement suggests, as did Tony's, that he may be thinking of past assignments as models that could be leveraged in the future and, in addition, recognizing the benefit of practice and skill development. Similarly, Sean commented on being surprised to find a number of artifacts that he could use that he had previously considered disposable: "How many assignments I was able to find that are useful from the 'recycle bin'" [FF:Surp]. Sean's statement reflects that he has rethought the value of his past work.

ENACTED: Liberated performance

The environment in the Communication Portfolio Studio could be seen as attempting to mimic certain aspects of a professional workplace environment. For example, typical workplace activities were included (e.g., frequent peer reviews, collaborative work, useful products, remuneration). In addition, some characteristics typical of the school environment were minimized or removed (e.g., teacher figure, grades, competition, pseudotransactional work).

Several of the participants made statements that either explicitly indicated or suggested that they appreciated the freedoms in the Communication Portfolio Studio afforded by the absence of grades and detailed specifications to follow – freedom to be creative in their work, to provide their own motivation, to work without the burden of stress and fear of failure. Some participants made statements that suggested that, despite the absence of grades and prescriptive guidelines in the Communication Portfolio Studio, they remained concerned about being correct.

Sean spoke to these freedoms, explicitly mentioning that he appreciated the “degrees of flexibility, so you're your own style, and there's no grades involved” [I4]; he described that rather than worrying about doing a bad job, he could focus on positive motivation, “you just want to do it [the portfolio tasks] right away... to get some feedbacks... and proceed onto the next session” [I4]. Along similar lines, Craig spoke about the stressful nature of grades and how their absence in the Communication Portfolio Studio allowed him to rely on his own motivation to drive him forward to reach his goal (i.e., having a completed portfolio for his labors):

whatever you put into class you get a grade out. Whatever you put into like a portfolio is for you, so... because with grades you might be stressed out like...but with the portfolio ... you do it as you feel you need to do it, and that's how it works out [I4].

In addition, Ryan described being able to focus on creating a product (i.e., the portfolio) of tangible, near-term (as well as long-term) value – contrasting that with his typical focus on working to earn a high grade on a product with less tangible value (i.e., a school assignment that he may not even look at again):

I was trying to really establish something that was of high quality that would benefit me in the future as opposed to just getting an A or getting a 4.0...it wasn't just another trivial task, it was really something that I put a lot of work into because I wanted it to benefit me [14].

As noted earlier, Ryan indicated many times, and in many ways (across data sources), that grades were very important to him; in fact, grades appeared to be an important way in which he defined himself as student, as an engineer, and as a prepared communicator (again, as indicated across data sources). Ryan does not explicitly identify whether “another trivial task” pertains specifically to assignments in his communication course or to school assignments in general – knowing this would add meaning to the statement. In any event, Ryan seems to be expressing a frustration that is not uncommon among students: that much of the work assigned in school is perceived as busy work, whose relevance and value are not always clear.

Greg also shared his perspective on the freedom in the Communication Portfolio Studio afforded by the absence of grades, comparing this freedom to classroom environments he had encountered, which he described as punitive and constraining:

here's the freedom to kind of express myself... It's not like I'm going to get punished for anything, it's not like I'm going to get a bad grade, it's not like I'm going to lose my compensation for being unique and original...no consequences to doing it uniquely [14].

And, finally, Joan reported being appreciative of the freedom to make choices about the content and layout of her portfolio, unlike the strict rules and guidelines that she often work with in her other courses:

when you're writing like an instruction manual, there's definitely a set of rules you have, and when you're writing like a poster, like the geothermal thing, there's definitely like rules, like have clear headings, and this one [the portfolio] was kinda like you could choose what your headings were, choose like what kind of information to put on the page. It was like really up to you, so--that's just more personal [14].

Turning to the persistence of concerns for correctness, Joan's comment about finding artifacts implied that she was hesitant to trust her instincts on decisions about appropriate evidence for her preparedness argument:

Um, it was taking the artifacts, I think, was the hardest for me, because I didn't really know what degree of like interesting they should be or like how technical they should be, because I think the less technical things are more interesting, personally [I2].

Ryan's desire to be correct can be seen in this short, but potent, statement that he made on a feedback form: "The session helped to verify that my professional statement met expectations. I did what I was supposed to do" [FF:Aha]. Similarly, Greg's desire to know the "right" way can be seen in his response on a feedback form, recording his "frustrating" moment for the previous week's work: "not enough ideas to know how to complete tasks" [FF:Frustr].

Communicating as Engineers

Findings are presented, categorized by the three analyses, as follows: (a) stereotypes and disconnects (revealed); (b) increased awareness (impacted); and (c) representing self as communicator (enacted).

REVEALED: Stereotypes and disconnects

Some participants made statements about the communication skills of engineers in general, making explicit reference to stereotypes (held within engineering or by others outside the field). Participants also indicated concerns about the level of engineering students' interest in, or facility with, communication skills compared to technical skills. Many of these statements were also paired with remarks about the importance of communication in engineering and the ways in which the participants envision communication's role in their futures as practicing engineers.

Sean, Nate, and Neil are highlighted here because they provided the most detailed statements about stereotypes and about the tension between curricular emphases in engineering, on the one hand, and the realities of the needs in the workplace, on the other. Sean spoke about these disconnects between communication preparation for engineering students in CEE, the

students' prevailing notions and competencies relative to communication, and his convictions about the need for communication in his future as a civil and environmental engineer:

you'd be surprised...as engineers in U-Dub, I guess we don't really get this many opportunities to learn about communication, the importance of communication. We have a capstone project every spring quarter for seniors...that's the only opportunity we get to actually talk about what we've done, and other than that we just... we get limited opportunities to express our communication skills [14].

Note that Sean's statement above emphasizes a lack of oral communication opportunities (e.g., discussions, presentations). Sean went on to talk about what he considered to be a big problem with the attitudes of students in his CEE cohort about communication and engineering:

Most engineering students think that only business students or art major students, they have more opportunity to present...engineering students are supposed to be different...if you are given this idea, right, they just don't want to spend that much time trying to develop their communication skills, and they spend most of their time trying to be... develop their sort of technical skills [15].

At another point, Sean added detail to his observation about his peers' preparation: "Right now I'm pretty sure 80 percent of the students in my class...they have no idea...what kind of communication skill that are going to be expected from them" [I19]. And, finally, Sean articulated on several occasions his belief that engineers have a responsibility for the safety of the public and that, as such, they also have a responsibility to develop communication skills: "Therefore, it is my duty to further develop my skills...to utilize my communication skills in helping raise public awareness on many of the engineering/environmental issues that we're facing today" [PS].

Nate also combined his observation of stereotypes with a statement about the importance of communication in engineering: "there's the stereotype that engineers aren't as good communicators as other – you know, people in other majors, but, you know, in real life it's very important to have good communication skills likewise" [I37]. Nate's belief in the importance of communication skills for engineers appears in other data sources. For example, Nate commented on the role of knowledge sharing in engineering: "No matter how good your technical abilities

are, people will not know if you cannot communicate. Likewise, if your technical ability is strong, but you are a good communicator, your chance of success is much higher" [PoS35]. Further, Nate's stories about his involvement with a student organization (SEBA) that is focused on helping scientists and engineers realize the important role of business work (see Chapter 7) also underscore his commitment to communication. However, on the other hand, Nate also reveals his own stereotypical thinking when discussing his surprise at the notion of having engineering students making communication portfolios:

I know as an engineer, I would think a portfolio would be something that kind of directly relates to the work that I'll be doing in the future or something, so maybe examples of design projects or stuff I've done, like some kind of documentation or whatnot. But I never thought about it as being, you know, something as broad as communication [14].

Lastly, Neil also described stereotypes in combination with the disconnects discussed above. Like Sean, Neil indicated that there was a lack of emphasis on professional preparation in his CEE classes. Neil described his experiences with recruiters at career fairs, reflecting on the connection between the recruiters' emphasis on communication and prevailing stereotypes:

I would go to career fair things...they'd be talking about how communication is an important thing... And just thinking about it logically and how the stereotype for an engineer is someone that's not the greatest communicator, I could see how that would be something that they're worried about [135].

As noted before, Neil spoke about the fact that communication is learned experientially, by being immersed in some activity or experience—that it is not learned in school, or even in the engineering workplace:

Well, I think engineering experience is kind of its own deal, almost separate of communication. I mean certainly you can learn some communication through an engineering...scholarship or co-op or something, internship, but it wouldn't quite be the same as--that's not really where you learn communication...But communication itself I think comes more from those general life experiences [15].

Neil's statements seem to suggest that he does not consider school or the engineering workplace to be *experiential* sites of learning, at least not for communication.

Stories from other participants provide additional perspectives on stereotypes and disconnects. For example, when asked about a positive speaking experience, Joan described comments that she had received from a science professor about her writing: “I remember writing a short fiction essay for this water quality class where we had to incorporate science/facts. I liked expressing them in clever ways, my professor said it was written with a quality above the typical engineering-type” [PrS3]. The fact that Joan chose to share this story when asked on a survey about a positive writing experience, seems to reinforce the idea that she has been socialized into accepting the stereotypical view of engineers as poor writers.

On another occasion, Joan commented that , if the opportunity [the research study] to join the Communication Portfolio Studio had not presented itself, she would never have considered making a portfolio for engineering “because I just wouldn't have thought it was very important for engineers” [I5]. This statement suggests that Joan does not see a need for engineers to communicate their work in a persuasive, visual way.

Craig, in talking about the discussions in the studio sessions and comparing them to group work in engineering courses, speculated that interactions in an engineering design course, which he had yet to take, would be more substantive and purpose-driven than the brainstorming and collaborative efforts in the Communication Portfolio Studio:

I haven't got into like the deeper group lab work or something...But from what I've heard, it's not--it's kind of like working together, you're not--I don't know, it's more for a goal rather than just kind of light...light bouncing ideas off [I4].

Craig’s words seem to suggest his own bias regarding the relative importance of the two settings, considering the work in his engineering courses to be the real “goal-oriented” thing, as opposed to the “light” work in the Communication Portfolio Studio.

IMPACTED: Increased awareness

Participants made statements indicating that their engagement in the Communication Portfolio Studio had increased their awareness of the importance of communication skills for

engineering practice and that it had prompted them to think more deeply about what it means to be a communicating engineer.

Sean indicated, on several occasions that the Communication Portfolio Studio had increased his appreciation of the importance of communication skills in the engineering workplace. For example, he observed that “Before this portfolio experience, I wasn't sure how important communication in the professional work environment is” [PoS26]. Sean also noted that, while his technical communication class helped him develop his communication skills, the Communication Portfolio Studio “really allowed me to understand the different methods of communication and how important they are” [I5]. Sean also spoke about how useful the Communication Portfolio Studio would be for other engineering students: “this session [the portfolio studio] would definitely give them a new insight on how big communication is in the real world after graduation” [I1].

Neil spoke about how the Communication Portfolio Studio experience had enabled him not only to create a portfolio, but also to “see more the benefit of communication and what a difference that can have on how you come across to people” [I6]. Neil indicated that prior to the Communication Portfolio Studio, he focused on his identity as a people person, a person who took on numerous leadership roles. Making a communication portfolio prompted him to spend time thinking about what it meant to be an effective communicator:

previously if I were to go into an interview and they were to ask me, what are your strengths? I'm not so sure communication would have been one of the first things that come to mind... I think that if I were to go into it now, I think that's definitely something I'd be like, yeah, I am good at that. I think that's a strength of mine [I35].

Lori also spoke about how having a portfolio enhances the way in which you are perceived: “just having a portfolio, that will kind of make you stand out from other people” [I34]. Ryan also commented that the portfolio studio experience taught him a lot about what it means to communicate and helped him realize how relevant communication skills are: “Communication is an essential skill in the modern workplace and this portfolio development experience has

motivated me to expand my horizons and become a more effective communicator” [PoS26]. Tony explained that he felt that a main benefit of engaging in the Communication Portfolio Studio was “Learning about the importance of communication. Realizing my background with communication. Understanding I still can learn a lot more about effective communication” [PoS31].

Craig noted that the studio experience not only contributed to his understanding of the role of communication in the workplace, but also provided a space in which to practice that role:

It has bridged some of the gap between pure school work and real world application of how to go about communicating an idea to a specific audience. I see the purpose of communication in the engineering workplace and this experience has acted as an intermediary to practicing effective communication in the workplace itself. It has also given me the chance to analyze my current artifacts and see what I can improve on for the future. Knowing how to improve for the future is good for confidence in my abilities [PoS26].

Although Craig had extensive workplace communication experience (albeit in one organization), his statement indicates that his experience in the Communication Portfolio Studio advanced his thinking about engineering workplace communication. In his comment about communicating to a specific audience, his choice of words, such as “pure school work” and “real world application,” suggest that he had experienced writing in school and writing at his internship as quite separate worlds, and that the activities of the Communication Portfolio Studio, have, perhaps through critical reflection of past work in terms of future application, helped bridge these two worlds.

ENACTED: Representing self as communicator

The participants’ conceptions of the genres of engineering practice, the relative importance of particular genres, and any stereotypes embraced by the participants were expected to play out in the artifact selections of the participants (see Table 5.2). However, most professional work products of the participants were unavailable due to confidentiality of access

issues, making it difficult to draw conclusions from the artifact selection. Many participants promoted work products from school courses as evidence of preparedness, some focused on lifewide products or experiences as evidence.

Table 5.2 Artifact sources (W/P=workplace, L/W=lifewide) and mode/media (W Doc.= written documents, O Com=oral communication (incl. slide decks), Other=images, posters), by participant.

Participant	School	W/P	L/W	W Doc.	O Com.	Other
Joan	5	0	2	5	1	1
Greg	4	1	0	2	1	2
Tony	4	0	1	3	2	0
Nate	3	0	2	1	1	3
Lori	3	0	2	1	3	1
Sean	2	1	2	5	0	0
Ryan	4	0	1	4	1	0
Craig	1	3	1	3	1	1
Molly	5	0	0	4	1	0
Neil	2	0	3	2	2	2
Total	33	5	14	31	11	21

Specifically, Craig and Sean were the only ones who were able to use work products they produced as interns. Greg included an artifact from his internship, but it was a photograph of co-workers and not a deliverable. Thus, most artifacts (about 63%) were drawn from coursework in school, many artifacts (about 27%) were drawn from lifewide experiences, and only a few (about 10%) were drawn from the workplace.

Greg, for example, wanted to include work products from his internship but was not able to access them. Despite this, he still indicated that he “tried to show concrete examples of the experience and skills I have” [PoS9]. Thus, his five artifacts included four products from engineering courses (e.g., technical reports, CAD drawings) and one photograph of his workplace colleagues. His professional statement, however, focused almost exclusively on his internship, describing how he could leverage his skills and experiences to be more effective on the job—a short excerpt follows:

Small group leadership classes as well as participation in student government for many years have sharpened my oral communication skills. In the work place I will rely on my

teamwork skills obtained through baseball and other team sports to communicate quickly in a non-formal manner what must be done to complete a given task [PS].

Greg's frustration with the mismatch between his professional statement and artifacts was one of the reasons that he decided he would not use his communication portfolio. Like Greg, Nate was unable to access his work products: "My best stuff were from industry and cannot be disclosed, so I had to look for alternative artifacts" [FF:Surp]. However, Nate continued with the portfolio as a transactional task; he planned to use the portfolio, and he used artifacts from his technical communication course as proxies for his internship work products.

Joan also did not have any artifacts from her workplace in her portfolio; although she did not make an explicit statement about this, it is reasonable to assume that work products from her internships at the naval shipyard were unavailable to her. However, she provided a wide range of artifacts and was the only participant who included more than the suggested five. She selected the following seven: team contract that she wrote for a course project, professional follow-up letter to a recruiter, team email in which she established work division, her section of a team technical report (documenting her analytical thought process), slide deck from a presentation to peers at a professional meeting (describing her internship experience), poster from a technical communication course, and her section of a design project report. This selection of artifacts represents an interesting and varied look at the way in which Joan sees communication integrated into her role as a professional engineer. Of particular interest is her team contract document:

It would be advantageous to create a document like this in the workplace, so that group member responsibilities and group dynamic can be established to limit a number of confrontations that might arise. It was helpful to have a document to refer to and creating the contract started an open discourse that was continued on throughout the quarter. This is an idea that I plan to carry on into my career [AA1].

In this statement, Joan described how she transferred expertise she gained in the workplace to contribute to the creation of this document in school, which she then planned to leverage in the workplace in the future.

Like Joan, Tony did not explicitly comment on why there were no artifacts from his student web support position with the UW; again, it could be assumed to be an access issue. Tony described the way that he convinced his portfolio audience that he was ready to communicate in the workplace: "I included sample memos and power points that would be practical in the engineering work place" [PoS9]. In addition to the memo and slide deck mentioned above, Tony included the following artifacts: a video interview for a school project on the idea of design thinking, an email to his academic adviser, and a fiction writing assignment. One of the artifacts that Tony most fully and enthusiastically annotated was the video interview in which he highlighted several communication skills that could be leveraged in the workplace.

In terms of those participants with workplace artifacts, Craig's portfolio included two documents from his workplace, his internship report, a poster from a technical communication class, and his personal web design online portfolio. Craig commented that to convince his audience of his preparedness, he "tried to provide very real world examples of communication in the industry" [PoS9]. Sean, who rarely otherwise mentioned an internship he had in China, and who reported no professional workplace experience, included a translation memo from that internship as an artifact in his portfolio.

Lori, who was just getting started in her program and who had no workplace experience, included three products from a technical communication course, a slide deck from a high school presentation, and a photograph of her volunteer involvement at her church. While her annotations for the latter two artifacts do a good job of bringing in communication skills, her statement about how she convinced her audience of her preparedness shows her focus on what she might consider the more compelling examples: "I provided three artifacts that dealt with HCDE 231, which is a technical communications class that deals with engineering topics" [PoS9].

Four of Ryan's artifacts were drawn from his technical communication course and the fifth was his personal engineering statement. Ryan's statement about how he convinced his portfolio audience of his preparedness included "I wrote solid annotations and used solid examples of artifacts that support my communication abilities. Everything is well-written and clear" [PoS9].

Molly made the following statement about convincing her audience of her preparedness: "I collected examples of work I had done that showed my communication skills. I accepted and thought about the constructive feedback that I received during the process of creation. I explained my ideas about communication as an engineer, and why they are important" [PoS9]. Her artifacts were all drawn from coursework: four from her engineering courses and one from geology; they included mostly written reports and one oral presentation. Neil made the following statement about his plan for convincing others of his preparedness: "I feel like I convince people by providing strong examples where I have experience in communication" [PoS9]. Neil selected two leadership experiences, a combination biotechnology report/poster/slide deck, a laboratory report, and one poster from a technical communication class. The first three represented experiences that seemed to be particularly meaningful to Neil, in which he had a significant leadership or teaching role.

Summary of findings

Findings were reported for Socialization through Experts and Genres, by sub-theme: (1) Recognizing and Learning the Genres of Practice, (2) Performing the Genres of Practice, and (3) Communicating as Engineers. For each sub-theme, analyses were conducted to explore (A) what is *revealed* about participants' rhetorical awareness, (B) what *impacts* are there on participants' rhetorical awareness, and (C) what does *enactment* of participants' rhetorical awareness look like?

With respect to *recognizing and learning the genres of practice*, the analysis revealed that participants' experiences with genre learning in the workplace were different than the genre learning that participants experienced in school, with genre learning in school bringing

additional complexities; workplace and other organizational experiences appeared to mediate genre learning in school. Individual differences influenced genre learning in all settings. Participants, particularly those with no engineering workplace experience, reported that their conceptions of the genres of engineering practice were expanded through discussions and other peer interactions surrounding the activities of making preparedness portfolios; lifewide experience had an impact. As participants developed their preparedness portfolios, they experienced conflicts with genre expectations about preparedness portfolios, as well as challenges and success with learning the unfamiliar genres and vocabularies of the preparedness portfolio and of the supporting activities in the Communication Portfolio Studio. Experiences varied across participants.

With respect to *performing the genres of practice*, the analysis revealed that participants measured the success of their genre performances in various ways including external measures (e.g., grades), internal measures (e.g., perceptions of expertise), and observed outcomes (e.g., achievement). Participants were typically concerned about correctness, and criteria for success tended to be related to context of performance and to participants' workplace and lifewide experiences. Participants reported that reflecting on past work prompted them to re-think their past measures of performance and to recognize new value and uses for past (and, some said, future) work. As participants developed their preparedness portfolios, they expressed appreciation for the freedom from grades and other forms of evaluation in the Communication Portfolio Studio, as well as the opportunity to provide their own motivations for making progress on their portfolio work. Throughout the process, some participants indicated that they maintained a concern for correctness in the absence of grades and of strict guidelines.

With respect to *communicating as engineers*, the analysis revealed that participants had encountered, and were concerned about, stereotypes about engineers as poor communicators, as well as engineering students' focus on technical skills at the expense of communication skills. Participants reported that the Communication Portfolio Studio increased their awareness of the

importance of communication to the practice of engineering and caused them to think more deeply about what it will mean for their future careers to be communicating engineers. As participants developed their preparedness portfolios, artifact selection had the potential to serve as enactment of participants' beliefs about what counts as communication for practicing engineers. However, participants with workplace experience had difficulty accessing workplace products. Thus most artifacts were drawn from school coursework, some from lifewide experiences, and only a few from the workplace.

6. LEARNING TO CONSTRUCT AND INTERACT WITH AUDIENCE

This chapter presents the findings for the analyses of rhetorical awareness that addressed Research Question 2: With respect to learning to construct and interact with audience (i.e., how audience is understood and addressed):

- D. What is *revealed* about the participants' rhetorical awareness through their engagement in the Communication Portfolio Studio?
- E. What *impact* does engagement in the Communication Portfolio Studio have on the participants' rhetorical awareness?
- F. What does the participants' *enactment* of rhetorical awareness in the Communication Portfolio Studio look like?

Findings for Research Question 2 are presented according to the sub-themes of the audience component of the rhetorical awareness framework: (1) Conceptualizing audience, (2) Addressing audience, and (3) Self as audience. As noted in Chapter 2, these sub-themes emerged from the participant data and were used because they aligned with key points in Winsor's discussion of learning to construct and interact with audience. Within each sub-theme, findings are presented for each of the three analyses: (A) revealed, (B) impacted, and (C) enacted.

Of note, participant quotes provided in this chapter include citations to data sources (see also Chapter 4).⁹ In addition, a list of participants' workplace experience and communication courses taken is provided here for reference in reading the findings (see Table 4.1 in Chapter 4 for a full summary of participant demographics):

- Engineering-related workplace experience
 - Yes: Joan, Greg, Tony, Nate, Sean, Craig
 - No: Lori, Ryan, Molly, Neil
- Engineering-related communication coursework
 - Within the discipline: Greg, Sean, Neil (CEE)
 - Outside the discipline (e.g., HCDE 231): all but Molly

⁹ AA=artifact annotation, I=interview, FF=feedback form, PoS=post-survey, PrS=pre-survey, and PS=professional statement.

Key findings for each of the major sub-themes, and types of analyses within each, are overviewed in Table 6.1.

Table 6.1 Overview of findings for Research Question 2, learning to construct and interact with audience, by sub-theme and by analysis (i.e., impacted, revealed, and enacted).

Conceptualizing Audience	
<i>Revealed:</i> Varying views of audience	<ul style="list-style-type: none"> • Varying perspectives on audience roles and relationships • Workplace, lifewide experience and context not shown to mediate
<i>Impacted:</i> Fostering audience interactions	<ul style="list-style-type: none"> • Peer interactions lead to idea sharing and rhetorical views of audience • Benefits of creating versus sharing portfolios, individual differences
<i>Enacted:</i> Portfolio audience(s)	<ul style="list-style-type: none"> • Most adopt portfolio task as authentic, envision real-world audiences • A few reject use of portfolio, name team as audience, value the process
Addressing Audience	
<i>Revealed:</i> Varying perspectives	<ul style="list-style-type: none"> • Varying perspectives on attending to audience, awareness range • School instruction, workplace and lifewide experiences mediate
<i>Impacted:</i> Reinforced and new ideas	<ul style="list-style-type: none"> • Views on attending to audience are reinforced, a few learn new strategies • Oral presentation of portfolios raises various audience issues
<i>Enacted:</i> Implementing awareness	<ul style="list-style-type: none"> • Accessibility through conventions of writing and layout • Some consider rhetorical goals, interpersonal factors
Self as Audience	
<i>Revealed:</i> Few experiences with reflection	<ul style="list-style-type: none"> • Few prior experiences with reflection were reported • Reflection set the studio experience apart from regular coursework
<i>Impacted:</i> Deeper learning and self-assessment	<ul style="list-style-type: none"> • Facilitating deeper understand of past work and communication • Reflection for assessing self as communicator
<i>Enacted:</i> Value in revisiting past work	<ul style="list-style-type: none"> • Gained greater understanding of past work and self as communicator • Leveraged understanding in preparedness argument

Conceptualizing Audience

Findings are presented, categorized by the three analyses, as follows: (a) varying views of audience (*revealed*); (b) fostering audience interactions (*impacted*); and (c) portfolio audience(s) (*enacted*).

REVEALED: Varying views of audience

Participants' stories and statements reflected variation in their perspectives on audience roles and relationships. Some participants spoke about communication in terms of transmitting information or ideas to an audience, often a vaguely-defined and non-participating audience; whereas other participants expressed more rhetorical views in which audience members were

active participants in an ongoing and recursive relationship with the author or sender. Workplace and lifewide experience did not appear to have a noticeable effect on views of audience relationships. In addition, the type of communicative act discussed (i.e., professional or general setting) did not appear to affect the participants' audience perspectives.

When the participants described what effective communication meant to them, the majority used words that aligned with the uni-directional, transmission view of communication described above. They used words such as *convey*, *transmit*, *explain*, *deliver*, and *inform*. A mini-analysis was performed of three different questions about the meaning of effective communication – two were asked in a general context (pre-survey and post-survey) and one was asked in a professional context (interview). Six participants consistently gave uni-directional descriptions that typically included (a) one of the transmission verbs listed above; (b) a purpose such as being understood, getting one's message across, achieving a goal; and, on occasion (c) adjectives such as clear, concise, appropriate. Two participants consistently described effective communication in ways that suggested a two-way interaction, including terms such as *listening*, *discussion*, and *shared understandings*. Two participants provided both uni-directional and interactive definitions – one used a uni-directional definition for the two general context questions and an interactive definition for the professional context question; the other participant used a uni-directional definition for the professional setting and each type for the two general context. Thus, there appeared to be no consistent way to relate the context to the participants' perspectives on audience relationships from this mini-analysis, given the variable involved (the ratio held fairly constant in terms of uni-directional: multi-directional relationships). One discrepancy to these findings surfaced during Neil's interview when he was speaking about his oral communication strengths; his comments, which are presented in the following discussion, provide a stark contrast to his consistent uni-directional definitions of effective communication.

Many of Greg's descriptions of effective communication reflected a uni-directional perspective in which the audience's role was simply to receive the message. For example, when

asked to describe a time when he felt that he was communicating successfully, Greg provided the following statement, summing up his strategy for effective communication as persistence:

I can think of multiple situations where I've been pretty pleased with myself in that regard ... you know they don't understand, you need to repeat them, you need to repeat them in different ways... I've said the same thing 50 different ways, and finally that 50th way finally works and the person gets the message, understands, and it clicks [19].

Greg's words appear to reflect a detached view of audience, one in which the audience has little role to play except to understand what Greg is saying. The audience would appear to be relatively interchangeable, if not invisible, to Greg. On another occasion, Greg described what communication meant to him in an engineering context:

I think it's getting the point across to whoever it is, like if it's a director, if it's a citizen that doesn't know anything about engineering... That's what communication means to me, at least in the engineering sense, and even in a broader sense it's just like getting people to understand what you're trying to get them to understand [17].

Again, the audience is portrayed as a passive receptor, and Greg is allowed to hold on to his original ideas without any intrusion of, or reconciliation with, ideas from the audience.

Other participants provided descriptions of communication that also used terminology that reflected a uni-directional model view of communication; however, the statements of these participants tended to imply that they were at least thinking of an audience (although not identified specifically). For example, Neil described effective communication as “conveying a point clearly and concisely to the intended person” [17], and Craig gave a similar definition: “To me, it means being concise while still conveying what is important to a specific audience” [PoS14].

Ryan provided definitions of effective communication that varied by rhetorical setting. For a professional setting, Ryan defined effective communication using language suggestive of uni-directional view:

I think that effective communication is the conveying of ideas and information from one person to another successfully...it represents the transfer of anything, data, ideas, concepts, anything from one person to another or more in a more general sense [I7].

This definition is typical of other statements Ryan made about effective communicators, and communicative acts, across data sources. However, Ryan provided a very different perspective on one survey where the prompt did not constrain the context but simply asked about the definition of effective communication; he described it as “the successful sharing of information and ideas between two or more individuals” [PrS2].

Lori also described effective communication in different ways at different times, sometimes using a uni-directional model, often focusing on being understood, and sometimes talking about shared meanings. For example, when offering definitions of effective communication with no setting defined, on two different occasions, Lori wrote: “Effective communication means being able to explain something so another person understands it well” [PrS2]; and then “Effective communication means providing a way to explain something using eye contact and pacing, as well as organizing your writing and making it concise” [PoS14].

However, when Lori spoke about what effective communication in a professional setting, she emphasized interaction between parties, with each party having a voice and listening: “when I think of communication, I think of two people interacting with each other...people should be able to effectively explain their side of the story...and being an effective communicator is also being an effective listener” [I7].

Neil also spoke about communication in terms of inclusion and interaction, emphasizing the importance of listening:

there's kind of two types of people in a conversation, the type of person that will just run it in their direction and just you're always on their terms kind of, and someone else who kind of listens to what the other person is doing and is actually trying to legitimately respond to what they're saying and just interact with them more... there's a lot of good things that people might want to talk about or have to say, but if you don't listen for them and you just will go by without ever realizing that, so [I24].

