

IN THIS TOGETHER: CONSUBSTANTIAL ETHOS IN WRITING IN THE SCIENCES
CLASSROOMS

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ABSTRACT

“In This Together: Consubstantial Ethos in Writing in the Sciences Classrooms” explores the ethos of instructors tasked with instructing STEM students how to *write in the sciences*. Building on the importance of ethos in education and Dale Sullivan’s foregrounding of the importance of consubstantial ethos in building effective communicative acts, this study sought to determine how student and instructor perceptions of ethos were similar and dissimilar to determine if there was a sense that we were truly “in this together” as Sullivan claims is necessary.

For this mixed-methods study, I distributed surveys to students as they entered and exited the course. Student surveys inquired about attitudes and beliefs about previous English courses, the trajectory of the course, the overall worth of English courses, and their roles within the course. Instructor surveys, in turn, asked mirrored questions to see how instructors perceived students’ attitudes and beliefs towards the course, the practice of writing, and WAC/WID and English courses more broadly. Encouragingly, the majority of students reported seeing a value to English courses, but this worth was primarily seen as emerging from two components: 1) the content of the course and 2) student perceptions of the instructor—both, this project argues, are closely tied to ethos. As such, the final two chapters of the project suggest adjustments to foster optimal ethos for Writing in the Sciences courses by introducing more direct teaching of Writing Studies theory in such courses and implementing assignments such as the Forum Analysis and Popular Discourse Report that encourage students to critically analyze the work of experts writing in their fields.

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CHAPTER 1: INTRODUCTION

In the Spring of 2017 I sat down for a scheduled meeting with a student in my Writing in the Sciences course. The student wanted to discuss what he should do to improve his first major writing project for the course, a web-based forum analysis. It was evident from my previous in-class experiences with this particular student that he was a good student, particularly studious, and wanted to ensure he had checked all the boxes of my approval before submitting his final draft. The meeting lasted about 45 minutes, and from the outset it was apparent that this student was primarily concerned with producing a document that would earn him a “good” grade. As the meeting ended, I tried to reassure the student that he had done good work thus far and that my main goals in the course were to get students to improve their writing, to try to think critically about what they were doing as writers, and to put forth their best effort; concerns of whether or not they were making the “right” moves in terms of spelling, grammar, punctuation, etc., were secondary. I joked that I wasn’t simply trying to assign them to write and then working to find ways to take points away from them. The student confided in me that he’d had a difficult time in the past with writing classes. He claimed he wasn’t a strong writer, though his work in his forum analysis demonstrated otherwise and said he had been avoiding taking the Writing in the Sciences class until the last possible moment. When I asked him why this was, he related to me that, with writing, he felt the rules were always changing. He had not had good experiences with English classes in the past, and it made him wary of enrolling in them.

What this student did next surprised me. He switched gears in the conversation and told me he knew that English classes were important because he was going to have to write in the future. If nothing else, he told me, he was going to need solid writing skills to craft the necessary documents to get accepted into dental school. He just worried, he said, that whatever English

courses he took that the teacher would just be another “stickler” like all the English teachers he had in the past. It wasn’t English classes themselves he disliked; it was usually the teachers, he told me. This part of the conversation struck me as a particularly unfortunate overgeneralization. English teachers are not, categorically, all bad people searching for new ways to traumatize students. We’re not all strict grammarians or “sticklers” as the student put it. Though I know the student’s stereotypes of English teachers to be problematic, sweeping overgeneralizations, and though I know many wonderful colleagues who defy his stereotypes, this wasn’t the first time I’ve had a conversation like this with a student.

For the past four years in my Writing in the Sciences courses, I’ve encountered at least one student each semester who has related to me a history with English classes that rang eerily similar to this student’s story. Plenty of research exists that demonstrates that STEM students have an aversion to English and writing courses, but I wanted to know more about why this was. While the student I met with acknowledged writing would undoubtedly be a part of his future and the skills an English course promotes can benefit students from all academic backgrounds, many of his peers are far less generous in their estimation of the role writing will play in their futures. Often, these STEM students see writing as *apart* from what they will do in the sciences rather than as *a part* of what they will do. In addition, these students often confide to me that their previous English instructors have had a lot to do with how they feel about English courses and the practice of writing. This, at its core, is an issue of ethos--the ethos of individual English instructors, courses, and the discipline more broadly (including its diverse subdisciplines such as Rhetoric, Writing Studies, etc.). For my dissertation I sought to learn more about the prevalence of negative opinions and attitudes regarding writing among STEM students; to learn more about what causes STEM students to form such opinions and attitudes, particularly about Writing in

the Sciences courses; to better understand how writing instructors' opinions about students' perceptions resemble or differ from what students actually report; and to theorize how instructors can potentially make changes to pedagogical practices in Writing in the Sciences courses to better engage STEM students and improve the ethos of the course and, by extension, the discipline of English more broadly.

This study frames students' opinions and attitudes as part of the broader context of the Writing in the Sciences classroom and the ethos of Writing Across the Curriculum (WAC) and Writing in the Disciplines (WID) as well as the context of the ethos of the English department. When referring to "English" courses throughout the document, the term is used broadly to denote those courses housed in English departments under various umbrella terms such as Rhetoric and Writing Studies. In addition, though the study concerns itself with ethos as it pertains to Writing in the Sciences courses, when discussing the ethos of the broader discipline of English, all courses under this label, including literature and creative writing courses are relevant to discussions of the English department's ethos. Though scholars in the field understand the distinct differences among the disciplines subdisciplines and the diverse content these subdisciplines concern themselves with, the general public and our non-major students do not possess this nuanced understanding of English studies. Many students, administrators, and even colleagues in other disciplines are unaware of the existence of subdisciplines under the umbrella term of English. These outside perspectives and beliefs are important because the construction of ethos--which will be defined for our purposes in the next section--is perceived as complex, socially constructed, and "consubstantial" as Dale Sullivan terms it. In "Ethos of Epideictic Encounter," Sullivan suggests a rhetor or teacher's ethos isn't merely constructed by the speaker or the audience, but rather is constructed as part of the relationship created between the two.

Ethos is their common consubstantial dwelling place (126-27). Just as important as course content or teacherly credentials, then, in the classroom, an instructor's understanding of his or her students and the students' understanding of the instructor coalesce to form the ethos of a particular classroom, which can serve to help or hinder the communication and learning that may potentially happen in the classroom.

Building on the importance of ethos in education and Sullivan's foregrounding of the importance of consubstantial ethos in building effective communicative acts, this study sought to determine how student and instructor perceptions of ethos were similar and dissimilar to determine if there was a sense that we were truly "in this together" as Sullivan asserts is necessary for fostering effective communicative acts and effective pedagogy. For this mixed-methods study, I distributed surveys to students as they entered and exited an upper-division university writing course entitled Writing in the Sciences, typically enrolling junior and senior STEM and pre-medical students. Student surveys inquired about attitudes and beliefs about previous English courses, the trajectory of the course, the overall worth of English courses, and their roles within the course. Instructor surveys, in turn, asked mirrored questions to see how instructors perceived students' attitudes and beliefs towards the course, the practice of writing, and Writing Across the Curriculum/Writing in the Disciplines (WAC/WID) and English courses more broadly.

This research expands on the work of articles such as Dana Lynn Driscoll's "Connected, Disconnected, or Uncertain: Student Attitudes about Future Writing Contexts and Perceptions of Transfer From First Year Writing to the Disciplines." In this text, Driscoll explores student's valuation of writing over a semester of First Year Writing (FYW). Driscoll found, disconcertingly, that Composition students' valuation of writing actually *decreased* throughout

the semester and that 29.1% of students were uncertain about the value of writing and its transferability to classes in their major and 16.3% of students explicitly stated that the class was most certainly disconnected from work in their own academic major/discipline (“Connected, Disconnected”). Given that Writing in the Sciences courses at many universities enroll students further along in their majors than the FYW course (often 3rd year and beyond) and that the course is often a general education requirement, students’ attitudes towards English classes may worsen and the ways in which they value writing may lessen by the time these students reach the upper-division Writing in the Sciences course, making it even more difficult to convince this population of the transferability of skills learned in English courses. This project explores both student and instructor attitudes relative to the Writing in the Sciences course and makes suggestions for improved pedagogy to help improve student attitudes toward the course and improve the overall ethos of English as a discipline. Before outlining the study and its findings, however, it is important to review some of the available scholarship on the complex, multifaceted concept of ethos in order to more clearly define what we mean when we talk about ethos, explore its relation to teaching, outline the ethos of the English department more broadly, and demonstrate how this ethos relates to the present study.

Defining Ethos

Aristotle famously noted that of the three *pisteis*, ethos was likely the most powerful in terms of persuading one’s audience. In explaining the power of ethos, Aristotle argued, quite simply, that people often like to align themselves those who are like them (1381a25-1381b22). In order to know whether our ethos meshes well with our students, we must first understand what comprises an orator’s ethos. As Aristotle explicitly outlined it, ethos was created by three characteristics: judgment, virtue, and goodwill (1378a8-9). Michael Halloran and other scholars

have attempted to more clearly delineate exactly what Aristotle meant when he spoke of ethos. Halloran marked Aristotle's concept of ethos as 1) an "argument from authority" shaped by a speaker's reputation, audience impression and "dramatization of character;" 2) a concept emphasizing the public rather than the private, aligning one's self with the dominant values of a culture; and 3) an act of habituation, an act of "pulling oneself up by one's bootstraps" (60-61). For Halloran, Aristotle's concept of ethos exists solely in the public sphere (62), separate from an orator's private character. Halloran may be correct in asserting that his own is a more studied and appropriate definition of ethos than those outlined by other scholars, but, as he readily concedes, popular conceptions of exactly what constitutes ethos have changed over time. At any rate, there are numerous scholars who believe Aristotle defined and imagined ethos functioning in subtly different ways. Christopher Gill makes it clear that ethos has to do with self-representation of the orator as it is connected to the pathos of a given audience (153). If what Gill claims is true, and he may have a strong basis for his claim, this suggests that ethos does not simply stand on its own, but can influence and is influenced by a discursive moment's potential pathetic appeals, making it all the more difficult to nail down because of the slippery, ineffable nature of emotions.

Though Aristotle is often seen as the premiere authority on all things rhetoric, other ancient rhetoricians viewed ethos in myriad different ways. Dionysius understood ethos and pathos as essentially the same thing and Quintilian viewed them as closely related tools rather than effects (Gill 158-59). Quintilian, in fact, believed so strongly in the power of ethos and schooling in proper ethical behavior that Richard Lanham argues Quintilian may have likely believed that if an individual were to properly understand rhetoric and ethos, that individual would be unable to communicate or behave unethically because the very understanding of ethical

behavior necessitated that one behave ethically (155). Ethos, once understood, then, became central to one's moral core in Quintilian's eyes. Similarly, William Sattler argues that the "noble rhetoric" advocated by Plato is heavily dependent on a conception of ethos deeply entangled with an orator's character, intelligence, ability to adapt an argument to an audience as well as their consideration of an audience's goodwill (56-57). St. Augustine, in stark contrast to Halloran's conception of Aristotle's ethos as existing solely in the public sphere, regarded ethos as heavily dependent on ethical and moral Christian actions carried out not only in public, but in private as well (Kennedy 269). In St. Augustine's definition, ethos is all-important and omnipresent and the topic of ethos itself was widely debated amongst classical rhetoricians.

Because of its centrality to the history of rhetoric and the long-lasting influence of Greek and Roman rhetoricians, ethos remains an important area of study in the field, and modern scholars continue to complicate our understanding further by expanding and diversifying our definitions of the term, and in some cases fracturing the very concept of ethos by separating it into separate subcomponents and renaming these components. Logue and Miller, for example, define ethos as the individual's character as exhibited in a speech, which they view as distinct from source credibility or what the audience perceives to be credible. Thus, ethos, in Logue and Miller's model stems directly from the orator while source credibility belongs to the audience (23-24). Logue and Miller aptly note that different characteristics of an individual may create different types of "status." For example, one might have a low social status based on employment, income, etc., but may have a high rhetorical status because of their ability to win over a crowd (27). Despite the the subdivision of the concept and its new labels, in Logue and Miller's definition, ethos notably remains heavily dependent upon social interaction and rhetorical context as ancient definitions did.

Nedra Reynolds also sees ethos as strongly tied to one's social status, arguing that it is formed by one's interactions with social institutions and situatedness within social and cultural spaces (326). In addition, the concept is fluid and ever-changing as the rhetor evolves and moves between various social situations. Fortunately for ease of understanding, however, Reynolds maintains that her definition is something akin to what Aristotle originally defined: practical wisdom, judgment, and goodwill (326-27). Reynolds' conception of ethos builds from Karen Burke LeFevre's, which, like many other views of ethos acknowledges the fact that credibility is not merely created by the rhetor. Rather, "the social matrix of necessary others who form community and audience are less obvious, but nevertheless present. Ethos, we might say, appears in that socially created space, in the 'between,' the point of intersection between speaker or writer and listener or reader" (LeFevre 45-46). A rhetor's message, like his or her ethos, is collaboratively crafted.

This collaborative crafting of ethos becomes even more complex when considering the role new communication technologies take in shaping how we communicate. As our means of communication diversify, so do our varied understandings of what influences ethos. In the prescient article, "Technology as a Form of Consciousness: A Study of Contemporary Ethos," Carolyn Miller observes that the burgeoning of communication technologies immensely impacts the way we conceive of ethos by expanding the possibilities for different means of social interactions, thus complicating the task of defining ethos even further. Though one might expect greater opening of channels for communication to allow for a clearer standardization of communal or universal ethos by making it easier to spread information across great distances, Miller contests that the opposite is true; diversified means of communication necessarily create diversified definitions and means of cultivating ethos (234-35). Rather than narrowing the field

of various forms of ethos that exist, technology fragments our collective and individual sense of ethos making it harder to define on an individual level and nearly impossible to settle on a clear concept of “ethos” that we can pin down with an absolute definition. The widespread sharing of fake news stories and memes surrounding the 2016 presidential election in the United States serves as a perfect example of the difficulties many in the digital age have in evaluating a source’s credibility and the potential for misinformation to spread rapidly through various social media platforms. These events also reinforce the importance of understanding how ethos is socially constructed and defined.