As noted above, this discussion by Neil at the interview when talking about his strengths with oral communication, is very different from all of the definitions that he gave of effective communication that were not tied to a specific event of competency of his own.

Molly stood out from the other participants in terms of her consistent description of effective communication as an interactive and inclusive act that resulted in shared meanings and understandings. For example, on one occasion (on the first day of the Communication Portfolio Studio), Molly gave this definition of effective communication: “a positive interaction where all parties have an understanding of the ideas and intents of the others” [PrS2]; and, on the last day, she gave this description: “Effective communication happens when the intended meaning and tone are understood by all parties, and they have the desired effect” [PoS14]. On another occasion, Molly described characteristics of an effective communicator to be “Somebody who shows that they're listening to other people and shows that they understand the concepts that other people are trying to convey to them, that's the first thing that comes to mind” [I8].

Sean also emphasized reaching understandings between parties, as well as avoiding misunderstandings, in his definition of effective communication: “The ability to convey what you mean into words accurately and effectively without creating confusion” [PrS2]. Many of Sean’s statements about effective communication included a focus on adapting communication for a particular audience and on cultural sensitivity; these are discussed in the section on Addressing Audience.

IMPACTED: Fostering audience interactions

This section on impacts to participants’ perspectives on audience interactions draws from a much smaller dataset than that drawn on for impacts concerning genre (in Chapter 5). This is not surprising given that peer interactions around notions of genre were central to development of the preparedness portfolio argument, whereas issues of audience occupy a much smaller focal point in discussions. The specific focus in this section is on fostering participants’ audience

awareness through peer interactions relative to both written and oral communicative acts (e.g., peer reviews, brainstorming, presentations) in the Communication Portfolio Studio.

Nearly all of the participants made statements that suggested that peer interaction in the Communication Portfolio Studio led to sharing of ideas, in written and oral form (e.g., multiple peer reviews and opportunities for revision, discussions and brainstorming), which promoted more interactive views of audience.

An analysis of the survey question asking for participants' main take-aways from the studio sessions revealed that more than half of the participants focused on peer interactions – typically, peer reviews and group discussions – as a catalyst for developing new ideas. For example, Lori found it helpful to be able to share ideas through group discussions: “the opportunity to talk about different areas that were maybe hard to understand, and we went over it as a group to explain it to make sense in the end” [PoS2]. Tony also made a very similar statement about discussions generating ideas: “Group discussion raised a lot of good points that wouldn't have occurred to me. Questions that people raised about my portfolio helped shape its final structure” [PoS2]. Craig commented on the benefits of sharing strategies for oral presentation and for improving portfolios; Ryan also indicated that feedback from peers helped him improve his portfolio [PoS2]. In addition, Greg specifically noted that “I felt like the biggest take aways were the group discussions and peer reviews. I felt like those two aspects of the sessions were what I learned the most from” [PoS2]. Molly also indicated that she appreciated the opportunities in the Communication Portfolio Studio for sharing views. Molly had been apprehensive in the beginning about having to work collaboratively, and, yet, by the end of the series of studio sessions, she had made various observations about how useful the peer interactions were in terms of benefiting from the collective knowledge of the group; for example: “It was good to hear all the great ideas and opinions that were different than mine” [PoS2]. Of note, Tony and Molly also indicated that they did not put much value in having their work reviewed by peers.

In addition to these grand take-aways from the studio sessions, participants had more to say about the value of collective idea generation. Joan indicated that the studio sessions helped stimulate group thinking and, again, suggesting the power of collective ideas: “instead of writing it by yourself, because you wouldn't come up with like all those ideas by yourself” [I26]. Nate commented that peer review was not common in his engineering coursework: “in engineering classes, we don't do much writing, so there's not much, you know, peer review writing” [I4], and he reported that the peer reviews in the studio were a valuable part of the overall Communication Portfolio Studio experience: “I think especially getting the feedback from each other is very helpful, because in basically everything--that you're not just doing for yourself, then you have to kind of understand what other people think... you want to see the feedback of the audience” [I34].

Two of the participants compared the relative benefits of portfolio creation and group discussion—both finding that the discussions were more valuable to them than the portfolio creation. Specifically, Tony indicated that his ideas about communication were impacted more by the peer discussions than by the actual development of the portfolio: “so maybe not the portfolios necessarily, but half...like the daily like interactions with people focusing on communication, that helps” [I10]. Joan also indicated that the group work in the studio sessions, which supported the participants in making their portfolios, was more valuable than the individual work of putting the portfolios together: “I think you have to think group work is a lot more important than, um, making this portfolio. Because you learn a lot from a group” [I36]. Molly, however, had a different perspective, indicating that she found more benefit in creating the portfolio than in sharing it. However, she was quick to point out that this was because she would have shared her work anyway: “The sharing I probably would have...I've done that already. I made my boyfriend look at it, made my dad look at it. I'm a sharer...” [I34]. Molly went on to explain that she thought sharing the portfolios was a very valuable component of the Communication

Portfolio Studio, particularly for those participants who would not have been inclined to share on their own.

ENACTED: Portfolio audience(s)

Most of the participants embraced the development of their communication portfolios as transactional task for which they envisioned a real or plausible future audience (e.g., interviewers or future employers). Two participants explicitly rejected the task as transactional and explicitly identified the studio team as their envisioned audience.

One of the first tasks the participants faced in the Communication Portfolio Studio was to think about the audience(s) they wanted to address with their communication preparedness portfolios. While the participants were free to choose any audience they liked, there was a natural connection between making a preparedness argument and choosing potential employers as an audience (see pedagogy description in Chapter 3), which is what many of the participants did. Specifically, eight of the participants specified audiences related to future employment in some way: general and specific references to potential employers or interviewers, and statements about linking their portfolios to an online resume or professional networking site.

Craig was more specific than most with his audience characterization, describing a software engineer or person of similar technical background: “my interviewer tended to be someone with technical knowledge rather than just an HR recruiter” [PoS8]. The level of specificity and thoughtfulness of rationale in Craig’s audience statement emphasize his adoption of the task as authentic and, perhaps, are indicative of his professional engineering experience. Molly, like Craig was thoughtful and thorough in her characterization – but, unlike Craig, she painted a broader and more varied picture (likely reflecting her newness to engineering):

I have in mind potential employers, for a co-op or a job, and probably researchers in labs I'm interested in working in. I would also show it to networking contacts who I would like to know more about me and my skills. [PoS8]

Molly's reference to using her portfolio to showcase herself and her skills in what could be a high stakes situation for her (e.g., networking), provides additional support to the notion that she adopted the Communication Portfolio Studio activity as authentic and found it valuable to her future as an engineer.

Three participants envisioned a more general audience – an employer or interviewer. For example, Neil commented, "I had in mind employers, since I am trying to demonstrate my communicative abilities as something that sets me apart from the rest of the engineering workforce" [PoS8]. Similarly, Ryan envisioned his portfolio audience as: "Potential employers. I would like to get a job in the engineering field when I am finished with school and having an effective communication portfolio could potentially help that cause" [PoS8]. And, in like manner, Lori described her audience as "an interviewer because in a real life situation, this is what the portfolio was created for" [PoS8]. These participants all had no professional workplace experience, which is perhaps reflected in their broad statements and relative lack of specific details.

Joan and Nate both indicated that they planned to connect their communication preparedness portfolios to their resume or professional networking site. Joan commented specifically on linking her portfolio to her resume at some point so that "employers could see the hard work i put into it. I want them to see examples of my coursework and my in each. I would be more personal than a resume" [PoS8]. Nate indicated that he would incorporate portions of the portfolio into his personal website and possibly connecting to his LinkedIn presence [PoS8]. These participants both had significant engineering internship experience and their statements indicate that they accepted the Communication Portfolio Studio task as authentic and valuable for future employment.

Sean took a different approach to characterizing his intended portfolio audience. In addition to a general statement about using the portfolio for job searching (i.e., unspecified

audience), Sean described giving a practice presentation to a friend, and also his plans to get feedback from a professor in CEE:

I tried to present this portfolio to a friend, he fell asleep. I think it's because our backgrounds are significantly different (he's an Art major). I would present this portfolio when applying for jobs relating to my major. I also would like to show this to one of my CEE professors and ask him for feedback. [PoS8]

Tony and Greg both indicated that they had no plans to use the portfolio that they created; and, in fact, they both stated that the studio team (i.e., the facilitator and the researcher) was their intended audience. For example, Greg made the following statement: “My target audience from the beginning was the studio team. I never intended to use this outside of this research setting. I wanted the experience of building a portfolio not necessarily having a ‘communication’ one. [PoS8]. Although Greg did not plan to use his communication portfolio, he did comment on multiple occasions on the benefit of having learned to make a preparedness portfolio:

I'm going to put together a portfolio, and what I'm going to gain from this is knowing how to do it, not necessarily the end product, like for me that was what was most important, because I know that I could put together something that could--that I would be willing to show. [I2]

This statement shows that, with respect to learning the process of making preparedness portfolios, Greg considered the activity to have been authentic.

Addressing Audience

Findings are presented, categorized by the three analyses, as follows: (a) varying perspectives (*revealed*); (b) reinforced and new ideas (*impacted*); and (c) implementing awareness (*enacted*).

REVEALED: Varying perspectives

Participants’ statements revealed different views on addressing audience; emphases included the following and were used in different combinations: rules and conventions (context-

specific and not), adapting for particular categories of audience, tailoring to a specific audience and purpose, analyzing rhetorical purpose, and empathizing with audience. Workplace and organizational lifeworld experience, as well as communication instruction in school, tended to mediate rhetorical understandings of the situated nature of communication.

Sean emphasized adaptability first and foremost when discussing his views of effective communication—his did this consistently and across data sources, speaking about the importance of adapting communication for a given situation. For example, Sean noted that having a fixed style of communication should be avoided:

you can change your style so that the other person has an easier time trying to understand you. An effective communicator should never have a fixed style of communication, and they should always change, adapt, into new environment, new people and new styles of communication [I7].

Craig was one of the few other participants who spoke explicitly about adaptability with any regularity: “The common denominator of different cases of communication is adaptability. The audience and purpose are always shifting...Because of this, the ability to adapt to the level of understanding of others and tailor your train of thought to join theirs is a valuable asset” [PS]. On occasion, Sean’s discussions of effective communication elaborated on adaptability and described selectively employing general conventions of communication to best meet his audience’s needs:

Effective communication is the ability to communicate ideas to people with similar/different backgrounds in a concise, interesting, and relevant form. The ability to adapt to different environment/culture and make the audience understand what you've trying to convey [PoS14].

At times, Sean’s focus on conventions of writing tended to be a bit more de-contextualized, perhaps taking priority over adapting for a specific audience and situations. Sean noted that he had learned in a technical writing class that audiences simply want to understand your text and will not be impressed by, or want to spend time deciphering, large words [I5]. The “rule” that he remembered from his writing course is something that may not apply in all settings.

Sean selected a research report that he had prepared for a technical communication course as one of his artifacts for his communication preparedness portfolio. When annotating the report, Sean argued for the report's effectiveness by describing the way in which he followed some context-free principles of good writing (e.g., concision) and some contextually-mediated conventions (e.g., transforming technical information for consumption by general audiences). It is possible that, because this artifact was a report from a writing course that only mimicked a real-world report, it could have been challenging for Sean to fully analyze the rhetorical possibilities with respect to an actual audience for the report:

The report requires the author to convey messages to the audience in a concise, effective, and understandable manner. This lab report is specifically designed to follow the format of a typical real-world engineering report. The success of an engineering report inevitably depends on the ability of the author to transform scientific/technical data into written statements that can be understood by people with minimal engineering background [AA2].

It is useful to compare Sean's annotation with one that Craig wrote for a report that he included in his portfolio. Specifically, Craig selected as one of his artifacts a report that he submitted for his internship, a document with an authentic audience and purpose. In the annotation, Craig described the ways in which he used layout and content strategies to communicate effectively with his audience – not unlike Sean's description. However, unlike Sean, he also engaged in a rhetorical discussion of his approach that focused on issues of confidentiality, and he situated the report within the larger system of communication artifacts and events emanating from his internship experience:

It was a challenge in some ways to not discuss my work in too great of detail because not only was it confidential but a general audience should still be able to understand it. Though it is in writing, this report would be very similar to how I would verbally explain my internship experiences to someone [AA4].

As discussed in a previous chapter, many of Lori's stories and statements revealed a strong focus on adherence to general conventions of communication as a measure of success. Lori

included a set of instructions for building a Lego penguin that she wrote for a technical communications course in her portfolio. In the annotation Lori describes the way she employed conventions of writing, highlighting those that are particularly helpful for the intended user of the instructions:

I built a penguin out of Lego blocks and wrote instructions on how to complete this task. This assignment demonstrates my effective communication as a writer because the content is specific enough so the audience can understand the instructions, yet it wasn't overwhelming to read...The pictures in the document complimented the instructions by providing additional information to help complete the penguin [AA3].

Further, Craig often went beyond adapting for general classes of users to empathizing with a specific user. He spoke about aligning himself with his audiences' thinking by role-playing the part of the audience or asking himself the "am-I-being-effective question" [I10]. In speaking about his strengths as a writer, Craig revealed his sensitivity to audience needs, as well as his appreciation for the recursive and ongoing nature of his relationship with his audience:

basically doing the standard thing that authors try do is jump in the reader's shoes...kind of think like them and then phrase what you're going to say so it kind of comes across the best you can...you can't just go right off the bat know what they think, but, you know, kind of a little bit of trial and error and then see exactly how they think and then maybe generalize from there [I23].

The next three participants that are highlighted here all had professional experience, which often provided rhetorical depth to their discussions about adapting for audience—going beyond the more general rules learned in the classroom. The annotation that Craig wrote for one of his artifacts (i.e., his own professional design website) provides an example of the way in which he attends not only to the immediate audience (i.e., the visitors to his professional design website), but also to the ways in which he can essentially transport a set of strategies to another situation with similar rhetorical needs:

The site is designed to feel as simple and lightweight as possible while not looking too minimalistic. I apply this same procedure to documents that require just the facts and highlights as well as anything requiring visual appeal. By streamlining the information

presented, the reader tends to have an easier time getting at the points that are being made [AA1].

In addition, Nate spoke hypothetically about the way in which he would prepare to give a presentation at a client's office that he had never been to before: "try to find out as much about them before I actually, you know, go and talk to them. You know, maybe they might be sensitive to particular things and I would want to avoid" [I11]. This statement's reference to sensitive topics shows rhetorical awareness on Nate's part. And, finally, in thinking about how she attended to audience, Joan described the planning portion of her writing process:

thinking about where they're going to be at when they're reading it, what kind of situation, how much time they'll have. And I guess it's the same way for like English teachers, too, I think, just that they're going to be grading it like where they're going to be at, like just tell them what they want to hear and get it over with [I11].

The first part of Joan's statement represents a very thorough audience analysis, including her detailed descriptions of the conditions under which the reader will engage with her text; the second part describes her pragmatic approach to addressing her teachers as audience. Two artifact annotations from Joan's portfolio demonstrate how she applies standard conventions to adapt her text for a given audience and rhetorical purpose: "My presentation style was meant to engage the audience, to keep their interest was my task, so for this reason I chose to limit the words on each slide. I wanted the focus to be on me as a speaker" [AA5] and "Spaced paragraphs with graphics, to break up wordiness. The poster is meant to be viewed both as a standalone mounted on a wall as well as at a science fair with a presenter nearby explaining figures" [AA6].

Greg included a photograph of himself from an ugly sweater contest at his internship and described why this provided evidence of his readiness to communicate as an engineer:

The picture below demonstrates my communication skills and the great lengths I will venture to in order to be a part of a team. Laughter is an important function in the engineering world due to its stressful atmosphere. Fitting into this little number made all of my coworkers laugh at last year's ugly Christmas sweater contest [AA1].

The contrast between this annotation about the sweater and Greg's annotation for CEE laboratory report is striking in terms of enthusiasm and depth of analysis. The annotation for the sweater artifact is all about reaching audience, eliciting a response from audience; however, the annotation for the laboratory report does not even acknowledge the existence of an audience: "The level of detail in not only the explanations but also the graphs is an example of my ability to communicate data and complex civil engineering concepts" [AA2].

Ryan, provided several statements and stories that reflected varying levels of rhetorical awareness that could be indicative of his socialization in a technical communication course and lack of professional workplace experience. For example, Ryan commented: "I feel like a large piece of communication is context. I feel like you have to really consider your audience and their circumstances and situation which they're going through reading this" [I7]. However, in the same conversation, in describing his use of graphical elements and organization structure in a set of instructions for changing oil in an automobile, Ryan noted "I felt like the structure really represented a certain aspect of communication, even if someone couldn't understand it, they would look into that and say that I had organized it in a way that the average person could probably understand" [I7]. On another occasion, Ryan described why he decided not to include a particular technical paper he had written for a chemistry class in his preparedness portfolio; his statement shows a lack of sophistication with respect to audience awareness:

it was thick and just really heavy, and someone who didn't have a serious chemistry background probably wouldn't really get much out of it...if anything, it represented my inability to communicate because there was really nothing in there that translated to what a normal person would understand [I18].

However, in one of the few statements Ryan made about his experiences as a warehouse manager, Ryan revealed rhetorical awareness: "When I do analyses for work, when I was a supervisor in a warehouse, I had to consider what my staff, you know, they don't have time to read fancy e-mails and stuff. I'm not going to write a three-page monologue for them" [I11]. The rhetorical awareness that he seems to have developed in the workplace does not appear to have

transferred back to school or other engineering-related activities – at least as evidenced by many of his statements. For example, Ryan’s professional statement provides another look at the general way in which he articulates the principles that he has learned: “I have the potential to share almost any type of information with nearly any audience. Overall, my adaptive skills combined with my thorough understanding of purpose and context enable me to proficiently converse in practically any situation” [PS].

Molly, on the other hand, who had just come to the field of engineering as a transfer student from the humanities, had no engineering workplace experience, and she had not taken any technical writing courses but had taken many other writing and writing-intensive courses from other fields. When talking about effective communication, Molly focused almost exclusively on interactions that led to mutual understandings and rarely spoke of conventions of communication. Molly described an effective communicator as one who not only listens to others and conveys a sense of understanding, but also considers the other person’s background and interests: “you don't want to be talking to your... financial officer about the technical details. He probably does not care and would probably be annoyed if you went on and on about something he doesn't care about” [18]. Molly’s statement reflects her emphasis on social interaction in communication, and working to find common ground.

IMPACTED: Reinforced and new ideas

All of the participants were comfortable discussing the notion of attending to audience when communicating, albeit in varying levels of sophistication, as described in the previous sections of this chapter. Due to the nature of the questions asked of the participants and their discussions in the studio sessions, very few of the many statements made about their views on adapting for audience were specifically attributed to their experiences in the Communication Portfolio Studio; and, as such, impacts of the approach in this area are likely underrepresented. Participants reported that the Communication Portfolio Studio experience had provided opportunities for strengthening or adding to their notions of attending to audience, and a few

commented on learning some specific strategies for dealing with audience. In addition, participant stories illustrate that the oral presentation served as one experience that brought many audience issues together.

Joan stated explicitly that, although most of her ideas about what constitutes communication in the engineering workplace had been formed during her years of internship, the Communication Portfolio Studio experience “may have emphasized the importance of writing for an intended audience” [PoS21]. Sean indicated that his participation in the Communication Portfolio had helped him more fully appreciate the importance of clarity: “I had to learn about how to present my ideas that are clear for both me and the audience, so I guess I know how to do that before...I'm not really good at it, but now I'm fair at it [I32].

Craig, who often expressed empathetic and insightful ideas about audience, noted that the Studio experience had added to his awareness: “Formatting and purpose are very closely related (more so than I previously thought). It's all about being able to communicate your ideas to the target audience for mutual understanding.” [PoS17].

In addition, Lori indicated that she had learned some specific strategies for improving her writing. For example, she spoke about her enhanced awareness of prewriting: “it's more important to go through the writing process before you actually start writing, so like the outlining, the brainstorming... I should put more time into that before I start...the writing” [I12]. She also commented that the Communication Portfolio Studio had experience had helped her make her written work more concise and gave her the opportunity “speak in front of an audience and get my point across in the little amount of time” [PoS26]. Two participants recorded new insights about audience on in-session feedback forms following the *thinking-aloud* exercise and peer review. As their “aha” moments of the day, Tony indicated that “people don't like to read long paragraphs!” [FF:Aha], and Joan noted that “short and to the point is the way to go” [FF:Aha].

Joan shared a story about a developing an increased awareness of the importance of tone. She noted that, in looking for a workplace email message that she could use as an artifact in her portfolio, she realized she should use a more professional tone with her correspondence:

Yeah, it made me realize I should probably do it a little bit more elegantly instead of just like a one -word response or, I don't know, just so I could -- it's more professional, I guess, like it's more important to be professional, even doesn't matter how small the communication was [I14].

This story indicates that Joan has learned something about her habits of communicating that she would like to change — and, further, that she perhaps this is something she might not have discovered without going through the reflective work in the studio.

The oral presentation of portfolios on the final day of the Studio provided a learning experience which was appreciated explicitly by nearly all participants. Some of the benefits cited by participants are particularly relevant for a discussion of audience. Lori commented on multiple occasions about the oral presentation of portfolios, noting that it was helpful to have practice speaking in front of an audience and to be forced to make an argument in two minutes. In particular, she noted that “the two minute presentation was beneficial because it gave me the opportunity to practice in front of an audience before going out to the real world” [PoS31]. Sean also spoke about how the portfolio studio experience helped him present himself effectively, in ways that could be “understood by others and appreciated by others” [I30]. Ryan indicated that he had learned some new strategies for planning and organizing oral presentations from the elevator pitch activity: “I had never really prepared to do a two-minute kind of really fast speech like that before, so it really taught me that I needed to time myself more clearly” [I12]. These statements by Sean, Lori, and Ryan, suggest that the oral presentation activity in the studio brought new insights about attending to audiences when presenting.

ENACTED: Implementing awareness

Participants demonstrated, and spoke about, the various ways in which they attended to audience as they worked through the tasks of creating and presenting their communication preparedness portfolios. Some participants focused on traditional strategies for providing accessibility to the audience, while others brought in rhetorical goals and sensitivity to interpersonal factors.

Sean described the ways in which he tried to make his communication portfolio more organized and user-friendly for his audiences, so that they could navigate the site easily.:

I see that as like the most important part of portfolio, because everybody is going to look at the website as a whole, the portfolio website as a whole. So I try to make sure the artifacts are organized, and the annotations. The artifacts, the way they're presented are easy to navigate, and that's going to be one of the, I guess, most important part [12].

This statement, as did others, suggests that Sean employed what he knew about writing and document design to not only provide the user with a good experience, but also guide them to the parts of the portfolio he most wanted them to see. Along similar lines, Molly described how she designed the layout and organization of her portfolio to facilitate user experience and guide audiences to the content she felt was most important:

I like the fact that my artifacts are as easy as possible to see, so someone would be really likely to just scroll down and at least glance at the content. I like the introduction page that has my ideas and strengths presented clearly. I like the look and feel of the site as a whole. [Molly: Post-Surv: Q5]

Craig also spoke about organization; however, he approached this from a more specific perspective, focusing on the rhetorical nature of organizational patterns for the content in his professional statement. He indicated that he planned to revise the statement to not only be more accessible (i.e., concise), but also to have an organization that aligns more with the message he is trying to communicate to the audience (i.e., his facility with a range of genres – specifically media/mode variation):

The statement needs to be trimmed significantly to better fit the content and a reader with a short attention span. The statement is redundant in a few places and needs to better fit the artifacts as more have been added and the general approach to categorizing them has changed (i.e. going from their individual purposes to whether they are visual, textual, or verbal artifacts) [PoS6].

This statement shows Craig's adaptability: his decisions about the most effective organization structure for his readers change dynamically with the addition of more content.

Nate commented on the importance of the annotations, and, in particular their function in explaining to the audience why the associated artifact provides evidence for the preparedness argument: "it's important to have an annotation for each artifact, otherwise it would just be some random thing there, then the audience would be like, oh, what's it doing there?" [I32].

Molly's professional statement was different from those of the other participants (with the possible exception of Nate's) in that it did not present a narrative argument with specific claims about her preparedness to which she could anchor the associated artifacts through the annotations. Instead, she presented a bullet list with the ways in which communication makes engineering useful and a second list of her strengths as a communicator. In the list of strengths, she enumerates ways of adapting for audience – for example, "I strive to keep the audience foremost in mind, and to use a clear, concise style" [PS], which is a very general, convention-based statement, and "I can support claims with evidence and construct convincing arguments about both technical and non-technical subjects" [PS], which gets at a category of content and type of audience, but is still general. However, she retains her focus on audience partnerships and inclusion with her choice of words. For example, she stated: "The tone of my written, spoken, and visual communication can be adjusted to suit the audience; it is inviting and positive, instead of exclusive or overly complicated" [PS] and "My interpersonal communications are professional, respectful, and helpful" [PS].

As noted earlier, Greg was one of the two participants who identified the studio team as the audience envisioned for the portfolio and who stated that he did not intend to use the

portfolio he created. Greg indicated that he was not comfortable about the final oral presentation in which the participants were to listen to each other's portfolio presentations while role-playing the part of potential employers and then provide feedback to the presenter. Considering his peers as an audience in this situation appeared to have made Greg uncomfortable, and he sought ways to deflect that discomfort by including a photograph of himself wearing a very small sweater in the ugly sweater contest at his internship:

I wanted people to relax and laugh a little bit, because I feel like nobody ever really sees all of your flaws in your work if you're kinda laughing them up a little bit, if you get them to not take everything so seriously... Like I don't want a room full of kids to be... like putting their employer hat on, like, am I going to hire him, is this like really an effective communication portfolio? Like I want them to kind of loosen up, relax, like okay, this kid is funny, you know what I mean? And then it kind of takes the tension off the whole situation [I17].

It is not unreasonable to assume from this statement that his discomfort played a part in his decision to not fully embrace the task by creating a portfolio that he would actually use. However, the annotation in his portfolio for the ugly sweater contest artifact reveals Greg's rhetorical awareness with respect to audience – at least in terms of his statements about alleviating stress and building connectedness through humor:

a little personal embarrassment often brings people closer together. The picture below demonstrates my communication skills and the great lengths I will venture to in order to be a part of a team. Laughter is an important function in the engineering world due to its stressful atmosphere. Fitting into this little number made all of my coworkers laugh at last year's ugly Christmas sweater contest [AA1]

Although the preceding discussion of Greg's statements about the peers as portfolio audiences represented a unique set of expressions among the participants, they are presented in detail because they could reflect some important concerns that students often express about vulnerability, exposure, and peer review. Thus, although other participants did not express these views, that does not mean some were not thinking about them. It is important to note, however,

that the large number of very positive statements made by participants about the oral presentation experience, would seem to mitigate the possibility that many felt as Greg did.

Self as Audience

Findings are presented, categorized by the three analyses, as follows: (a) few experiences with reflection (*revealed*); (b) deeper understanding and self-assessment (*impacted*); and (c) value in revisiting past work (*enacted*).

REVEALED: Few experiences with reflection

Few statements were made by participants about reflecting on past experiences, achievements, and work produced. As such, the dataset was sparse for this analysis. A few participants indicated that they had engaged in reflection before, some noted that reflection was one feature that distinguished the Communication Portfolio Studio from their other coursework, a few addressed the lack of reflection opportunities in the engineering curriculum, or in university courses in general.

Craig described a previous reflective learning experience, which he then compared to his experiences in the Communication Portfolio Studio. Specifically, Craig spoke about the role that reflective thinking sometimes played for him in extending learning experiences beyond the classroom by modifying how he viewed the world:

whatever you're learning in school... if you're learning physics, you're like, oh, I'm looking at light particles right now. But here it's like you're learning about communication, it's like whenever I send off an e-mail to my boss...it's a am-I-being-effective question that pops into my head [I10]

He explained that, just like the learning physics heightened his awareness of his environment, thinking deeply about communication in the studio prompted him to be more reflective about the effectiveness of his communication at work.

Joan highlighted reflection as a defining characteristic of the Communication Portfolio Studio, and noted this as a difference between the studio and other coursework, stating “definitely, it was the self-reflection part that was different than my other classes” [I4]. Along

similar lines, when speaking about the value of the time spent in the Communication Portfolio Studio, Neil compared the work in the studio to that in his engineering courses, again highlighting reflection:

it was interesting. I enjoyed it, and so it wasn't like it was the same type of -- it's not like in engineering where you have a homework assignment that you're stuck on, you have no idea how to do and you're just frustrated, like it was good work and it was reflective work, [I33]

In addition, Neil commented on several occasions about the lack of opportunities since high school for him to step back and reflect on what he was learning. Specifically, during the interview he suggested that there was a need in school for both reflective work and for the content work that he encountered in his engineering courses [I4]. He re-iterated this thought again: "I haven't really had many opportunities in college to just like sit back and reflect on kind of what I've done, and so it [the Studio] was a good opportunity for that" [I6].

IMPACTED: Deeper understanding and self-assessment

Participants' statements indicated that they appreciated the opportunity to reflect in the studio. They commented that, through reflection, they gained greater understandings of their past work, contemplated deeper meanings of communication, and learned to better assess themselves as communicators.

Craig noted that the Communication Portfolio Studio experience had gotten him to look back critically at his past work. He described the ways in which he saw and evaluated things in his past work differently than when he originally created the work. Craig commented that sometimes he saw positive aspects of work not recognized before, and sometimes he saw problems that he had not noticed before: "like what was I thinking back then, those words don't make sense, or--I don't know, sometimes it's the opposite, too, it's like, oh, wow, there's a golden piece out of all that" [I35]. Craig's statement indicates that, through reflection, he is adding to his prior understanding of his past work and experiences.

Lori also spoke about how reflecting upon and writing annotations for her artifacts gave her a deeper sense of understanding about her past work, and she felt that she could rely more now on the past work in making arguments about her preparedness [I31]. Similarly, Joan discussed the benefits of having gone through the process of writing the annotations that described her artifacts, realizing that she could now remember her past work more readily in an interview situation [I6]. Further, she noted that having to re-learn concepts in order to explain them to others was particularly helpful:

It was helpful in that way, so you had to like re-remember basically what you had learned and then try to explain it to other people. You don't really have to do that when you're doing like the first time, because they all know like everybody's lab report is the same, so they basically know what you did. [Joan:I-Trans:4]

Neil commented on the opportunities to step back and look at his past accomplishments and to have a sense of pride: “this process forced me to kind of look back at what I've done and kind of create this portfolio that shows everything that I have done, it kind of -- I don't know, I was kind of proud of a lot of the work that I had done in the past” [I1].

Tony commented on the value of reflection for getting to know oneself as a communicator more than any other participant. For example, Tony commented that reflecting on past work was a new experience for him: “I've never looked back at stuff I've written in that light of communication...it kind of gave me an awareness of where I stand as a communicator” [I6].

Tony explicitly indicated that this reflection enabled him to better assess himself as a communicator. In addition, when commenting about the value of the studio experience, in light of time spent, Tony indicated that it was worth it; and he cited the following reason: “I was able to analyze my own work, and gaining--looking at something with that sort of insight helps me assess what kind of communicator I really am.” [I33]

And finally, Tony spoke again about how much he learned about himself from reflection, emphasizing the lack of such opportunities in school:

I guess it just surprised me how much I could get out of it, just from documents I've already written, and looking at it in a new light surprised me... Right. Well, you know, you write an essay, then you turn it in and then you don't ever look at it again, so I guess I would be surprised. I was surprised at how much it actually said about me, besides just the essay [I1].

Craig made several statements about the ways in which the Communication Portfolio Studio experience helped him reflect more critically and to learn from that reflection. For example, he noted that his thought processes had been improved – in fact, made more conscious, meaning that he can “ask myself better questions of what I am trying to communicate and therefore I can give better and more concise answers” [PoS15]. Similarly, he noted that the experience had prompted him to be reflective about his writing, while he is doing it, which he claimed was “probably the most important thing as far as improving your communication as time goes on” [I31]. And, finally, in response to a question about the major take-away from the Communication Portfolio Studio experience, Craig made this response:

I'm a little bit more reflective on my own communication after all of this. It's like whenever I write something I kind of -- I don't know, I guess the whole -- the goal of the portfolio is to analyze yourself as a communicator, and now I kind of do that all the time. [I5]

Neil spoke about how opportunities for guided reflective work in the Communication Portfolio Studio helped him to bring his own perceptions to the surface and articulate them:

So that perception of communication I think was already there and it's already a part of me, I just didn't-- might not have been able to verbalize it as well because I wouldn't have gone through all the prompts in the whole process of creating the portfolio that really made me think more about communication specifically [I14].

Neil elaborated further on the previous comment by noting he “was able to get a better grasp of what it [communication] is and what it means” [I14].

ENACTED: Value in revisiting past work

The primary task of the Communication Portfolio Studio, creating preparedness portfolios, engaged the participants in several reflective activities, which they often found rewarding. They reflected on, and assessed, their past work and experiences; and, as such, gained greater understandings, which they leveraged in making compelling arguments about preparedness.

Most of the participants indicated at one time or another that they found reflective work in the studios to be rewarding. Three participants shared their reactions relative to elaborating, remembering, and assessing past experiences and work, on feedback forms, as follows: “Reflecting on my strengths and weakness and assessing them” [Tony]; “Reflecting on the importance of my skills” [Nate]; “elaborating on my experiences and actually reflecting on them” [Craig]; and “looking into my old documents, remembering all the things I did” [Joan] – all were [FF:Rew]. These reactions suggest that the reflective activities connected with making a communication preparedness portfolio helped the participants reconnect with and draw meaning from their past work and experiences.

Sean found value in the reflective work involved in figuring out how artifacts provided evidence of his communication skills and capabilities: “writing those annotations really helped me more appreciate those artifacts more” [I3]. Craig acknowledged that making his claims in the professional statement put him into the reflection process; however, he indicated that it was writing the annotations, which are essentially an analysis of the artifacts and their role in the argument, which prompted the serious reflective work:

I'd say more the artifacts definitely got me to think about that a little more towards the end...I guess the personal statement was kind of like getting your mind in the mode of thinking about those experiences...when you actually focus on the...actual meat to those experiences or like the evidence...I'd say that definitely...got me to reflect a lot. [I26]

Ryan also described how thinking about and organizing his past experiences into the portfolio led to new understandings about those experiences, suggesting that restructuring may

have provided new insights about past work: “I really felt like in terms of just because of the structure of the communication portfolio that it really enabled me to sort of look at them from another perspective” [I26].

Summary of findings

Findings were reported for Learning to Construct and Interact with Audience, by sub-theme: (1) Conceptualizing Audience, (2) Addressing Audience, and (3) Self as Audience. For each sub-theme, analyses were conducted to explore (A) what is *revealed* about participants’ rhetorical awareness, (B) what *impacts* are there on participants’ rhetorical awareness, and (C) what does *enactment* of participants’ rhetorical awareness look like?

With respect to *conceptualizing audience*, the analysis revealed that participants’ views of audience ranged from one in which information is transmitted from one party to the other with the audience as passive receptor, to one in which both parties interactively contribute to the development of shared understandings. Participants reported that through interactions with peers in the Communication Portfolio Studio (e.g., multiple peer reviews and opportunities for revision, discussions and brainstorming that resulted in development of new ideas), they developed more interactive, rhetorically aware views of audience. As participants developed their portfolios, most of them chose to adopt the task as transactional (i.e., one that serves an audience that is identified in the task specifications), identifying potential employers and interviewers as primary audiences; however, a few did not (i.e., they named the studio team as their envisioned portfolio audience and did not plan to use their portfolios).

With respect to *addressing audience*, the analysis revealed that participants’ views on addressing audience varied, including reliance on conventions of communication (both contextually mediated and more general) and applying relevant conventions adaptably and empathetically for a specific audience and situation. Workplace and lifewide experience, as well as school instruction in communication, may mediate the participants’ views. Participants reported that their strategies for addressing audience were reinforced and, in some cases

strengthened, through their engagement in the Communication Portfolio Studio; further, the oral presentation served as a significant site for bringing together various audience issues.

Participants enacted their rhetorical awareness with respect to attention to audience as they worked on their portfolio content – some focused on traditional strategies for accessibility while others focused on rhetorical goals and dealt with interpersonal factors.

With respect to *self as audience*, the analysis revealed that few participants had previous experiences with reflection, with some explicitly calling out the lack of opportunities for reflection in school, and noting that reflection was a distinguishing feature of the Communication Portfolio Studio. Participants reported that, through opportunities for reflection, they gained a deeper understanding of their past work, contemplated deeper meanings of communication, and learned to better assess themselves as communicators. Participants leveraged their increased understanding of their prior work and experiences, as well as their assessment of themselves as communicators, in developing their preparedness arguments.

7. THE NEGOTIATION OF “REALITY”

This chapter presents the findings for the analyses of rhetorical awareness that addressed Research Question 3: With respect to the negotiation of “reality” (i.e., how persuasion is understood and appreciated):

- G. What is *revealed* about the participants’ rhetorical awareness through their engagement in the Communication Portfolio Studio?
- H. What *impact* does engagement in the Communication Portfolio Studio have on the participants’ rhetorical awareness?
- I. What does the participants’ *enactment* of rhetorical awareness in the Communication Portfolio Studio look like?

Findings for Research Question 3 are presented according to the sub-themes of the persuasion component of the rhetorical awareness framework: (1) Conceptualizing persuasion, (2) Gaining a voice, and (3) Shaping the practice. As noted in Chapter 2, these sub-themes emerged from the participant data and were used because they aligned with key points in Winsor’s discussion of the negotiation of “reality.” Within each sub-theme, findings are presented for each of the three analyses: (A) revealed, (B) impacted, and (C) enacted.

Of note, participant quotes provided in this chapter include citations to data sources (see also Chapter 4).¹⁰ In addition, a list of participants’ workplace experience and communication courses taken is provided here for reference in reading the findings (see Table 4.1 in Chapter 4 for a full summary of participant demographics):

- Engineering-related workplace experience
 - Yes: Joan, Greg, Tony, Nate, Sean, Craig
 - No: Lori, Ryan, Molly, Neil
- Engineering-related communication coursework
 - Within the discipline: Greg, Sean, Neil (CEE)
 - Outside the discipline (e.g., HCDE 231): all but Molly

¹⁰ AA=artifact annotation, I=interview, FF=feedback form, PoS=post-survey, PrS=pre-survey, and PS=professional statement.

Key findings for each of the major sub-themes, and types of analyses within each, are overviewed in Table 7.1.

Table 7.1 Overview of findings for Research Question 3, the negotiation of “reality,” by sub-theme and analysis (i.e., revealed, impacted, and enacted).

Conceptualizing Persuasion	
<i>Revealed:</i> Dynamics of persuasion	<ul style="list-style-type: none"> • Varying views of the dynamics of persuasion • Views of appropriate use of persuasion, context and purpose mediate
<i>Impacted:</i> Making arguments	<ul style="list-style-type: none"> • Learning to make and support arguments • General arguments, about preparedness, about presenting self
<i>Enacted:</i> Presenting self persuasively	<ul style="list-style-type: none"> • Strategies for persuading through the portfolio • Revealing thought processes, using structure, persuasive content
Gaining a Voice	
<i>Revealed:</i> Position and expertise	<ul style="list-style-type: none"> • Persuading in W/P and other organizational settings • Perceived effectiveness hinged on expertise – real or illusory
<i>Impacted:</i> Standing out	<ul style="list-style-type: none"> • Standing out; portfolios enhance perceptions of others • Knowledge acquisition boosted self-confidence
<i>Enacted:</i> Level playing field	<ul style="list-style-type: none"> • Collaborative problem-solving led to co-construction of knowledge • Experts on selves, some hesitant to turn over expertise to peer review
Shaping the Practice	
<i>Revealed:</i> Contributions of communication	<ul style="list-style-type: none"> • Communication contributes to idea sharing, which leads to progress • Focus within on teamwork; outward on social responsibility
<i>Impacted:</i> New insights	<ul style="list-style-type: none"> • New ways of thinking about communicating in engineering • Engendered deeper thinking – seeing broader impacts
<i>Enacted:</i> Expressing goals and visions	<ul style="list-style-type: none"> • Broad goals: using knowledge for the good of society • More personal goals: adaptability and involvement

Conceptualizing Persuasion

Findings are presented, categorized by the three analyses, as follows: (a) dynamics of persuasion (*revealed*); (b) learning to make arguments (*impacted*); and (c) presenting self persuasively (*enacted*). The dataset upon which the analyses for persuasion drew is smaller than that for the other framework components.

REVEALED: Dynamics of persuasion

Participants’ statements and stories revealed varying perspectives on the dynamics of persuasion, views that ranged from a uni-directional dynamic with one party exerting a force on another, to a recursive interaction between parties – much the way perspectives on audience

relationships varied (as described in Chapter 6). In addition, statements of some participants suggested that context and purpose of the communicative act mediated their acceptance and use of persuasion.

The statements made by Greg are highlighted here because he made the most detailed, frequent, and varied comments about persuasion. He most typically spoke about persuasion as a uni-directional force exerted by one party on another, often framed as “convincing” or even as acts of manipulation. For example, Greg spoke about one of his experiences as a council member of a student government group, in which he attempted to persuade other students to vote for a motion that he had put forth: “I talked them through it, and I kind of pulled them aside and put them in a room where there was no pressure... and then I also gave them something to look at and kind of rely on. So that's what I did” [I13]. On another occasion, when asked to give an example of the ways in which communication can be empowering, Greg described a film he had seen recently; in particular, he spoke about Hitler’s skill as an orator:

I was sitting there thinking, it's like, wow, like I can understand why people would get sucked up into following such an evil person is because he communicates so freaking well... I think that that is a very, very true statement, is that effective communication is empowering, it's extremely important [I13].

On another occasion, Greg spoke generally about the manipulative nature of communication:

“the word ‘effective’ to me is kind of almost uneasy because it relates back to my true feelings of communication when you boil it down is...to be effective at it is kind of like you're an effective manipulator” [I29] and then about his own ability to manipulate others:

I'm capable, if I want to, of convincing people of things, just by the manner in which I bring up topics, the style in which I bring it up, the tone of my voice, the way I engage with them, like I can alter the way people think through my communication skills... do I want to be more effective at manipulating people? It's like, no, because I already do a damn good job of it [I29].

In contrast to the previous examples of persuasive communicative acts, Greg also shared an experience in which he engaged in persuasion as a recursive interaction aimed at problem-

solving: “My coworkers and I repeatedly brainstormed out loud and derived the appropriate answer through collectively correcting each argument and playing devil’s advocate” [PS].

Several participants were relatively hesitant to speak or write the actual term, *persuasion*. Many engaged with the notion of persuasion through their descriptions of effective communication that focused on achieving goals, getting things done, moving projects along. For example, Tony and Nate made the following statements: “Yeah, so if you want to get something done, you better be able to communicate it well, I'd say” [Tony, I13]; and “Effective communication means to be able to convey a message or idea to successful achieve your goal/objective” [Nate, PoS14]. In a longer discussion, Nate elaborated on this description, juxtaposing his statement about goal attainment with an expression of sensitivity to the maintenance of good:

I guess we communicate to kind of--we want something, that's why we communicate. You know, it's a way to express, you know, what we want. And I think effectively communicate is you...get what you want while not like offending anyone...you know, win-win situation, the other person is happy and then you got what you want so you're happy [I7]

Sean recounted a personal experience with persuasion, one that recurred regularly over time and that adds detail to the more general statement made by Nate, above. Specifically, Sean described his yearly travels to China to visit with relatives, indicating how much he enjoyed the interchanges, which often resulted in new perspectives for all parties:

it's a joy to...change their way of thinking and to make sure they understand your opinion and they can more appreciate your knowledge...I've been persuaded by other people before, too, and it's really good, because once you understand their point of view...you get a new way of thinking, and it just opens your mind... [I13]

In Sean’s statement, the interactive, recursive nature of the communicative act is apparent. His explicit statement about being persuaded by others is somewhat distinct among the participants’ stories.

A mini-analysis of the participants' responses to a question about a time when they were able to bring about action, or make things happen, through effective communication revealed that seven of the nine who responded provided stories that involved oral communication, and only one occurred in a professional workplace context. As an example of stories shared, Molly spoke about an experience she had in which a paycheck from her employer bounced, the employer refused to make the check good when she approached them, and she sought her own remedy:

I ended up getting a piece of poster board and writing on it what happened, and I stood outside on the sidewalk in front of the restaurant holding the sign. There was a bus stop right there, right next to the restaurant, just on the sidewalk, like they bounced my check and they won't pay me the fees, don't eat here, don't work here, just stood on the sidewalk. And I think I stood there for about two hours until they finally came out and said, okay, come back tomorrow and we'll give you your money in cash... So that was effective and empowering. That worked out pretty well [I13].

Responses from other participants to the same question included coming up with a solution when speaking to a supervisor, delivering a successful campaign speech, and piquing the interest of young students in Sunday school.

Participants also made statements about occasions for using persuasion, some of which shed light on the ways that context and purpose may mediate notions of appropriateness of the uses of persuasion. For example, Neil spoke about the importance of convincing organizations that he might approach for support when he goes out into the mission field as a practicing engineer: "I definitely need to be able to--with written words explain who I am, what I know, how I can be beneficial to them" [I15]. Ryan noted that persuasion could be appropriately used for the communication of scientific information if you were "trying to persuade someone to give you money" (e.g., federal research funding), but he commented that if you were writing a set of instructions where the users were already motivated to perform the tasks, it would not be appropriate. Lori commented that communicating scientific and technical information would definitely be persuasive – that presenting information in an effective and credible manner helps

persuade the audience to see your thinking: “it's good to be an effective communicator so you can persuade people” [I20].

In addition, Lori attended to the issue of whether the communication of technical and scientific information should be objective:

“I guess in some sense the facts do speak for themselves. If you have the evidence to prove it, then, yes, but being able to convey those to other people, I think that comes with the communications part, you need to be able to explain it well enough to them for them to make it more effective”[I21].

Ryan also shared his thoughts on whether facts speak for themselves. As noted earlier in the findings about socialization through experts and genres, Ryan recalling having been cautioned about the importance of objectivity by a science instructor:

I feel like science is relatively absolute and that when you write a lab report typically it is very technical and very cut and dry... I feel like for your average lab report, teachers will cut you points in like any class if you put anything persuasive in there... You can't persuade someone to believe your opinion [II21].

It should be noted that the Ryan and Lori’s four statements above are responses to the two provisional questions that were included in the interview protocol that were to be asked if time allowed (i.e., [I20] and [I21]). As such, Ryan and Lori were the only two participants who were asked these questions. In another context, Sean touched on the importance of persuasion in the communication of scientific and technical information: “Clear and effective communication allows engineers to transform technical/objective information into persuasive and humane information that the public can understand” [I35]. Sean’s statements here echo others that he made about the social responsibility of engineers to become good communicators so that they can appropriately inform and safeguard the public with respect to their engineering work.

IMPACTED: Learning to make arguments

Several participants made statements about the ways in which the Communication Portfolio Studio had afforded opportunities for them to learn how to make and support

arguments—arguments about their preparedness to communicate as engineers, about their ability to present themselves, or arguments in general. As with other impact analyses, the dataset is smaller than that for the revealed or enacted analyses due, in part, to the nature of the data collection and the discussions in the studio sessions.

Molly commented that she had learned in the Communication Portfolio Studio about the importance of argumentation skills for an engineer: “I discovered that one element of engineering communication I think is important is the ability to make and substantiate a claim” [PoS17]. Neil also indicated through his experience in the Communication Portfolio Studio that he had learned to make a successful argument: “I was able to organize most of my thoughts and present a good argument for why I am a strong communicator” [PoS1]. Ryan commented that one of his major take-aways from the Communication Portfolio Studio experience was having learned to make and support effective arguments: “I feel like I can establish an argument and back it up with strong artifacts and explain why those artifacts are relevant and why they would support my argument” [I5]. In addition, Greg reported having come to a new understanding about the notion of preparedness arguments, noting on a session feedback form that it was rewarding “Figuring out that artifacts are truly arguments on their own & proof of arguments made in the prof. statement” [FF:Aha]. Greg’s statement was particularly salient given that he was the one participant who routinely made abstract statements about not being impacted by the Communication Portfolio Studio experience. Molly, like Greg, commented on having come to new understandings about the language of argumentation in the preparedness portfolio: “I really liked that idea of it’s [the portfolio] an argument and you’re supporting it with evidence. I loved that” [I30]. Lori also acknowledged that it was rewarding during that first session to discover what might be accomplished with a preparedness portfolio: “learning about what a portfolio is and what it can do” [FF:Rew].

Some participants spoke explicitly about having learned in the Studio that making an argument was an effective way to present themselves. Sean described how the Communication

Portfolio Studio helped him develop a way to represent himself: “you can talk about the stuff that makes you stand out... And this experience really gave me a really important--a really good idea on how to do it” [I30]. Similarly, Craig explained that he learned in the studio “how to effectively present yourself through your work. What a good portfolio consists of and the various strategies that can be used in constructing and presenting it.” [PoS1].

In addition, Sean and Tony indicated that the Communication Studio Experience had impacted their thinking about the communication of scientific and technical information. Sean stated that “Effective communication requires a more “human” form of communicating instead of just technical/objective facts” [PoS17] and Tony reported “just because someone has all the relevant facts and data doesn’t mean their writing is persuasive. A lot depends on soft skills like formatting, organization, clarity, and persuasive” [PoS17].

ENACTED: Presenting self persuasively

As the participants developed their preparedness portfolios in the Communication Portfolio Studio, they employed a variety of strategies in making their arguments: revealing their thought processes, using structure to guide readers to important points, and writing persuasive content.

Joan commented on her thought process for the selection and annotation of her artifacts: “by analyzing my own past work I showed employers that I am thoughtful and ready to engage in the workplace” [PoS9]. Joan’s statement shows that, in addition to the evidence she offered up in the portfolio of her skills, the ways in which she made her arguments provide additional evidence of her skill as a communicator. Along similar lines, Joan indicated that she liked that fact that “The bulleted points I wrote about each artifact really walk the reader through my thought process and explain the choices I made” [PoS5]. In addition, Joan’s statement about the important role that annotations play in the portfolio suggests that she sees that her artifacts (and technical writing, in general) need a spokesperson to help readers understand the argument being made:

It's easy to see from developing a portfolio that annotations are more essential than the artifacts in most cases. Good communication is necessary to describe context of the artifact, and a single technical writing piece cannot stand alone [PoS17].

Joan's statement provides a stark contrast to Greg's comments (discussed in Chapter 5) about his vision of the portfolio as a collection of artifacts with no explanatory documents to set context or explanations about why they provide evidence of skills.

Sean described how he used the structure of his portfolio as a persuasive strategy. Specifically, he spoke about the ways in which his organization enhanced the accessibility of the material with the an eye toward helping readers be able to spend more time reading about his skills and competencies and less time struggling with navigating the information space: "I want the audience to spend more time looking at the portfolio and see whether [it is] interesting rather than trying to spend time trying to make sense of it on their own" [I2].

Many participants included persuasive text in their portfolios – some in their professional statements, some in the annotations, and some in both. The use of these genres as arguments was very uneven among the participants. For example Joan, Greg, Sean, Craig, and Neil wrote very persuasive and compelling professional statements that described their preparedness in great detail, using a variety of strategies not only for organization but also for emphasis in the content. Of these, Joan and Craig wrote convincing artifact annotations that made claims relating back to the professional statement arguments – annotations that spoke directly to the skills that were employed in creating the artifact and often indicating how those skills could carry forward into the workplace. Molly's professional statement was, as discussed earlier, not traditional. It did not make separate textual arguments, but it did have a comprehensive list of way that communication contributes to engineering followed by a list of her own competencies and skills that relate to the communication of engineering. Her annotations provide context for the artifact, indicate her contribution to the production, and, at times, the goal achieved by the artifact. While Greg's professional statement and one artifact about the sweater context are engaging and persuasive, as Greg noted himself, the artifacts are

disconnected completely from the statement, due to the fact that he did not have access to his workplace products. Neil's professional statement is intriguing and convincing (he was also the only one to include a photograph of himself alongside the statement); however, as noted elsewhere, the effectiveness of his annotations is very uneven; he wrote compelling and lively annotations for his artifacts from lifewide experiences, but wrote very short, general, and relatively bland annotations for the artifacts from the technical communication course and the CEE laboratory writing course.

Nate seemed to miss the opportunity to leverage his professional statement or artifact annotations as persuasive arguments. His professional statement, in fact, does not make any explicit claims about his preparedness to communicate – in terms of form, it is a bit like Molly's. However his lists are not as relevant or obviously connected to communication as Molly's were, and thus would really benefit from persuasive glue; for example, he presents an impressive list of awards, professional organization affiliations, licenses (i.e., real estate broker), and design projects and coursework but does not then state how these provide evidence of his ability to communicate. The only reference to communication appears near the end of the narrative: "In both academia and industry, communication is very important. This portfolio showcases: proposals, slide decks, posters, blogging and my LinkedIn profile" [PS]. Nate was also unable to access his work products due to confidentiality issues; he, therefore, notes in the annotations that his artifacts are proxies: "Due to the proprietary nature of these proposals, enclosed please find a copy of a proposal for a mock consulting project used in the HCDE 333 class" [AA1]. Nate's use of substitute artifacts was a good solution; however, he too missed the opportunity to use the professional statement as an example of his persuasive communication skills. In other words, he left the reader with the task of making connections between his many accomplishments and his effectiveness as a communicator.

Gaining a Voice

Findings are presented, categorized by the three analyses, as follows: (a) position and expertise (revealed); (b) standing out (impacted); and (c) level playing field (enacted).

REVEALED: Position and expertise

Participants made statements about their use of persuasion in a variety of settings for a variety of purposes. Specifically, reported here are participants' stories about their persuasive attempts to effect actions or achieve goals within workplace or other organizational settings. Also reported here are participants' stories of communicative experiences, drawn from a variety of settings, which suggest that their perceptions of their effectiveness (or persuasiveness) hinged on their expertise, real or illusory.

Craig's annotation of a report that he wrote for the CEO at his internship reveals his awareness of the rhetorical possibilities involved in his task:

I consciously laid out the report in sections that made the most sense in terms of what was required of each platform so it was easy to see the pros and cons. I also had to summarize my findings down to the basic what's and why's and verbally present them to the CEO. I designed this document with these considerations in mind and I believe that it achieved its purpose [AA5].

Craig's statement shows how he used document design elements to guide the CEO not only to his key points, but also to his summary of findings, demonstrating that he was able to persuade someone in a position above him in the hierarchy at his workplace. Craig described a different workplace communication experience, one in which he communicated laterally within his company, across divisions or fields (i.e., engineering and finance) – keeping the lines of communication open so that the parties understand what is possible, or perhaps even lobby for what is possible (it is unclear in the text): “like we can't do this but we can do this” [I15]. Craig's statement shows his understanding of the importance of being able to communicate effectively to achieve a goal.

In the only statement that Sean made about an internship experience in China (other than the annotation for his artifact from the internship), he describes his need to use persuasion to convince the senior engineers to accept his advice about translation:

I had to talk to...senior engineers there, and they don't really speak English... it's hard for them to adapt into a way of thinking... So I had a hard time trying to convince them that this is really how you translate this word into this word, you know. Yeah, it takes time, a lot--a lot of communication [I17].

Sean's statement shows that he recognizes that it is hard work to persuade others to your own way of thinking, particularly others who are in a higher position. Nate also provided a story about communicating within an organization to effect change. He described his leadership role in a student business association for science and engineering students (SEBA) and the impact that his communication has on the organization, by virtue of the position he holds:

I'm planning the mentorship program for this year...[I] have to communicate with the students and then have to communicate with the professionals, organize the meetings, kind of get an understanding of everybody's expectations, and then also, um, try to learn from what has happened to help refine the program for next year [I25].

Nate's statement suggests that he appreciates the fact that his position as an officer makes it possible for him to not only facilitate dialogue and connect people together in the present, but also to impact future activities of the association.

The next set of participants' stories deals with the role that expertise can play in the ability to have an impact on others through communication (i.e., to be persuasive). For example, Lori described how having expertise affected her perceptions of an oral presentation that she made during her senior year in high school:

I was the expert there about it, because I was the one that did the research, so I knew more about it than anyone else, or so I'd like to think that, and just being able to get everything that I wanted to say to everyone and explain it effectively and have everyone engaged in--my speech, I felt that made it effective [I19].

Lori also described, on other occasions, how feeling knowledgeable helped her to be more successful. Lori was not the only participant who addressed issues of knowledge and communication; many others spoke about the effect that feeling like an expert had on their ability to communicate effectively. When Tony was asked to describe a positive speaking experience, he focused on expertise: “I felt confident and relevant. I knew exactly what I was saying and I knew people would listen. Being knowledgeable in the subject matter helped a lot” [PrS4]. Tony’s statement is quite salient, given his many statements about his lack of confidence in his ability to communicate orally – this is one of the only times that he indicates that lack of knowledge may be a contributor; his typical focus is on the mechanics of processing input and being expected to craft a response in the rapid sequence that occurs during conversation (see Chapter 9).

When describing his experiences at his internship with a city public works department, Greg emphasized the importance of learning the codes and regulations so that he could provide accurate information to the public. In addition, in speaking about his preparedness to communicate as a practicing engineer, Greg again highlighted the importance of knowledge:

I feel like I'm very prepared as far as the toolbox that I have to communicate with... But as far as the material that I need to understand to be able to communicate as a professional engineer in the professional engineering environment before I'm a professional engineer...that's where I feel like I'm lacking [I31]

A few participants spoke about the ways in which the *appearance* of expertise enabled communication to be more persuasive. Nate described being impressed by the ethos established by the entrants in a business plan competition: “I think most of the people that compete in business plan competitions as a whole they give me an impression, you know, they really know what they're talking about...they're just good at public speaking” [I8]. He went on to discuss how he thinks that even if they don’t have the answers, they are adept enough to move the conversation into a different area. Ryan, on the other hand, presented a more extreme view: “I can speak well. I can speak articulately, efficiently, I can...make it look like I know what I'm talking about even in cases when I don't, and I feel like in industry that's a very relevant skill”

[I25]. While this sentiment was not expressed by any of the other participants, Ryan's statement does represent one participant's view on the ways in which communication can be used to bring about action, and it provides a glimpse into what the participant sees as preparation for communicating as a practicing engineer.

IMPACTED: Standing out

Participants made statements about the ways in which having a preparedness portfolio impacted how others perceived them in terms of their expertise and preparedness – in other words, the ways in which the portfolio will help them stand out as skilled communicators. Participants also made statements about the ways in which the knowledge they gained in the Communication Portfolio Studio, both about their own expertise in communication in general and in terms of knowing how to make preparedness portfolios, increased their perceived self-efficacy for communicating as practicing engineers (see Chapter 9).

For example, Neil spoke explicitly about the Communication Portfolio Studio having helped him become aware that communication skills affect the way that others perceive you: "I also now have a portfolio, and I've been able to see more the benefit of communication and what a difference that can have on how you come across to people" [I6]. Neil also noted that having the portfolio will help him in the future when competing for engineering positions: "I feel like that's [communication skills] something that is looked for, because...we have the technical skills, it's...communication is lacking among engineers, and so maybe that's exactly what an employer wants to see" [I3].