Though so many definitions of ethos are available and the concept itself arguably resists definition, it is important to choose a term to outline what constitutes ethos for the purposes of this project. Definitions of ethos are diverse to be sure, but common to all the varying conceptions of ethos from antiquity and contemporary times are the concepts of space/place and social construction. Michael J. Hyde and others explore the importance of space and place as it relates to ethos in *The Ethos of Rhetoric*. As Hyde observes, the original plural of ethos, “ethea,” implied a dwelling place (xiv). Ethos, for classical rhetoricians, then, implied not only a space, but also relationships and interactions that filled the space--a relationship among self, community, discourse, being, and god. One’s ethos then is not only tied to different spaces one inhabits, but the different audience members one encounters in these different spaces. Sullivan argues that a rhetor’s ethos is constructed by five different factors: rhetor’s reputation, rhetor’s vision, rhetor’s authority, rhetor’s presentation of good reasons, and rhetor’s creation of consubstantiality with the audience (118). Though all of these factors are important and contribute to the construction of a rhetor’s overall ethos, the first four factors are largely in service of the fifth factor, a sense of consubstantiality between rhetor and audience. According to

Sullivan, in creating a sense of consubstantiality, it is the goal of the rhetor to create a sense that he or she is “in this” and “acting together” with a given audience (126). Thus, ethos is not so much about the rhetor *or* the audience. Rather, ethos is created in a common, consubstantial dwelling place inhabited by both.

Sullivan’s model provides a neat and more precise understanding how rhetor’s and audiences collaborate to cultivate a sense of ethos, but a clear definition of the concept of ethos itself is still necessary before exploring ethos as it relates to education and Writing in the Sciences. To this end, Terence McLaughlin provides a definition that, while not comprehensive, touches on Classical and contemporary notions of how ethos may be defined, attending to its social construction and the factors that comprise ethos:

At the most general level, an ethos can be regarded as the prevalent or characteristic tone, spirit or sentiment informing an identifiable entity involving human life and interaction [...] An ethos is evaluative in some sense and is manifested in many aspects of the entity in question and via many modes of pervasive influence. The influence of an ethos is seen in the shaping of human perceptions, attitudes, beliefs, dispositions and the like in a distinctive way which is implicated in that which is in some sense established. Although ethos most commonly refers to something which is experienced, an “intended” ethos as well as an “experienced” ethos can be pointed to in the case of an ethos which is deliberately shaped or stipulated. (311-12)

McLaughlin’s definition of ethos allows for the Classical sense of ethos as “dwelling place” because it is broad enough to encompass many situations, but focuses on social interactions which necessarily need a place—material or digital—in which to take place. As a corollary,

McLaughlin's definition also allows for the various fragmented ways we may construct and deconstruct ethos through diverse multimodal means. It encompasses the ways in which ethos is constructed in both public and private realms. Most importantly, McLaughlin imagines ethos as something socially constructed by all parties involved. This is particularly important when discussing ethos' relation to education because ethos is socially constructed by students and instructor alike. McLaughlin's definition is complex and arguably messy, but if Aristotle is right, and ethos is one of the most if not the most important rhetorical appeal at our disposal, its definition will necessarily be complicated. If nothing, McLaughlin's definition gives us something to hang our theoretical hat on as we explore ethos' role in education.

The Importance of Ethos in Teaching

A place-based sense of ethos may seem antiquated in 21st-century classrooms in which students and instructors may meet in person, entirely online, or in some hybrid of the two forms. However, the metaphor of place-ness persists even in the digital age. Users communicate in forums, navigate to different "sites," and even create communities through shared interests. In addition, though many colleges and universities have begun to offer online and hybrid courses, the majority of courses in higher education are still conducted face-to-face in a dedicated classroom space. Thus, in classrooms (both digital and face-to-face), instructors and students still socially construct a sense of ethos. On day one, an instructor steps into a classroom, and students have already made some sort of judgment about the instructor and the course. Halloran observes that this deeply place-based, socially constructed sense of ethos is one of the most important considerations for instructors and their students. He asserts that the formal educational process is one of the most visible means by which a culture shapes its overall ethos. Ethos is shaped by macro issues in the education process as well as the micro decisions we make as instructors: "By

the way we structure the curriculum and the way we arrange the furniture in our classrooms, by the clothing we wear at school and the books we select for our courses-by these and the countless other choices we make, the world in which our students gather together is defined” (63). The centrality of ethos to the education process and English’s concern with the broader concept of ethos makes the writing classrooms the perfect space in which to have conversations about the intricacies of ethos, “and it is why a Composition course that deals only with technical matters of stylistic choice is inadequate. Rhetorical choices define the character of the speaker and of the world. We must understand how that happens, and we must help our students to understand too.” (63) As Halloran points out, the ability to shape one’s ethos is an important tool for any rhetorician, both teachers and students alike. Not surprisingly, research shows time and again that students’ conceptions of their instructors’ ethos dramatically impact students’ willingness to learn, motivation in daily classroom activities, and belief in the potential for transfer of course concepts to other classroom and workplace situations. Because of this, it is critical for teachers to have a sense of the ethos they consubstantially create with their students and to understand the impacts of this ethos in the classroom.

The ethos of instructors in any classroom is difficult to parse simply because of the complex roles of the many parties involved in the university (administrators, instructors, students, and other outside influences as well). Those familiar with the current climate of university education in the United States recognize that students are often seen by many in the university system more as discerning customers rather than as students in a more traditional sense. Singleton-Jackson, Jackson, and Reinhardt argue that the university system is shifting to a “culture of entitlement” (49), wherein education is less about learning and more about an award or achievement. Education, in other words has become more of a product than a process, and

students simply want the product, or diploma, that will serve them best in securing a desirable occupation. Rendering education a product rather than a process in this way, some argue, could undermine the very endeavor of the university system and the very degrees conferred by universities. Given the continued increases in university enrollments, it would seem premature to argue that a university education has entirely lost its value and meaning in our culture, but we must remain aware of such attitudinal changes in our students to ensure we may continue to maintain the integrity of the educational goals of the university system.

Though the process-to-product shift in popular conceptions of university education may frighten university educators at first, other scholars point to the many positive characteristics of the changing university student population. In one of the first articles on Millennials in education, Elam, Stratton, and Gibson posit several positive qualities of Millennial students, namely that they are hard working and conditioned to strive for success, highly engaged in various academic and extracurricular activities, interested in public service and social problems, and highly generous yet practical (21-22). Because of such qualities, rather than Millennials facilitating a complete undoing of the process of education, some see the shift towards student-as-consumer as more likely to catalyze a student culture of healthy skepticism regarding deeply entrenched institutional and classroom practices and/or teacherly authority that may lead to improvements in educational best practices. Glenda McGregor argues that as a result of rapid communication technologies and constant subtext of change in the twenty-first century, students necessarily become more malleable in their worldviews and critical of the institutions they encounter and in which they participate: “Logically, if many young people are being socially and culturally positioned to question notions of truth and determine their own values outside the school, there are likely to be consequences for the conduct of business within the school” (2). This questioning

of teacherly authority is not wholly a bad thing, and some may even consider it a unique opportunity for growth in the university setting. Innovative and student-centered pedagogical practices such as the collaborative learning model of instruction continue to increase in popularity across the disciplines and encourage instructors to refrain from simply taking up the mantle of expert at the head of the class in favor of helping students see themselves as collaborators in communities and in the social construction of knowledge (Love et al. 178).

Students with diverse critical perspectives who actively participate in the collaborative creation of knowledge have long been a goal of instructors in the Humanities, but, as Schiewer notes, a completely “authority-diffused, decentered classroom is a difficult ideal to achieve” (546) and may be an undesirable goal. In order to avoid total chaos in the classroom, the instructor must maintain some sort of authority and teacherly rapport with students. Maintaining this authority and rapport, however, need not come at the cost of failing to proffer some sense of agency and authority to one’s students. In traditional classroom settings, the teacher is often the one at the front of the room, and the teacher is the one who assigns each student a grade. Because of the imbalance of the student-teacher power dynamic and the need for collaborative learning, we must reconsider our ethos as instructors in order to create what Schiewer terms as “hospitable” learning environment (547). Despite its names potential connotations, building a hospitable learning environment means not simply catering to students’ every whim, but rather acknowledging their attitudes and expectations of a course from day one and being transparent about how student expectations deviate from and fit with course goals and expectations. Small moves toward this end may have dramatic impacts in producing an ethos conducive to student learning and more effective pedagogy overall.

Regardless of how hospitable one makes their classroom environment, Marshall Gregory argues that instructor ethos is a central concern for students: "...[S]tudents care little about what method their teachers use but do care immensely about what kinds of persons their teachers are. Without using the word ethos, ethos is nevertheless a primary concern for most students" (76). Schiewer concurs, noting that the content of a course is important, but, "...curriculum alone cannot teach students. [...] Effective teaching (and learning) requires a teaching presence and ethos that bring the curriculum to life." (547). It is no surprise that the content of a course and a teacher's particular pedagogical choices are going to impact an instructor's efficacy, but Schiewer, Gregory, and others argue that these are subservient to the cultivation of a strong, teacherly ethos. Schiewer encourages instructors to embrace the metaphor of themselves as "hosts" of the classroom (545). Gregory offers up what he calls the "befriending" model of teaching as a means of creating a sense of community and camaraderie in the classroom. Gregory aligns his model with that of the Classical rhetoricians, claiming that Socrates is perhaps the ideal example of a "befriending" teacher: "If students need teachers, and they do, to become the best versions of themselves, teachers need students to become the best versions of themselves as well" (87). Gregory's call for mutually beneficial approaches to pedagogy echoes Sullivan's call for consubstantial ethos: "and in this reciprocity of mutual assistance all of us, students and teachers alike, may learn, if we are careful how to tend better through education the fragile relations of personal development, human community, and civilized conduct" (87). Schiewer and Gregory's metaphors of teachers as "hosts" and even "friends" may likely be too intimate for the taste of many teachers, but these models for how teachers should comport themselves may be instructive in thinking about effective pedagogy because unlike so many other scholars

considering the topic of pedagogy, Schiewer and Gregory foreground teacherly ethos as central to students' willingness and motivation to learn.

Because an instructor's ethos is constrained and constructed based on its rhetorical context, it is essential to understand the factors particularly relevant to student populations in the classroom setting. According to Gregory, students concerned with their instructors' ethos focus primarily on five factors:

1. their views of the teacher's trustworthiness
2. their views of the teacher's competence
3. their views of the teacher's depth of commitment to the importance or value of the skills and ideas being taught
4. their view of the teacher's dedication not just to teaching as a profession but to students as persons
5. their views of the teacher's commitment to fairness (78).

The Writing in the Sciences course presents an interesting test case for considering each of these five factors. The course often features a scholar of Rhetoric, Writing Studies, or some related field tasked with instructing students enrolled in the course from diverse majors across diverse STEM disciplines. As with any other course, students will, of course, be concerned with a teacher's trustworthiness, fairness, and willingness to recognize students as individuals, particularly in a writing-intensive course where students often view grading as highly subjective. Given the differences in disciplinary background that exist in Writing in the Sciences, however, Gregory's second and third factors of teacherly ethos fit the dynamic of the course particularly well. Teacher competence is a factor in any classroom, but unique in its construction in a course in which the students and instructor come from vastly different disciplinary backgrounds.

Closely tied to teacher competence, a teacher's commitment to the importance and value of a course's skills and content determine much about student attitudes and motivations in a particular class. A teacher may seem competent in their subject matter, but if students refuse to recognize this subject matter as having any value relative to their own goals, this competence ceases to matter as students construe the content as irrelevant. Thus, in the Writing in the Sciences classroom, the instructor must work doubly hard to ensure students recognize instructor competence and also understand the course content's importance and how it relates directly to the work that happens within their own disciplines. This ensures that students view the instructor as competent and, perhaps more importantly, competent in a subject matter the instructor values as important and having real-world applications students view as practical.

As in every classroom, the instructor must work to prove their dedication to the profession of teaching, trustworthiness, fairness, and to their students' success, but in the Writing in the Sciences classroom, he or she must pay particular attention to these issues of teacher competence and how they relate to student goals. Students in upper-division courses such as Writing in the Sciences may resist the disciplinary difference and doubt that an expert in English has anything to teach them about the writing that happens in their respective disciplines. In addition, the fact that such courses, where required, are often offered under the much maligned banner of general education courses positions some students to be resistant to the courses from the outset. Students often express disdain for general education courses as obstacles to complete as mere requirements for a degree rather than true educational experiences. In the Writing in the Sciences classroom, disciplinary difference, coupled with the designation of the course as a general education requirement may coalesce to present the instructor with a group of students resistant to the class on multiple fronts, compounding the already difficult task of teaching

effective writing. Knowing what our students look for in terms of our ethos as instructors, however, and having guidelines for beginning to develop an effective teacherly ethos are invaluable components for improving instruction in the Writing in the Sciences classroom and a step towards better engaging students.

To this end, Gregory, in addition to pinpointing five factors of ethos particularly important to students, also provides suggestions for 10 ethical qualities to guide teachers in the development of their ethos. Each of the qualities Gregory lists is applicable to the Writing in the Sciences classroom, but four of them—honesty, unpretentiousness, curiosity, and courage (83-85)—fit well with the demands of this particular setting. Honesty and unpretentiousness go hand in hand as instructors must be honest about the particular skill sets they have and recognize that both the discipline of rhetoric and the various disciplines of the students have merit, and one discipline is not inherently superior to another. In fact, the curiosity that Gregory espouses can go a long way in fostering interdisciplinary work and learning in the classroom. If instructors are openly willing to learn from their students, students will likely reciprocate. Lastly, while instructors must remain unpretentious in their approach to disciplines and the classroom, they must also have courage in facing opposition from many different pressures including student retention, student resistance to classroom activities or concepts, “...and, most discouraging of all perhaps, pressure from students, administrators, some colleagues, and society at large to measure everything in education by a bottom-line ideology that is invoked as a mantra, never defended as an argument” (85).

Gregory, Schiewer, and others’ scholarship on the topic of teacherly ethos provide a beneficial starting point for teachers of all disciplines looking to improve their ethos. No two classes are the same, however. Student preparedness, course content, and the ways in which

ethos is collaboratively created by instructors and students differ immensely depending on many different factors. Not the least of these factors is the overall, popular opinion of the ethos of a discipline. there is little research available on students' perceptions of instructor competence or ethos in writing classrooms, particularly in complex settings such as upper-division, interdisciplinary WID courses. Our ethos is created collaboratively, and we should strive for consubstantiality in order to be as effective as possible as instructors. To this end, we need to know much more about our students and ourselves as well. When one thinks of the impossibly broad terms related to different disciplines such as "Philosophy" "Science," "Psychology," "Mathematics," etc., there are clear images and ideas conjured by the mere thought of these words. The thoughts we associate with these different terms is shaped as much by our own individual experience (or lack thereof) relative to these disciplines as well as the cultural milieu in which we exist. These thoughts are informed by past experiences, to be sure, and may likely inform our future encounters with these disciplines. Just as there are certain connotations surrounding each of these other disciplines, the broad umbrella term of "English" as a discipline undoubtedly elicits certain thoughts, both positive and negative, from the general public. These thoughts have much to do with the shaping of the ethos of the discipline. Given the original definition of ethos as a "dwelling place," it may be necessary to first consider the available research on where we, as scholars and instructors of English, dwell before moving on to a more direct inquiry into our students' exact attitudes and understandings of the departments and disciplines under the umbrella term of English.

The Ethos of the English Department

Since the Classical era, the ethos of instructors of rhetoric has been called into question. In Plato's *Gorgias*, Socrates attacks Gorgias' livelihood by claiming that rhetoric cannot be a true

art because it has no real subject or substance (459C). Though he is considered one of the discipline's staunchest critics, his views on rhetoric softened in the later text, *Phaedrus*. This softening of Plato's views, according to Edwin Black, took place in part because Plato despised not rhetoric itself. Rather, he simply opposed the excesses and practices of the sophists as immoral and deceitful (374). His view of the ideal form of rhetoric was something akin to the winning of souls to good causes (Stewart 120). Plato espoused a form of rhetoric combined with the study of philosophy to ensure the ethical behavior of students. Many of the characteristics of such a model are still alive and well in English departments in the United States and beyond. One would be hard-pressed to find a rhetorician who wouldn't argue the the discipline of rhetoric entails not only education in communication skills but also in some form of ethics as well. Scholarship and popular conversations, however, suggest that our students and the broader public, may not have such a generous understanding of the discipline of rhetoric and may hold views more akin to those put forth by Socrates in Plato's *Gorgias*. Such views may lay additional impediments at the feet of instructors in courses like Writing in the Sciences.

As in the Classical era, today, rhetoric still has its detractors. The term "rhetoric" is bandied about on 24-hour news networks and casual conversations as a dirty word, often used as a substitute for "deceit" and "lies." In addition, the casual onlooker's conception of the ethos of the English department is something cobbled together by brief (sometimes unpleasant) experiences in primary and secondary school English classrooms, the generally mandatory first-year Composition classroom, and the occasional upper-division writing course. As a result of these brief encounters, the general public, other scholars, and our own students rarely have an opportunity to learn what English scholars and departments actually study and what their true goals are, leaving them with a deficient understanding of the discipline and constructing an ethos

that runs counter to the lived values of the discipline. When compared to other disciplines from a financial standpoint, William Chace observes that English departments are often considered “more liability than asset” in a university system designed “to attract financial resources rather than simply use them up” (37). These views continue beyond the bounds of the university. Chace asserts that both on and off-campus, opinions of English departments held by our colleagues, administrators, students, and the general public are “mirror image[s]” of one another (37). Many among these various interested parties perceive English courses as obstacles and the funding of departments as a financial waste or risk.

The reasons for these disheartening views of the discipline certainly cannot be blamed on any one characteristic of the ethos of English, but popular beliefs about the content of the discipline likely don't help matters. Chace argues that some in and outside of academia believe English has nearly exhausted its potential as a scholarly endeavor partially because “to teach English today is to do, intellectually what one pleases” (39). I believe Chace overstates the problem, but the sentiment rings eerily similar to what many of us hear when our colleagues and students joke that in English class there are no wrong answers. Particularly for undergraduate students in “hard” sciences, English and its various subdisciplines may seem atheoretical and unmoored from any form of objectivity. For STEM students, who likely conceive of their own disciplines and the scientific method as the pursuit of some sort of capital-T “Truth,” the prospect of entering a classroom dedicated to a discipline they perceive as highly subjective and idiosyncratic may prove daunting. More importantly, STEM students may see English classes as an unnecessary obstacle on their path to pursuing a degree they see as completely removed from the purview of the discipline of English.

Blaine Greteman posits several possibilities for this toxic view of the content of English and its subdisciplines and the endeavor of studying language and writing as a scholarly pursuit. He points both to “out-of-touch traditionalists, who refuse to adapt to a changing world,” and “digital humanists chasing new trends and succumbing to ‘the language of salesmanship’” (Greteman). Though seemingly worlds apart, both of these caricatures are two sides of the same coin. Both represent an out-of-touch ivory tower academic community that the public and, by extension, students have come to resent. Greteman even confesses to being part of the problem himself: “I really do wear tweed, but I also tweet at my pajama-wearing students when I’m not harping on them to turn off their damn phones and bring their books to class. Mea culpa” (Greteman). Though Greteman makes light of these interactions with students, they certainly do not go unnoticed by our students. In my own classroom, I have seen students detail popular stereotypes of English teachers closely resembling those he illustrates. Before beginning this study, while pilot testing some survey questions, I asked my Writing in the Sciences students in the fall semester of 2015 to explain to me what exactly a student or scholar of English would study, they struggled to provide anything beyond stereotypes perpetuated by Hollywood and their own bad experiences. My students informed me that scholars of English study grammar, Shakespeare, creative writing, and little else. Despite the diversity of a field that continually attempts to make interdisciplinary connections and explore new possibilities for research in an ever-changing communication landscape, the picture of English scholars as tweed jacket-wearing book club members who drink copious amounts of coffee and mercilessly look down their noses at others’ perceived linguistic and grammatical deficiencies persists.

As scholars and even undergraduate students of English know, this view of the ethos of the English department is highly limited and arguably misguided, but it contributes to the

ongoing crisis regarding the viability and future of English departments. This crisis in English departments is certainly nothing new. Greteman assures us that English scholars feel conflicted because that's simply what we do: "Crisis [...] is what the humanities do best [...] we do feel conflicted. That's why we're humanists!" (Greteman). A certain sense of crisis can keep scholars motivated to defend and strengthen their discipline, and the relatively stable numbers of humanities majors means that a much larger "absolute value" of students are majoring in English and the humanities, which seems to indicate that English as a discipline is here to stay for the foreseeable future (Mandler). While a moderate amount of crisis can be helpful in keeping us on our toes, it is important not to remain the department of eternal crisis because, "the moral of the tale of the 'boy who cried wolf' is that, ultimately, the wolf did come to eat the boy" (Mandler). If the field continues to portray itself as under attack and refuses to directly address popular misconceptions regarding our role in the academy, English departments and their faculty may very well suffer further. In order to ensure the discipline avoids this fate, we must learn to balance the rhetoric of crisis and the need for disciplinary preservation with rhetoric that clearly outlines the benefits of the study of English. In order to do this, we must first understand students' current views, so we can adjust our rhetoric accordingly.

The struggle with the ethos of English departments exists not just in broader, public discussions, but in our own scholarship as well. We ask ourselves, *Are we using the right methods? Are we being objective enough? Should we even be analyzing x in the first place?* This problem also exists in the pedagogical requirements and practices of English departments, particularly in regards to WAC/WID programs and courses—*Should I be teaching this? Am I even qualified to teach x genre or concept?* Given the limited contact scholars of rhetoric have with outside audiences, there seem to be some misconceptions regarding what actually goes on

in English departments. English departments are diverse, vibrant research and teaching communities performing important critical work in areas such as cultural studies, digital humanities, and the rhetorics of countless disparate discourse communities. Nevertheless, students and colleagues in other departments and those outside of university settings seem to have limited views of English departments as atheoretical, antiquated bodies dedicated to close-reading of texts that those outside the discipline may perceive as irrelevant to pursuits outside the humanities. At the university level, these perceptions greatly impact the First-Year Composition classroom as the flagship course of the discipline and one of the courses most commonly included in most universities' general education requirements. Given their ubiquity, these perceptions of the discipline undoubtedly spread to other English classes as well. While the First-year Composition course has been greatly studied as a course central to the experience and general education of nearly every university student in the United States. The upper-division Writing in the Sciences course, however, has been the site of considerably less scholarly inquiry. Given the unique standing of the course as an upper-division writing environment geared directly towards a population of students generally known to be averse to writing and English courses, perceiving them as impractical (Cass and Fernandes 315), it may be a perfect site for inquiry into the topic of the perceived ethos of English amongst a group known to have a low estimation of the discipline and its educational worth.

The English Teacher in Writing in the Sciences

First-year Composition courses and upper-division writing courses are increasingly required of students in all majors. Accompanying this expansion is a proliferation of WAC programs and WID courses. Proponents of the spread of WAC/WID believe its goal of increasing the amount of writing students complete has immense benefits. Implementation of

writing across the curriculum helps students reflect and become more engaged in their own disciplines (Anson x) and can give students a better understanding and appreciation of the work experts do within their disciplines (National Research Council 76). Increased writing, then, helps students not only to become better writers, but also to see the role that writing and communication play in various disciplines, to better understand their disciplinary content, and to visualize the various roles inhabited by experts in their disciplines. These potential benefits of increasing the amount of writing that students complete in their coursework is limited, however, by how willing students are to see the skills and content learned in English courses as transferable to other settings.

Students are not the only population one need convince of the benefits of increased student writing. Despite the promise of research on the potential for WAC/WID to spread the benefits of education in effective writing across campuses, the movement has its detractors. Scholars such as Dan Frazier argue that the bulk of skills taught in these courses simply don't transfer to other settings (34). Though many WAC/WID courses at universities across the United States are led by scholars with expertise in disciplines similar to those of the students enrolled in the courses, this is often cost prohibitive. In such cases, scholars of English-related fields instruct students in disciplines quite dissimilar to their own. Frazier believes that writing instruction is best left to those educated in the discipline of their students or even in post-collegiate settings without explicit classroom instruction. He writes, "students learn best how to produce specific forms of academic writing by interacting with scholars and researchers interested in producing that specific form of writing" (36). Similarly, Susan McLeod argues that teaching the genres and conventions of a given discipline is inseparable from the teaching of disciplinary knowledge (Zawacki, Myers, and Rogers 60). If one lacks disciplinary knowledge, in other words, they

cannot possibly teach specialized genres effectively for students outside the instructor's home discipline. Further complicating the inability of writing instructors to teach certain genres, Linda Bergmann observes that WAC/WID theory and humanistic perspectives can sometimes outright conflict with disciplinary practices in vastly different fields such as those in the STEM disciplines (4). This suggests that a conflict in ideologies may distract from students' ability to learn the appropriate discipline-specific content necessary for success. In addition, tension may exist between English faculty who often view (rightly or wrongly) their colleagues in other disciplines as resistant to the teachings of English and the faculty in other disciplines who view English faculty as opportunists who wish to overtake and determine other departments' curricula (4). Such a relationship in which the goals of English and other disciplines are perceived as mutually exclusive is clearly not conducive to interdisciplinary relationships and the reformation of the ethos of WAC/WID and English departments let alone effective day-to-day writing instruction.

Compounding these critiques of the WAC/WID approach are more practical concerns such as the question of who should ultimately be the instructor at the front of courses such as the Writing in the Sciences classroom. In "Playing Devil's Advocate: Evaluating the Literature of the WAC/WID Movement," Ochsner and Fowler explore problems of ethos in the scholarship of WAC/WID and in the programs themselves. They point to what they argue is one of the saving graces of WAC/WID—its staffing:

Large research universities, for example, almost invariably staff 1st-year writing courses with the cheapest labor available—graduate teaching assistants, part time instructors, or nonprofessorial adjuncts. Arguably, these quasi-faculty are capable teachers of writing, but the university's reliance on their cheap labor also,

arguably enables the appointment of much better paid professorial faculty to teach in WAC/WID courses. (132)

Beyond the problematic academic hierarchy underlying the assumptions in Ochsner and Fowler's wording lies another problem; many universities simply don't have the resources to staff WAC/WID courses in the way Ochsner and Fowler indicate. The reasons for this are multifaceted, but most notably full, tenured faculty representation in upper-division WID courses continues to wane because it is prohibitively expensive to fill all these positions with full-time, benefitted faculty members. As a result, statistics indicate that many WAC/WID courses are increasingly taught and shaped by graduate students and non-faculty instructors, some with and some without experience writing in the fields of the students they are tasked to instruct (Thaiss and Porter 551). This disparity in expertise between the instructors and students in WID courses can cause undue stress on graduate students and adjunct/lecturing staff. Susan Miller-Cochran writes of her skepticism and self doubt when first using a WID approach in her classroom: "how could a teacher with a background in English teach writing in other disciplines? I was no expert in writing in biology or nursing or math or psychology or any other field other than rhetoric and composition? What in the world would I teach my students?" (Miller-Cochran). Not surprisingly, research shows that students prefer credible instructors, and instructors, in turn, hope to appear credible in the eyes of their students (Teven and Herring 236). Underpaid and potentially underprepared instructors who lack the disciplinary knowledge of their students' respective disciplines are justified in worrying about their ethos in the WAC/WID classroom. As the institutional shifts necessary to staff such courses with highly qualified tenure track faculty are unlikely to happen in the near future, it is incumbent upon the staff presently in these classrooms to engage in acts of bricolage. Though the instructors in such settings may be from exploited

groups such as graduate students and adjunct faculty, the courses must be staffed. The teaching staff in these courses may not have the same disciplinary background as their students, but can make the best of the situation by meeting students in the middle, and working doubly hard to demonstrate the value English and Writing Studies for STEM students.

The critical attacks of WAC/WID and the nature of such courses' staffing are very real obstacles, but they do not necessarily mean that scholars of rhetoric are incapable of teaching students in other disciplines important concepts about the communication that happens in those varied disciplines. Rhetorical scholars bring a particular skill set to the WAC/WID classroom. Tinberg observes that "as teachers, we benefit from playing a tutor's facilitative role—allowing students to retain ownership over their writing, as we writing teachers say. On the other hand, as teachers we bring a disciplinary knowledge and credibility that comes from such expertise" (64). Just as Tinberg acknowledges the efficacy and importance of the guide-on-the-side teaching approach in the writing classroom, I argue that the humanistic perspective of the discipline of English, by its very nature, allows students a greater sense of agency and control over their writing that can be fruitful and unique to WID classrooms led by English faculty and staff. As scholars of rhetoric, we bring to the table a strong understanding of the function of language, the social nature of communication, and the importance of ethos. By helping students explore the discursive practices in various disciplines and teaching the theories underlying our own scholarship, instructors of rhetoric can do important interdisciplinary work while bolstering the ethos of the discipline. Being able to do this, however, is contingent upon a strong, consubstantial sense of ethos between students and instructors.