Lori described how she realized now that it was empowering to have a portfolio that demonstrated her communication skills that she could take with her to show interviewers [I14]; she also noted that "the fact of just having a portfolio, um, that will kind of make you stand out from other people, so I think that will help me when I apply" [I34]. Craig explained that he discovered, through the Communication Portfolio Studio, "how easy it is to build a portfolio...given a structure and need to kind of populate it with yourself...yeah, probably just

how simple a portfolio actually can be with how strong it can be at the same time” [I1]. These participants’ statements describe tangible impacts of the Communication Portfolio Studio on their perceived self-efficacy for presenting themselves and job searching, which will be addressed further in Chapter 9.

A few participants made statements that indicated, or implied, that the knowledge they gained in the Communication Portfolio Studio, with respect to communication skills and portfolio development, may have enhanced their ability to effect change through their own communication efforts. For example, Ryan described having gained knowledge about his own capabilities and how important that knowledge will be for him in the future:

I have completed a communication portfolio, I have learned a lot about my own personal communicative capabilities, and I have learned how communication can be pertinent within the context of the engineering workplace [PoS31].

Craig’s statement explicitly calls out having increased his knowledge of his own skills: “I am definitely more prepared and more aware of the state of my communication skills but more importantly what it takes to be effective” [Craig PoS34]. Both Ryan and Craig’s statements suggest that they have an enhanced sense of their capabilities to communicate effectively and have an impact (i.e., be persuasive).

Molly noted on several occasions that she found it empowering not only to have the portfolio that backs up her claims about being an effective communicator, but also to have the expertise to create another if she wanted to: “I think the most rewarding thing is the – the feeling of capability of doing it again and understanding the process” [I3]. Even Greg, who had indicated that he did not see any value in having a communication portfolio, commented on a number of occasions that he appreciated having learned the process of how to make one and that he would likely make a general engineering portfolio in the future: “the most rewarding part was probably just seeing the process, having a better understanding” [I3]. Molly and Greg’s statements demonstrate that the Communication Portfolio Studio had an impact on their abilities to make preparedness portfolios, which are inherently persuasive texts aimed at inducing action.

ENACTED: Level playing field

The Communication Portfolio Studio attempted to provide an environment in which all participants were on the same level in terms of position and expertise. With respect to position, participants were all assumed to be novices in this rhetorical community, and there was a facilitator rather than a teacher – hence, the structure was flat. With respect to expertise, participants were each assumed to be the most expert in the studio with respect to their own skills and competencies. As Winsor noted, reality is constructed through persuasive interaction between reality and a knower and among knowers, within a power structure based on position and expertise. Participants engaged in collaborative problem-solving activities that led to the construction of knowledge. Some participants struggled with turning over the expertise on their own preparedness to others for peer review.

To explore knowledge sharing and construction in the studio sessions, the mini-analysis conducted in Chapter 6 to get at reactions to peer review (of the take-away question from the studio sessions) was re-explored from the slightly different perspective of discussion, brainstorming, and other group-think activities. Findings revealed that nine of ten people wrote about the discussions and interactions in the studio being helpful, and seven participants identified particular forms of help, including learning from others, collective sense-making, and improving one's own work based on input from others. These findings, together with the previous findings for positive peer review reaction, strongly suggest that the studio sessions were sites for the co-construction of knowledge in terms of the rhetorical task of development of communication preparedness portfolios.

As a final note here, each participant was assumed to be the expert in the sessions on themselves and their preparedness arguments. Two participants appeared to struggle with turning over their expertise with respect to peer review. Molly indicated that she did not really see much value in having peers review her work “I don't put that much stock in peer feedback really, much...most of the time...I have my own opinion that I think is pretty great” [14].

However, at the same time, she very much wanted to have feedback from the facilitator – or someone whom she considered to be expert; Molly mentioned at the interview that she had been frustrated that she did not get that feedback. Tony, on the other hand, truly did not want anyone's review – he saw himself as the only legitimate reviewer of his own work:

the whole notion of like sharing my work with someone doesn't really gain me much benefit, because, you know, it's my work, I don't need to show it to anyone else to help me at all, because, you know, I can...I can know it's mine and I can write about it on my own and get the same benefit [I34]

Despite these statements by Molly and Tony, each of them wrote on in-session feedback forms that they found it rewarding to be reviewed by peers. There is no clear way to know from the data whether the positive aspects of peer review outweighed the reservations expressed above, or, if Molly and Tony's positive reactions to peer review was only for the part where they were reviewers (or due to any other combination of factors).

Shaping the Practice

Findings are presented, categorized by the three analyses, as follows: (a) contributions of communication (*revealed*); (b) heightened awareness (*impacted*); and (c) expressing goals and visions (*enacted*).

REVEALED: Contributions of communication

Participants made many statements, across data sources, about their views on the ways in which communication contributes to the field of engineering. A primary focus for many participants was the notion that sharing ideas and knowledge led to progress in engineering. In addition, some participants emphasized teamwork (i.e., idea sharing within the discipline), while others focused on social responsibility (i.e., knowledge sharing beyond the discipline, informing the public).

Craig commented that idea-sharing was a driving force for progress in the world, and that the ability to communicate persuasively enables one to participate in the negotiation:

“Any form of progress in the engineering world started with or involved communication of an idea. In order to be successful at being able to be heard and being able to listen, one must know how to communicate effectively” [PoS35].

Molly shared a similar sentiment about idea-sharing and added an emphasis on establishing relationships: “Information must be shared to be useful, and communication is sharing information. I also think that relationships are important in engineering, and they are often based on good communication” [PoS35]. Molly reiterated this same thought again on a different occasion: “Information that is not shared has no meaning or value, so I think that communication gives value to engineering” [I37].

Other participants spoke about the need for information to be shared, especially as it relates to teamwork.. In particular, Neil addressed the fact that engineering projects require multiple individuals and, as such, communication plays a critical role:

One person alone cannot build a bridge, it takes many workers, and organizing that many people requires communication. Having strong technical skills is meaningless as internal information, but gains meaning through implementation and sharing [PoS35].

Greg also spoke about teamwork, referring to the story of the Tower of Babel, in which the only way to stop the building of the tower from reaching the heavens was to remove the possibility of communication among the builders. Greg sums up his example in this way: “that's how important communication is to engineering. Without communication, there would be no engineering, there would be no structures. So it's fundamentally important to engineering” [I37].

Along similar lines, Ryan spoke about communication being essential for connecting people together so that knowledge sharing can take place, and so that teams can function effectively:

“People have to communicate in order to work successfully with people...they've got information and knowledge that maybe you don't, and then you've got information and knowledge that maybe they don't. And in order to really promote synergy within a team and to really just work hard--work well in a team” [I37].

Lori also spoke about the importance of clear communication between team members, so that work can progress and outcomes can be reached that are aligned with expectations of the parties:

really important in engineering because just being able to get your thoughts out and hearing other people's ideas, that's what makes it happen, like if you're not able to clearly express what you want, then how is -- they're not going to be able to understand what you're saying, and you're not going to get the product that you're trying to do, [I15]

Sean spoke about the responsibilities of engineers to pass their knowledge on to upcoming generations of engineers to keep the knowledge flowing:

you always have to look after the people in the new generation, so every engineer, every generation, have their own methods of communicating, right, communication, and as engineers, you want to assist junior engineer, you want to be able to pass it down to newer generations...you never want to have a line cut between them [I15]

The two next examples deal with communicating outward, to the world beyond engineering. Neil focused on the importance of communicating engineering work to those in society in order to not only inform them, but also keep informed on their needs:

It's essential, kind of the backbone of everything that you do, because you're always-- especially like civil engineering, you're doing infrastructure for a society, and so you need to know--be able to communicate with that society in order to know what needs to be done [I37].

Sean also spoke about engineers communicating to the public. He focused here, specifically, on the social responsibility that engineers have to communicate clearly in order to keep the public safe:

there's a specific guideline what we did wrong...which part of the project we did and which part that we didn't really pay attention to...those had to be really clear and important, not just to engineers but to the public as well, because you have to make sure the public are safe, because you have done something right [I37].

Sean also explained how his personal views of communicating knowledge work differed from a traditional engineering perspective that restricts engineers to presenting objective facts:

you are engineer but...you are allowed to express your own opinions...express those technical facts as like telling a story...you're supposed to get other people's attention, right, get their interest? If they're not interested, then you're just presenting objective

facts, then they might misunderstand, you know, and it's hard for them to understand something that they're not interested in [I37].

IMPACTED: New insights

A few participants commented on having developed new ideas about the various roles that communication plays in the field of engineering, such as the ability to make and substantiate claims, and the dangers of miscommunication. In addition, a few participants spoke about how the Communication Portfolio Studio prompted them to think more critically about the meaning of communication in an engineering context. This dataset was very small – there were no direct questions about having developed new notions the role of communication, in contrast to the large dataset for the previous section, which was drawn from two direct questions (asked of all participants) about the contribution of communication to engineering.

Molly spoke about having discovered that being able to make claims about one's work, and back them up, is critical to one's work being accepted and used:

I discovered that one element of engineering communication I think is important is the ability to make and substantiate a claim, since that is how engineers make their work useful to others. I can see technical and scientific information as all needing to make claims and justifications to be useful, and I hadn't thought of it in that way before, specifically [I17].

In addition, Molly indicated that she came up with a new understanding about the importance of everyone being on the same page in engineering work: “most people most of the time don't have bad intentions, but there's miscommunication...seems like a pretty big problem in communication in general, and, you know, in engineering that would be really important to communicate correctly [I7]. Further, on an in-session feedback form during the second studio session, Molly indicated that it was rewarding “Thinking about why communication is important to engineering in particular” [FF:Rew].

Several participants, while commenting on the impact of the Communication Portfolio Studio on their views of the importance of communication in engineering, also commented on

the way in which the experience helped them clarify their thinking about what it means to communicate in an engineering context. For example, Lori indicated that she knew before the studio that communication was important in engineering practice; however, the studio caused her to think more deeply about the ways in which it would be important:

I realize that it's going to be more important... I kinda knew that before, but I didn't think that it played a major key role, I guess... In engineering. Then I realized that, oh, it's actually really important, and I think that to be an engineer you could--you basically need to be an effective communicator [I16].

Sean described the ways in which the Communication Portfolio Studio experience gave him an even greater appreciation for the importance of communication to engineering and to life beyond, what an important skill it is, and how empowering it can be generally:

"communication is important, right? I know that before, but after this I know...It's one of the most important skills. So it is empowering, you can--you can use it in different occasions, and not just in the engineering major, right? Communication is important as a person in life, and you can--and use it on many different occasions... I never realized how much I can use communication towards the things I'm doing right now, and after this session, yeah, it opens my mind" [I16].

And, finally, Molly discussed the ways in which the Communication Portfolio Studio helped her think more concretely about communication and to articulate those thoughts:

I have always considered myself an excellent communicator in professional and academic environments, but I hadn't given much thought to exactly what that meant or entailed. It was clarifying to think and make statements about why communication is important and what that means in an engineering context. It is possible to say some specific, concrete things about something that sounds vague (communication) [PoS15].

ENACTED: Expressing goals and visions

Participants were asked to make claims about their preparedness to communicate as practicing engineers in their professional statements and to support them with persuasively annotated artifacts. As such, many participants' statements and annotations focused on their own specific skills and how they prepared them for what was needed in the engineering workplace.

Many participants wrote about what they hoped to accomplish as engineers, what their visions were for how their individual contributions could better the field, and what role communication played in those goals and visions. This section includes excerpts from participants' professional statements and artifact annotations that focus on using knowledge for the good of society, communicating clearly to avoid misunderstandings, communicating adaptively for various audiences, and maintaining involvement through communication.

Neil wrote in his professional statement that he would like to leverage the knowledge that he had acquired in school to help people in society:

The trait that distinguishes me most beyond other engineers is my communication ability ...I realize the practicality of what I have learned and the ways in which it can be used to directly help people in our society. I genuinely enjoy all the aspects of engineering that I have encountered and find enjoyment from thinking critically to solve problems [PS].

Similarly, Nate shared his thoughts about wanting to use his knowledge to solve problems and improve the lives of others:

I am well versed in Asian and North American culture and business practices and I hope to take my experiences to a new level to my knowledge into developing solutions to solving complex problems. At the personal level, I am passionate about making a positive impact in the lives of others by mentoring and bridging connections [PS].

Sean commented on the social responsibility of engineers to communicate clearly:

I believe that it is also every engineer's responsibility to express themselves effectively with regards to preserving the welfare of the society... In the end, it would be my duty to utilize my communication skills in helping raise public awareness on many of the engineering/environmental issues that we're facing today [PS].

In his professional statement, Ryan emphasizes the importance of communicating in ways that others can understand: "fundamental to the demonstration of knowledge and understanding within any group or organization. In order for an individual to convey his or her understanding to others, he or she must be able to effectively express ideas in an efficient manner" [PS].

Joan highlights in her professional statement her positive attitude and desire to work collaboratively: “I am comfortable in a variety of situations, and I approach group projects with optimism. Generally, I look forward to working with people” [PS]. Further, in one of her artifact annotations, Joan reveals some of her commitments to engineering:

“As a member of the American Society of Mechanical Engineers, I presented this PowerPoint to a group of my peers. I was my goal to stir interest for Puget Sound Naval Shipyard (PSNS) as well as to encourage internships at the undergraduate level in mechanical engineering” [AA5].

Joan also focused on the role of clear communication in facilitating the execution of responsibilities within a team: “It would be advantageous to create a document like this in the workplace, so that group member responsibilities and group dynamic can be established to limit a number of confrontations that might arise” [AA1].

In a similar way, Molly wrote about taking on the responsibility for communicating with a client for a team project in a class: “I served the group by conducting all the communication with our mentor over the course of the project...Our group maintained a good working relationship with our mentor throughout the course of the project” [AA2].

In one of his artifact annotations, Greg spoke about ways he could use his communication skills as an engineer to benefit society:

Porous pavement has always been an interest of mine due to its ability to positively benefit society and control water quantity and quality issues. As a future engineer I am excited to give presentations on material that I am passionate about. After years of debate and public speaking in high school giving presentations have become second nature. Communicating to crowds is one of my strengths [AA3]

In his professional statement, Craig outlined several different areas of competency that are needed for engineering today and why; he also noted that he has experience in each of the areas listed, implying his ability to contribute in each. He stops short of explicitly articulating his own professional goals:

The business-engineering relationship has its gaps in communication due their almost mutually exclusive purposes in the industry and differences in background. Carefully summarizing but not over-summarizing is a useful skill in designing communication to effectively translate from 'engineer-speak' to 'business-speak'

In her professional statement, Molly described the function of effective communication in the practice of engineering. She highlighted the critical role of expertise in the ability of an engineer to have her knowledge work accepted and used: "The engineering practice is based on the expert opinion of the professional, and the opinion must be well-reasoned and well-argued to be accepted and used" [PS]. This statement also suggests that Molly is able to see the technical and communicative aspects of engineering work as intertwined.

A few participants confined themselves in their professional statements to listings of skills and accomplishments and general statements about the importance of communication, without touching on any specific visions for the field or goals of their own involvement. For example, Ryan focused on describing the importance of communication and on promoting the skill set that he brings: "I am suited for a variety of roles within virtually any organization. Overall, I am a valuable member in any group" [PS]. Tony described his job duties and some of the skills he uses in his position as student web editor for UW: "I have demonstrated many effective tools of communication towards a wide range of people and these skill sets will definitely carry over to many different job environments" [PS]. Lori simply listed her experiences, assignments, and skills, and notes that "These experiences help show my effective communication skills as a practicing engineer" [PS].

Summary of Findings

Findings were reported for The Negotiation of "Reality," by sub-theme:

(1) Conceptualizing Persuasion, (2) Gaining a Voice, and (3) Shaping the Practice. For each sub-theme, analyses were conducted to explore (A) what is *revealed* about participants' rhetorical awareness, (B) what *impacts* are there on participants' rhetorical awareness, and (C) what does *enactment* of participants' rhetorical awareness look like?

With respect to *conceptualizing persuasion*, the analysis revealed that participants held varying views of the dynamics of persuasion, with some describing it as an act in which one party exerts influence on another, while other participants described it as a recursive interaction between parties. It was also revealed that context and purpose likely mediate participants' acceptance and use of persuasion. Participants reported that the Communication Portfolio Studio provided opportunities for learning to make and support arguments about their preparedness to communicate as engineers, about their ability to present themselves, or in general. As the participants developed their preparedness portfolios, they employed various strategies that demonstrated their notions of persuasion: revealing their thought processes, using structure to guide readers to important points, and writing persuasive annotations for their artifacts.

With respect to *gaining a voice*, the analysis revealed some of the ways in which participants employed persuasion within the workplace or other organizational settings in order to effect action or achieve particular goals. In addition, the analysis revealed that some participants' perceptions of their own effectiveness (or persuasiveness) depended upon their expertise – real or illusory. Many participants reported that they believed that having a completed preparedness portfolio influenced the way that they were perceived by others and could help them stand out. Participants also indicated that their increased knowledge of their own expertise in communication increased their self-confidence for communicating as practicing engineers (covered in Chapter 9). As participants interacted with their peers in the Communication Portfolio Studio, they engaged in collaborative problem-solving activities, such as brainstorming, that resulted in the co-construction of knowledge relative to the rhetorical task of creating a preparedness portfolio. In addition, some participants struggled with handing over their expertise about their own preparedness to peers in a review session.

With respect to *shaping the practice*, the analysis revealed that most participants held strong views on the contribution of communication to the field of engineering – primarily, that the sharing of ideas and knowledge leads to progress. Some participants focused on teamwork

and, hence, the idea-sharing they spoke about was within the field, typically. Others focused more on social responsibility, which typically meant that they commented on sharing knowledge outside of the field (e.g., keeping the public informed and safe). A few participants commented on having developed new ideas about the various roles that communication can play in the field of engineering; some indicated that the Communication Portfolio Studio prompted them to think more critically about the meaning of communication in an engineering context. As participants wrote claims in their professional statements and persuasively connected their chosen artifacts to their claims in the annotations, they often revealed personal goals and visions for their future practice, highlighting the importance of their communication skills and experiences in the fulfillment of those goals and visions.

8. DISCUSSION OF RHETORICAL AWARENESS

This chapter discusses the findings for Research Questions 1-3 pertaining to the analyses of rhetorical awareness, which were presented in Chapters 5-7 (questions in brief form here):

1. With respect to **socialization through experts and genres**: (A) What is *revealed* about the participants' rhetorical awareness through their engagement in the Communication Portfolio Studio? (B) What *impact* does engagement in the Communication Portfolio Studio have on the participants' rhetorical awareness? (C) What does the participants' *enactment* of rhetorical awareness in the Communication Portfolio Studio look like?
2. With respect to **learning to construct and interact with audience**: (A) What is *revealed* about the participants' rhetorical awareness through their engagement in the Communication Portfolio Studio? (B) What *impact* does engagement in the Communication Portfolio Studio have on the participants' rhetorical awareness? (C) What does the participants' *enactment* of rhetorical awareness in the Communication Portfolio Studio look like?
3. With respect to **the negotiation of "reality"**: (A) What is *revealed* about the participants' rhetorical awareness through their engagement in the Communication Portfolio Studio? (B) What *impact* does engagement in the Communication Portfolio Studio have on the participants' rhetorical awareness? (C) What does the participants' *enactment* of rhetorical awareness in the Communication Portfolio Studio look like?

The remainder of this chapter includes the following sections: summary of findings, main discussion topics, methodological considerations, and connections to the pedagogy of the Communication Portfolio Studio.

Summary of Findings

Findings for Research Questions 1-3, which were reported in Chapters 5-7, are summarized in Table 8.1.

Table 8.1 Summary of findings for Research Questions 1- 3, by sub-component and analysis type (R=revealed, I=impacted, E=enacted).

Research Question 1: Socialization through experts and genres	
Recognizing and learning the genres of practice	<ul style="list-style-type: none"> • (R) Genre learning in school and workplace experienced differently • (I) Conceptions of genre expended through peer interactions • (E) Conflicts with genre expectations; varied genre learning experiences
Performing the genres of practice	<ul style="list-style-type: none"> • (R) Measures of success for genre performance vary • (I) Re-thinking purpose and measures; recognizing new value and use • (E) Freedom from grades and guidelines; concerns for correctness persist
Communicating as engineers	<ul style="list-style-type: none"> • (R) Stereotypes about engineers as communicators; disconnects • (I) Increased awareness of importance; thinking of meaning of communication • (E) Role of communication; self as communicator; enacting through artifacts
Research Question 2: Learning to construct and interact with audience	
Conceptualizing audience	<ul style="list-style-type: none"> • (R) Varying views of audience role and relationships • (I) Peer interaction led to idea sharing; benefits of creating vs. sharing • (E) Seeing portfolio task as transactional; envisioning portfolio audience(s);
Addressing audience	<ul style="list-style-type: none"> • (R) Varying views of addressing audience • (I) Reinforced views of audience; new strategies; oral presentation audiences • (E) Accessibility through writing and layout; rhetorical goals and interpersonal
Self as audience	<ul style="list-style-type: none"> • (R) Few prior reflection experiences; reflection sets studio apart from coursework • (I) Deeper understanding of past work; reflection for assessing self • (E) Leveraged increased understanding of past work and self in arguments
Research Question 3: The negotiation of "reality"	
Conceptualizing persuasion	<ul style="list-style-type: none"> • (R) Varying views of persuasion; appropriate use by context and purpose • (I) Learning to make and support arguments; presenting self • (E) Persuading through portfolio content, structure, rhetoric
Gaining a voice	<ul style="list-style-type: none"> • (R) Using persuasion in workplace/org setting; effectiveness based on expertise • (I) Standing out with portfolios; increased knowledge boosts self-confidence • (E) Collaborative problem-solving, co-construction of knowledge, releasing self
Shaping the practice	<ul style="list-style-type: none"> • (R) Contributing to idea sharing, to progress; teamwork; social responsibility • (I) New ways of thinking about communication, deeper thinking • (E) Broad goals: knowledge for society; personal goals: adaptability/involvement

The three main sub-components of each research question are listed in the left-hand column of the table, while a brief one-bullet summary of the findings for each type of analysis is presented in the right-hand column. The discussions for the three research questions follow.

Discussion

The broad, two-fold purpose of the study reported in this dissertation is briefly (1) to explore students' conceptions and perceived self-efficacy for the communication of practicing engineers, and (2) to examine a particular pedagogical approach (i.e., PPPS) for its effectiveness in facilitating this exploration. In this study, the research questions were constructed such that the examination of the pedagogical approach was not a separate research question, but, rather, was embedded within each of the research questions.

Thus, each of the three rhetorical awareness research questions listed above has embedded within it not only the questions about the three types of analyses conducted (i.e., revealed, impacted, and enacted), but also the question about the effectiveness of the pedagogical approach used (e.g., What is *revealed* about the participants' rhetorical awareness **through their engagement** in the Communication Portfolio Studio?). The individual discussions of the findings for each of the three research questions will touch on the contributions of the pedagogy; however, the most explicit discussion of the findings for the effectiveness of the pedagogical approach is handled collectively for the three research questions at the end of this chapter, under "Connections to the Pedagogies of the Communication Portfolio Studio."

It is beyond the scope of this document to discuss all 27 findings individually. Thus, for each research question (i.e., each chapter), two main topics are discussed, each of which draws from one or more of the nine findings for that research question. The rationale for the selection of discussion topics, as well as their underlying findings, is given.

Research Question 1: Socialization through experts and genres

The two discussion topics for Research Question 1 are Genre Encounters and Measures of Success. The original, working title of this research question included "what counts as professional communication for engineers" (full question text appears in Chapter 1).

Discussion Topic 1: Genre Encounters

This discussion topic draws from findings reported under the first framework sub-component, Recognition and Learning the Genres of Practice, as well as the third sub-component, Communicating as Engineers, focusing on the participants' breadth of understanding of the genres of professional practice and on issues surrounding stereotypical thinking about communication and engineering.

Winsor suggested that "the engineering genres they [the student in her study] most commonly wrote affected their understanding of engineering writing and engineering epistemology" (1996a, p. 19). She further noted that the students' employers and professions "created the demands that their writing had to meet and provided support that helped them to do so in the form of experienced writers and established texts" (p. 21).

With respect to genre learning in the workplace, stories told by Joan and Greg about their experiences as novice engineers suggest that the specific forms and protocols they used at their internships shaped their understandings of the ways of knowing for their engineering disciplines and also the ways of doing at their particular places of employment. Joan and Greg both indicated that there were genres and specialized jargon or codes that they had to learn in order to take part in the activities at their internships – and, thus, learn to "think and act as a member of one's profession or discipline" (Bazerman, 2009, p. 289).

While Joan spoke about a mentor who was available to her on a daily basis to help her learn the ways in which she needed to communicate with colleagues at the naval shipyard, Greg made no mention of a mentor, indicating that he had to learn the "hard way" how to communicate "inside of the engineering world." These differences were not altogether surprising given that Joan typically focused on teamwork and collaboration, while Greg typically focused on his own individual achievements – evidenced across data sources and time. The specialized forms, jargon, and office protocols that Joan and Greg talked about seem to provide support to Freedman's (e.g., 1993) argument that it may not be desirable or even possible to explicitly teach

students the genres they will need in the workplace because it would be impossible for teachers to adequately predict, and be familiar with, all the genres they will need and because part of learning genres includes the social context in which they are embedded. While Devitt (2004; 2009) acknowledges that genres will likely be taught incompletely, she asserts that “students will understand more about it [genre] than they would have if we had taught them nothing about it at all” (p. 341); thus, she promotes the teaching of explicit genres by teaching critical genre awareness.

Winsor found that individual differences likely drove the opportunities to write that the students in her study had at their co-ops: “writing experiences are affected by the strengths and interests that lead a given student to do some tasks rather than others” (1996a, p. 41). Craig, one of the most rhetorically aware of the participants in my study, described some of the communication tasks that he had been given at his internship, tasks that suggest that he had a position of some responsibility, as noted in his description of the recommendation report he wrote for his CEO. Craig’s experiences seem to resonate with Winsor’s observations above.

With respect to genre learning in school, the participants’ stories seemed to reflect more variation among participants than those stories from the workplace; this could be due to the fact that there were more stories overall from school, or that the settings for communication instruction varied (e.g., coursework in the discipline versus stand-alone communication courses), or due to the complexity that results when students write or speak with the intention of satisfying the teacher rather than with the intention of meeting the audience and purpose as outlined in the assignment description (Spinuzzi, 1996).

The experiences of Sean and Neil with the CEE laboratory report writing course resonate with Winsor’s statements about genre learning through texts and experts and the role that individual differences can play. In addition, the different ways in which Sean and Neil experienced the transactional nature of the laboratory report writing also reinforce the role of individual differences. Specifically, Sean appeared to have orchestrated his own enculturation by

actively seeking out models and experts. Through mentoring, and his own labor, he learned the laboratory report genre, which he believed to be similar to those he would encounter in the workplace. Thus, Sean could master this genre and use it as an appropriate antecedent genre in the future workplace – speaking to Devitt’s (2009) argument that genres taught and used in the classroom can “serve as scaffolding for later genre acquisition, as these partially learned genres act as antecedents for other genres” (p. 346). Sean’s statements align with a transactional view of an assignment: “its rhetorical aims are transparent; its purported audience and purposes are authentic” (Petraglia, 1995, p. 21).

Neil, on the other hand, appeared to focus on his frustration with what he perceived to be a lack of support for laboratory report writing in CEE and feedback that came too late to be helpful, noting further that communication cannot be taught in a classroom but rather only learned through experience. Devitt (2004) asserts that once a genre is learned, it is hard to step back and examine it critically – that for “full participants in the genre, resistance becomes more difficult (some say futile) and choices become less visible (some say invisible)” (p. 196). Neil’s statements suggest that he was not actively interested in learning the genre of the CEE laboratory report for later use in learning reports in the workplace and, thus, it might be said that he considered the assignments to exist only for the purpose of demonstrating to the teacher for a grade that he could perform the genre (i.e., for Neil, the assignment was pseudotransactional in nature). Neil’s ideas expressed above, and on many other occasions, align with Winsor’s (1999) finding that students preferred practice over classroom instruction, while down-playing the role of their introductory technical writing course in preparing them for professional writing: “Only 14% mentioned it as one of the ways they learned to write for work” (p. 164).

Impacts of the Communication Portfolio Studio on the participants’ breadth of thinking about the genres of practice varied among participants based, in part, on school experience, workplace experience, and involvement in other lifewide organizations. Views of genre expressed by participants with no professional workplace experience were constrained, reflecting

socialization that they had undergone in school, including those participants who thought of communication in terms only of writing and giving oral presentations, as well as those who expressed surprise that photographs, emails, texting, or blogging would be considered as forms of communication that might be undertaken in the professional workplace. As would be expected, participants with workplace experience made fewer statements about having their views of the genres of professional practice expanded by the Communication Portfolio Studio.

With respect to stereotypes, Sean, Nate, and Neil expressed concerns about generalizations of engineers as poor communicators, stereotypes originating within and outside their disciplines, stereotypes that Winsor wrote about years ago (e.g., her co-op students' statements that engineering writing is "boring and rather ineptly done," 1996a, p. 87). Winsor suggests that stereotypes can create problems for novice engineers because, if poor writing is a characteristic of being an engineer, then "maybe one shouldn't because to do so would be to mark oneself as not an engineer" (p. 88). Given Nate's senior status, significant professional workplace experience, and his involvement with an engineering-business student organization on campus, his statement that a communication portfolio does not really showcase the kind of work he will be doing as a practicing engineer is either a testament to the strength of stereotypes, or, it may be an indication that his views of communication are so embedded in engineering work that he sees no need to highlight communication separately from his engineering artifacts. In like manner, Neil's statements about engineering and communication being separate could be interpreted not about separateness, but, rather, about connectedness, about communication disappearing into engineering. In other words, Neil may have internalized learning communication into the experiences in which he uses communication – but, in school, when asked to bring communication to the surface and make its learning visible, he has no desire to objectify it on its own.