Despite our understanding of the importance of ethos to our discipline and the broader endeavors of education itself, few studies exist exploring the role ethos plays in the efficacy of

writing instructors in the Writing in the Sciences classroom. Though there is somewhat of a dearth of research on the topic, two important studies are heavily steeped in the importance of ethos and the role it plays in facilitating the transfer of concepts and skills learned in writing classrooms to other writing contexts: Driscoll's "Connected, Disconnected, or Uncertain: Student Attitudes about Future Writing Contexts and Perceptions of Transfer from First Year Writing to the Disciplines" and Driscoll and Wells' "Beyond Knowledge and Skills: Writing Transfer and the Role of Student Dispositions." While many prominent studies approach the controversial topic of transfer (Wardle, Downs and Wardle, Bergmann and Zepernick), Driscoll and Wells' work is unique in that it specifically explores the ways in which students' attitudes and dispositions relative to writing courses may influence their ability to facilitate the transfer of skills to other contexts. Though Driscoll and Wells rarely use the term "ethos" and rather talk about student "dispositions," the two are inextricably linked. Given Sullivan's model of consubstantial ethos and McLaughlin's complex definition of what exactly comprises ethos, student dispositions relative to instructor and course valuation are central to the social construction of the ethos of an instructor and, by extension, that instructor's course and discipline.

The question of transfer has become synonymous with success in the writing classroom. If students can transfer what they learn in the writing classroom context to other classes, the workplace, or any other situation, we can judge the instruction a success. As Driscoll and Wells point out, however, scholars and instructors often forget to look to the student and his or her experiences to determine just how to successfully negotiate transfer of writing knowledge and skills. It is important to attempt an understanding of students' previous experiences and their dispositions regarding the writing classroom because this informs how students engage with the

classroom and the material therein: “[W]riting transfer theorists have not always considered the learner or what the learner brings with him/her to the transfer problem. In some definitions, the learner is someone to whom or through whom transfer happens rather than being the agent of transfer” (Driscoll and Wells). While we can reflect on the instructor, pedagogy, and the latest theoretical rhetorical concepts, all our research and scholarship is fruitless if we refuse to focus on what the student is actually getting out of the class. At the most fundamental level, the baseline for success in the classroom is whether or not a student leaves with the “right” content knowledge, skills, etc., that the instructor positions as central to the course and whether or not students can pinpoint the value inherent in that content.

Student attitudes and beliefs regarding a course, which Driscoll and Wells refer to as “dispositions,” deeply influence students’ conceptions of instructor ethos and, as a result, can impact the quality of students’ learning experiences. Driscoll and Wells outline five important features of student dispositions:

1. Dispositions are a critical part of a larger system that includes the person, the context, the process through which learning happens, and time.
2. Dispositions are not intellectual traits like knowledge, skills, or aptitude, but rather determine how those intellectual traits are used or applied.
3. Dispositions determine students’ sensitivity toward and willingness to engage in transfer.
4. Dispositions can positively or negatively impact the learning environment; they can be generative or disruptive
5. Dispositions are dynamic and may be context specific or broadly generalized. (Driscoll and Wells)

The self-efficacy theory undergirding Driscoll and Wells' study posits that "people's beliefs about their capabilities to produce performances influence events that affect their lives" (434). Students' beliefs about themselves, their instructors, and the courses in which they enroll are central to student success. Those who believe in their writing ability, then, are more likely to take the necessary steps to prove themselves as effective writers. The type of ethos and environment an instructor cultivates, however, has an impact on student performance, and based on the dispositions of many STEM students, English courses may be perceived as lacking an ethos or environment in which they can thrive.

Driscoll conducted a study of students' dispositions or attitudes regarding the transfer of skills from First-year writing into their work in their respective disciplines. As she laments, "[F]or over a century, educational researchers working in a variety of settings have been more successful in demonstrating how transfer of learning fails rather than how it succeeds" ("Connected"). Driscoll's study is based on the premise that students' attitudes regarding the transferability of writing knowledge can impact their ability to learn and use writing knowledge in situations beyond the FYC course. Building on Feather's work in Expectancy-Value Theory, she notes that students are more likely to invest effort into a task from which they expect some sort of reward, such as knowledge that they will be able to use in the future. If students fail to see the potential for transfer and/or the potential for benefits outside the classroom from expending efforts in English courses, they are unlikely to put forth much effort, but also more likely to have a lower estimation of English courses.

Driscoll reports four primary findings from her surveys of FYC students: "[S]tudent beliefs about transfer decline over time; students' attitudes concerning future writing fit four categories; students' retain limited definitions of writing; and students students' expectations of

future writing contexts” (“Connected”). Such results paint a grim picture of student experiences with Composition courses. Driscoll’s qualitative interviews with students also revealed that students often had rather primitive and narrow definitions of writing, primarily founded upon their previous experiences writing genres such as literary analyses in literature-heavy English classes in high school and middle school. In addition to most students associating English with literary genres, Driscoll surprisingly finds that students provided rather cohesive responses when asked to explain what “good writing” entailed. Driscoll notes that many students rightly observed that whether or not writing is good, of course, depends upon the context and purpose of the writing task at hand. Interestingly, many students purport to believe that writing should be original or creative in some way, which suggests a “romanticized,” expressivist view of writing and English courses (“Connected”). In the context of Writing in the Sciences and other WID courses, this may be problematic if for no other reason than students come into the classroom on the first day with one conception of what the course they have enrolled in should be (a literature course or FYC volume 2, perhaps) and are flummoxed or even disappointed when they eventually find that the course is something quite different from what they had expected. Better understanding and managing student expectations, then, is the first step toward ensuring student attitudes relative to our courses and discipline are conducive to learning.

Driscoll’s project undertakes important work in better understanding what preconceived notions FYC students have when entering the Composition classroom and how those perceptions change throughout the semester. There is a gap, however, in our understanding of students’ attitudes and expectations in other general education writing courses. In particular, we lack specific knowledge regarding how populations believed to be writing resistant, such as STEM students, may react when required to take an upper-division writing class as part of a vertical

writing curriculum. If, as Driscoll found, students' valuation of writing declines throughout the one-semester FYC course, it is certainly possible their valuation of writing may decline more steeply by the time these students reach a WID course in their third or fourth year of college. By this time most students are more deeply steeped in the content of their disciplines and view general education and English courses as a relic of their first year at university. Because of this, STEM students may be predisposed to have negative perceptions of these courses before they even sit down in our classrooms. Better understanding students' perceptions of writing instructors and the Writing in the Sciences course can provide a more accurate vision of the ethos we cultivate. Knowing this can, in turn, help us be more transparent regarding course objectives and improve pedagogy on day one of the course as well as students' ability to transfer skills from the Writing in the Sciences classroom to other contexts.

By adapting the work of Driscoll and Wells from the FYC classroom to the upper-division writing context, specifically Writing in the Sciences courses, this study sought to determine where writing instructors of STEM students currently stand in relation to their students in the Writing in the Sciences classroom. The following chapter outlines the methodology for the study, detailing the creation and findings of pre-semester surveys. The results and discussion therein explore both student and instructor expectations of Writing in the Sciences. Chapter Three responds to the results of the surveys by proposing specific changes to the content of the Writing in the Sciences course to bolster the ethos of the instructor and, by extension, writing courses more broadly. Chapter Four proposes two assignments to be used in this new Writing in the Sciences classroom to help students explore course concepts in depth and better transfer these concepts to other settings. Chapter Five outlines preliminary results of a semester post-test survey of students who enrolled in a course resembling the one outlined in

Chapters Three and Four. Though the findings of the project have their limitations, the initial data is positive and suggests that re-structuring our courses as outlined could help writing instructors better craft a sense of consubstantial ethos in which instructors and their students truly are “in this together.”

CHAPTER 2: FRAMING THE STUDY, RESULTS, AND DISCUSSION

Methodology

In order to better understand the ethos of instructors of Writing in the Sciences, particularly those with specializations in English (an intentionally broad designation used to include those with degrees in Rhetoric, Writing Studies, Literature, and all other subdisciplines within the field) this study adopted Sullivan's (1993) model of a consubstantial, socially constructed ethos as its theoretical foundation. Such an approach necessitated a methodology that provided information regarding the instructors' conception of their own ethos as well as students' views regarding their instructors' ethos. Thus, instructors and students engaged in courses related to the topic of writing in the sciences were selected as participants in this study. The study sought to determine primarily how instructors perceived and attempted to structure their own ethos and that of the discipline of English in these courses as well as students' attitudes and perceptions of English classes and, more specifically, the Writing in the Sciences classroom and instructor. The ways in which student and instructor perceptions of ethos converge and diverge are useful in providing a better sense of the current consubstantiality of our ethos in the Writing in the Sciences classroom and determining potential adjustments that could be made to improve this ethos in the future.

IRB approval for the project was secured for the project from the primary investigator's home institution in the Summer of 2016. All appropriate IRB protocols were followed regarding providing informed consent information for participants, and participation in the study was completely voluntary. Student pre-test surveys (Appendix B) were distributed during the first week of the fall 2016 and spring 2017 academic semesters to students enrolled in a one-semester upper-division Writing in the Sciences course at a mid-size state university in the Upper

Midwest. The course is intended for students with at least junior-level status majoring in the a variety of “hard” science disciplines. Additionally, the course often enrolls a significant number of students majoring in engineering and health-care related disciplines despite the fact that the university also provides courses related to writing in the technical and health professions. The student surveys were adapted from Nancy Driscoll’s (2011) surveys in her article “Connected, Disconnected, or Uncertain: Student Attitudes about Future Writing Contexts and Perceptions of Transfer from First Year Writing to the Disciplines” (for Driscoll’s original surveys, see Appendix A). While Driscoll’s study focuses on the First Year Composition classroom, her model was applicable to the upper-division WID classroom, particularly because her study examines student attitudes and expectations regarding writing courses as well as the ways in which these attitudes and expectations may evolve throughout a semester-long writing course. Most students in the upper-division Writing in the Sciences courses examined in this study were third- and fourth-year undergraduates, and it was assumed their attitudes regarding writing courses had likely shifted even further since enrolling in their FYC courses. The majority of these students had already completed the bulk of their general education coursework, are further removed from their previous experiences in English courses, and are more familiar with the content/expectations of their disciplines than first-year students. As a result, these students may be more likely to view writing courses as further removed from the overall trajectory of their academic progress.

Surveys were distributed to ten sections of the Writing in the Sciences course over two semesters, four of which were instructed by the primary investigator. Student participation was entirely voluntary, and students received no compensation for their participation in the study aside from potential extra credit points totaling no more than 1% of a student’s overall grade in

the course. In addition, because ethos is a fluid, ever-changing construct, it was important to track perceptions of ethos as they shifted from the beginning to the end of the semester to determine if amendments to the traditional structure of the course could evince a positive result regarding students' valuation of writing and the relevance of writing to STEM majors. A post-test survey (see Appendix C) was distributed to two sections of the Writing in the Sciences course during the last week of the fall 2017 semester to compare how students' attitudes and perceptions of the Writing in the Sciences course evolved throughout the semester. The results of the post-test are discussed in-depth in Chapter Five.

Given the theoretical grounding of this study upon the premise of ethos as a socially constructed concept and the need for a sense of consubstantial ethos for effective communication and pedagogy, surveys (see Appendix D) were also distributed to instructors of Writing in the Sciences and similar courses in scientific and technical communication designed for students in STEM disciplines. Because a large number of students were readily available at the primary investigator's home university but the number of instructors available was relatively low, in order to retrieve a more representative survey size, instructor surveys were distributed beyond the primary investigator's home university to instructors found on disciplinary email listservs such as the WAC listserv created at the University of Illinois and the WPA listserv at Arizona State University. In addition, individual departments were recruited using snowball sampling of professional connections made by the primary investigator at several Rhetoric and Writing Studies conferences. Because of the mixed-methods nature of the study and the multiple data sets available, the investigator used a grounded theory approach (Glaser and Strauss 1967) to track and better understand patterns emerging from the data. For example, one question from the beginning-of-the-semester survey asked students, "What previous experience do you have with

English courses? Based on this experience what opinions do you have about English courses?"

The investigator read through the responses to the data set several times and began to notice four prominent themes emerging. Students reported their experiences with English courses as either positive, negative, mixed, or neutral. Neutral responses were typically those in which students were either quite vague in their responses or answered the first half of the question by simply listing English courses they had taken and ignored the second part of the question asking them to detail their opinions. Comparisons were then made among the different thematic groups in order to learn more about the percentages of students reporting various types of experiences with English courses.

Results and Discussion

Coming into the Classroom

Student pre-test surveys at the primary investigator's home university received a total of 136 responses, and instructor surveys received a total of 77 responses from Writing in the Sciences instructors both in the United States and at several international universities. Cass and Fernandes (2008) and others have repeatedly reported STEM students' disdain for writing and English courses and the task of writing in general. As such, the primary investigator hypothesized that most survey respondents would report extremely low valuation of English courses. Immediately evident from students' responses, however, was the fact that many STEM students report much more nuanced and occasionally positive views of English courses and exhibit an understanding of the values and practical applications of writing. Using a five-point Likert scale ranking system ranging from "strongly disagree" to "strongly agree," students beginning the Writing in the Sciences course were asked to respond to the statement "I will be able to use the information I learn in this course in other college courses." 64.9% of students

agreed with this statement, and an additional 19.4% selected “strongly agree.” Combined, nearly 85% of students at least self-report that when first entering the Writing in the Sciences course, they believe the course will help them write in other settings while in college, indicating a positive valuation of what English courses have to offer. When asked to extrapolate beyond their college career, students provided similar responses. Responding to the statement “I expect my English course content to help me with writing beyond college,” 60.4% of students agreed with the statement, and 26.1% strongly agreed. Interestingly enough, slightly more students responded positively to the second question, which suggests that some of these students may view writing tasks as separate from their coursework in their major courses but believe the skills will help with other life writing tasks outside the classroom.

The Writing in the Sciences classroom is often starkly different from the majority of STEM students’ other courses. In an academic economy where students see themselves not only as students but as savvy consumers, such a difference may cause students to wonder about the benefit of general education courses that may distract from core content courses within a student’s major of study. It was assumed that providing students with a more qualitative question regarding the value of English courses, responses might shift. However, when students were asked a more qualitative question--“Do you expect what you learn in this course to help with writing in your major? Why or why not?”--the response was still overwhelmingly positive. Only 9.7% of participants provided responses that could be coded to suggest students felt the course would not help in writing for their major and 5.9% reported being “unsure” whether or not the course would help them improve their writing in their major. Such results seem to indicate that the majority of STEM students are willing, at least at the beginning of the semester, to see the

Writing in the Sciences course as something that contributes to, rather than distracts from, their overall pursuit of a degree.

In addition to their pre-existing opinions regarding English classes, students also have strong opinions of their own abilities in writing and what to expect from a course dedicated to writing in the sciences. Responding to the statement “I am a good writer,” the majority (58.2%) of students chose “Agree” while 9.7% of students strongly agree. Students were more ambivalent regarding whether or not they actually enjoyed writing. 37.3% of students claimed to be neutral regarding the statement while 33.59% either disagreed or strongly disagreed. As the expectancy-value theory underlying Driscoll’s study suggests, students’ positive views of their own abilities as writers coupled with their responses indicating belief in English courses’ ability to help in other areas of academia and life bode well for the Writing in the Sciences course. If students believe they will get some clear benefit from a course and they also believe they have the skill sets necessary to succeed in the course, they are more likely to place a high value on that particular course, be motivated to participate, and work harder to retain and transfer that course’s content.

While the data suggests student attitudes towards English classes are generally positive, students still report a certain amount resistance to the task of writing itself. Parsing the qualitative responses to student responses provides a clearer understanding of students’ attitudes towards writing and writing classes. The responses related to the task of writing itself provide a much more nuanced view of students’ experiences than the general questions about students’ experiences with English courses. For example, the range of students’ experiences and opinions regarding their previous work and development in writing was more diverse than one might expect in a course dedicated to a specific population of STEM students. Not surprisingly, a large

proportion of the students described having taken only the first-year university writing requirement, but several students did acknowledge having taken literature and creative writing courses to fulfill general education requirements or even for personal enjoyment. Still others, interestingly, conceived of the question more broadly and went further back when describing their experiences, detailing high school Advanced Placement courses, Communication courses, and even primary school experiences with writing. When reviewing these student responses and comparing them to students' quantitative responses regarding whether or not they would be able to use the content of Writing in the Sciences in other courses, their major, or in their future occupations, it became evident that students' thoughts on the matter were more complex than initial responses revealed. While it may be heartening to know that some students described English courses as "a necessary, integral component to any undergraduate education," other students may not view their enrollment in our courses so generously. While students reported seeing value in English courses, they may also troublingly view them as one student responded: as "a necessary evil." While being considered necessary by students is certainly appealing, being seen as any sort of "evil," even a necessary one, is less than desirable.

In discussing what they saw as beneficial in English courses, students often pointed to the possibility for expression and creativity in English courses: "Creative Writing I really enjoyed because we were able to make up our own stories and poems. Overall, I think English classes are very informative and useful. However, I find myself enjoying English classes that are more creative. Classes where I can choose what I write about are also more enjoyable for me." In fact, this expression of students' preference for choosing their own topics or "writing about what they wanted" was a common theme: "I don't mind writing if it is something that interests me and that I am familiar with," "I enjoy normal English courses, but it really depends on what the topics

are.” Though students reported preferring to be able to write about topics that interested them, surprisingly, these responses didn’t necessarily mean that STEM students wanted to write about topics that could be construed as more pragmatic or even more closely related to their major, science, or even more formal, professional documents such as job search materials. Several students noted that they actually wanted the subject matter of their English classes to be quite different from that of their courses in their disciplines: “...I enjoy literature more than I enjoy scientific writing, so this will probably not be one of my favorite classes.” It is certainly encouraging from a humanistic perspective to hear of STEM students’ desire for self-expression, but such responses could also be related to the broader misconception about the field of English outlined in the introduction, namely that English as a field is primarily or solely concerned with creativity and the production of literary works. Regardless of whether students report a strong affinity for English courses, viewing these courses begrudgingly as a “necessary evil,” or appreciating English courses rooted in expressivist approaches to writing, many of them do report that they believe in their writing ability, see some sort of worth in English courses and their content, and believe that these courses will be helpful in other aspects of their holistic student experience and in post-collegiate life. This is arguably a testament to the work already done by our discipline in terms of espousing its worth and should be taken as a point of pride on progress made thus far. The Writing in the Sciences instructor is likely to encounter difficulties in reaching students who view English courses in a less favorable light and even those who value English courses but specifically those with expressivist leanings that represent, for some students, an escape from their work in STEM majors.

In comparing the quantitative data to qualitative responses, when students were afforded an opportunity to explain themselves, they seemed more likely to report less-than-positive

experiences in their English classes. Of survey respondents, 32% reported having had bad experiences with English courses, and 10% cited mixed feelings regarding English courses, indicating that some experiences had been positive while others had not (based on content, instructor, and other variables). Though, these students as individual groups are not a simple majority, the fact that, collectively, 42% of STEM students reported mixed-to-negative feelings regarding English classes is worrisome. Students' qualitative responses varied, but made their feelings clear: "I not [sic] big fan of English classes and writing. I've been improving on my procrastination skills when it comes to writing a paper, my opinion towards these courses are negative to neutral," "I have never really enjoyed English classes as a whole." The large number of students who self-report favorable views of English should provide confidence that STEM students can be convinced of the worth of English courses and their applicability to STEM majors and professions, but we must understand more about this population of more reticent students in order to improve our pedagogy.

Students' reported grievances with their courses tended to fall into three categories: complaints about course content, writing assignments, and perceptions of the instructor. Some students described their previous English classes as a struggle because of the nature of the work they were asked to complete (both daily activities and major assignments) and course content, which are inextricably linked as instructors use "work" or activities and assignments in order to teach and reinforce course concepts. A few students in this category indicated they were dissatisfied with previous English courses because they were too easy or filled with tasks the students viewed as busy work. One reported finding course content and assignments to be "pretty basic." Similarly, another student "felt like [he or she] didn't learn a whole lot." Similarly, a number of students, both those indicating negative and positive experiences in English courses,

discussed English as a subject in which they put forth minimal effort but received high marks. Regardless of whether students were reporting this as a positive or negative characteristic of English courses is problematic because it suggests a lack of rigor in the content of our courses. In stark contrast to the group suggesting English courses were too easy, others indicated that they saw the courses as outside of their own skill set or as inherently difficult: “English is always a tough subject for me and I struggle the most in. I like science classes much more than writing papers because I struggle with them,” “The Composition courses I did not enjoy due to the large amount of writing and form in which we needed to do it. Those classes were very research based which I find rather boring.” Whether students saw their previous English courses as too easy or too hard, the rigor of the course’s content and assignments were a frequent topic of discussion and factors prominently into how students evaluate their experience.

In addition to discussing the rigor of English courses’ content, other students raised concerns not related to the contents’ difficulty but because they believed English’s content to be more subjective than that found in science courses. One student succinctly reported his or her experience with English courses seemed inconsistent because of the very nature of the discipline. This student also believed English courses seemed to have no coherent means of evaluation: “I dislike English classes sometimes because it is not apparent what is right and wrong. It is based on the teacher's opinion. In math $1+1=2$ and if you put 3 you are obviously wrong. In English, your grade is hard to quantify and that is frustrating. I am hoping that with English 324 it is not as bad in that respect.” This student appreciated the more objective ethos of courses in the sciences while rejecting the somewhat subjective nature of English courses and the broader discipline. Another student shared similar thoughts: “I feel that the subject of English is very inconsistently taught. Every teacher I have had has given completely different guidelines and

procedures for writing.” These comments may seem misguided by many scholars and instructors of English. Those within the discipline would likely take it as a given that every rhetorical situation is unique and because of this, each writing class would necessarily include different expectations and different guidelines for what constitutes effective writing because of the simple fact that each assignment, course, and instructor constitutes a different rhetorical situation, much like any writing task. From a student perspective, this is perhaps not so obvious, however. In fact, such responses may point to a deeper threat to the ethos of the Writing in the Sciences course, one articulated anecdotally by many scholars but arguably unsubstantiated by any previous research--STEM students may perceive English courses as courses that have no true content unlike their more technical and “objective” science course counterparts.

As responses indicate, many students drew connections between a course’s content and assignments and the instructor of the course. When students reported negative experiences with content and assignments, they often were quick to add a comment about their previous instructors as well. Responses enumerating experiences with previous English instructors made for some of the most scathing and detailed of all survey data. Some students who had a mixed reaction to previous English courses, seemed to understand that English, like any discipline, has instructors with a variety of skill levels, that certain teaching styles may not appeal to every student in every setting, and that these factors may influence students’ experiences and opinions in a course. One student explained, “I have had both good and bad experiences. Most of those stem from my perspective of the teacher/professor. I enjoy reading and writing.” Unlike the students who merely articulated dissatisfaction with the content/workload of their English courses, this student highlights the importance of the individual at the front of the room. He or

she reports enjoying the content and work required in English courses, but expresses a belief that the instructor ultimately makes or breaks the course for the student.

Placing the success or failure of a course squarely at the feet of the instructor based purely on student perspective and opinion may seem an undue amount of pressure to place on instructors, many of whom are underappreciated and underpaid, but it was a trend that emerged again and again in student surveys, and if students see this as a primary concern, it is something that must be addressed. Student responses indicating both satisfaction and dissatisfaction with previous instructors varied immensely but suggests student experience and opinions regarding a course's instructor are directly linked: "I have never been very fond of English courses, but depending on the environment of the class and how helpful/understanding the professor is could definitely help with how well I do in the course," "My instructor was not good, I didn't learn anything from the class and I actually felt like I lost some of my writing knowledge after leaving that class." One response perhaps best summed up the difficulties students had with their English courses and instructors: "High school English classes were not fun, teachers weren't very good. Took English as a freshman in college and had a better teacher there, but still felt like I didn't learn a whole lot. I feel like not having good teachers made me dislike English a more than I should have [sic]." This quote paints a bleak picture of one student's experiences, but it also provides a glimmer of hope. The student's word choice in musing that he or she dislikes English courses more than he or she "should have" shows a certain amount of belief on the part of the student that English as a discipline may have something of value to offer despite this student's previous negative experience with an instructor.

Though the student's initial experiences in the English classroom negatively colored his or her initial thoughts on the topic of English courses, he or she recognizes that there are

effective English teachers. The student acknowledges having a “better” teacher later on. The student even independently puts forward the thought that if early experiences with English courses had been more positive, it may have had a positive effect on the student’s outlook towards the broader discipline. One can almost read a twinge of regret in the student’s response, lamenting that they *could have* liked English courses if not for the negative experiences of the past. As instructors, we cannot change students’ experiences in English courses before they get to our classroom, however, we can do our best to understand students’ previous experiences and attempt to avoid making the perceived mistakes of previous English instructors. To ensure our students don’t repeat unpleasant experiences in our own courses, we must better understand students’ attitudes and expectations of the classroom and be able to address attitudes and manage student expectations through the simple act of being transparent about our own expectations for students and the course on day one.

Expectations of Learning and Roles in the Classroom

Students were asked two related questions: “How do you think this course will differ from and/or resemble English courses you have taken in the past?” and “What do you expect to learn in this class?” Responding to the first question, almost all of the students (94.5%) indicated that they believed the course and its content would be different from previous English courses in some fundamental way. Those who were unable to provide a response typically provided a response such as “I don’t know,” while a few students exhibited more caustic responses: “I believe we will do more unnecessary over analyzing of meaningless topics [sic].” Such responses are likely in response to previous experiences in which particular students felt disengaged with the content of English courses because of a perceived lack of practical application.

Two students, already confident in their own abilities, expressed nearly identical sentiments: “Not much, I already know how to effectively write and read scientific articles and journals” and “Not much. I feel like I already have a decent enough grasp of the English language to write a good scientific paper.” In stark contrast to these more curt responses, one student provided an answer that every teacher dreams of, writing, “I hope to better learn to research more efficiently and be able to utilize the information from the research to formulate a well thought out, cohesive argument. I also hope to be able to learn to better write not just a paper based on research, but to write better about anything overall.” Reinforcing students’ belief in the importance of the instructor in cultivating a successful classroom experience, this student went on in responding to this same question to say, “I also hope that should I experience any difficulty with a topic or if I have a question about something, the Professor will be willing to cooperate to resolve any concerns.” This student’s response reinforces the trend of student recognition of the potential for English courses to provide students with useful information as outlined in student responses about their previous experiences in English courses and points to the willingness, at least on the part of some students, to recognize worth in being required to take a course such as Writing in the Sciences.

Not all student responses were as abrupt as the first two examples or as diligently thought out as the third response. The majority of students fell somewhere in between these two extremes when describing their vision for what they would learn. Students often provided quite generic responses that reflected little to no clear expectations for the course or even an expectation that Writing in the Sciences would differ very little from their previous English courses: “I expect to learn more about writing and what makes a good paper. I expect to learn how to make writing easier and how to use citations properly.” Such responses tended to focus on technical aspects of

language and writing such as citation styles and “techniques” as one student put it. Still other students provided vague responses noting that they believed the course would help them learn, “How to form a clearly written 15-20 page paper,” or even “How to write better.”

Those students who provided more salient answers tended to fall into two categories: students concerned with writing and its relation to professionalization and writing and its relation to science. Just over one-fourth of students (27.9%) declared that they thought the class would have something to do with improving students’ ability to be seen as professional in some way, mentioning terms such as “professional,” “job,” and “career” or explicitly making reference to gaining skills from the course that would improve their ability to acquire employment. Responses in this category ranged from the oft-cited desire to learn to write in a more “professional tone” to students who detailed specific genres (primarily résumés and cover letters) they thought would help them to get a job or get into graduate school. This concern with overall professionalization reflects a broader concern not just of STEM students but of students across the university. Regardless of the course in which they are enrolled, students privilege those skills they may learn that they believe will better equip them to be competitive on the job market.