Participants' comments suggest that we are not using the right vocabulary when we talk about effective communication with engineering students, that we have not been able to help

them see communication as an important part of their practice – as indicated by Nate, who thought the portfolio would be more directly related to the work he will do as an engineer, rather something broad and general, like communication. This struggle to articulate communication as an integral part of engineering work, resonates with Leyden's (2008) suggestion that engineers may see the technical realm and the human realm as a simple dichotomy, perhaps stemming, in part, from the fact that "even young engineers have acquired more language tools with which to name, classify, and evaluate technical artifacts and some of their vagaries than they have for human behavior and its vagaries" (p. 261).

In terms of activities associated with portfolio development, artifact selection provided an opportunity for participants to enact their rhetorical arguments for preparedness. However, this did not work out entirely as intended because most of the participants with workplace experience had problems accessing their internship work products (e.g., confidentiality issues, logistics for access). However, for many of the participants, their selection of artifacts that were generated in technical communication courses or disciplinary writing courses suggests that they saw those particular genre performances (e.g., sets of instructions, posters, research reports) as representative of the genres they anticipated facing in the workplace. Some participants who included examples of the aforementioned school-based artifacts wrote annotations that suggested they may not be enthusiastic about those artifacts; further, many of those annotations lacked meaningful explanations about the connection between the artifact and their preparedness to communicate. For example, when compared to his annotations for lifeworld experiences, the annotations Neil wrote for the course assignments lacked rhetorical sophistication, suggesting that it may be difficult to understand more than the surface features and form of genres learned in a technical communication course or, though to a lesser degree, a disciplinary writing course.

Genre learning in the Communication Portfolio Studio provided an opportunity to see the participants in a rhetorical community (Miller, 1994) come together for the rhetorical task of creating preparedness portfolios. The genre system in the Studio comprised the individual genre

sets that participants used in collaboration with one another (Devitt, 2004; Bazerman, 2005) – for example, the written genres (e.g., artifact annotation, professional statement, feedback forms, peer review) and oral genres (e.g., elevator pitch, think-aloud exercise, brainstorming). The facilitator performed a mentoring function, providing minimal guidelines and few models. While model use has been fraught with problems that have been debated by educators with some noting that the risk of misappropriation or copying outweighs the value to the students, Devitt (2009) observes that, “to ask students to write new genres with no samples of those genres is to reduce their learning by increasing their anxiety” (p. 209). Ryan and Neil’s initial struggles underscore Devitt’s point. Further, activities in the Communication Portfolio Studio (e.g., peer reviews, discussion that involved looking at participant portfolios in progress) likely contributed to Ryan and Neil’s abilities to overcome their initial struggles, master the genres, and produce their portfolios – resonating with Winsor’s (1999) description of the co-op students in her study mastering genres in the workplace: “[they] examined a previous example of successful writing, attempted to imitate it, and then received feedback from supervisors of coworkers on whether their imitation was successful” (p. 162).

Discussion Topic 2: Measures of Success

Integral to a socialization process is one’s assessment of his or her progress through that process. This second discussion topic draws from findings reported under the second framework sub-component, Measures of Success.

Winsor notes that students are often primarily concerned with the correctness of their writing based on standards taught in school. Winsor (1996a) found that her students carried their concerns for correctness into the workplace and looked to reactions of coworkers to see if they were performing correctly (e.g., issues of grammar and word choice), often relating to supervisors as teaching, instead accomplishing an authentic workplace goal: “Jason evidently anticipated an audience that would evaluate his text based on its correctness” (p. 25). Winsor notes that, although there are some standards of effective writing that can transfer between

situations, “a writer is expert not because he or she has learned to write well according to criteria that stand apart from any context, but because he or she has learned to ‘read’ local contextual demands more accurately” (1996a, p. 21). Winsor found that her students, over time, were able to look to more authentic measures of success for their work products.

The participants’ statements indicate reliance on a variety of evaluation criteria for their own genre performances, including external measures such as grades, internal measures such as perceptions of meeting specifications and following conventions, and observed outcomes such as goal attainment. This variety resonates with the variety that Winsor observed in her students’ progress toward measuring their performances based on authentic workplace goals and to her emphasis on the role of individual differences in the socialization process. Another way in which evaluation is very different in school than in the classroom deals with the motives of the evaluator. As Winsor noted, in the workplace, everyone is working toward the same goal; but, in school, as Freedman and Adam (1996) state, the institution requires that students be evaluated and ranked: “the instructor’s basic goal is that her students learn, but that goal is limited by the equally pressing need to grade and rank” (Freedman and Adam, 1996, p. 416).

Annotations written by Ryan and Craig for procedural documents they included as artifacts in their portfolios reveal the different measures of performance they chose to highlight when arguing for the effectiveness of their texts: Ryan emphasized grades and adherence to conventions and Craig focused on the ability of his tutorial to achieve an authentic workplace goal (i.e., he tested the tutorial to make sure it worked). The number of other instances in which Craig does not mention grades as indication measure of success supports the value of the comparison as an indication of the mediating effect of significant workplace experience on concerns for correctness (e.g., grades) versus achieving the authentic goals of the text. Ryan’s concerns for correctness expressed across data sources dealt with grades, both in terms of measuring the success of his genre performances and in terms of shaping his performances (e.g., the risk of having points taken off for including any non-factual information in a laboratory

report). In addition, there were occasions when Ryan's descriptions of effective communication, in the abstract, reflected success in terms of reaching authentic goals associated with some of his lifewide experiences (e.g., volunteerism, tutoring). These communicative acts could be considered transactional experiences for which the "rhetorical aims are transparent; its purported audience and purposes are authentic" (Petraglia, 1995, p. 21).

Lifewide experiences for Lori and Ryan include volunteer work and non-engineering employment; stories of these experiences suggest that they involved mostly oral communication. Statements and stories about these experiences, of course, included no references to grades; however, Ryan's included praise and other evaluations from external sources (e.g., feedback on his tutoring and Bible school teaching) and Lori's included following rules (e.g., speaking loudly when herding people at a social event). These lifewide experiences, however, elicited more authentic measures of the communicative performance (e.g., achieving the goal of the communicative act, effecting action). Lori, like Ryan, had no professional workplace experience and had taken only one technical communication course. It is highly likely that most of Lori and Ryan's writing and speaking efforts in an engineering context had been in response to assigned work in school, where their audience would have been the teacher, as Winsor noted for the students in her study – reflecting Petraglia's (1995) assertion that inauthentic writing is often promoted in writing courses, resulting in pseudotransactional writing by the students, "writing that is patently designed by a student to meet teacher expectations rather than to perform the 'real' function the teacher has suggested" (Spinuzzi, 1996, p. 295).

Freedman and Adam (1996), on the other hand, indicate that "any task in the university context is seen as authentic insofar as the instructor assigns it. From the perspective of the classroom, simulations are as authentic as academic essays, lab reports, or book reviews" (1996, p. 412). Freedman and Adam (1996,) found in their four-year study of academic and workplace writing, that the writing students are prompted to do in school is different from what they are expected to perform in the workplace and that "even in courses where the instructor is directly

simulating a workplace task through a factually based case study, the nature of the writing is fundamentally different because of the radical differences between the two rhetorical contexts” (p. 395). School provides opportunities for students to perform – the attention is on the learner and the learning; the workplace provides opportunities for participation – the focus is on task outcomes.

Tony and Sean’s statements about writing to teachers as their audience suggest that they have adopted pragmatic views of their roles as students to execute work assigned to them by teachers, views that underscore the reality of teacher as audience and grades as measures of success needed for students’ progress through school and out into the workplace. It is not clear from their statements, however, whether they were in conflict about these pragmatic views and any audience or purpose framed in the assignments – in other words, whether the assignments were framed as transactional, which according to Petraglia would mean “its rhetorical aims are transparent; its purported audience and purposes are authentic” (p. 21).

Analysis of participants’ stories about a time when they felt they had communicated effectively provides insights into the various ways in which they measure the success of their genre performances. That over half of the participants chose to talk about lifewide experiences was not surprising given that the experiences described produced tangible results, which could have made the experiences more memorable. That participants chose oral communication experiences was also not surprising in that oral communication, by its nature, produces much more immediate and multi-channel feedback than written communication – factors that could contribute to the salience of the experiences. However, given that the majority of artifacts selected by the participants for their preparedness portfolios were written, it is somewhat surprising that not one participant chose to talk about a piece of written communication, even a poster for which they may have received immediate feedback during its presentation.

Finally, and of most relevance here, all ten participants shared experiences for which they explicitly measured their performance by their ability to achieve the rhetorical purpose of the

communicative act they described; in other words, their communication was motivated by a desire to elicit a response and, hence, the act was transactional (Tamor & Bond, 1986). Of note, while none of the participants selected their effective communication experiences based on grades as a measure of success, a few participants did cite high grades in their artifact annotations, as rationale for their inclusion and proof of readiness to communicate professionally. The presence of grades as rationale for effective communication in the portfolios, contrasted with the absence of grades as rationale in the exercise described above, suggests that decisions about measures of success may depend, in part, upon the rhetorical situation.

Despite the absence of grades and prescriptive guidelines in Communication Portfolio Studio, some participants had trouble letting go of their concerns for being correct. These concerns included things like selecting what they perceived might be the *right* artifacts to include (voiced by a participant who was a senior in school and experienced in the workplace), or wondering if a professional statement met *expectations*. The participants in the Communication Portfolio Studio did, during the course of the five weeks, begin to focus more on the authentic purpose of the portfolio as they created the content, much the way Winsor's students began to release their concerns for correctness and look more toward achieving the authentic purposes of their workplace tasks. Although the session facilitator in the Communication Portfolio Studio was introduced as a guide and not a teacher, some participants struggled with this concept and continued to refer to her as the teacher and continued to seek her evaluation of their work, demonstrating the strength of the teacher-as-evaluator model in school. The Communication Portfolio Studio was a paid research project that was not affiliated with any course; it would be interesting to see if, had the studio sessions had been held off campus, the participants would have been able to more quickly and completely transition from the expectations of the school setting with the teacher-as-evaluator model. In addition, the participants' statements about freedom from grades and subsequently diminished fear of failure, as well the flexibility to self-motivate and be more personally vested in a valuable outcome, suggest that participants

experienced both discomfort and comfort from the lack of structure in the Communication Portfolio Studio and that individual differences likely played an important role.

Research Question 2: Learning to construct and interact with audience

The two discussion topics for Research Question 2 are Appreciating Audience and Reflecting to Learn. The original, working title of this research question included “how audience is understood and addressed.”

Discussion Topic 1: Appreciating Audience

This discussion topic draws from findings reported under the first framework sub-component, Conceptualizing Audience as well as the second sub-component, Addressing Audience. This topic brings together the participants’ varying perspectives on audience roles and relationships with their awareness of adapting for given audiences and the strategies used for accomplishing that.

As Winsor notes: “A rhetorical view of writing and knowledge would prevent a writer from seeing the members of an audience as passive receptors of finished information, rather than as active interpreters of the text or as co-members of a discipline who will negotiate the text’s meaning” (Winsor, 1996, p. 45). Miller (2004) emphasizes that the traditional view of communication as characterized by the conduit metaphor promotes “the notion that clarity is a universal criterion of excellence that can be judged in isolation from the conditions in which the communication is used” (p. 46) and notes that it is important that ABET is moving toward using effective rather than clear as a criterion. Along those lines, Winsor asserts that clarity is actually a persuasive goal in that it focuses on the reader’s reception of the text: “in actuality rhetoric is in play whenever the writer considers a reader’s possible reactions to the text” (p. 45). Many of the participants in my study focused on clarity in their discussions of effective communication – focusing on being understood, getting the message across.

With respect to audience relationships, statements by many of the participants about effective communication revealed perspectives that resonate with Winsor’s characterizations of

audience as a passive receiver, a “stable target that the writer aims at” (p. 100); the participants use terms like transmit, convey, and deliver, and only mention iteration as an attempt to clarify one’s intended message – rather than as an attempt to engage the audience in any co-construction of meaning. The participants’ statements suggest that teachers are still promoting these less rhetorical views of audience. A few participants, however, described a more reciprocal process in which both writer and audience are shaped by one another, which Winsor noted takes time to develop and requires the social nature of writing in the workplace. These participants tended to either have significant workplace experience or formal involvement in other lifewide organizations and activities.

Greg was highlighted as an exemplar for the uni-directional view of audience – his statements revealed a picture of the audience as having little role to play, almost being interchangeable without affecting Greg’s message. However, on one occasion, Greg spoke about participating in a brainstorming session in which he played a part in a problem-solving negotiation. In alignment with Miller’s statements about the traditional view of clarity as the standard, which did not encompass the rhetorical situation, Greg consistently equated effective communication with getting his point across, whether talking about communication generally, in terms of persuasion, or in terms of reaching his audience, with no opportunities for input from that party. On the other hand, his dogged focus on clarity (i.e., his persistence in getting his message across) is, as Winsor notes, rhetorical because clarity is a local and temporary concept that considers the reader’s reactions. Greg was not alone in his desire to be understood, or in his focus on clarity, or in his desire to retain ownership of the content of his message; other participants expressed these views. He did stand out, however, in his consistent and vigorous insistence on being heard, sometimes seemingly at the expense of listening to or even acknowledging others. Some participants who emphasized clarity (e.g., Lori, Sean, Craig) also attended to shared understandings and, on occasion, mentioned interaction between parties. Even (or, perhaps, particularly) those participants with professional experience, tended to

provide very traditional views of communication as the transmission of complex information from one party to another as clearly as possible. Molly's statements about communication, across and within data sources, emphasized characteristics such as shared understandings, agreement, diplomacy, and inclusiveness. With the exception of her professional statement in which she argued for her preparedness, Molly typically avoided mentioning rules and conventions, media and technology, or particular genres or forms of communications. She was unique in this regard.

With respect to attention to audience, all of the participants could talk convincingly about attending to audience, and many of their stories and statements seemed to reflect a sophisticated understanding of meeting the needs of a particular audience in a particular rhetorical situation. Some participants, even those who spoke or wrote in vivid detail about their experiences or artifacts at one point, however, also made more perfunctory statements that seemed to traditional textbook definitions from composition or technical writing courses. Statements made by most of the participants, at one time or another, reflected an understanding of the situated nature of communication, or as Dias et al. (1999) note, "Writing is not a module that we bring along and plug into any situation we find ourselves in. Rather, the context constitutes the situation that defines the activity of writing; to write is to address the situation by means of textual production" (p. 17). Ryan's several statements about considerations of context and attending to specific audience and purpose were emphatic but consistently nonspecific; for example, he noted, "I feel like you have to really consider your audience and their circumstances and situation which they're going through reading this" [I7]. It is almost as though Ryan memorized and internalized the general, basic principles about audience he learned in school, but may not yet have the rhetorical awareness needed to fully understand or apply them.

Sean and Craig spoke more often than other participants about adapting for audience. Many of Sean's statements focus on the need to be ready to change your communication and adapt to new situations and people that you encounter throughout life. Sean spoke on many occasions about communicating in culturally sensitive and socially responsible ways that

resulted in achieving shared understandings. However, Sean's statements tended to be a bit abstract – the audience addressed, but somewhat unspecific. Craig also spoke about adaptability; however, he appeared to be much more intimately in tune with real, as well as elaborately envisioned, audiences. Craig spoke about how he typically tried to “jump in the reader's shoes” and to try to think like them; he was also one of the few participants who spoke about communication as an iterative process involving both parties.

The annotations that Sean and Craig wrote for reports they were including as artifacts in their portfolios include descriptions of the strategies they used to serve the needs of their audiences – Sean's report was what he referred to as a simulation of a “typical real-world engineering report,” whereas Craig's was his actual internship report. Sean spoke about adapting but, as noted before, he did not rhetorically analyze his report the way that Craig did, perhaps because it was an assignment that only simulated a real-world report. Comparing these two annotations suggests that the transactional nature of a text may affect the level at which it can be understood from a rhetorical perspective, and that, again, workplace experience seems to have an effect on the participants' focus in critiquing and examining the effectiveness of their own work.

Several participants with workplace experience described having performed quite sophisticated audience analyses for past experiences and products. For example, Joan consistently and thoroughly addressed audience in very detailed ways that often articulated specific, pragmatic goals and context of use for the text (or presentation). Nate included statements about being mindful of sensitive topics one might want to avoid with particular audiences. Greg wrote a thoughtful annotation for a photograph that he included as an artifact in his portfolio highlighting his attention to affective elements in the work environment. The statements discussed above referred to workplace, general, and professional settings. It is very difficult to say, given the size of the dataset, and the limited number of participants with workplace experience, whether a connection can be made between the more rhetorical statements above, made by the participants, and Winsor's finding that students adopt rhetorical views of

audience only after they had been in the workplace performing authentic tasks for authentic audiences.

Lastly, the Communication Portfolio Studio provides space for the participants to enact (through both oral and written communication acts) their rhetorical awareness with respect to their views on attending to audience. A few participants made detailed statements about the ways in which they designed their portfolio to accommodate the audiences they had identified dealing, specifically, with issues of content and form (e.g., argument, concision, structure, design). Craig altered the overarching structure of his content, moving from purpose to mode; Sean addressed organization and navigation; and Molly placed content where the users will easily encounter it. And, finally, Molly's professional statement serves as a strong example of both audience awareness and facility with persuasion. Her statement is unique: aside from brief and relatively peripheral references to writing conventions and specific genres, the primary emphasis is on sharing of ideas and information, on reaching mutual understandings, and on the critical role that communication plays in engineering work.

Dannels' (2003) study of oral design presentations found that "in delivering and evaluating presentations, students and teachers resolved audience and identity contradictions by deferring to the expectations and norms of the academic activity system" (p. 144). This would seem to be the case for some of the participants with respect to the two-minute elevator pitch—they tended to look to the facilitator for assurance about their presentations and to interact with their peers who were posing as potential employers, more as peers than as potential employers. Greg spoke about his use of humor in his portfolio to alleviate the awkwardness he felt about being evaluated by peers—although he was the only participant that acknowledged this awkwardness, he likely was not the only one who felt it.

Discussion Topic 2: Reflecting to Learn

This second discussion topic draws from findings reported under the third framework sub-component, Self as Audience. Reflection was a large element of the Communication Portfolio Studio experience and is taken here to include thinking, writing, and speaking.

Winsor identified *the self* as an audience for her students' writing when she saw it emerge in her data. Her students wrote to themselves mostly to reflect on, and manage, their own actions, to record ideas and pre-write, and to stimulate thinking (i.e., writing-to-learn). One student of Winsor's indicated that recording his work accomplishments was a source of pride for him: "'just for my personal reference, because I felt good about what I had learned. I was proud of myself' (1990, 11. 108-110)." At a later time, he wrote: "'When you're writing it down, you're thinking; ideas are turning in your head. As you write, more ideas come' (1994, 11. 218-220)" (p. 66).

In the study reported in this dissertation, very few participants had stories to share, or observations to make, about reflective activities they had engaged in throughout their school years, or even lifewide. A few participants commented explicitly on the lack of opportunities for taking the time to step back and reflect on any of their coursework, and one spoke about the fact that there should be time in the engineering curriculum for reflection activities.

Regarding greater understandings and acquisition of new knowledge, when the participants wrote their annotations for their artifacts, they were given an opportunity to think critically about the past work they were annotating, and, in the process, indicated that it strengthened their understanding of that work. For example, the statements that Joan made about acquiring deeper understandings and new perspectives on past work through revisiting the original learning for the purpose of explaining the work to others, resonate with Bazerman's (2009) text: "Not only am I learning as I write, I learn from what I have written as the formulations I made rattle around in my mind and change the way I look at things afterward" (p. 279-280). Reflecting on and writing/speaking about their past work presents the participants

with a situation akin to the one described by Bereiter and Scardamalia (1987): a dual problem. Specifically, the participants dealt with a content problem (i.e., what to write in their portfolios) and a rhetorical problem (how to write the text). It has been shown (Bereiter & Scardamalia, 1987) that working back and forth between content problems and rhetorical problems elicits new ideas and facilitates deeper understanding. Craig's story about seeing his past work differently provides a good example of this: he shifts his evaluations and sees attributes in past work that he did not previously recognize and through reflection, discovers that "golden piece." In the Communication Portfolio Studio, reflecting on and writing about past work becomes a social process involving peer review, discussion, and other collaborative activities, which aligns well with research showing writing to learn as "a means of fostering students' knowledge construction and transformation processes through cognitive stimulation and social participation of the kind that different writing tasks may provide" (Tynjala et al., 2001, p. 14).

In addition to reflecting on work to achieve deeper understandings of that work, the participants also learned through reflection how to evaluate themselves as communicators, to understand what skills and accomplishments they already had and what their capabilities were for attaining future accomplishments. Most of the participant data on reflection were also coded for perceived self-efficacy; this will be taken up again in Chapter 9. For example, Tony spoke about reflective activities helping him learn to better assess himself as a communicator, and Neil described how looking back at his past accomplishments made him proud, much the way that Winsor's student, Al, took pride in the record that he kept of what he had learned at his workplace. The reflective writing that the participants do in the Communication Portfolio Studio can be seen as helping them to develop their perceived self-efficacy with respect to communicating in general, as well as in the context of engineering.

Research Question 3: The negotiation of "reality"

The two discussion topics for Research Question 3 are How and When to Persuade and The Power to Shape. The original, working title of this research question included "how

persuasion is understood and appreciated.” Findings for Research Question 3 are the least extensive of the three rhetorical awareness questions – participants typically spoke less freely about persuasion than they did about genres or audience awareness.

Discussion Topic 1: How and When to Persuade?

This discussion topic draws from findings reported under the first framework sub-component, How and When to Persuade. The discussion includes stories about the participants’ conceptions of persuasion, their experiences using persuasion, and their thoughts about when it is appropriate to use persuasion.

Winsor suggests a definition of persuasion as “interactive, multi-directional, and ongoing rather than a force that is exercised on one person by another in a single, discrete encounter” (p. 70). She notes that engineers are hesitant to acknowledge their use of persuasion, seeing persuasion as manipulation rather than just an attempt to bring about a change – and that engineers often “believe that they are simply displaying self-evident data rather than arguing a point” (p. 4).

With respect to the dynamics of persuasion, participants expressed varying views – some aligning closely with the more traditional view of persuasion as a force exerted by one party on another and others holding views more closely aligned with the interactive, recursive relationship advocated by Winsor. Greg’s stories are highlighted because he provided not only detailed and vivid descriptions and examples of a strongly uni-directional perspective of persuasive communication, but also, on occasion, spoke of recursive negotiations. Thus, Greg’s views provided a basis for comparisons across participants and also for analysis within case (i.e., examining his data across the various sources). Lastly, Greg’s detailed examples are helpful, given the small size of the dataset on persuasion and the reticence of some participants (e.g., Craig, Lori) to talk about personal experiences using persuasion.

Some participants spoke about persuasion in pragmatic terms; for example, Joan and Molly often spoke about using persuasion to move projects forward (e.g., handling the

communication for her team), or to achieve goals (e.g., getting accepted into a co-housing group). Sean, Nate, and Tony spoke in various ways about using communication to achieve a goal, reach mutual understandings, obtain a win-win solution, or just get what one wants.

As noted, participants' views on the appropriate use of persuasion varied depending on the rhetorical setting and goal. A mini-analysis was undertaken, in which participants' stories of times when they believed they had communicated persuasively (i.e., when they made things happen) were examined. This analysis revealed that most stories dealt with oral communication and were drawn primarily from lifewide (rather than formal classroom or workplace) experiences. In addition, participants offered up other comments about using persuasion in their work. For example, Neil spoke about the importance of being able to persuade potential stakeholders to fund his future engineering projects and Ryan about the need for persuasion in a grant application.

Winsor argues that engineering is about technology, and technology is designed for use by humans and for influencing their behavior; therefore, engineering, by its very purpose, is persuasive by nature (p. 11). Winsor also suggests that modern culture and academia often present a less rhetorical view of the communication of scientific and technical information, one that centers on commitment to facts and objectivity. Winsor found that her students become more aware as they gained experience that "data will not produce knowledge in any straightforward way" (p. 42).

The Communication Portfolio Studio provided an opportunity to see the participants enact their perspectives on the use of persuasion, which in turn provided opportunities to observe the effects of individual differences. For example, as reported before, Greg saw no reason for the preparedness portfolios to contain anything other than a collection of separate artifacts; he commented that he did not understand why he was being asked to write a professional statement. His comments suggest that he saw data as being able to stand alone without a spokesperson. Joan, on the other hand, explained that the artifact annotations were an essential

part of the argument in her portfolio, providing the context needed for the reader to understand her artifacts: “Good communication is necessary to describe context of the artifact, and a single technical writing piece cannot stand alone” [PoS17]. A contrasting perspective to the idea that data need spokespersons is arises through Ryan’s rather startling anecdote about a science teacher who graded students down if their lab reports contained any content other than data – as such, Ryan expressed the view that facts speak for themselves. Lori, on the other hand, described how persuasion was useful in the communication of scientific and technical information, and that communicating effectively and persuasively is important for credibility, for being able to persuade others to adopt one’s viewpoint. Sean also emphasized the importance of using persuasion to convey scientific and technical information to the public in ways that they could understand, in order to keep them safe and accurately informed. As Bazerman (1988) commented, the popular misconception that scientific discourse simply transmits natural facts has been successfully argued despite the fact that it is wrong. The divided views of the participants resonate with the struggle that Bazerman suggests.

Discussion Topic 2: The Power to Shape

This discussion topic draws from findings reported under the second framework sub-component, Gaining a Voice as well as the third sub-component, Shaping the Practice. This discussion topic brings together the participants’ statements regarding the persuasive power of position and expertise with the critical role that communication plays in advancing engineering work.

As Winsor notes, rhetorical views of knowledge imply that “knowledge is created both in an interplay between physical reality and knowers and in persuasive interaction among knowers themselves” (p. 69). Thus, persuasion draws power from an individual’s position within a hierarchy, as well as from the individual’s status as an expert. Findings are relatively sparse here because only a few participants shared experiences about having communicated persuasively within a hierarchy. Craig’s report to the CEO and Sean’s translation document provide examples

of times when they used persuasion to influence the actions of someone above them in a hierarchy. Craig's rather matter-of-fact account of his efforts to convince the CEO to accept his recommendations may reflect his longevity, and position, at his internship. Sean's account, on the other hand, of the labor that it took him to convince managers of his solution may reflect that his was a brief internship at a young age, meaning his ethos likely had not been developed in the way that Craig's appeared to have been. Thus, Craig was able to have an impact on decisions made at this company through the proposals he wrote for his CEO, resonating, in a small way, with Winsor's (2006) finding that individuals "participated in the generation of power to the extent that they could participate in the writing" (p. 18) and, in addition, that rhetorical skill put into action makes things happen. Craig indicated that he felt like he was able to achieve his goals by writing persuasively.

In terms of ethos in school, Lori and Tony, in particular, shared stories about times when they felt more effective and persuasive because they were (or felt) knowledgeable in their subject area. They both spoke about being the expert in the room and about being the sole owner of their knowledge. Molly coupled this understanding of the importance of knowledge with the importance of rhetorical skill: "engineering practice is based on the expert opinion of the professional, and the opinion must be well-reasoned and well-argued to be accepted and used" [PS]. Her statement resonates well with Berkenkotter and Huckin's (1993) comment that also deals with the importance of persuasion in having one's work accepted and used, "For writers to make things happen, that is, to publish, to exert an influence on the field, to be cited, and so forth, they must know how to strategically use their understanding of genre" (p. 477).

Most of the participants at some point in the studio spoke earnestly and in some detail about what communicating meant to them in the context of engineering practice, and, more specifically, the ways in which communication contributed to the field. Molly spoke about communication giving engineering meaning, Craig spoke about all progress beginning with the sharing of ideas, and Greg commented that without communication there would be no

engineering. Some of the participants indicated that it was the responsibility of engineers to help the public understand their information: that if they just presented the facts, and they were acted upon in an uninformed or inappropriate way, the safety of the public could be in jeopardy. The participants who spoke most about social responsibility and the impact that they planned to have on the field through communication, had little or no workplace experience. It is interesting to wonder if it may be that these participants' views are unconstrained by the realities of day-to-day engineering work; their views of how they are going to use persuasion to make changes in the field are predicated on their assumption that they will be in positions from which they have opportunity to exert influence, and perhaps they will be. It does appear, overall, that some of the participants make their decisions about the appropriateness of persuasion based on goals that they believe serve the common good.

Methodological Considerations

It should be noted that Ryan and Lori's statements about the persuasive nature of the communication of technical and scientific information, as well as about facts speaking for themselves, are responses to two provisional questions that were included in the interview protocol that were to be asked if time allowed (i.e., [I20] and [I21]). Ryan and Lori were the only two participants asked these questions. All participants, however, answered these same two questions as scaled agreement items on the post-survey: fewer than half of the participants agreed that the communication of scientific and technical information was persuasive by nature; more than half agreed that it was objective and that facts speak for themselves. It was not possible to triangulate among data sources as originally planned due to the fact that only two participants received the questions during the interview. However, given the discrepancy between Lori's answers between interview and survey, and the surprising agreement ratings for some participants, given other data they provided, it seems likely that the questions and answer slots on the survey were difficult to process, particularly for the second-language speakers.

Connections to the Pedagogy of the Communication Portfolio Studio

The original two-fold purpose of the study reported in this dissertation included an examination of the Preparedness Portfolio and Portfolio Studios pedagogy that would support the exploration of rhetorical awareness and perceived self-efficacy. This examination, rather than being identified as a separate research question, is embedded in all of the research questions; for example, “What is *revealed* about the participants’ rhetorical awareness **through their engagement in the Communication Portfolio Studio?**” In Chapter 3, potential connections between the findings for rhetorical awareness and the different pedagogical elements and supporting activities were hypothesized. Many of these connections were confirmed; a few representative examples of the particular ways in which the participants engaged in the pedagogical elements of the Communication Portfolio Studio are presented.

As anticipated, several activities within the Communication Portfolio Studio engaged the participants in discussions that did result in cross pollination of ideas about what it means to communicate as an engineer, as evidenced by the participants who spoke about having their eyes opened about communication: about it being more than writing and speaking, about realizing that email and blogging are important genres in the professional workplace, and about being surprised at how much time is spent in the workplace with meetings and telephone conversations. In particular, brainstorming activities in the studio sessions led participants to comment on feedback forms that it was rewarding to listen to others’ ideas, to ask questions and share ideas, and to hear alternative ideas from others. In addition, participants indicated it was surprising how many different artifacts their peers suggested and how many different ways there were to communicate. Tony summed up this cross-pollination:

a lot of those activities where we would shout out like, oh, what's good about this or what could be improved...some of them might have stuck to me... probably subconsciously... I've probably gained knowledge on what effective communication is [I10]

As an example of the significance of the commitments to student reactions, brainstorming, and preparedness arguments in the Communication Portfolio Studio that led to Tony's comment above, consider this next statement from Neil, a junior in Civil Engineering.

I think the idea of such--blogging, texting, those types of media as a form of written communication, but just one that I didn't often associate as like communication in a professional sense, so. . . [I16]

Neil had taken one technical communication course, had no workplace experience, but extensive leadership experience with engineering and non-school related organizations. Given this statement, it seems likely that the Communication Portfolio Studio was the first opportunity that Neil had to think about professional communication, and to visit with peers who were currently holding internships in industry, where they came into contact with a range of communicative activities. Tony, for example, commented in his professional statement that in his job as student web editor, "The main communication tools was email requests... Beyond email communication, the second most used resource was Google Chat, an instant messaging program" [PS]. Other participants with no workplace experience who had their views expanded included Ryan, who thought communication was only writing and oral presentation, and who held the belief that he would get graded down for including anything except facts in his laboratory reports, and Sean, who would not have considered photographs as communication. Engineers, particularly civil engineers, as Sean was studying to become, must certainly have an appreciation of the specific value of photographic images in carrying out and conveying their engineering work. As such, the Communication Portfolio Studio, it would seem, has provided, at what could be very little cost, a huge return on investment for these participants in terms of having their eyes opened by their peers.

It was anticipated that the pedagogical commitments to *student reactions* and *student progress*, as well as the supporting peer reviews and check-in activities, would facilitate mastery of the portfolio genres. Peer review was one of the activities mentioned as most meaningful on various open-ended questions about major take-aways from the experience, and was often

recorded on the in-session feedback forms as the day's rewarding experience. Specifically, seven of ten participants identified the first peer review activity as rewarding, and all ten participants found the think-aloud exercise – and the feedback that it provided – rewarding. The pedagogy in the Communication Portfolio Studio also includes, as part of the commitment to student reactions and progress, and in conjunction with the first peer review, a brainstorming session on how to conduct an effective peer review. This activity, which called upon participants to share experiences and thoughts about the peer review process, and honored those inputs by discussing them, is likely responsible for some of the overwhelmingly positive reactions from students to the peer review activities.

In addition, and as anticipated, the commitments to student reactions and preparedness arguments, as well as the two-minute elevator pitch activity with supporting peer review, provided opportunities for the participants to practice and get feedback on newly learned genres. The oral presentation, and feedback received, was cited as one of the most valuable experiences of the Communication Portfolio Studio. For example, Lori and Sean provided the following responses to a survey item about the main benefits of the entire experience, respectively:

the two minute presentation was beneficial because it gave me the opportunity to practice in front of an audience before going out to the real world [PoS31]

The main benefits would be creating a portfolio of my own, and being able to present it and utilize it for future employment opportunities [PoS31]

Given the fact that oral presentation is intimidating for many people, and that speaking about oneself is also intimidating, presenting themselves orally to the other participants could have turned out to be a negative experience. It would seem likely, then, that the pedagogical commitments to student progress, student reactions, and schedule (i.e., spreading the activities over five sessions) provided a nurturing and safe environment in which Lori and Sean were able to experience the oral presentation as a positive experience.

It was anticipated that the commitment to preparedness arguments would encourage students to think about audience in real-world terms (e.g., envisioning future employers, recruiters), rather than adopting the teacher-as-audience mode, and to consider the creation of their portfolios as a transactional task that would benefit them in the future. This definitely happened, as participant statements revealed that they were thinking seriously about their audience(s), and all but two spoke about their plans to use their completed portfolios in the future.

In addition to envisioned real-world audiences for their portfolios in the future, the participants had to deal with the audience for their oral presentation of their portfolios (i.e., their peers role-playing as potential employers). It was anticipated that this situation would bring complications for the participants. One participant in particular grappled with this precise issue. Greg made it clear that he was not happy about having his peers pose as potential employers who were scrutinizing his preparedness. Aside from Greg, three others mentioned being nervous – two mentioned that it impacted their presentation. However, as noted before, the oral presentation was cited by nearly all participants as one of the most valuable experiences in the Communication Portfolio Studio overall and many expressed appreciation for the opportunity to present their elevator pitches to their peers. Results of this research study suggest that the pedagogical commitments to student reactions and progress, supported by multiple opportunities to provide feedback and to hear synthesized feedback of peers, did indeed create bonds between participants that provided, for most participants, a safe environment in which the awkwardness was somewhat mitigated.

It was also anticipated that the Communication Portfolio Studio would provide a space for participants to develop an appreciation for more iterative and collaborative views of audience relationships, through the pedagogical commitments to student progress and reactions, and to distributing the work over five sessions and the supporting peer reviews and brainstorming activities. Participants did, in fact, appreciate the opportunities to have their work reviewed – the

participants mentioned this as a benefit of the studio experience, as they indicated that they did not have much opportunity for this type of interaction in their other classes. The think-aloud exercise, in particular, drew comments from all of the participants. Most found the opportunity to watch a *user* interact with their portfolio and react to the experience out loud to be very helpful for their future considerations about audience.

As anticipated, the focus on pedagogical commitments to preparedness arguments, artifacts, student reactions, and supporting activities (e.g., the artifact scavenger hunt and brainstorming session) provided many opportunities for reflecting on past work critically. As participants thought about the effectiveness of their past communicative products and experiences, they reflected on, and then articulated, the ways in which these products—as artifacts—supported their arguments. As anticipated, the participants did re-visit the original motives for their prior work, often being torn between measures of success that served an authentic audience and purpose and those that focused on grades and addressing the teacher as audience.

As anticipated, several of the activities within the Communication Portfolio Studio supported the participants in learning to make preparedness arguments. The brainstorming session about professional statements, followed by individually drafting the statements, and returning for the *taking-the-pulse* and peer review of the statements did, in fact, result in collective and individual knowledge construction about crafting arguments. While, as anticipated, the comments from the participants do blend regarding appreciation for learning the genre, for seeing past work, and for learning how to make arguments, it is possible to draw some take-aways. Molly for example, indicated that she liked the idea of the portfolio being an argument that you support with evidence, noting “I loved that” [I30]; it is possible that many of the other participants were have similar “aha” moments as well.

Ryan spoke about the collaborative learning of argumentation supported by the *taking-the-pulse exercise* and the peer review, noting that they [the studio participants] all worked

together to establish strong arguments. The commitment to *student reactions* provided a synthesis of participant reactions to working on their portfolio, which served as another venue for ideas to be shared. Being a relative newcomer to the field, Molly commented specifically that she learned in the Communication Portfolio Studio, among other engineering students, the particular value of making arguments within the engineering discipline: “I discovered that one element of engineering communication I think is important is the ability to make and substantiate a claim” [PoS17].

It was assumed that the commitment to artifacts and the supporting activities, such as the *artifact scavenger hunt* and subsequent brainstorming, would provide opportunities for the participants to share thoughts about what makes particular artifacts compelling evidence. Further, the commitment to artifact annotations would provide opportunities for collaboration about how to persuasively explain why an artifact provides evidence. These assumptions were upheld. As a specific example, Greg commented about his new understanding of arguments on a feedback form, noting that it was rewarding to figure out that “artifacts are truly arguments on their own & proof of arguments made in the prof. statement” [FF:Aha]. As noted in Chapter 5, Greg’s expectations for the portfolio genre were challenged by having to include the persuasive glue (e.g., annotations and professional statement) rather than just provide a set of exhibits. The change in his thinking demonstrated here speaks to the effectiveness of the peer-driven pedagogy in the Communication Portfolio Studio. Joan shared a realization that she had regarding the persuasive nature of artifact annotations:

It’s easy to see from developing a portfolio that annotations are more essential than the artifacts in most cases. Good communication is necessary to describe context of the artifact, and a single technical writing piece cannot stand alone [PoS17].

Joan’s statement, given the fact that portfolio development was new to her, does suggest that the commitments in the PPPS pedagogy to artifact annotations and to supporting activities, such as the artifact and annotation peer review, the ongoing presentation of synthesized student feedback, and the brainstorming sessions contributed to her developing rhetorical awareness.

Although many of the participants were not as vocal as Joan in describing their experiences, it is entirely likely that many other participants also advanced their rhetorical awareness through the pedagogical commitments in the Communication Portfolio Studio.

9. PERCEIVED SELF-EFFICACY

This chapter presents and discusses the findings for the analyses of perceived self-efficacy that addressed Research Question 4:

- A. What *impact* does engagement in the Communication Portfolio Studio have on participants' perceived self-efficacy for (i) making arguments about preparedness to communicate as practicing engineers and (ii) communicating as practicing engineers?
- B. For identified impacts, what *sources of self-efficacy information*, and *pedagogical elements*, if any, are indicated pertaining to perceived self-efficacy for (i) making arguments about preparedness to communicate as practicing engineers and (ii) communicating as practicing engineers?

The inquiry into perceived self-efficacy reported in this dissertation is exploratory. The original purpose was to discover as much as possible about the potential impacts of the Communication Portfolio Studio on participants' perceived self-efficacy for the communication of practicing engineers. This purpose was refined over time into a more specific exploration of possible sources of self-efficacy information upon which participants drew when forming their self-efficacy judgments as a result of their engagement in the Communication Portfolio Studio. These refinements were based on themes that emerged from subsequent data analyses, recent trends in self-efficacy research, and connections between the theoretical construct of perceived self-efficacy and the pedagogy of the Communication Portfolio Studio.

As discussed in Chapter 4, data were brought forward liberally from the initial filtering for perceived self-efficacy into the subsequent analyses for the sources of self-efficacy information. In other words, inclusion criteria did not insist on strict conformance to Bandura's definition of perceived self-efficacy: "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances" (1986, p. 391). Rather, criteria extended to include those used in self-efficacy research (e.g., confidence in, or assertions about, one's skills or capabilities) (e.g., Pajares, 2007). The intention was to cast a wide

net for self-efficacy statements in order to learn as much as possible about the sources upon which individuals base their self-efficacy judgments. As discussed in Chapter 4, analyses were separated into perceived self-efficacy for (i) making arguments about preparedness to communicate as practicing engineers and for (ii) communicating as practicing engineers; presentation of findings follows this structure.

There has been an attempt in this dissertation to be internally consistent in the use of terminology pertaining to perceived self-efficacy, while staying true to the literature (which is inconsistent). The construct of interest in this study is “perceived self-efficacy” – an individual’s beliefs about his or her capabilities to perform in certain ways. In reporting findings about impacts to participants’ perceived self-efficacy, it is often convenient to use a slightly different construction that has the same meaning; for example, self-efficacy judgments or self-efficacy beliefs. Similarly, there has been an attempt to remain consistent when discussing Bandura’s hypothesized sources of self-efficacy information, which are referred to in the literature in various ways by Bandura himself and by scholars building on his work. The terminology used in this dissertation is the one used most often by Bandura: “sources of self-efficacy information” (e.g., Bandura, 1986).

Findings

Findings are presented for Research Questions 4A (what *impact?*) and 4B (for identified impacts, what *sources of self-efficacy information* and *pedagogical elements* are indicated?).

Research Question 4A: What impact?

Findings are presented in this section for Research Question 4A: What *impact* does engagement in the Communication Portfolio Studio have on the participants’ perceived self-efficacy? A summary is presented in Table 9.1.

Table 9.1 Impact of engagement in the Communication Portfolio Studio on perceived self-efficacy for (i) making arguments about preparedness to communicate as practicing engineers, and (ii) communicating as practicing engineers; prior portfolio and workplace experiences are included.

	Joan	Greg	Tony	Nate	Lori	Sean	Ryan	Craig	Molly	Neil
Making Preparedness Arguments – RQ 4A (i)										
Impacts ¹¹	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
Portfolio experience ¹²	–	–	–	◇	–	◇	–	◇	–	–
Communicating as Practicing Engineers – RQ 4A (ii)										
Impacts (quant) ¹³	–	–	–	–	–	–	–	–	–	–
Impacts (qual)	↑↓	↑	↑	↑	↑	↑	↑	↑	↑	↑
Workplace experience ¹⁴	□	□	□	□	–	□	–	□	–	–

Findings summarized in Table 9.1 do not represent prevalence, but, rather, presence. The focus in this dissertation is not on comparing the prevalence of impacts to perceived self-efficacy, across participants, but on identifying sources of self-efficacy information that may have contributed to those impacts. The characterization in Table 9.1 enables readers to apprehend at a glance the presence of a phenomenon across participants. The table also allows comparison of the perceived self-efficacy analyses (i.e., for making preparedness arguments and for communicating as practicing engineers), displayed in the top and bottom sections of the table, respectively.

An arrow in Table 9.1 signifies that the participant made at least one statement indicating that his or her perceived self-efficacy had been impacted by engagement in the Communication Portfolio Studio. Upward arrows indicate a positive impact, and downward arrows, a negative impact. For Research Question 4A (i), dealing with preparedness arguments, a diamond shape represents prior experience with portfolio construction. For Research Question 4A (ii), dealing with communicating as practicing engineers, a square represents engineering-related workplace experience.

¹¹ Arrow indicates at least one impact statement made – direction of arrow indicates positive or negative.

¹² Diamond indicates at least one prior portfolio (of any type) was reported by the participant.

¹³ Quantitative findings (standardized instruments): no significant differences were found.

¹⁴ Square indicates any current or past engineering workplace experience reported by participant.

Impacts to perceived self-efficacy for making preparedness arguments

All participants made at least one statement indicating that their perceived self-efficacy for making preparedness arguments had been increased by engaging in the Communication Portfolio Studio (Table 9.1, row 1). No negative impact statements were identified in the analysis. In addition, only three participants reported having made a portfolio before, two of which were collections of print artifacts, and one was an online design portfolio (Table 9.1, row 2).

Impacts to perceived self-efficacy for communicating as practicing engineers

For the inquiry into perceived self-efficacy for communicating as practicing engineers, a quantitative data collection component was included; the standardized, quantitative instruments, along with the rationale for their inclusion and subsequent decisions to focus on the qualitative findings of the study, are described in Chapter 4. No significant differences were detected by any of the pre-post standardized instruments (Table 9.1, row 3). The short time frame for the study (i.e., 5 weeks) made it difficult to detect differences with these instruments; and, as noted above, the study evolved such that the phenomena measured by these instruments were no longer the focus of the investigation. The findings are included here for completeness.

With respect to the primary, qualitative analysis (Table 9.1, row 4), all participants made at least one statement indicating that their perceived self-efficacy for communicating as practicing engineers had been impacted by engaging in the Communication Portfolio Studio; some participants made multiple self-efficacy statements. Further, at least one positive impact statement was identified by each participant, and at least one negative impact statement was identified by Joan. In addition, six participants reported having engineering workplace experience (Table 9.1, row 5).

Research Question 4B: What sources and pedagogical elements?

Findings are presented in this section for Research Question 4B: What *sources* and what *pedagogical elements* are indicated. A summary is presented in Table 9.2.

Table 9.2. Sources of self-efficacy information indicated¹⁵ by participants in their impact statements relative to (i) making arguments about preparedness to communicate as practicing engineers and (ii) communicating as practicing engineers.

	Joan	Greg	Tony	Nate	Lori	Sean	Ryan	Craig	Molly	Neil
Making Preparedness Arguments – RQ 4B (i)										
Mastery experience	▲	▲	▲	-	▲	▲	▲	-	▲	▲
Vicarious experience	▲	△	-	▲	△	-	▲	▲	△	▲
Verbal persuasion	△	△	-	-	▲	▲	-	-	△	-
Physiological state	▲	-	-	-	-	-	-	-	△	-
Communicating as Practicing Engineers – RQ 4B (ii)										
Mastery experience	-	-	△	△	▲	▲	▲	▲	▲	▲
Vicarious experience	▲	-	△	-	-	-	△	▲	▲	-
Verbal persuasion	△	-	-	▲	-	△	-	▲	-	-
Physiological state	-	-	-	-	△	△	-	-	-	-

Each participant statement that was coded as an impact to perceived self-efficacy as a result of engagement in the Communication Portfolio Studio was analyzed in terms of the conceptual framework to determine what sources of self-efficacy information might be indicated. As with Table 9.1 the data do not represent prevalence, but, rather, presence (or absence). The focus in this dissertation is not on comparing the prevalence of attributions to sources of self-efficacy information, but rather to attempt to identify any potential sources upon which the participants may have relied.

A triangle in Table 9.2 signifies that the participant made at least one statement that attributed an impact to a particular efficacy information source (i.e., mastery experience, vicarious experience, verbal persuasion, or physiological state). Solid triangles represent those statements for which the attribution is fairly strong (or unambiguous). Outlined triangles represent statements for which the attribution is weaker (or somewhat tenuous). As with Table

¹⁵ Triangle indicates at least one indication to the efficacy source on that row – solid triangle means the attribution is strong (unambiguous); outlined triangle means that the attribution is weaker (less clear).

9.1, Table 9.2 provides access to comparing the efficacy information source attributions across participants and between the two perceived self-efficacy analyses.

A notation system was developed in order to standardize the presentation of findings and make them more accessible to the reader. There are only two variables in this system:

- **Future performance**, for which the self-efficacy has been impacted, designated as “FP” across all sources of self-efficacy information; and
- **Impact trigger**, designated as follows for each source of efficacy information: “M” for mastery experience; “O” for vicarious experience (observed); “V” for verbal persuasion; and “P” for physiological arousal.

The following hypothetical example illustrates this system, which will be used to report the findings in this chapter:

“When I (Sally) saw Frank do a great job giving his oral presentation, I felt more confident that I could do a good job on my oral presentation too.”

- FP = the oral presentation that Sally will give (and for which her perceived self-efficacy has been increased);
- O = the successful oral presentation that Frank gave.

Following self-efficacy theory, the hypothetical example illustrates that Sally’s observation of Frank’s (i.e., a similar other, peer) successful performance of a specific task (his oral presentation) increases Sally’s perceived self-efficacy for performing the same (her oral presentation), or similar, task.

Sources and pedagogical elements indicated for making preparedness arguments

In terms of patterns in the data, looking across participants, and down the rows of sources of self-efficacy information (Table 9.2— top portion), reveals the following: most participants attributed at least one self-efficacy impact statement to mastery experience; most attributed at least one to vicarious experience (although some of the attributions are weak); half of the participants attributed at least one to verbal persuasion (most are weak); and only two attributed statements to physiological state (one is weak).

For each of the sources of self-efficacy information, a few examples of participants' statements are provided and interpreted, using the notation system developed (explained above). In addition, potential connections are suggested between the sources and the Communication Portfolio Studio pedagogies.

Mastery experience

As noted before, most participants attributed at least one self-efficacy impact statement to mastery experience, as was expected given mastery as the most influential source (e.g., Bandura, 1986). Oral presentation emerged as the most frequently cited mastery experience. Other mastery experiences that were prominent in the data ranged from specific actions, such as writing the artifact annotations, to broader accomplishments, such as having completed a portfolio. Future performances for which perceived self-efficacy was said to have been impacted varied in terms of their future performance's similarity to the mastery experience responsible for the impact. For example, presenting the two-minute elevator pitch of the portfolio may have impacted perceived self-efficacy for future portfolio elevator pitches, for future presentations of one's skills more generally (in oral or written form), or, for giving oral presentations for any purpose or setting. Conversely, different mastery experiences (e.g., giving the two-minute elevator pitch and writing the annotations) may have impacted the same future performance (e.g., presenting oneself in an interview). The point here is to see what we can from the participants' own words about how they converted mastery experiences to increases in their perceived self-efficacy for future performances. Three annotated participant examples are given, one of which provides two mastery experiences.

Example 1. Joan explained that writing about her past experiences and skills increased her beliefs in her ability to articulate these experiences and skills in the future:

I could remember like these examples really quickly, if I just wanted to talk about them right there at the interview, so that was helpful, and I could just say a little bit about it because I had written paragraphs about each the little thing [16].

- M = writing paragraphs about her skills (artifact annotations)
- FP = talking about her artifacts at an interview (an oral version of the annotations in a different setting)

Joan's statement suggests that her own performance (i.e., writing the annotations that explained why her artifacts provided evidence of her preparedness to communicate as a practicing engineer) increased her perceived self-efficacy for a similar performance in the future (i.e., constructing an oral version of these annotations – on the spot – at an interview). Thus, this statement of Joan's serves as a fairly strong example of a mastery experience influencing perceived self-efficacy. In addition to mastery experience, it is possible that some additional sources of self-efficacy information may have contributed to Joan's self-efficacy beliefs. For example, Joan could be comparing her annotations to those of other participants in the studio (i.e., vicarious experience) or thinking about positive feedback she received during peer review (i.e., verbal persuasion).

Pedagogical elements and activities: The commitments to preparedness arguments and to professional statements and artifact annotations provided opportunity for Joan to reflect on and write about her past skills and experiences, resulting in the mastery experience explained above. In addition, the commitments to student progress and student reactions, and supporting activities (most likely, here, the peer review of artifact and annotation) provided opportunities for the vicarious experiences and verbal persuasions that could potentially play a part in Joan's statement above.

Example 2. Molly wrote about two separate mastery experiences as chief take-aways from the Communication Portfolio Studio experience: making her preparedness portfolio and presenting it. One difference between this example and the preceding one is that this example makes explicit reference to possible contributions from vicarious experience and verbal persuasion. Molly spoke about the value of these two experiences:

I had never considered making a portfolio before, but it seems like a really valuable thing to create and have. I feel empowered to be able to make another portfolio if I want to, and

to improve on the one we made here. I also feel confident to present it to someone in a professional or academic context, because of our discussions in class and our practice presentations. [PoS1]

- M_1 = creating her portfolio; M_2 = the oral presentation of the portfolio
- FP_1 = making another portfolio; FP_2 = presenting the portfolio in another context

Molly's statement suggests that, because of these two performances, she is now more confident to repeat either one of them in the future, in different settings. As noted above, Molly's reference to discussions and practice presentations strongly suggest that self-efficacy judgments may have been enhanced through vicarious experience (i.e., the observation of others' presentations) and through verbal persuasion (e.g., encouragement given during the feedback period or during group discussions).

Pedagogical elements and activities: The pedagogical elements and supporting activities for Molly's portfolio preparation (includes annotations as well as the professional statement) include commitments to preparedness arguments, professional statements and artifact annotations, student progress and student reactions, as well as supporting activities such as peer review of artifact and annotation, and the taking-the-pulse activity. Pedagogical elements and supporting activities for Molly's oral presentation are similar to those for the previous example (Lori's oral presentation) – in other words, commitments to preparedness arguments and to student progress; as well as supporting activities such as brainstorming effective presentations, peer feedback on presentations, two-minute elevator pitch.

Example 3. Sean described his final oral presentation of his portfolio as a main benefit of the Communication Portfolio Studio experience. His words suggest that this was a significant learning experience in which he moved from not knowing how to approach the problem (condensing his portfolio into two minutes effectively) into having learned enough, either from his own performance or others' that he is confident and feels "in control" about a future performance such as this:

I had to present my, I guess, portfolio and my resume in front of other people, so that gave me idea, I didn't know I was going to before I had this opportunity. So I had not that much confidence, and now I have more confidence, I will be more...in control what to present [I31].

- M = the oral presentation of his portfolio
- FP = presenting himself in an interview situation in the future (and being in control).

Sean's statement strongly suggests that his own mastery performance (the oral presentation of his portfolio) increased his self-efficacy for a similar future performance has been increased; Sean made one of the few explicit statements about having his confidence increased. Although not mentioned explicitly, vicarious experience (observing peers' perform) and on verbal persuasion (feedback after the presentations) may also have contributed to the increase. The explicit reference to other people is a slight indication that Sean was aware of their contribution to his overall experience. It is, of course, impossible to tell from his statement.

Pedagogical elements and activities: The commitments to preparedness arguments and to student progress, and supporting activities (e.g., the two-minute elevator pitch) provided opportunity for Sean to present his portfolio argument orally, resulting in the mastery experience described above. In addition, commitments to student reactions and supporting activities (e.g., brainstorming about effective presentations, peer feedback on presentations), could have contributed to perceived self-efficacy through vicarious experience and verbal persuasion.

Vicarious experience

As noted earlier, most participants attributed at least one self-efficacy impact statement to vicarious experience; some of these attributions are relatively weak. The observed experiences referenced by participants varied and included peers' artifact selection, written work (in general), and portfolio solution (even more broadly). As distinct from mastery experience, future performances for which perceived self-efficacy has been increased tended to align with the observed performances (e.g., watching a presentation increased perceived self-efficacy for giving

a presentation). Future performances included writing portfolio content, selecting artifacts, and coming up with a portfolio solution. Three annotated participant examples follow.

Example 1. Joan described how seeing her peers' artifacts and hearing what they had to say about them increased her self-confidence in her ability to select artifacts and make effective statements about them as well:

just seeing like what the other people had, that helped me choose my artifacts, first of all, and then like also if they said that they were--like their idea is kind of like build it off of theirs, because it was like that makes sense, 'cause I kinda do the same thing. I can say that about my... [I26].

- O₁ = peers' artifact selection; O₂ = peers' ideas for annotations
- FP₁ = "choose my artifacts"; FP₂ = "say that about [them]"

Not only did Joan mention getting ideas from her peers, but she underscored the similarity of her situation to theirs ("I kinda do the same thing. I can say that about my..."), which is a key factor in weighing the importance of vicarious information. In addition, Joan's statement clearly reflects mastery experience; and, further, it implies verbal persuasion from peer feedback.

Pedagogical elements and activities: The commitments to preparedness arguments, professional statements and artifact annotations, and student progress supported by activities (e.g., artifact scavenger hunt and brainstorming) provided opportunities for Joan to observe the artifact selections of her peers and to hear what her peers had to say about their own artifacts. These observations provide vicarious experience upon which Joan's perceived self-efficacy for performing similar tasks was increased. In addition, the pedagogical commitment to student reactions as well as various peer review activities provided opportunities for verbal persuasion to contribute to increased perceived self-efficacy if the peers offered encouragement (i.e., verbal persuasion) to Joan about her ability to select and annotate her artifacts.

Example 2. Neil described seeing his peers' artifact selections, particularly those that were unique and went beyond the technical skills he felt everyone had learned in school:

kind of gets into who they are uniquely and what sets them apart, and I felt like that made a big difference....through watching those and through just deciding to go with it and just

try it myself, I think that it made a lot more impact to branch out and get away from just the documents [12].

- O = peers' artifact selection
- FP = selecting his own artifacts (branching out beyond just documents)

This example is similar to Joan's, above, in that it deals with observing peers' artifact selection, but it is also different in that it includes a reference to strategy modeling – another component of vicarious experience. In his statement, Neil indicates that his views were expanded through these observations, learning about new possibilities and gaining the confidence to try them.

Pedagogical elements and activities: The commitments to preparedness arguments, professional statements and artifact annotations, and student progress, as well as the supporting activities (e.g., artifact scavenger hunt and brainstorming) mentioned in the example above are potentially responsible for providing opportunities for vicarious experience.

Example 3. This last example is quite broad and a little less clear, but it provides a good look at an important aspect of learning in a group setting. Nate commented on the variety of ways in which peers approached the portfolio development task and how he found them to be successful:

Everyone had their own styles doing it, and I think they were all great, they were all very effective, it's just there's not one way to do it. There's many ways to do it. So I think just that itself, realizing the fact that, you know, portfolios can be done in many ways [15].

- O = peers' portfolio solutions
- FP = his own portfolio solutions.

This statement is a less-fully formed efficacy statement. However, it seems plausible to suggest that Nate's realization that there are many possible effective portfolio solutions may have led him to view the task as less daunting than one for which he must discover "the" one right solution – and, hence, increase his self-efficacy judgments for being able to create a successful portfolio.

Pedagogical elements and activities: Once again, the pedagogical commitments (e.g., to preparedness arguments, professional statements and artifact annotations, and student progress) and supporting activities (e.g., taking-the-pulse, peer review of artifact and annotation) provided

opportunities to observe the peers' portfolios and increase self-efficacy judgments through vicarious experience.

Verbal persuasion

Half of the participants attributed at least one self-efficacy impact statement to verbal persuasion (most are weak attributions). The trigger for verbal persuasion can be peers' comments during peer review, the facilitator's reaction to an idea suggested during a discussion, or paired activities such as brainstorming artifacts. Future performances for which self-efficacy beliefs may have been increased typically deal with writing the portfolio content (e.g., annotations or professional statements) but could also be artifact selection. Two annotated participant examples follow.

Example 1. Lori described how the support from peers in the studio helped her gain in self-confidence, noting that the peer reviews were a significant part of her Communication Portfolio Studio experience:

so you get a lot of everyone's opinions in it, and that's what I enjoyed the most, I would come in not feeling totally confident about my work, and there are people here to support you, and, you know, give you, oh, hey, you know, it's actually – it's actually pretty good [15].

- V = peers' encouragement or about her work ("it's actually pretty good")
- FP = increased confidence in "my work" (implies ability to complete the portfolio content)

In this statement, Lori attributes an increase in self-confidence to the verbal persuasion, or encouragement, given to her from peers with respect to her progress on her professional statement, artifact annotations, or both. It is reasonable to assume it is both, because this statement comes during the exit interview in response to a major take-away from the entire experience. In addition, her word choice "I would come in ..." suggests multiple peer review experiences. Lori's statement is a less fully formed efficacy statement because it refers to

confidence in work and not explicitly in her capability to do further work or to employ these skills in other situations.