Some responses were broad but thought-provoking such as one student who hoped to learn more about, “The connection between science and English.” One can just as easily imagine a student skeptical of this connection providing this response as one deeply intrigued by learning the ways in which a richer education in writing could improve his or her ability to work effectively in STEM professions. A few students took this first response’s potential optimism and made it more explicit: “I expect to learn how to write as a scientist. I've taken plenty of English classes and even more Science classes, so I am eager to have a class that will combine the two.” One response encapsulated students’ overarching concerns that science be front and

center in the course: “I expect to learn about rhetoric in a *science* setting, defining the *scientific* methods more, & understanding how to translate *science* to writing via *scientific* journals” (emphasis added). While not every student peppered their response with as much science, the trend clearly indicated that students hope to learn how to write more scientifically, and for a surprising number of students, this meant learning to improve their overall tone and diction as well as their grasp of scientific genres.

Notably, when asked to describe what they thought they would learn in the class, 45% explicitly stated they believed the course would be different because it would more directly related to science than previous English courses they had taken. Beyond this, students related vague understandings of a course that might be “More involved and advanced,” “specified,” or “more challenging” than what they were used to experiencing in writing courses. Though several students noted that the course might require new “forms,” “formats,” or “styles” of writing, none of the respondents specifically mentioned the concept of genre—a central component of any writing course. In a department in which the majority of students responding to the survey would have previously enrolled in the university’s required FYC course, the near absence of the word “genre” represents a larger problem of transfer. The English department in which the Writing in the Sciences course is housed advocates a genre-based approach to writing instruction in both its FYC and upper-division writing courses. Most of the students responding to the survey would have enrolled in a FYC course in which they would have heard the word “genre” used on a daily basis, but few of them explicitly transferred this most basic of concepts to the upper-division WID course. Rather than transferring the terminology of the FYC to Writing in the Sciences, students chose, either consciously or unconsciously to rely on more colloquial terminology to explain their belief that the course might focus on different approaches to writing. This does not

necessarily mean that students lack any sort of understanding of the concept of genre, but its scarcity in student responses may be indicative of students' ambivalence relative to the helpfulness or usefulness of the accepted terminology of English as a discipline. If one of the most important terms in the university's writing program and, arguably, the discipline escapes students' memories, clearly there is a problem of transfer. Students may view genre theory as inconsequential and choose to speak of genre in different terms, or they may simply have forgotten the term. Regardless of the root cause behind the absence of genre and other Writing Studies terms in student responses, the usefulness of such terms and their applicability to students' academic and professional lives must be addressed.

Beyond the problem of transfer and students' uncertainty regarding the course's content, another obstacle that may complicate the Writing in the Sciences classroom for some students is the difference in its general format and pedagogical approach. The majority of students in STEM courses are used to courses with larger student enrollment in which assessment typically takes the form of multiple-choice exams scattered throughout the semester. While instructors in STEM courses often lecture and students take notes, the instructor in Writing in the Sciences and other English courses often employs a discussion and active learning based approach to instruction. As the student who spoke of the difference between English and Math courses so astutely observed, English courses are different in that they are more open to interpretation and privilege analysis and critique over the precision and memorization privileged in traditional STEM courses. The differences inherent in these courses necessitate a different approach to student and instructor roles in the classroom, arguably a more active role on the part of the student, that many STEM students may not be used to. While students may have a more passive role in many lecture-based courses in their major, the Writing in the Sciences course is generally smaller (enrolling around

20 students at the university in this study) and because of this smaller enrollment asks students to be more active in participating in activities such as in-class discussions and writing workshops rather than simply listening to lecture. While active learning approaches continue to increase in STEM classrooms, but anecdotally, students in my classes note that much of their experience in courses within their major involves lecture and note taking. Because many students still experience a fair amount of lecture on a daily basis, unfamiliar activities such as in-class discussion and writing activities may make students feel uncomfortable and reticent to participate if the instructor fails to properly prepare students for the ways in which student and instructor roles differ between Writing in the Sciences and students' traditional coursework. If students are prepared for the more active role they are to play in the classroom, the transition into Writing in the Sciences will be a smooth one. If not, some additional work may be required of the instructor to effectively prepare students.

To better understand how students understood the role they were to take in the Writing in the Sciences course, the beginning of the semester survey asked students to articulate the different roles they envisioned themselves and their instructor taking in the classroom. Some students defined the roles by simply parroting back the most obvious answer to the question: "A learner, and a instructor [sic]." Others replied with potentially problematic, responses that echo Freire's banking model of education: "My role is to pay attention and take in information. My instructor's role is to supply that information." Some students used creative metaphors to describe what they envisioned as a guide-on-the-side approach to instruction: "I like the imagine students as sponges and teachers help to guide the sponges to water [sic]." Whatever the metaphor or imagery used, these responses reveal students' extensive experience in lecture-based courses. Perhaps unaware that there could be multiple possibilities for a classroom dynamic, a

few student participants even expressed frustration or confusion when asked about these roles: “Student and instructor. I’m not sure of the focus of this question.” The fault in this particular instance may, in fact, have to do with the way the wording of the question the student was responding to. The question could perhaps have been too broad or too close to the students’ own experience for effective critical reflection. If students have only had limited experiences in homogenous classroom settings where students rarely take an active role in discussion and classroom activities, it may likely be difficult for them to articulate anything that differs from this experience. Similarly, while instructors routinely think about the particulars regarding how a course will be structured in terms of its participation and daily activities, students likely have not spent as much time thinking about the subject. Perhaps re-structuring the question to focus on the differences student expected in these roles relative to their previous experiences in other courses may have elicited richer data.

Regardless of the wording of the question, when pressed for information regarding roles and responsibilities, students provided very little beyond definitions broad enough to be applicable in any classroom setting and did little to differentiate the experience they expected to have in Writing in the Sciences from courses they had taken in the past. Those students who did attempt to think more critically about these roles provided more complete responses, but still spoke primarily in terms of their role hinging on the importance of “[paying] attention,” “participating,” and completing assignments. Students’ inability to articulate potential structural differences in the course may be important in considering the broader context of the course. Students indicated that their perceived ethos of the instructor, the types of assignments, and content of a course were all determining factors influencing whether or not students found value in a given course. The structure of student and teacher roles is closely related to each of these

categories. For example, the required assignments may change student and instructor roles quite dramatically. Courses requiring students to complete oral presentations invert the expert-audience dynamic of more traditional lecture-based courses. If the overall structure change of the Writing in the Sciences courses is especially unfamiliar, it may cause discomfort for students as it is inherently related to teacherly ethos, course content and required assignments. As such, students coming into Writing in the Sciences expecting an experience similar to that of their core coursework in STEM fields, may need proper preparation for the differing structure of student and instructor roles, or they may be sorely disappointed with their experience in the course from an early stage and fail to take full advantage of the learning opportunities available in the course. Because ethos in the classroom is consubstantially created, one must consider not only students' attitudes and expectations concerning the shape of the course, but instructor perspectives and concerns as well as instructors' understanding of what students are thinking when entering the classroom because if the instructors do not understand students' attitudes and expectations, they cannot effectively connect with students.

Instructor Responses

Not surprisingly, though students provided noticeably vague responses when asked about their expectations of course roles and responsibilities and what students should be learning in the course, instructors had clearly given the matter some thought. Disconcertingly, when asked what students were expected to learn in the course, one instructor respondent replied that he or she expected students to learn “very little” in the Writing in the Sciences course. Despite this outlier, most instructors responding to the survey had much more specific ideas of what students *should* learn in the course, how the writing in the sciences course differs from other English courses, and the roles that different parties should play in the course. Like many of the student respondents,

instructors often indicated that the course had a more “scientific” focus than other English courses. Instructor respondents moved far beyond this basic premise, however. For example, many instructors explicitly cited the centrality of genres in the course. They noted the importance of students “[gaining] experience in preparing genres that are common in the profession” as well as providing specific examples of genres used in these courses, including but not limited to research reports, grant proposals, articles for public audiences, oral presentations, and poster presentations. Recognizing the Writing in the Sciences course requires more than skill-and-drill instruction, instructor respondents reported course concepts beyond rigid, prescriptive genre conventions. Topics such as the role of communication in the scientific process, considerations of audience, purpose in writing, and styles of argumentation such as Swales’ CARS (Create A Research Space) model, featured prominently in instructor responses.

Addressing the question of roles in the classroom, instructors provided diverse but carefully considered conceptions of how students and instructors should participate in a course. Many students saw themselves as simply working hard and submitting assignments on time, but instructors were more vivid and detailed in their descriptions and envisioned students taking on a more active role in the classroom. Instructors portrayed students as peer reviewers; “emerging scientists;” “experts in their fields;” and, in some surprisingly egalitarian responses, “colleagues” and “fellow learners and teachers.” Instructors were also far more reticent than students to provide responses echoing the banking model of education. Rather, terms like guide, facilitator, and coach featured prominently. One instructor’s explanation summed up the general sentiment of instructors asked to relate their role in the course:

My role is to not tell students what to believe; my job is to teach them to express

what they believe to the best of their ability. I tell my students that statement on day one and repeat it throughout the semester. My role is a coach. The students' role is to see themselves as writers.

Instructors, like, students, saw the scientific nature of the course as an important characteristic, but more often focused on encouraging students to see writing as an integral part of the scientific process and to envision themselves as not just scientists, but writers and communicators as part of a community. This disconnect, however, in the expectations of student and instructor roles may prove to be problematic. Returning to our understanding of the importance of consubstantial ethos in education, we recall the importance for all parties to feel they are “in this together” in order to cultivate an effective ethos and thereby a profitable learning exchange. If the rift in expectations for the various roles of classroom participants isn't addressed early on in a course, this may undermine the efficacy of the course. Students, particularly those who feel uncomfortable in a potentially unfamiliar discipline and unaccustomed to the pedagogical differences inherent in a writing course may think the instructor fails to appropriately address student needs, and instructors may misconstrue student confusion as an unwillingness to put forth adequate effort or participate fully within course expectations.

An unexpected finding of instructor surveys related to the types of texts instructors select to use in their Writing in the Sciences classrooms. Instructors were asked “Which texts (textbooks, articles, Handouts, etc.) do you have students read in your course? Why do you choose to use these texts?” Given the diversity in terms of location and background of the sample population, responses varied greatly from instructor to instructor. Though clear favorites such as Penrose and Katz's *Writing in the Sciences* and Swales and Feak's *Academic Writing for Graduate Students* were very popular responses. Though there was little consistency from

instructor to instructor in terms of the specific texts they selected, specific types of texts, namely “how-to” texts and examples were quite popular: “I use the Handbook of Technical Writing by Alred, Bursaw, and Oliu and Williams’ Design for Non Designers Handbook. I also use a number of handouts,” “The selection of articles varies, but I use academic writing skills textbooks and a selection of articles suitable for the subject areas the students are interested in,” “...Mostly, though, we spend time with texts written by those who teach them and with the texts that they write themselves.” Such responses are not troublesome in and of themselves, but they are indicative of a broader pattern in the responses; instructors, like students tend to format the course as a skills-based “how-to” guide to writing in the sciences rather than as a course with true content, if not in the language they use in their lessons, at least in the texts they select for course use. Providing students with texts that foreground a prescriptivist genre approach to writing reinforce the popular stereotypes of English teachers, courses, and the broader discipline as prescriptivist and concerned only with the guidelines of one’s chosen writing handbook as the sole guide to determining students’ success or failure.

Though not as prevalent, a few instructors did explicitly foreground their instruction in rhetorical theory: “No textbooks. I use a variety of rhetorical readings to get started and shock science students into thinking of writing and science as flexible and dynamic. Miller (1984), Cooper (1986), Druschke and McGreavy (2016), Selzer on rhetorical analysis, Gross (1994), etc.,” “...I think I try to strike a balance between the practical and the theoretical that help to bring up questions of how writing functions in workplaces and how it impacts individuals.” The fact that these instructors who cited explicitly using texts deeply rooted in rhetorical theory does not necessarily imply that other instructors ignore rhetorical theory outright, however, their clear foregrounding of the rhetorical nature of these texts implies that they are likely much more

explicit in highlighting the rhetorical nature of writing and the importance of rhetorical theory in the Writing in the Sciences course. If most instructors responding to the survey focused their responses on handbooks, examples, and “how-to” guides to writing, their classes may likely take this shape as well. Such an approach would indicate a prescriptivist, skill-and-drill approach to Writing in the Sciences, which has proven ineffective in the FYC classroom and would reinforce the popular view of English as an atheoretical discipline with no true content to offer students.

Implications

Student and instructor responses were indicative of many important characteristics of the students entering the writing in the sciences course that may influence the possibility for cultivating a sense of consubstantial ethos. Survey responses suggest five important environmental factors of the Writing in the Sciences class, which we shall now explore in detail:

1. Students are open to the possibility of English courses as interesting and useful.

Despite popular perceptions of STEM students as categorically opposed to English courses, many student respondents indicated that they are ready, willing, and able to view their English courses in a positive light. Whether or not STEM students prefer their major courses to courses about writing and communication, these results would seem to indicate that in the Writing in the Sciences classroom, we have an audience that is already partially persuaded that writing and communication skills have the potential to impact students’ success in their major and beyond the college classroom. If students view the discipline of English as having something to offer them in the way of professionalization, instructors must attend to students’ understandings of the instructor’s teacherly ethos.

2. Students’ perceptions of and willingness to see English courses as useful are heavily influenced by their perceptions of course content, writing assignments, and the instructor.

Students' willingness to acknowledge the usefulness of Writing in the Sciences and other English courses was not without its conditions. Students also believed that a great deal of their attitudes and beliefs regarding the value or usefulness of an English class was contingent on the actions and competence of the instructor of the course, the organization of the course, and the course's having a clear content. If this is the case, the instructor has a clear-cut strategy heading into the course. One must be prepared to have a transparent trajectory for the course and to be explicit about the disciplinary "content" of Rhetoric and Writing Studies that is important for students to learn. Similar to the ways in which Plato's Socrates in *Gorgias* labels rhetoric as mere cookery and bemoans what he perceives as the discipline's lack of true content, many students reported that they want a clear, discernible content for their courses. When students reported disliking an English course, they often followed their discussion of the course instructor with mentions of a class's perceived lack of content or seemingly arbitrary writing assignments and daily tasks. This does not mean that we must necessarily raze our syllabi and start from scratch, but we must look at what we do as instructors, what content we include in our courses, and what tasks we ask students to perform, and then we must work to be very explicit and transparent in articulating the purposes behind the various aspects of a course. If students understand why the class involves a particular reading, topic of discussion, or assignment, they are much more likely to discern some sort of content undergirding the course rather than a series of skill-and-drill hoops to jump through throughout the semester.

3. *Students entering the course privilege the professionalization and scientific aspects of the course while instructors focus more on improving writing skills more broadly.*

Just as the instructor must prepare the students for the content of the course, they must also prepare them to understand how that content will help them in their professionalization and their

work towards their degree. Not surprisingly, students, when asked about their expectations of the course emphasized the “Sciences” portion of Writing in the Sciences rather than its having to do with “Writing.” Instructors, on the other hand, emphasized writing and related tasks such as research, critical thinking, and analysis. In order to ensure appropriate student-instructor relations for creating an effective consubstantial ethos, this dissonance must be addressed. Particularly in Writing in the Sciences classrooms wherein the instructor is a scholar of Rhetoric and Writing Studies rather than a scientific discipline, the course cannot focus predominantly on the topic of science and be effective as the expertise of the instructor lies elsewhere. In addition, “science” is an umbrella term, overused in popular parlance and improper for labeling the course. Students in my Writing in the Sciences courses come from disciplines nearly as diverse as students’ individual backgrounds. When one has a student body comprised of pre-medical majors, students in Psychology, Natural Resources Management, Veterinary Technology, and Physics, it becomes impossible to prescriptive instruction in genres that will fit every student’s needs. To teach students all aspects of how to become proficient in writing in the sciences, even just within their individual majors, one would need far more than one semester. As such, Writing in the Sciences instructors must ensure students understand that the course necessarily focuses on approaches and content that will help students learn *how to learn how to write* for various situations rather than direct instruction on topics such as genres. Constructing a course in this way requires additional transparency on the part of the instructor regarding both student and instructor roles and responsibilities.

4. *Students entering the course struggle to explicate a framework for student and instructor roles and responsibilities that deviate from the traditional lecture or banking model of*

education while instructors have a clear preference for a guide-on-the-side approach to instruction.

Student responses to surveys and conversations I've had with my own students suggest that they are quite comfortable with a lecture-style course in which students' primary responsibilities include note-taking and completing examinations. The Writing in the Sciences classroom, however, necessitates more active participation than traditional lecture-style courses. When the instructor comes from a discipline vastly different from the majority of students, the instructor must position themselves as the expert on the subjects of Rhetoric and Writing Studies and encourage students to take a more active role as pseudo-experts and ambassadors of their respective disciplines. Instructors must be up front about their approach in the classroom to ensure such a framework can be successful. If students are unprepared for the more active role they may be expected to take in the Writing in the Sciences classroom, they may ultimately shut down, but if they understand the ways in which Writing in the Sciences may differ from their traditional classroom experiences and that the instructor will necessarily take a guide-on-the-side approach to instruction, this lays a solid foundation for a sense of consubstantial ethos.

5. Many instructors assign texts in Writing in the Sciences courses that privilege a prescriptivist "how-to" approach to writing rather than texts steeped in rhetorical theory.

Though many instructors indicated that they were more concerned about the "writing" aspect of the Writing in the Sciences course, a substantial number outlined a surprisingly prescriptive approach to the class. Instructors detailed goals of very explicit, prescriptive writing instruction in genres such as proposals and IMRAD reports. In addition, very few instructors indicated including readings with a particularly rhetorical approach, instead favoring readings on how to

craft particular genres. Instructors also cited frequent use of examples from professional and student work as models for classroom expectations. Explicit, prescriptivist genre instruction has proven ineffective in the FYC course, and its use with third- and fourth-year students, likely does a disservice as well. Therefore, just as Downs and Wardle (2007) advocate for a re-envisioning of FYC as an Introduction to Writing Studies course, I argue that a model of the writing in the sciences classroom that focuses less on teaching genre and more on explicit instruction of the content of Rhetoric and Writing Studies such as Karen Burke LeFevre's understanding that all rhetorical invention is always already a social act, James Paul Gee's concept of Discourse/discourse and Amy Devitt's approach to critical genre awareness can better engage and prepare our students for the varied rhetorical situations they encounter in their courses and post-collegiate careers. In the following chapter, I outline how a Writing Studies framework can best inform the writing in the sciences classroom and how two unique assignments can be utilized in the classroom to encourage students to reconsider their approach to writing and its role in their disciplines.

Limitations to this Study

Though the data gathered from the surveys undoubtedly helps provide better understanding of ethos in the writing in the sciences classroom, the study, of course, has its limitations. Firstly, students in the survey were all students enrolled in Writing in the Sciences courses wherein the instructor held a degree in English, Rhetoric, or a related discipline. This was the intended area of study as the dissonance of student and instructor expertise in such a setting provides an interesting avenue for inquiry. In an effort to focus on this unique classroom environment, the recruitment e-mail for instructor participants specifically requested individuals who "have a background in any English-related field (Rhet-Comp, Literature, etc.) and work

with students in a course or courses geared towards helping students write in STEM professions.” Though the survey did not explicitly ask for instructors’ education backgrounds, it became clear in reviewing the data that many of the instructors likely had scholarly expertise in areas outside of the English department as inferred from several instructors reporting that they taught classes such as General Chemistry, Graduate Statistics, and Biochemistry or explicitly stating their position was not housed in the English department. These statistics complicate the instructor data because instructors from these disciplines lie outside the intended sample population, but are intriguing nonetheless because they offer insight into another significant portion of the population responsible for teaching Writing in the Sciences. Unfortunately, the nature of the data made it impossible to clearly separate instructor responses by disciplinary background.

In addition to the variety of disciplinary backgrounds of the instructor responses received, a number of instructor participants reported teaching in international contexts or, at the very least, Qualtrics software used in collecting survey data indicated that these instructors completed the survey in a location outside of the United States. Increasing the diversity of the locations of instructor locales certainly does not invalidate the study; arguably, it may even enrich it. Despite this fact, this unexpected diversity of populations points to the potential for greater specificity in future scholarship on the topic. Instructors with expertise in STEM disciplines bring a very different set of experiences and skills to the writing classroom, and likely have different conceptions of the goals of such a classroom than scholars of Rhetoric and Composition. Similarly, the U.S. context for the writing in the sciences course differs from that in other universities or even the ELL-specific courses in the United States in which several participants reported teaching. Future research into these differing contexts will undoubtedly shed light on

the specific needs of these diverse populations and, in turn, improve pedagogy. In addition, because the data gathered in this study were all self-reported, this could potentially skew the data. More objective methods such as providing students with skills-based assessment tests related to the central concepts of scientific writing or writing in general may provide important data to supplement the picture of the needs of Writing in the Sciences students as they enter our classrooms.

Though these factors are somewhat limiting, the data derived from this study provide interesting insights into the unique setting that is the Writing in the Sciences classroom. The majority of students come into the class willing to believe that writing is important and that they have the necessary skills to be successful in writing and in the course. Responses suggest, however, that students' previous experiences in English courses may color their attitudes and beliefs about the Writing in the Sciences course before they even set foot in the door. This and other factors such as differences in student and instructor beliefs about the overall trajectory of the course and the roles and responsibilities of students and the instructor in the course reveal that we might not be on the same page as our students. If students and instructors report completely different envisionings of the course, this may limit our ability to cultivate a truly consubstantial ethos. Because of this, we must explicitly acknowledge our students' attitudes and expectations for the course and be transparent about our own. Some may argue that doing so privileges students over the instructor. This, however, could not be further from the truth. Acknowledging students' hopes for what the course will be does not necessitate acquiescing to student demands. Rather, it helps students see that instructors and students truly are in it together in regards to the success of the course. Lastly, though instructors privilege skills such as analysis and critical thinking, the texts and assignments outlined by instructor responses suggest many

continue to use a skill-and-drill approach in Writing in the Sciences. Because students report wanting to see a clear content for the course, instructor and student expectations for the course are somewhat dissonant, and instructors self-report a desire for a more content-based course, Chapters 3 and 4 outline potential adjustments that could be made to the Writing in the Sciences course in terms of its content and assignments that may help address the issues raised in this study.

CHAPTER 3: RE-FRAMING “WRITING IN THE SCIENCES” AS “RHETORIC OF SCIENCE”

The data provided by student responses to the survey suggest there are several simple pedagogical changes that can be made to the Writing in the Sciences classroom in order to create a culture of consubstantial ethos more conducive to student learning. Surveys revealed that students are very receptive to the idea of English classes having inherent value provided they see the instructor as competent and having their best interests in mind and they see the material or course content and assignments as relevant to their major and/or contributing to their professionalization. All three of these components--instructor, content, and assignments--are directly tied to the ethos of the instructor. The first component of student perceptions of instructor competence and character fits the Aristotelian definition of ethos very clearly. The second and third aspects of course content and assignments are related to instructor ethos more indirectly. As Terence McLaughlin's definition of ethos outlines, "Although ethos most commonly refers to something which is experienced, an 'intended' ethos as well as an 'experienced' ethos can be pointed to in the case of an ethos which is deliberately shaped or stipulated." (312) The content of our discipline or, in other words, the theory of English and its various subdisciplines we bring into the classroom to our students serves as a representative of what shapes our perceptions, attitudes, beliefs, and dispositions. Put another way, the content of our courses represents to our students the clearest sense of our worldview that they will see. It is "deliberately shaped" by the texts we include as required course readings and the topics we foreground in in-class discussion and has an intended effect which may or may not resemble students' actual experience of the content.

Further, McLaughlin, outlines ethos as, “evaluative in some sense and is manifested in many aspects of the entity in question and via many modes of pervasive influence” (311). The evaluative nature in regards to student attitudes and perceptions has been foregrounded thoroughly thus far. University students come into Writing in the Sciences and other courses with preconceived notions of what English as a discipline is and what English instructors are like as people, whether those evaluations are accurate or not. Just as student’s attitudes and expectations are important, instructor evaluation and appraisal of classroom ethos is just as influential in a model of consubstantial ethos. In a very literal sense, the most evident forms of direct evaluation--instructor grades and student evaluations of the instructor--are closely tied to the ethos of a given course. As the instructor evaluates the students, the students evaluate the instructor and vice versa. As one student respondent reported in Chapter 2, an important determinant of whether or not students view an instructor and course as effective has to do with an instructor’s means of evaluation, both as it relates to more explicit evaluation like grading and more nuanced evaluation like feedback for revision. As the student indicated, instructors willing to work with students when they struggle rather than simply passing judgment or evaluating harshly without providing means for collaboration between instructor and student in improving writing are generally viewed more favorably. The instructor, course content, and assignments an instructor chooses, then, greatly contribute to the overall sense of ethos of a course. In fact, McLaughline observes, “The influence of an ethos is seen in the shaping of human perceptions, attitudes, beliefs, dispositions and the like in a distinctive way which is implicated in that which is in some sense established.” (311-12). Seemingly then, anything an instructor or student does in a course has the potential to shape its ethos. This butterfly effect may seem to place an undue burden on the instructor to be nearly authoritarian in attempting to control all factors of the

classroom environment that may create an unfavorable sense of ethos, but such an all-encompassing attention to minor details is not only undesirable but certainly impossible. That said, an instructor should consider ethos as a central concern and work to control those most central components of ethos outlined here: student perceptions of instructor competence and character, course content, and course assignments.

Part of an instructor's goal in teaching the content of his or her discipline is to encourage students to incorporate the content of our courses into their ever-evolving worldview. Eric White argues that this is built directly into the core values of the National Academic Advising Association: "Most noteworthy is the imperative to *engage students beyond their own worldviews.*" (138) This, White suggests, indicates that "the academic advising community synchronizes itself with the ideals of a general education curriculum that asks students to challenge their own perspectives or at least to acknowledge other viewpoints as viable" (141). The texts that we choose to use in our courses and the theories that we choose to foreground become an important part of our ethos and the ethos of our discipline. According to the results of my instructor survey, however, a surprising number of instructors self report teaching little to no "theory" in their Writing in the Sciences courses, focusing instead on an approach that instructs students rather in the intricacies of how to write in a series of "scientific" genres such as the research proposal and IMRAD report. Because of the self-reported nature of my data, it may simply be the fact that these instructors *do* incorporate some direct instruction in rhetorical theory and incorporate readings with such content and simply chose not to report it when responding to the survey. The noticeable lack of instructors explicitly reporting their use of direct instruction in rhetorical theory remains important, however, because it suggests that even if these instructors do teach theory in Writing in the Sciences courses, they may not see it as central to

their instruction of such courses. If, as I suggest, the disciplinary content we teach in our courses is central to shaping students' perceptions of our worldviews/ethos, in courses in which there is no discipline-specific theory taught or in which this theory is taught but seen as secondary, the ethos of our instructors, courses, and discipline that we attempt to project could understandably ring hollow for many students.

In the following two chapters, I suggest two significant pedagogical revisions to the Writing in the Sciences classroom to ensure students are more likely to be receptive to the ethos we as instructors and scholars of English and its subdisciplines project and, by extension, what we have to offer when teaching Writing in the Sciences: 1) we can alter the course content to make the course more content-based and less skills-based, so students see the instructor as a competent part of a broader academic discipline with true theory and content that is rigorous and valuable, and 2) we can implement assignments that help to scaffold and further students' learning of these new course concepts. This chapter will explore the possibilities for implementing more theory in the Writing in the Sciences course and make some suggestions for readings in broader Rhetoric and Writing Studies theory that because of their focus can be of practical help in instructing students in the Writing in the Sciences classroom.

From Writing in the Sciences to Rhetoric of Science

Many scholarly studies have explored the importance of perceived instructor ethos. Teven and McCroskey outline three dimensions of teacher credibility or ethos: competence, trustworthiness, and caring (2). Scott Myers notes that an instructor's ethos is typically directly associated with his or her perceived effectiveness (130). In addition, credible instructors are seen as less likely to use ineffective behaviors that may inhibit student learning (Thweatt and McCroskey 350). Not surprisingly, studies also indicate that students of instructors perceived as

credible report higher feelings of motivation in the classroom (Martin, et al. 437). Because the ethos we project influences students attitudes, it is also worth noting that several scholars have suggested that students attitudes toward specific disciplines may be connected to the grades students receive in courses in these disciplines (Gable and Roberts 289). The results of my student surveys echo the work of these previous scholars; students want their instructors to be knowledgeable, and they want the instructor to have their best interests at heart, to create a sense of consubstantial ethos. Cultivating such an ethos can be difficult in a general education course such as Writing in the Sciences because students often see general education as irrelevant obstacles on their journey to a major and a career (Kirk-Kuwaye and Sano-Franchini 99). In such an environment a skill-and-drill approach in which students are taught explicit genres and asked to play-act them for an instructor is doomed to fail. I advocate that a smarter approach to the Writing in the Sciences course is to reframe it not as a course on *how to write* in the sciences, but rather as a course on the rhetoric of science, one that focuses more on *how to learn how to write* in different situations one might encounter.