Pedagogical elements and activities: As with other participant comments about increased self-efficacy judgments for creating portfolio content, the pedagogical commitments to preparedness arguments, professional statements and artifact annotations, and student progress – as well as the supporting activities (e.g., taking-the-pulse, peer review of artifact and annotation) provide opportunities for peers to increase each other’s perceived self-efficacy through verbal persuasions or encouragement. Verbal persuasion may also come from the facilitator – this persuasion could be supported by any number of supporting activities, including recapping feedback forms, or group discussions.

Example 2. Joan indicated it was difficult learning to how to analyze and leverage one’s own past work in a preparedness argument, and she noted that conversations with peers were helpful:

“the hardest part is looking at your past. After you can look at your past with a critical eye the actual process of writing becomes a lot easier. It helps to discuss with others your experiences” [PoS1].

- V = comments from peers regarding her past experiences
- FP = increased confidence in ability to write about the experiences

Joan’s statement is a less fully-formed efficacy statement – in which “it helps” is interpreted as implying an enhanced sense of self-efficacy. Her words seem to suggest that her perceived self-efficacy for making her preparedness argument was at first hampered by her own evaluation of her actual performance, but was then aided by encouragement from others. Of note, Joan’s self-efficacy judgments may also be increased through vicarious experience if social comparison of her past work to her peers’ past work is possible through the discussions.

Pedagogical elements and activities: As in the previous example, the pedagogical commitments to preparedness arguments, professional statements and artifact annotations, as well as supporting activities in which peers give and receive feedback (e.g., taking-the-pulse, peer

review of artifact and annotation, brainstorming) provide opportunities for perceived self-efficacy to be enhanced through verbal persuasion or encouragement from peers or facilitator.

Physiological state

Very few participants attributed a self-efficacy impact statement to physiological state, and any attributions are tenuous. One annotated participant example follows.

Example 1. Joan provided her reactions to her oral presentation of her portfolio during the final studio session on the in-session feedback form, indicating that it was frustrating:

“relaxing enough to speak thoughtfully” [FF:Frustr].

- P = not being able to relax
- FP = speaking thoughtfully during her oral presentation

Her statement reveals that her inability to relax during her oral presentation caused her to perceive that she was not able to speak thoughtfully. This statement was one of a very few that suggested that an experience degraded perceived self-efficacy, and it was one of few that named a specific physiological arousal as the source (i.e., not being able to relax).

Pedagogical elements and activities: The pedagogical commitments to preparedness arguments, professional statements and artifact annotations, as well as supporting activities such as the two-minute elevator pitch and the accompanying peer feedback, provided circumstances in which Joan’s perceived self-efficacy for giving an effective presentation was decreased through physiological arousal. It is not clear whether Joan’s statement in this example represents mastery experience as a source of efficacy information as well.

Findings pertaining to changes to perceived self-efficacy for communicating as practicing engineers are presented in the next section.

Sources and pedagogical elements for communicating as practicing engineers

In terms of patterns in the data, looking across participants, and down the rows of sources of self-efficacy information (Table 9.2 – bottom portion), reveals the following: most participants attributed at least one self-efficacy impact statement to mastery experience (although

two of the attributions are weak); half attributed at least one to vicarious experience (although some of the attributions are weak); fewer than half of the participants attributed at least one to verbal persuasion (most are weak); and only two participants attributed statements to physiological state (both are weak). As was expected, fewer source attributions were apparent in the participants' impacts statements with respect to perceived self-efficacy for communicating as practicing engineers than in the statements discussed in the previous section dealing with impacts to perceived self-efficacy for making preparedness arguments.

For each of the sources of self-efficacy information, a few examples of participants' statements are provided and interpreted, using the notation system developed (explained above). In addition, potential connections are suggested between the sources and the Communication Portfolio Studio pedagogies. It is useful, at this point, to remind the reader of the notation system developed for the analysis. The future performance was designated as "FP" in the findings, across all sources of self-efficacy information. The trigger varied by efficacy source, as follows: "M" for mastery experience; "O" for vicarious experience (observed); "V" for verbal persuasion; and "P" for physiological arousal.

Mastery experience

As noted before, most participants attributed at least one self-efficacy impact statement to mastery experience. As expected, mastery experiences described by the participants are more varied than in the section on perceived self-efficacy for making arguments and include oral presentation, realization of skills, development of more conscious thought processes in communicating, and making and presenting preparedness arguments. The future performances for which participants' self-efficacy beliefs may have been increased are, for the most part, similar to the mastery experience that gave rise to the impact. Future performances include public speaking, promoting self as communicator, asking better questions and giving better answers, and conveying ideas effectively. Three annotated participant examples follow.

Example 1. Lori indicated that the experience of giving her oral presentation increased her confidence for public speaking and that she believed she could now perform some of her volunteer activities that require public speaking more effectively:

I think that just kind of makes me a little bit more confident going out and speaking in front of my, let's say, fellowship committee and things like that... so hopefully, you know, I can express what I want to say to them more effectively [130].

- M = the oral presentation of her portfolio
- FP = speaking publicly on other occasions in other contexts

Lori's statement serves as an example of mastery experience: she stated explicitly that presenting her portfolio in the Communication Portfolio Studio increased her self-confidence for public speaking in other setting in the future. As with many of the examples of mastery experience, it is likely that Lori relied upon additional sources of self-efficacy information in enhancing her perceived self-efficacy. For example, Lori could be drawing on vicarious experience (i.e., observing others present) or on verbal persuasion (i.e., receiving verbal encouragement from others).

Pedagogical elements and activities: The pedagogical commitments and supporting activities that may have made the mastery experience possible impact possible are similar to those described for the oral presentations in the previous section (e.g., commitments to preparedness arguments; supporting activities such as the two-minute elevator pitch). In addition, as before, commitments to student reactions and supporting activities (e.g., brainstorming about what makes an effective presentation and the peer feedback at the end of the presentation) could have resulted in contributions to perceived self-efficacy through vicarious experiences and verbal persuasions—however, as noted above, it is difficult to say which, if any, of these sources were used by Lori.

Example 2. Neil indicated that his experiences in the Communication Portfolio Studio prompted him to think about himself as a communicator, which was a new idea for him; and, further, that he had become comfortable with that idea and planned to promote himself:

previously if I were to go into an interview and they were to ask me, what are your strengths? I'm not so sure communication would have been one of the first things that come to mind... I think that if I were to go into it now, I think that's definitely something I'd be like, yeah, I am good at that. I think that's a strength of mine [I35].

- M = realization of himself as a communicator (reflecting on skills)
- FP = promoting communication as one of his strengths

Neil's new recognition of himself as a communicator (could be framed as his reflection on, and writing about, past skills and accomplishments) increased his self-efficacy for speaking about his strengths as a communicator at an interview or similar situation. It is not clear from his statement what other sources might have contributed through his studio experiences. It is not unreasonable, however, to assume that vicarious experience contributed, especially given the statements Neil made on various occasions about drawing upon peers' work. It is also likely that he may have received verbal persuasion, or encouragement, from peers.

Pedagogical elements and activities: The commitments to professional statements and artifact annotations provided opportunity for Neil to reflect on and write about his past skills and experiences, resulting in the mastery experience explained above. In addition, with respect to the hypothesized contributions from vicarious experience and verbal persuasion, the commitments to student progress and student reactions, and supporting activities (mostly likely, here, the peer review of artifact and annotation) provided opportunities for those sources to contribute.

Example 3. Craig commented on how he had improved his thought processes when communicating, which in turn increased his beliefs in his abilities to interrogate his communication process and given better answers:

It has improved my thought process that goes on when I'm am trying to communicate and has made this process a more conscious one. I am able to ask myself better questions of what I am trying to communicate and therefore I can give better and more concise answers. [PoS15]

- M = having developed an improved, and more conscious, thought process
- FP = asking better questions about my communication and giving better answers

Craig's statements suggests that refinement of his thought processes was a mastery experience – Craig stated that it (i.e., the Communication Portfolio Studio experience) helped him improve his thought processes, making it more conscious for him and thus increasing his perceived self-efficacy for asking better questions and giving better answers in future communicative acts.

Pedagogical elements and activities: Attribution to the pedagogical elements is not straightforward here. It is reasonable to assume that reflecting on past work played a part. Thus, the commitments to professional statements and artifact annotations, to preparedness arguments, and to supporting activities such as the scavenger hunt and associated brainstorming, provided opportunities for this mastery experience. In addition, it is possible that Craig also relied on vicarious experience and verbal persuasion in developing his more conscious thought process; however, no clear indications were found for that.

Vicarious experience

As noted earlier, half of the participants attributed at least one self-efficacy impact statement to vicarious experience; some of these attributions are relatively weak. Observed performances highlighted by participants all referred to artifact selection, in some way; and, in addition, they did not match up with the future performances that were noted as impacted. Future performances included preparedness based on skill sets and achievements, ability to use skills in newly recognized ways, and enhanced assessments of one's own experiences. Three annotated participant examples follow.

Example 1. Joan reflected on her potential artifacts in an unfavorable light, noting that she did not have as many leadership experiences as many of her peers:

I did not like choosing my artifacts. Seeing all the cool things other people were involved in kind of bummed me out that I wasn't more involved like they were. i don't have impressive leadership skills, and it was just hard to realize that. [PoS4]

- O = peers' artifact selections
- FP = decreased confidence in her preparedness

Her statement is not a fully-formed efficacy statement (i.e., she does not explicitly state that her self-efficacy judgments were lowered). However, her negative phrase, “bummed me out” suggests that in seeing her peers’ leadership experiences, her self-efficacy for communicating as an engineer (and thus by extension, making preparedness arguments) may have been decreased through vicarious experience and physiological state.

Pedagogical elements and activities: The commitments to preparedness arguments, professional statements and artifact annotations, and supporting activities such as the artifact scavenger hunt, brainstorming of artifact selection, and peer review of artifact and annotation provided opportunities for Joan to compare herself to others – in this case, unfavorably, thus decreasing her perceived self-efficacy through vicarious experience and, relatedly, through physiological state.

Example 2. Ryan indicated that his conceptions of communication in an engineering context have been expanded and that, as a result, he saw his capabilities as having been expanded:

the portfolio development experience has enabled me to examine engineering communication in a much more broad sense. I feel as though this experience has made me more open and able to communicate in a much more general sense [PoS15].

- O = seeing peers’ artifacts and annotations and claims (seeing communication more broadly)
- FP = employ wider skill set

It seems reasonable to interpret Ryan’s statement about looking at communication more broadly to mean that seeing his peers’ artifacts opened his eyes to available kinds of communication (as stated several other times and places by Ryan). Thus Ryan was likely indicating that exposure to the range of peers’ artifacts, annotations, and claims made in their professional statements, had caused him to see new areas in which to examine his experiences for making claims about his skill sets, which may be said to have increased his self-efficacy judgments about his preparedness to communicate in the workplace. Ryan had several lifewide experiences, volunteer and

employment, that called for communication skills. He indicated on occasion that he had not previously thought of those experiences as readying him for the engineering workplace.

Pedagogical elements and activities: The commitment to preparedness arguments, professional statements and artifact annotations, and student progress and supporting activities (e.g., artifact scavenger hunt and brainstorming) mentioned in the example above are all relevant here. Commitments to student reactions and activities such as the think-aloud and the taking-the-pulse could have provided opportunities for Ryan to have observed his peers' work and increased his self-efficacy for preparedness based on those vicarious experiences and social comparisons.

Example 3. Craig described his experiences reflecting on past work. Although this is an example of mastery experience, it is included here because of the references to vicarious experience and verbal persuasion:

through the experience...of seeing others' work or of hearing what others had...to say about your work... I mean it's gotten me to like look back at like as far as going back over the artifacts... kind of one of those things like what was I thinking back then, those words don't make sense, or--I don't know, sometimes it's the opposite, too, it's like, oh, wow, there's a golden piece out of all that. [135]

- O = the "work" of peers
- FP = enhanced assessment of his own past experiences

Craig's statement is not a fully formed self-efficacy statement because it does not explicitly mention increased confidence in his abilities to evaluate his past performances. However, it does indicate that he engaged in a level of performance that has been stimulated by the actions and performances of others; and, further, it adds value to an exploration of sources of efficacy beliefs for students. There are at least three sources potentially indicated in this one passage (and possible four). As noted already, Craig explicitly mentioned that seeing his peers' work products (likely their annotations of artifacts and discussions surrounding them) had prompted him to critically reflect on his past experiences – a contribution from vicarious experience. Next, Craig explicitly mentions that hearing what his peers had to say about his work products (likely their

comments in peer review of annotations, or in discussions and brainstorming sessions) also prompted this critical reflection – a contribution from verbal persuasion. Although not explicitly stated, and capturing a different aspect of Craig’s comment, his critical reflection that results in surprising positive and negative discoveries may be considered as a mastery experience. It could be hypothesized that this meaningful experience he reports serves as the impetus for further deep reflections (FP); and, in addition, that physiological arousal (“it’s like, oh, wow”) may play a role in raising his self-efficacy beliefs in his ability to engage in similarly significant reflection experiences in the future.

Pedagogical elements and activities: As with the previous example, commitments to preparedness arguments, professional statements and artifact annotations, and student progress and supporting activities (e.g., artifact scavenger hunt, brainstorming, and peer review) could all have provided opportunities for increased Craig’s self-efficacy based on vicarious experiences.

Verbal persuasion

Fewer than half of the participants attributed at least one self-efficacy impact statement to verbal persuasion (most are weak attributions). The future performances tend to match up to the verbal persuasion that triggered the impact; these performances involve public speaking and improving work based on feedback. Two annotated participant examples follow.

Example 1. Sean suggested that that he came to appreciate his oral presentation skills through the Communication Portfolio Studio experience and now frames these skills as capabilities that he can use in the future. While this is also a mastery experience, the focus here is on the verbal persuasion:

I can talk about something that is really valuable to me in a way...that can be understood by others and appreciated by others, and that is really important, when you are trying to market yourself or like present yourself in front of other people [130].

- V = perceived appreciation of peers at his oral presentation
- FP = speaking on another occasion in ways that are appreciated and understood

The hypothesis here is that Sean received positive feedback from peers in the Studio when he presented his portfolio, and that this feedback increased his self-efficacy judgments for presenting himself effectively in the future (“I can talk about something”). Interpreted thus, Sean is extending his increased self-efficacy judgments from presenting his portfolio to a more general statement about presenting information verbally in other settings.

Pedagogical elements and activities: With respect to verbal persuasion in this example, pedagogical commitments to student progress and student reactions, as well as the supporting activities (e.g., two-minute elevator pitch and peer review) provide opportunities for peers to increase each other’s perceived self-efficacy for presentation information orally in other settings, through verbal persuasion. In addition, as noted before, this is a mastery experience that provides vicarious experience as well, supported by pedagogical commitments to preparedness arguments, student progress and reactions, as well as supporting activities (e.g., two-minute elevator pitch, brainstorming on effective presentations, peer feedback on presentations).

Example 2. Nate commented on the usefulness of creating and sharing portfolios in the Studio, indicating that it was very helpful to get feedback from peers on his work:

in basically everything...that you're not just doing for yourself, then you have to kind of understand what other people think of it...with everything, you want to see the feedback of the audience, so I think just getting the feedback from each other is very helpful [134].

- V = feedback on his portfolio
- FP = completing the portfolio task (implied and may extend beyond)

Nate indicates that receiving verbal encouragement from peers in the Studio was helpful in completing his portfolio tasks. This could be interpreted to mean that his self-efficacy beliefs for finishing the task, or more broadly, for writing compelling arguments, have been enhanced through verbal persuasion. This partially-formed efficacy statement is included for the value that it has in shedding light on sources of self-efficacy.

Pedagogical elements and activities: The pedagogical elements (e.g., student progress and reactions) and supporting activities (e.g., taking-the-pulse, think-aloud, peer reviews) could have provided opportunities to enhance self-efficacy judgments through verbal persuasion.

Physiological state

Very few participants attributed a self-efficacy impact statement to physiological state, and those attributions are weak. One annotated participant example follows.

Example 1. Lori indicated that in the past she had been nervous communicating orally, which affected her performances. However, she is now confident enough to take on more public speaking performances:

I wasn't really big on communicating orally publicly in front of people, because I get really nervous, and then I -- my thoughts get jumbled and then I end up not being able to explain what I'm trying to get out ... through this experience and through my 231 class... I was considering taking ... a public speaking class. [I27]

- P = being nervous (and surviving)
- FP = taking on more public speaking performances

Lori seems to be indicating that through repeated practice she is now less nervous or has found a way to harness nervousness as a facilitative strategy. Her statement is not a clear efficacy impact statement nor an explicit attribution to source; but, in any event, she moved from not liking (“wasn’t really big on”) public speaking to taking a class that centers on speaking publicly. This example also involves mastery experience and, likely, all four sources of self-efficacy information.

Pedagogical elements and activities: The pedagogical commitments to preparedness arguments, professional statements and artifact annotations, as well as supporting activities such as the two-minute elevator pitch and the accompanying peer feedback, provided opportunities for Lori to present her portfolio. Although she speaks about typically being nervous, the pedagogical commitments to student feedback and reactions, must have mitigated the nervousness and helped her to produce a presentation that she deemed acceptable or that produced an acceptable level of stress.

Summary of findings

Research Question 4A: What impact

Findings for this research question deal with the presence or absence of at least once statement, by participant, that acknowledges impacts of the Communication Portfolio Studio experience on that participant's perceived self-efficacy.

Specifically, with respect to perceived self-efficacy for making arguments about preparedness to communicate as practicing engineers, all participants made at least one statement indicating that their perceived self-efficacy had been increased. No negative impact statements were identified in this part of the analysis. With respect to perceived self-efficacy for communicating as practicing engineers, all participants made at least one statement indicating that their perceived self-efficacy for communicating as practicing engineers had been increased. Further, Joan made at least at least one negative impact statement. No significant differences were detected by any of the pre-post standardized instruments for perceived self-efficacy for writing, for communication competence, or oral communication apprehension.

Research Question 4B: What sources and pedagogical elements?

Findings for this research question include an analysis for the presence or absence of at least once perceived self-efficacy impact statement (from the analysis under Research Question 4A) that attributes the impact to a particular source of self-efficacy information, by participant. Findings also include some indications of pedagogical elements associated with the attribution. The pedagogical commitments to student reactions and progress are implicated in the statements throughout and, therefore, not emphasized in each section.

Specifically, with respect to impacts on perceived self-efficacy for making arguments about preparedness to communicate as practicing engineers, most of the participants attributed at least one self-efficacy impact statement to mastery experience; most of the participants attributed at least one statement to vicarious experience; half of the participants attributed at least one statement to verbal persuasion; and, a few participants attributed at least one statement to

physiological state. With respect to perceived self-efficacy for communicating as practicing engineers, most of the participants attributed at least one self-efficacy impact statement to mastery experience; half of the participants attributed at least one statement to vicarious experience; fewer than half of the participants attributed at least one statement to verbal persuasion; and, only two participants attributed at least one statement to physiological state. Findings summarized above include both strong attributions (i.e., the participants' statements were fairly clear in their indication of the source of their increased perceived self-efficacy) and weak attributions (i.e., the participants' statements were suggestive of a source).

With respect to the associations of source attributions with pedagogical elements, a few summarizing statements are made, in which the two analyses (i.e., perceived self-efficacy for making preparedness arguments and perceived self-efficacy for communicating as practicing engineers) are combined.

With respect to mastery experiences, the two-minute elevator pitch (oral presentation of portfolios) is the self-performance cited most frequently in the participants' self-efficacy impact statements. Other performances cited include writing the artifact annotations, drafting professional statements, revisiting prior work to look for evidence, assessment of self as communicator, practicing the oral presentation, creating the portfolios (e.g., pulling the components together, designing structure, uploading). Additional pedagogical elements that are likely associated (or explicitly mentioned) include peer review of artifact and annotation, taking-the-pulse activity (review of professional statements), and artifact scavenger hunt (making list of candidate artifacts from past work). Future performances for which perceived self-efficacy was impacted varied in similarity to the mastery experience upon which the impact was based (i.e., delivering the two minute elevator pitch could have impact perceived self-efficacy for giving another two-minute elevator pitch, or for making another oral presentation, or even for talking about one's skills in an interview).

With respect to vicarious experiences, peers' artifact selections (and peers talking about their artifact selections) were the observed performance cited most frequently (or implied) in the participants' self-efficacy impact statements. Other observed performances cited include written work (e.g., professional statements, artifact annotations), and completed portfolios (i.e., the peers' portfolio solution, as a whole). As with mastery experience, additional pedagogical elements that are likely associated (or explicitly mentioned) with vicarious experience include peer review of artifact and annotation, taking-the-pulse activity (review of professional statements), and artifact scavenger hunt (making list of candidate artifacts from past work) – note, these sharing activities are often implicated as more than one self-efficacy information source. Future performances for which perceived self-efficacy was impacted aligned fairly well, in most cases, with the observed performance upon which the impact was based (i.e., seeing others' artifact selection enhanced perceived self-efficacy for making one's own artifact selections).

With respect to verbal persuasion, the trigger (i.e., the verbal or social persuasions – or encouragement given by others) cited most frequently (or implied) in the participants' self-efficacy impact statements was *others* in the studio. These references to others appeared to be the other participants, but could have included the facilitator on occasion. One participant spoke about audience feedback (collectively), implying that it was the trigger for an increase in perceived self-efficacy. Pedagogical elements that are likely associated (or explicitly mentioned) include the various peer review activities (e.g., peer review of artifact and annotation, taking-the-pulse activity (review of professional statements), and artifact scavenger hunt (making list of candidate artifacts from past work)). Future performance for which perceived self-efficacy was impacted included increased confidence in ability to write about experiences, and to present in ways that are appreciated by the audience.

With respect to physiological state, very few impact statements made references to emotional or physiological arousal. The two statements reported here cited inability to relax (during oral presentation) and being nervous (and surviving) (general reference to the studio

experience). Note that the event associated with the trigger (i.e., an oral presentation) also serves as a mastery experience; in addition, physiological state tends to serve as an information source for decreased perceived self-efficacy, as illustrated by this example: the trigger in the first statement aligns with the future performance for which perceived self-efficacy has been decreased (i.e., speaking thoughtfully during the presentation).

With the findings summarized, the next sections presents the discussion of these findings.

Discussion

Findings are discussed for Research Questions 4A (what *impact?*) and 4B (for identified impacts, what *sources* and *pedagogical elements* are indicated?).

Research Question 4A: What *impact?*

The emphasis in this study, with respect to perceived self-efficacy, is not on the prevalence or strength of impacts, but rather on isolating individual impact statements so that they could be explored through Bandura's sources of self-efficacy information framework in order to learn something about the ways in which the Communication Portfolio Studio experience has the potential to enhance perceived self-efficacy for communicating as practicing engineers (broadly – including making preparedness arguments). As presented earlier, and as shown in Table 9.1, all of the participants made at least one statement in which they indicated that their perceived self-efficacy had been increased for making preparedness arguments and for communicating as practicing engineers.

It was anticipated that engagement in the Communication Portfolio Studio would lead to higher perceived self-efficacy for making preparedness arguments for two reasons, in particular. First, all participants successfully accomplished the main task of creating and presenting a preparedness portfolio, and theory indicates that successful performances raise perceived self-efficacy: "When students believe that their efforts have been successful, their confidence to accomplish similar or related tasks is raised" (Pajares, 2008, p. 115). Next, all participants were

novices in this domain (i.e., few had any portfolio experience and none had made a portfolio anything like the ones in the Communication Portfolio Studio), thus, the task was expected to be somewhat challenging; and, theory suggests that succeeding on more difficult tasks may enhance perceived self-efficacy more readily than succeeding on easier tasks (e.g., Bandura, 1986). Thus, it was not surprising that a positive impact statement could be found in the data for each participant, which corroborated the assumption of increased perceived self-efficacy.

It was also anticipated, but less strongly, that participants' perceived self-efficacy would be enhanced for communicating as practicing engineers; this projection was based on the understanding that the sub-skills involved in making a preparedness portfolio (e.g., writing a professional statement, giving an oral presentation, engaging in reviewing the work of peers) are likely to be the same skills that would be important for communicating in engineering practice. Thus, increases to perceived self-efficacy for making a preparedness argument could also increase perceived self-efficacy for communicating as an engineer, more broadly. Another reason for the more tenuous assumption of increases to perceived self-efficacy comes again from theory concerning the effects of task difficulty. Since six of the ten participants had engineering-related workplace experience, it could be assumed that the task of making an argument about preparedness to practice would be relatively easy and, thus, as Bandura (1986) notes, successful performances of easier (or familiar) tasks may be less likely to raise perceived self-efficacy than performances on more difficult tasks.

Before moving on to the analysis of sources of self-efficacy information, it is important to note that the findings from this first stage of the analysis are important in their own right, although not the main emphasis. Many of the participants made more than the one impact statement, as shown in Table 9.1. While a further quantitative analysis of the self-efficacy data is beyond the scope of the dissertation, the stories and statements of the participants described in the findings for rhetorical awareness, as well as for the sources of self-efficacy analysis, suggest that the Communication Portfolio Studio pedagogy has strong potential for enhancing students'

perceived self-efficacy for communication. This is an important finding, given the decades of research that has demonstrated a strong link between students' self-efficacy beliefs and their academic attainments, even apart from knowledge and skills possessed (e.g., Pajares, 2008; Schunk & Pajares, 2002).

Research Question 4B: For identified impacts, what sources and pedagogical elements?

Turning to the main analysis for the sources of self-efficacy information and associated pedagogical elements, it should be noted that the discussion here will be organized somewhat differently than the way in which the findings for this research question were presented, in order to best highlight the key findings for the study. The discussion will include a general overview of source attributions, followed by focused discussions on vicarious experience and verbal persuasion.

Discussion Topic 1: General overview of source attributions

At this point, it is useful to note again that the attribution data in Table 9.2 do not represent prevalence, but, rather, presence or absence of at least one impact statement attributing a given source. One of the most striking observations, in looking at the table as a whole – in other words, looking across the two separate analyses for self-efficacy impacts with respect to preparedness arguments and with respect to communicating as practicing engineers – is that mastery experience is the source for which the largest number of participants made at least one attribution. This finding aligns with theory and reported research: mastery experience was posited by Bandura (1986) to be the most influential source of self-efficacy information, and his assertion has been confirmed by decades of research for such areas as students' motivational, affective, and behavioral outcomes across various domains (e.g., Pajares 2008). In addition, Usher and Pajares (2008), in a review of the literature on sources of self-efficacy in school, emphasize the importance of mastery experience, noting that students, upon completing an academic task, “interpret and evaluate the results obtained, and judgments of competence are created or revised according to those interpretations. When they believe that their efforts have been successful, their

confidence to accomplish similar or related tasks is raised" (p. 752). Mastery experience has an enduring influence, especially when a challenging task is mastered, or difficulties are overcome.

Another striking observation from Table 9.2 is that there appears to be a general tapering off of numbers of attributions moving down the list of sources from mastery experience to vicarious experience, verbal persuasion, and physiological state – generally, across the participants. This pattern seems to hold across the two analyses, with the exception of the larger number of attributions to vicarious experience for the first analysis. This finding will be explored under the next discussion topic. The general pattern noted does *not* align with original theory or empirical findings (other than the prominence of mastery experience already noted). As distinct from Bandura's many writings that emphasize mastery experience as the most powerful source of self-efficacy information, "he makes no claims about the *relative* contribution of the other three sources" (Usher & Pajares, 2006, p. 128) [italics not in the original text].

As a final observation about the attribution patterns in general, while the presence of attributions is fairly similar between the two analyses, as can be seen in comparing the top and bottom portions of Table 9.2, there are more weak attributions for the second analysis. It should be noted that a formal analysis of strength of attribution was beyond the scope of this study. Rather, this rough categorization intends to provide information about where effort could be spent in adjusting the pedagogy to elicit more strong attributions and where more research effort could be expended in terms of data collection. Given the very exploratory nature of this investigation, and the fact that the data collection instruments were created before the decision to look specifically at sources of self-efficacy information, what can best be said about the strength notations is that the intent, once again, was to be inclusive in the analysis in order to learn as much as possible. When the attribution to a source was very clear, it was designated as strong; however, if a participant's statement, in its entirety, was suggestive of a source, it was included as a weak attribution.

Given the interest of this dissertation in exploring the PPPS pedagogy as a way to learn about the sources of information on which the participants rely in forming their self-efficacy judgments, as articulated in Chapter 3, and given recent trends in self-efficacy research, for example, the move in the last decade or so to looking at the sources of self-efficacy information, and given the fact that mastery experience research has been the least conflicted (e.g., Usher & Pajares 2006, 2008), it was decided to focus some of the discussion specifically on vicarious experience and verbal persuasion. However, before turning to those discussion topics, it is important to comment briefly on physiological state, as it has a strong relationship to communication. Writing can be personal and emotional, which can lead to anxiety and lack of confidence in one's abilities and "those affective reactions can lower self-efficacy perceptions and trigger additional stress and agitation that help ensure the inadequate performance feared" (p. 107). This study provided a very initial glimpse into the participants' physiological arousal surrounding particular activities, enough of a glimpse to demonstrate in a compelling way that the PPPS pedagogies employed in the Communication Portfolio Studio could become an important tool for teachers to use in helping students increase their perceived self-efficacy for communication.

Discussion Topic 2: Focus on vicarious experience

Vicarious experience was defined by Bandura (1986) as observing a *similar* other perform a task successfully; he noted that watching the successful performances of others can raise the observer's beliefs in his or her capability to master comparable activities, by persuading themselves "that if others can do it, they should be able to achieve at least some improvement in performance" (Bandura, 1986, p. 399). While Bandura focused on similar others, he also noted that observers benefit from watching more expert individuals model effective strategies. According to the literature, results from studies of vicarious experience have produced uneven results, and some researchers believe that the vicarious experience construct needs to be broken into two parts – one that addresses the similar others (e.g., peers) and one that deals with the

master modelers of strategies (e.g., teachers, mentors, parents) (Usher & Pajares, 2006). Research on self-efficacy has been predominantly quantitative. In their review of studies of the sources of self-efficacy information, Usher & Pajares (2008) note that a mere handful of qualitative studies have been done, and they call for more qualitative studies in order to examine the development of self-efficacy beliefs in way that can “capture the personal, social, situational, and temporal conditions under which students cognitively process and appraise their beliefs and experiences” (p. 784).

Vicarious experience was expected to be an important source of self-efficacy information for the participants in the Communication Portfolio Studio, and from this modest first attempt to analyze for this, it would seem that this was, indeed, the case, especially for making preparedness arguments. Several participants mentioned gaining confidence about selecting their artifacts from watching their peers make their selections. Participants’ typically drew strength from watching others perform – further, the vicarious experiences appeared to fall into both categories that Bandura originally identified: watching a similar other give a successful performance, and learning some new strategies for solving a problem.

Most of the attributions to vicarious experience involved observations of artifact selection, talking or writing about the artifacts, or, more generally, the portfolio solution as a whole (e.g., when sample portfolios are shown to the group during sessions). The future performances for which the perceived self-efficacy was impacted tended to be quite similar to the observed performance. In other words, observing artifact selection led to increased perceived self-efficacy for selecting artifacts, as opposed to mastery performances that often increased perceived self-efficacy for a somewhat dissimilar performance – for example, presenting a portfolio as a two-minute elevator pitch and using one’s voice for crowd control at a volunteer event. Vicarious experience, which has already been described as a complex source, also includes social comparison, which is slightly different from the observation of a similar other. Joan, for example, indicated that she was bummed out by seeing all of the experiences that the other

participants had that she wished she had, particularly leadership experiences. Her statement was recorded as a negative impact statement for perceived self-efficacy for communicating as a practicing engineer because she compared her repertoire of skills and experiences unfavorably to her peers' collections of skills.

Bandura posited, and research has confirmed, that vicarious experiences can be "most influential when students are uncertain about their own abilities or have limited experience with the academic task at hand" (Usher & Pajares, 2006, p. 127). The number of participants attributing at least one self-efficacy impact statement to vicarious experience seems to resonate with this notion of unfamiliarity – participants crossed over disciplinary boundaries to join the Communication Portfolio Studio just as do engineering students into the technical communication classroom. The nature of their interactions and reactions to their experiences suggest that this pedagogy holds promise as a site for promoting vicarious experiences that can increase the participants' perceived self-efficacy.

Discussion Topic 3: Focus on verbal persuasion

Verbal persuasion is the encouragement one receives in terms of the ability to accomplish a specific performance; it is a widely used source of self-efficacy information (e.g., teachers, parents, peers), but its effects are often short-lived, because it can be easily disconfirmed by subsequent unsuccessful mastery experiences (e.g., Bandura, 1986). Verbal persuasion is not strong when operating by itself, but "it can contribute to successful performance if the heightened appraisal is within realistic bounds" (Bandura, 1981, p. 204). When a person works alone, it is easier to undermine perceived self-efficacy with verbal persuasion than to increase it because individuals tend to give up quickly when facing difficulties. The impact of persuasory information depends upon the trust that the individual has in the persuader (e.g., skill in the domain, expertise at evaluating, and familiarity with the task); in addition, perceived self-efficacy may be raised for those individuals who tend to recall the positive performances more readily than the negative ones (Bandura, 1986).

Most formations of self-efficacy judgments are the result of the integration of multiple, interpreted efficacy sources (Bandura, 1986). For example, although few studies have shown verbal persuasion predicting self-efficacy beliefs, it has been found to contribute significantly with mastery experience to writing self-efficacy for high school students (Pajares et al. 2007). Two qualitative studies found that students relied on more than their own mastery experiences in forming self-efficacy judgments (Zeldin and Pajares, 2000). Usher and Pajares 2008 call for more research on verbal persuasion.

It was anticipated that the Communication Portfolio Studio would provide many opportunities for peers to provide verbal persuasion to one another with respect to performances of the tasks associated with the development of the preparedness portfolios. While the findings are modest here, there are a few examples, which may suggest potentialities for many more. For example, Lori commented specifically on internalizing encouragement from peers and, consequently, feeling more self-confident about her work. According to the theory, this would suggest that Lori trusts the persuaders (e.g., believes in their knowledge, their abilities as reviewers). The nurturing, connected environment in the Communication Portfolio Studio, promoted by the pedagogies of student reactions, student commitments, and liberating constraints, appears to be a promising site for participants to provide each other with verbal persuasion. Joan also described struggling with looking at her past work and subsequently feeling more confident about the writing process afterward (e.g., writing the annotations or professional statement). Sean spoke about how the experience of delivering his two-minute elevator talk about his portfolio increased his belief in his capability to present himself at another time. Following the findings of Pajares et al. (2007) and others, it seems likely that Sean's self-efficacy judgments were formed not only based on his interpretation of his own mastery experience, but also on verbal persuasion from others.

As noted before, the findings reported here are exploratory. However, given that the data collection was not targeting self-efficacy source information, the findings strongly suggest that

the pedagogy of the Communication Portfolio Studio has great potential for discovering more about the sources that students rely on in forming self-efficacy judgments and also for enhancing students' perceived self-efficacy. The findings also suggest that other pedagogies that engage students in observing and commenting on each other's work could be sites for raising students' perceived self-efficacy. This study is one of a few qualitative studies that looks at the sources of self-efficacy information in higher education.

10. CONCLUSIONS

Broadly, this study explored engineering undergraduate students' conceptions of the communication of engineering practice and their beliefs in their capabilities with respect to that communication. In addition, the study examined the effectiveness of a particular pedagogical approach for carrying out this exploration. Rationale for this study was provided by industry, professional organizations, and educators who call for increased attention to helping undergraduate students develop the communication skills necessary to meet the demands of the complex, and rapidly changing, environment in which today's engineers work. Motivation also came from surveys of engineering professionals and recent alumni who report that novice engineers are entering the workplace without the requisite skills, despite the increased attention within the engineering education community on preparing undergraduates for professional communication. In addition, a sincere interest in students' communication, developed through experiences with teaching, research, and program administration related to communication instruction for engineering undergraduates, motivated a desire to better understand the current state of students' conceptions about, and beliefs in, their capabilities relative to the communication of engineering practice.

Specifically, this multiple-case study explored the rhetorical awareness and perceived self-efficacy of ten engineering undergraduate students for the communication of engineering practice through engagement in the Communication Portfolio Studio, an implementation of the (PPPS) pedagogy (Turns et al., 2012) focused on communication. In addition, this study sought to evaluate the effectiveness of PPPS for advancing the participants' rhetorical awareness and perceived self-efficacy.

This study explored rhetorical awareness by engaging participants in an inherently rhetorical task (i.e., making arguments in the form of online portfolios about their preparedness to communicate as practicing engineers); as such, a nested, three-part analysis of rhetorical awareness was conducted. Using Winsor's (1996) *Writing Like an Engineer: A Rhetorical Education*

as a conceptual framework, the analysis examined what was *revealed* by the pedagogy about the participants' rhetorical awareness, any *impacts* of the pedagogy on participants' rhetorical awareness, and how participants' *enacted* their rhetorical awareness as they carried out the task of making preparedness portfolios in the Communication Portfolio Studio. This study also explored perceived self-efficacy through a separate, two-phase analysis. In the first phase, *impacts* of the pedagogy on participants' perceived self-efficacy were identified, and in the second phase, identified self-efficacy impacts were examined for indications of *self-efficacy source information* using Bandura's (1986) hypothesized sources of self-efficacy information as a conceptual framework. The following research questions were addressed in this dissertation (see Chapter 1 for the full text of the questions):

1. With respect to socialization through experts and genres, and through engagement in the Communication Portfolio Studio, (A) what is *revealed* about rhetorical awareness, (B) what *impact* is there on rhetorical awareness, and (C) what does *enactment* of rhetorical awareness look like?
2. With respect to learning to construct and interact with audience, and through engagement in the Communication Portfolio Studio, (A) what is *revealed* about rhetorical awareness, (B) what *impact* is there on rhetorical awareness, and (C) what does *enactment* of rhetorical awareness look like?
3. With respect to the negotiation of "reality," and through engagement in the Communication Portfolio Studio, (A) what is *revealed* about rhetorical awareness, (B) what *impact* is there on rhetorical awareness, and (C) what does *enactment* of rhetorical awareness look like?
4. With respect to perceived self-efficacy, and through engagement in the Communication Portfolio Studio, (A) what *impact* is there on perceived self-efficacy, and (B) what *sources of self-efficacy information*, and *pedagogical elements*, if any, are indicated in the impact statements?

This chapter provides a summary of findings, presents conclusions and contributions of the study, and describes implications for practice and research.

Summary of Findings

Before turning to the conclusions, brief summaries of the findings for rhetorical awareness (Chapters 5-7) and of the findings for perceived self-efficacy (Chapter 8) are presented.

Research Question 1: Socialization through experts and genres (Chapter 5)

Participants experienced genre learning and socialization somewhat differently in the workplace than in school, and their conceptions of the genres of engineering practice were expanded through peer interactions. In the rhetorical community of the studio, genre learning and socialization resembled experiences from both workplace and school. Workplace and other lifewide experiences tended to mediate genre learning and socialization. Participants measured the success of their genre performances in various ways, and concerns for correctness persisted for some in the studio, despite absence of grades and lack of strict guidelines. Participants grappled with disconnects between engineering and communication, including stereotypes, conflicts between espoused importance of communication and curricular realities, and the meaning of *effective communication*. Limited access to workplace products challenged participants' ability to demonstrate socialization through artifact selection. Workplace and lifewide experiences appeared to mediate socialization.

Research Question 2: Learning to construct and interact with audience (Chapter 6)

Participants expressed varying views on audience roles and relationships, with some seeing audience as a passive receptor of transmitted information, and others seeing audience as involved in interactions in which they are co-creators of information. Participants' views on attending to audience needs varied as well; many participants were interested in being clear and being understood; a few spoke of shared understandings. Participants demonstrated their audience awareness through identification of audience and through strategies employed in the development of portfolio content and structure. Mediating effects of workplace and lifewide experience were unclear. Reflecting on prior work to find evidence of preparedness to communicate resulted in deeper understanding not only of the prior work, but also of the

knowledge it represented, and of the ability to explain the work to others. In addition, participants spoke about becoming better at assessing themselves as communicators, and they developed a greater understanding and appreciation of their own skills, which led to more self-confidence in their capabilities as communicators.

Research Question 3: The negotiation of “reality” (Chapter 7)

Participants held varying perspectives on the dynamics of persuasion: some saw persuasion mostly as a uni-directional force exerted by one party on another, others saw an ongoing interaction among parties, and others had different views at different times. Some participants described persuasion in terms of manipulation, and some as an attempt to bring about change (e.g., move a project forward). Views of the appropriate use of persuasion often varied by context and purpose of the communicative act (e.g., proposing work to a stakeholder, writing a technical report). Very few participants told stories of workplace persuasion. Some participants described the importance of being and feeling knowledgeable to their ability to communicate effectively in school and lifewide situations. Participants all described the crucial role of communication to engineering practice – both within the engineering community (e.g. sharing of ideas as the basis of progress and teamwork) and outward to the public (e.g., social responsibility).

Research Question 4: Perceived self-efficacy (Chapter 8)

(A) What impacts? All participants made at least one statement indicating that their perceived self-efficacy for making arguments about preparedness to communicate as practicing engineers had been increased; no negative impact statements were identified. All participants made at least one statement indicating that their perceived self-efficacy for communicating as practicing engineers had been increased; one participant (Joan) made at least one negative impact statement. No significant differences were detected by any of the pre-post standardized instruments.

(B) What sources and pedagogical elements? With respect to *perceived self-efficacy for making arguments about preparedness to communicate as practicing engineers*, most of the participants attributed at least one self-efficacy impact statement to mastery experience; most of the participants attributed at least one statement to vicarious experience; half of the participants attributed at least one statement to verbal persuasion; and, a few participants attributed at least one statement to physiological state. With respect to *perceived self-efficacy for communicating as practicing engineers*, most of the participants attributed at least one self-efficacy impact statement to mastery experience; half of the participants attributed at least one statement to vicarious experience; fewer than half of the participants attributed at least one statement to verbal persuasion; and, only two participants attributed at least one statement to physiological state.

With respect to mastery experience, the two-minute elevator pitch was cited most frequently; other mastery experiences included writing annotations or professional statements, revisiting prior work, and completing the portfolio. Pedagogical elements potentially associated included peer review of artifact and annotation, taking-the-pulse activity (review of professional statements), and artifact scavenger hunt (making list of candidate artifacts from past work). With respect to vicarious experience, peers' artifact selection was the observed performance cited most frequently; other observed performances cited included the professional statements, artifact annotations, and completed portfolio websites. Pedagogical elements potentially associated include peer review of artifact and annotation, taking-the-pulse activity (review of professional statements), and *thinking-aloud exercise*. With respect to verbal persuasion, the trigger (i.e., persuasory information – or encouragement given by others) cited most frequently was, simply, *others* in the studio, which appeared to mean other participants, but could have included the facilitator. Pedagogical elements potentially associated include various peer review and brainstorming activities. With respect to physiological state, very few impact statements were made. Physiological arousals cited include inability to relax (during oral presentation) and being nervous (and surviving).

With the findings summarized, and before moving to the conclusions, it should be acknowledged that while there are always limitations to research of this nature, steps have been taken to ensure trustworthiness; they are covered in Chapter 4 (methods)..

Conclusions and Contributions

Conclusion and contributions are presented in four areas: the rhetorical awareness conceptual framework, the sources of self-efficacy information conceptual framework, the Communication Portfolio Studio pedagogy, and the three-part analysis of a rhetorical education.

The rhetorical awareness conceptual framework

This dissertation explored the conceptions that engineering undergraduate students have of the communication of engineering practice, with a focus on participants' understandings of genre, audience, and persuasion – referred to collectively in this dissertation as rhetorical awareness. Winsor's (1996) book, *Writing Like an Engineer: A Rhetorical Education*, was chosen as the conceptual framework for the analyses of rhetorical awareness; specifically, as an organizing mechanism for the analyses, as a reference point for connecting my findings, and highlighting places of alignment and extension. Winsor's (1996) book was written in the early portion of a long-term study she conducted of four engineering co-op students' socialization as novice engineers into the discourse of practice. While the focus of Winsor's research has evolved over time, as have the roles and writing activities of her former students (e.g., Winsor 2006, 2007), and scholars have built further upon her research (e.g., Leydens, 2008), it is her 1996 text that I am interested in here.

Winsor developed a framework of rhetorical awareness as she explored students' understanding and use of rhetoric in their writing. I had the opportunity to see if I could employ her framework to actually *advance* my participants' rhetorical awareness. In other words, instead of documenting and theorizing about the experiences of my participants, I wanted to see if it were possible, with the Communication Portfolio Studio, to accelerate the rhetorical education of

my participants along the lines of the education that Winsor described for her students as novice engineers in their workplaces.

I believe that my study demonstrates that (a) Winsor's framework of rhetorical education has continued applicability and relevance today, although there are some differences, of course; (b) her framework extends well to cover oral genres; (c) her framework has the potential to be applied more extensively to socialization in school settings than was done before; and (d) her framework has now been used in an exploratory study, in conjunction with the PPPS pedagogy, to accelerate the development of rhetorical awareness.

To return to the original goal of identifying points of extension and alignment, the statements and stories of the participants in this study resonated with many of Winsor's findings. Areas of alignment included: stories of socialization as novice interns, concerns with grades and writing to the teacher, talking about audience with varying levels of rhetorical awareness, and varying views of the appropriateness of persuasion.

Because my study engaged participants with and without workplace experience, it was possible to see the differences in their rhetorical awareness (sometimes resonating with Winsor's students' rhetorical journeys). It was also possible to see the participants expand each other's views on the communication of engineering practice. The participants with no workplace experiences had their view expanded by those who did. In addition, I believe my study underscores Winsor's findings about the important role of individual differences in the socialization of engineers.

The three-part nature of the rhetorical analysis that I conducted allowed me not only to capture the participants' rhetorical awareness through their responses in interviews and on surveys, but also to see them enact their rhetorical awareness as they worked on the rhetorical task of making preparedness portfolios. The experiences with genre learning, attention to audience, and making persuasive arguments were made visible not only through the texts and other artifacts the participants produced, but also through the interactions with peers in the form

of group discussions, peer reviews, and group sharing of participants' reactions to their experiences. Winsor suggests that we need to be working with students on a more rhetorical view of persuasion, one that sees it as "interactive, multidirectional, and ongoing rather than a force that is exercised on one person by another in a single discrete encounter" (p. 70). The collaborative process that the participants in the Communication Portfolio Studio go through in exploring and negotiating meaning as they create their portfolios is a good step in that direction.

This dissertation contributes methodologically by providing an example of mapping Winsor's framework to the activities of the PPPS focused on communication with the goal of exploring students' rhetorical awareness and perceived self-efficacy. This exploratory study organized and analyzed, in three ways, a large dataset through the main components of Winsor's rhetorical education of an engineer (1996). Connections were made between the findings of my study and Winsor's (1996) study, pointing out extensions or alignments. Although Leydens (2008) created a rhetorical awareness spectrum that reflected a foundation in Winsor's work, this dissertation work represents what I believe to be the first attempt to connect a full pedagogical approach to Winsor's (1996) rhetorical education as a framework in order to explore, advance, and observe rhetorical awareness of engineering undergraduate students.

The sources of self-efficacy information conceptual framework

This dissertation also explored the perceived self-efficacy of engineering undergraduate students with respect to the communication of practicing engineers. Specifically, Bandura's (1986) hypothesized sources of self-efficacy information were chosen as the conceptual framework for an analysis of the statements participants made about the impact of the Communication Portfolio Studio experience on their perceived self-efficacy.

With nearly thirty years of research confirming the link that Bandura posited between perceived self-efficacy and students' academic performance, researchers have been turning in recent years to investigations of the ways in which self-efficacy judgments are developed; as Pajares (2008) notes, "One lens through which to examine these ways is to think about the

sources students use to inform their self-efficacy beliefs” (p. 126). I was interested in contributing to this new body of research, and the Communication Portfolio Studio appeared to be an excellent approach for this exploration, with its pedagogical elements that mapped well to Bandura’s hypothesized sources. In addition, it has been particularly challenging to help students develop self-efficacy for writing, because writing is a solitary endeavor that requires a great deal of self-regulation and motivation (e.g., Pajares 2003); this provides yet another reason for undertaking this particular exploration. Only a handful of researchers have conducted qualitative studies of the sources of self-efficacy information, and none, to my knowledge, have incorporated as many different types of data collection as my study was able to include.

I believe that my study demonstrates that the Communication Portfolio Studio has great potential as a site for exploring the sources of self-efficacy information. All participants made at least one statement that associated a particular self-efficacy information source with an impact to their self-efficacy belief—some made multiple statements and some indicated multiple sources. In addition, my study demonstrates that the Communication Portfolio Studio has the potential to maximize the benefits of past mastery experience, which is theorized and demonstrated to be the most influential source of efficacy information. The participants had several mastery experiences in the studio sessions, which was not unexpected. However, what was somewhat surprising was hearing the participants talk explicitly about how they re-evaluated their past mastery experiences, as in this statement by Tony:

I like the aspect of analyzing work I've created in a new light. When I wrote my artifacts the first time, I never thought about how this demonstrates my communication background. I just focused on earning the highest grade. When I looked at this work focusing on how this demonstrates my communication background, I took a keen interest in dissecting and analyzing how this proves I'm an effective communicator. Really cool.
[PoS5]

Tony’s statement shows that he changed his assessment of past experiences from external (i.e., grades) to internal (i.e., value as proof of skills); thus, he changed the way he interpreted his

mastery experiences. As Turns et al. (2012) note in describing the PPPS pedagogy, “finding that one actually *can* make claims about preparedness that had not been considered before (i.e., discovering or at least re-remembering what one knows) can lead to increased confidence and self-efficacy” (p. 5).

According to Bandura, the impact that mastery experiences have on perceived self-efficacy depends on the individuals’ own interpretation of their experiences (1997); and, Pajares suggests that “teachers should help ensure that success[ful] experiences are neither forgotten nor minimized. Writing assignments that ask students to reflect on their academic successes... help students maintain a focus on their previous mastery experiences” (Pajares, 2008, p. 126). The Communication Portfolio Studio can be an effective way to do that.

This dissertation contributes methodologically by providing an example of mapping Bandura’s hypothesized sources of self-efficacy information to the activities of a pedagogical approach. This exploratory study contributes to the emerging body of qualitative research on Bandura’s hypothesized sources of self-efficacy information. It represents, I believe, the first application to engineering undergraduate students’ perceived self-efficacy and certainly the first that engages the participants in a collaborative studio setting to accomplish a rhetorical task that is, in part, the target of the self-efficacy under study. It may be the first to not ask specifically about the sources, but rather let that information emerge from the students’ stories and statements.

The Communication Portfolio Studio – peer interaction

The above sections have addressed the ways in which the Communication Portfolio Studio played an important role in the outcome of my study with respect to rhetorical awareness and perceived self-efficacy. In the case of rhetorical awareness, the unique contribution that the pedagogy made is unquestionable and allowed for the layered analysis of information about the state of participants’ rhetorical awareness, about what they say about the impacts that the experience had on their rhetorical awareness, and – in addition – provided a space in which

participants could accelerate through the socialization into and completion of the tasks within a rhetorical community and, thus, potentially enhance their rhetorical awareness. In the case of perceived self-efficacy, there is opportunity for participants to not only re-think their mastery experiences, but also to enhance their perceived self-efficacy through, in particular, vicarious experiences and verbal/social persuasions. The extensive amount of peer interaction in the Communication Portfolio Studio makes the pedagogy particularly well suited to providing these sources of self-efficacy information. Essentially, without the studio, there would be few opportunities for vicarious experience or verbal persuasion.

These two sources have been difficult to research; findings have been inconsistent (e.g., Usher & Pajares, 2006). Most studies are quantitative; a very small number of qualitative studies have been done. However, my study is, again, pushing the boundaries of research in this area and laying groundwork for more targeted studies using this studio environment that is so rich in opportunities for students to observe one another and to react to one another's work, particularly in light of the typically isolated and personal nature of writing (Pajares et al., 2007). This study has opened the door for an exciting, and more targeted, exploration of students' perceived self-efficacy for the communication of engineering practice, as vicarious and verbal persuasion can be brought to life through the unique pedagogies of the Communication Portfolio Studio.

A rhetorical education – a three-part analysis

This study has made visible the wealth of experiences (academic, workplace, lifewide) that the participants brought, experiences that have provided them with opportunities to develop and demonstrate communication skills and expertise. This study has also provided opportunities for students to demonstrate their use of these capabilities first-hand, and, in doing so, to make visible, to themselves and others, the strategies they use to solve rhetorical problems.

This study has also made visible various ways in which students have been "boxed in" with respect to their thinking about communication. In particular, we saw that participants who have not had professional workplace or other organizational experiences that provided

significant opportunities for communication rely on the socialization that has boxed them in – their appraisals of themselves as communicators has been compromised; their ability to look beyond the genres they have been taught has been limited – their basic understandings of what effective communication is has been confused.

The study reveals a breaking down of the sides of the boxes. Participants begin with reflection, an individual inward reflection on past experiences during that first week. However, as they come together again, reflection begins in the company of others with like goals, sharing reflections, at first roughly in discussion, then with crafted sentences, moving toward peer reviews and other forms of shared reactions, moving through revision, to *thinking-aloud exercises*, and arriving at the final oral presentation of portfolios in the last studio session. In this way, the participants' progression through the five-week Communication Portfolio Studio experience, with genre learning, audience awareness, and co-constructing knowledge, is not unlike an accelerated version of the rhetorical education that Winsor wrote about.

The layered analysis for rhetorical awareness provided a unique look at the participants' experiences: sometimes discrete, sometimes overlapping or concurrent. Each of the analyses independently adds to our knowledge about students; however, the strength of the approach lies in the way that one informs the other. The stories blend – what may have been framed as an impact could have been knowledge that resided with the participants before but was shaken to light. Impacts from the studio today will be a part of the participants' "revealed" tomorrow.

A prevailing conception of the good teacher is one who assesses students to figure out what they understand and then uses this information to design instructional experiences that build on this knowledge (e.g., Bransford et al., 2000). I believe that my study suggests an alternate pedagogical approach, one in which students have the opportunity to reframe their prior knowledge, and in the process, have new experiences. The three-part nature of the analysis for rhetorical awareness (i.e., revealed, impacted, enacted) produced findings that support the benefits of this alternate approach.

Implications

This study provides implications for practice and for research.

Implications for practice

This dissertation has laid out in detail the story of one implementation of the PPPS pedagogy, an implementation focused on preparedness for communicating in engineering practice. The findings present a compelling argument about the effectiveness of this pedagogy as a whole; it is an approach that has been refined over time to lead to an optimal learning experience for students. However, it is acknowledged that not everyone has space in their curriculum to conduct this pedagogical approach in its entirety, and it should be noted that adopting portions of the pedagogy would still provide good learning experiences for students. For example, preparedness portfolios could be made outside of a studio environment, or in a small studio with a more constrained configuration in terms of meeting time. Perhaps some of the collaboration that facilitates the commitment to student reaction and progress could take place online in the form of discussion boards, electronic peer reviews, or online feedback forms where everyone would still benefit from seeing the experiences of the other students. Peer reviews and brainstorming sessions could still take place. Nearly all participants in the Communication Portfolio Studio found peer interaction to be the most beneficial aspect of the experience, with the oral presentation being next.

Another activity that was overwhelmingly cited as beneficial was the act of reflecting on past work to make meaning of it in the future. The participants indicated that, as engineering students, there was little time in the curriculum for stepping back and reflecting on completed work—in fact, many barely look at their work after it is graded and handed back. Making time, creating an activity around reflecting on past work could be useful in and of itself. Researchers in educational psychology and related fields have demonstrated for years the benefit of revisiting information to strengthen learning—to develop a sense of achievement and pride, to enhance

motivation and perceived self-efficacy. Research has also shown that it is not just reflecting on past experience or work, but also articulating those reflections – whether in written or oral form.

In addition, there were several statements from participants about the value of just being able to talk about communication with a group of peers – some said that precisely, some said that the studio session were more helpful than actually making the portfolio, some said the process of making the portfolio was more important than having it. These comments lead me to believe that allowing time for students to talk about what communication means to them on some sort of a regular basis, even briefly, would help them develop their rhetorical awareness – or, conversely, it would slow down the socialization process that actually challenges the ability to develop rhetorical awareness.

Regarding possible small elements of the pedagogy use to strengthen perceived self-efficacy, there are a few different ideas. One of the things that participants found most helpful for their self-efficacy was presenting their portfolios to their peers – not only in terms of practicing speaking, which they say they don't do much of in their regular coursework, but also in terms of speaking about themselves and their skills. This was a particularly significant activity for the participants – it prepares them for something they will have to do many times in the future, with large consequences. Another activity that appeared to strengthen self-confidence for the students was seeing the work of others and hearing the reactions of others to the process.

Implications for research

Intersection of rhetorical awareness and perceived self-efficacy

It became apparent throughout the analyses that the data for rhetorical awareness and for perceived self-efficacy had many intersection points. In particular, reflecting on prior work and its effectiveness as evidence for preparedness arguments produced data for both rhetorical awareness and for perceived self-efficacy. Deeply reflecting on what one considers to be effective communication – particularly in assessing how effective one has been, relates directly to perceived self-efficacy. Thus, the selection of artifacts, the writing of the claims in the professional

statements and annotations, and the oral presentation of the portfolio are just a few examples of the ways in which the participants engaged in rhetorical awareness and in performing had opportunities to not only assess their self-efficacy judgments, but also enhance them. The reflective work that is central to the Communication Portfolio Studio pedagogies strengthens rhetorical awareness through sharing of those reflections and perceptions of self-efficacy through mastery experience, vicarious experience, and likely verbal persuasions, given the focus on peer review and students reactions. Several performances in the studio – the oral presentation, *thinking-aloud exercise*, and peer review – all elicit some type of statement about physiological arousal. Many of the activities of the Communication Portfolio Studio – reflection on past work, assessment of one’s own skills, arguing for one’s preparedness – are lifelong learning skills important to the students’ future life in engineering practice, and they all lead to possible impacts on rhetorical awareness and to perceived self-efficacy for communication in an engineering context. Engaging the participants in reflecting on the ways in which they are prepared to communicate prompts them to engage in metacognitive awareness, “which can then contribute to calibrating confidence and self-efficacy and pave the way for self-directed learning” (Turns et al., 2012, p. 5).

Sources of self-efficacy information

Little research has been done on the sources of self-efficacy information, and very few of those studies have been qualitative and few have studied adults in higher education or beyond. Questions could be asked in ways to get more information on the participants’ reliance on sources of self-efficacy information; for example direct questions would prompt participants to explicitly think about how they form their judgments, which would provide immediate benefits for learning as well as information to use in future implementations. Supporting activities in the portfolio studio could be adjusted in ways that might enhance the opportunities for more verbal persuasion and for revealing the participants’ reliance on verbal persuasion. Work is also needed on the emerging interest in vicarious information as two separate constructs: one for the modeled

strategies by an expert and one for the traditional vicarious experience provided by observing the performances of similar others.

Hearing from educators and practitioners

There are other areas for potential future research; for example one could carry this PPPS pedagogy focused on communication into other pre-professional fields (e.g., business, law, medicine). Another area would be to close the loop in terms of perceptions of the players. We have seen with this study the perceptions of the students; it would be good to get the perceptions of the educators and practitioners in the engineering disciplines. Engineering educators and practicing engineers could be invited to look through the students' preparedness portfolios, so that they (educators and practitioners) could see what the students thought it meant to communicate as practicing engineers, and, more importantly, how prepared they saw themselves.

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