My suggestion for re-framing courses such as Writing in the Sciences as courses with a rhetorical rather than a prescriptive bent is not wholly original. In 2007, Downs and Wardle argued for a re-conception of First-Year Composition as an Introduction to Writing Studies course. The general assumption of students, university staff, and community members outside the university is that First-Year Composition should teach students a universal approach to writing that will help them to be effective writers in any and all situations. Such a universal standard does not exist, however. By refusing to resist this popular misconception, Downs and Wardle argue that writing instructors, “silently support the misconceptions that writing is not a real subject, that writing courses do not require expert instructors, and that rhetoric and

composition are not genuine research areas or legitimate intellectual pursuits” (553). In essence, we help to perpetuate the notion that ours is a “trivial, skill-teaching discipline” (553). To do so ensures that students will be more reluctant to take our courses and our discipline seriously and will reject the notion that writing courses have relevance for their education.

For the First-Year Composition classroom, Downs and Wardle propose a new set of pedagogical best practices for resisting these misconceptions regarding what English courses’ goals are. They argue that instead of focusing on trying to teach students how to write a few different genres (often genres that are heavily Humanities and English-specific in nature), instructors should focus on approach to teaching about writing or rather, writing about writing: “This pedagogy explicitly recognizes the impossibility of teaching a universal academic discourse and rejects that as a goal for FYC.” (553) Downs and Wardle’s method of teaching FYC rejects the popular belief that there exists one true standard by which to assess all writing. Downs and Wardle claim that doing so changes the overall approach to FYC more broadly: “It seeks instead to improve students’ understanding of writing, rhetoric, language, and literacy in a course that is topically oriented to reading and writing as scholarly inquiry and encouraging more realistic understandings of writing.” (553) Downs and Wardle’s approach can help instructors resist teaching prescriptive ways of writing a few simple genres and allows us to help students learn that writing is “neither basic nor universal but content- and context-contingent and irreducibly complex” (558). Downs and Wardle suggest that helping students better understand the complexity of writing in the FYC classroom can not only better prepare them for future writing situations, but also help them to appreciate the overall complexity of writing and communication oriented disciplines.

If, as Downs and Wardle suggest, teaching FYC as a skills-based rather than a content-based course only serves to harm our standing in the academy and with our students, surely teaching Writing in the Sciences in this way does us no favors. Though a classroom such as Writing in the Sciences is necessarily more focused than FYC in terms of its goals and the fields of study of the students, a universal ideal of *good writing* still eludes the Writing in the Sciences classroom. This is not only because of the inherent complexity of writing but also because of the diversity of disciplines underneath the umbrella term of “science.” In any given semester while teaching Writing in the Sciences, I have encountered students in Psychology, Physics, Earth Science Education, Natural Resources Management, and dozens of other disciplines. In addition, due to oversights in advising at my institution, each semester I encounter a handful of engineering and pre-medical students in my classroom who actually have WID courses devoted to their own majors but who take my class because of scheduling or other various reasons. Because of this diversity, a “how-to” writing approach misses the mark of effective pedagogy. Downs and Wardle claim that Writing Studies content can be made perfectly accessible to first-year students in a general education setting. Similarly, the rhetorical content can be made accessible to students in an upper-division writing classroom. As an added benefit, students in such a classroom are further along in their disciplinary apprenticeship and, as such, will have more specific examples and knowledge to share in classroom discussions regarding writing and communication.

Downs and Wardle’s approach is not without its skeptics, of course. Miles et al, believe that such an approach “[dismisses] the importance of teaching situated procedural knowledge” and that Downs and Wardle’s approach is one “in which one course stands in for the whole of the discipline. In this shorthand, *the course equals the field*; for Downs and Wardle, *the field* then

equals *the course*” (504). Similarly, Joshua Kutney cautions, “we must not assume that the awareness *teaching about writing* offers will transfer beyond course or student” (279). This is a valid point, but one that could theoretically be made about anything taught in the university setting. One can’t be sure that the basics of wave-particle duality taught in a general education Physics classroom will transfer beyond the classroom, but that doesn’t stop the instructor from trying to instruct students regarding important theories of the discipline. The central concerns with Downs and Wardle’s approach seem to be “1) putting writing studies in first-year composition (FYC) weakens a writing studies curriculum; 2) putting writing studies in FYC unnecessarily engages all students too deeply in the disciplinary work of composition and rhetoric” (Bird 166). The reasoning behind this first charge that putting Writing Studies content into FYC courses is specious at best and smacks of intellectual elitism, suggesting either that first-year and non-English-major students could not possibly be mature or cognitively equipped to understand the intricacies of Writing Studies or that to bring Writing Studies content to students in these demographics taints it in some ill-defined manner. Making such a claim equates to reasoning that enrolling students in a general Chemistry course brings them *too deeply* into the discipline of Chemistry. The implication would be that students should focus solely on the specific content of their discipline, effectively doing away with general education courses and the frequently touted ideal of educating “well-rounded students” entirely.

Given the centrality of writing to all disciplines, one could argue that it makes perfect sense to bring students deeper into the world of Writing Studies, particularly when instructors are tasked with teaching courses geared towards helping students better understand the ways in which writing functions in specific disciplines. Downs and Wardle believe their re-envisioning of FYC goes a long way towards helping students better understand the complexity of writing

and even the simple fact that disciplines surrounding writing even exist and perform important inquiries in their field of study:

[I]ntroductory courses make students aware of what's going on in disciplines they don't wish to join, and that is much of their value, and point. Particularly for disciplines that students don't even know exist (nor do their parents, nor the colleagues and administrators and politicians who decide our funding and fate and approve the very curricula for which Miles et al. argue), it is hardly a gray area to design courses that make students aware that what they're learning is backed by disciplinary expertise of the same sort as other intro courses. (Downs 172-73)

As my own survey data suggests, even more advanced students in their third or fourth year of postsecondary education entering upper-division WID courses have little to no understanding of the scholarship that undergirds the fields of Composition, Rhetoric, Writing Studies, and English more broadly. Rather, they see the courses as skill-and-drill courses or somehow misconstrue all English courses as focused on literature and/or creative writing. Regardless of the specifics of their misconceptions and what they believe the content to be, they often see the field and the discipline as atheoretical in nature. Reforming the Writing in the Sciences classroom to incorporate more of the content and theory of the disciplines of Rhetoric, Writing Studies, and English can help students recognize the existence of a massive body of research existing and ongoing on the topic of writing. This can in turn help bolster the ethos of the instructor by showing them to be a knowledgeable scholar in an academic field with a more tangible and important purpose.

One of the primary reasons for reframing FYC to focus on more rigorous Writing Studies content is that doing so requires students to step into a more scholarly role. Downs asserts,

“What we believe is that there are a lot of reasons why, since FYC can’t teach everything...it can teach scholarly inquiry particularly well” (173). Though Downs speaks specifically of FYC, these sentiments are applicable to upper-division WID courses as well. I echo Downs in my belief that for myriad reasons it is a fool’s errand to attempt to teach Writing in the Sciences as a course intended to teach students *how to* write in the sciences. Instead, I advocate an approach similar to the Downs and Wardle’s Introduction to Writing Studies version of FYC. This approach eschews problematically prescriptive instruction in the various common genres among scientific disciplines and allows more room for Downs and Wardle’s goal of turning writing courses into spaces for scholarly inquiry. It is important to note that my approach does not necessitate wholly removing instruction of various prominent scientific genres such as the proposal and IMRAD report. On the contrary, the suggested approach includes these genres, but works to help students think more critically about their creation of these genres by incorporating more readings on the theory of Rhetoric and Writing Studies. The following section details some of the core theories or concepts that should be implemented in the Writing in the Sciences classroom.

Core Concepts of Writing Studies for Writing in the Sciences

Making the commitment to re-frame Writing in the Sciences courses to include more explicit instruction in the theory and content of Rhetoric and Writing Studies is an important first step. Making this step, however, also raises the question of what specific content should be taught in the limited time one has over a semester. In *Naming What We Know: Threshold Concepts of Writing Studies*, Linda Adler-Kassner, Elizabeth Wardle, and others outline what they believe to be the most prominent threshold concepts of Writing Studies. Adler-Kassner and Wardle’s work builds from that of Meyer and Land who define a threshold concept as something

“akin to a portal, opening up a new and previously inaccessible way of thinking about something. It represents a transformed way of understanding, or interpreting, or viewing something without which the learner cannot progress” (1). Threshold concepts, according to Meyer and Land can also be conceived of as “core concepts” and “building blocks” upon which the foundation of a student’s understanding of a given field and their subsequent academic success is built (4). Once a student better understands a threshold concept within a given field, this transforms the student’s understanding of the entire field and this brings them closer to being a full participant in the field: “Such a transformed view or landscape may represent how people ‘think’ in a particular discipline, or how they perceive, apprehend, or experience particular phenomena within that discipline” (1). Threshold concepts are thus not just important for one to understand the basics of a field but *essential* knowledge for one hoping to become a participant and work in that field.

Though the transformative nature of threshold concepts may make them seem something like an immediate gestalt switch, Meyer and Land caution readers that student understanding of these concepts may not be immediate. Truly understanding a discipline’s threshold concepts may take an extended period of time and can prove to be a struggle for some learners depending on their skill sets. For students in Writing in the Sciences, instructor and student struggles may be compounded by the fact that students, many of whom view English as an atheoretical discipline without content may very well view the discipline as one without threshold concepts to learn. As indicated by student responses to this study’s surveys, many students view their previous English courses as highly atheoretical, and as students elaborated, this perceived lack of content can be detrimental to their overall perception of the competence of the instructor and the value of the course and can cause students to become disengaged. Helping students better understand that

English is not a discipline without content and, in turn, helping them learn what the key threshold concepts in any course are can likely serve to help them to better engage with courses such as Writing in the Sciences and to see the discipline of English in a more positive light.

Adler-Kassner and Wardle's text is centered around five core principles and one metaconcept. The metaconcept of the text is that is absolutely imperative to view Writing as "an Activity and a Subject of Study." Building from this underlying premise, the authors detail the discipline's five central threshold concepts:

1. Writing is a Social and Rhetorical Activity
2. Writing Speaks to Situations through Recognizable Forms
3. Writing Enacts and Creates Identities and Ideologies
4. All Writers Have More to Learn
5. Writing is (Also Always) a Cognitive Activity (v-vi)

These threshold concepts are inarguably central to the project of Writing Studies, however, it would be incredibly difficult, if not impossible, to educate a course of even the most dedicated English majors on the finer points of these threshold concepts in the course of one short semester. I suggest three smaller concepts that can help instructors in Writing in the Sciences to better educate their students on the concepts most helpful in their quest to become better writers in their disciplines: Karen Burke LeFevre's view of rhetorical invention as a social act, Amy Devitt's approach of critical genre awareness, and James Paul Gee's understanding of Discourse communities. Though these three concepts fall short of encompassing every facet of Adler-Kassner and Wardle's list, they provide a practical and accessible introduction to the content of Writing Studies and serve the broader goal of helping students more independently and critically engage with communication practices in their respective disciplines. These three readings also

foreground the social nature of writing, the importance of rhetorical context, and the ideologies and power dynamics that inform writing practices, which can potentially contribute greatly to student understanding of the first three threshold concepts on Adler-Kassner and Wardle's list.

Invention as a Social Act

In *Invention as a Social Act*, Karen Burke LeFevre enumerates an important misconception of writing, which is that it is “commonly viewed as the private act of an individual writer for the particular event of producing a text, typically a theme or an essay” (1). Much as the writer is often depicted as the individual, secluded artist engaged in a lonesome labor of art, depictions of scientists in the media and popular culture often portray science practitioners as lone geniuses, or more troublingly, as reclusive mad scientists. Pushing back against these stereotypes of writers and scientists should be a central goal of Writing in the Sciences courses and LeFevre's work makes great strides in doing so. *Invention as a Social Act* was published almost three decades ago, but these popular ideas about writing as a solitary act still hold true today and are exemplified and amplified by student responses to my surveys. Students frequently talked about their own misgivings about writing and the individual issues they have with the practice of writing and saw writing as unrelated to their disciplines. Students rarely identified writing as a social experience other than the interactions they saw happening in the assessment of student work by their instructors.

LeFevre believes the continued perception of writing as a highly individualistic act persists because of the longstanding privileging of a Platonic worldview in Rhetoric and Writing studies. Such an approach has its strengths, she acknowledges, but it limits our discipline in three important regards: “A Platonic view of invention leads us to favor individualistic approaches to research and to neglect studies of writers in social contexts” (23), “A Platonic view depicts

invention as a closed, one-way system” (24), and “A Platonic view abstracts the writer from society” (25). The combined effect of these smaller problems is that our students view their writing as a product of their own making, and if they succeed or fail, it is viewed solely as the effect of their own effort or efficacy as a writer. In addition, because of the continued views of writing as solitary and science as performed by scientists in solitude, STEM students may perceive writing as apart from their work in the sciences rather than a part of their work in the sciences. I would argue that this, in turn, also inhibits students’ research processes because when they view writing as a solitary act, they are less likely to recognize ongoing dialogues as central to the work of their field and thereby less likely to seek out the conversations that are already ongoing in their fields to better understand their import and how such conversations are carried out.

LeFevre’s overall thesis is that, “writing is better understood as a social act, in which an individual who is at the same time a social being interacts in a distinctive way with society and culture to create something” (1). Such an approach to theorizing writing allows for consideration of the great influence of other individuals and institutions on each individual and the free flow of information and influence between individual and society. The self is not simply constructed socially, but constituted socially as well (2). LeFevre makes many recommendations for improving pedagogical practices to better demonstrate the social nature of writing to our students. She suggests not only more group activities and authorship but also questions the institutionally-entrenched practice of providing individual grades to individual students for individual assignments. Adopting LeFevre’s view does not mean embracing a course based solely on group work and group writing. On the contrary, it simply means that students are encouraged to see themselves, their writing, and the work of their disciplines as inherently social:

“Central to this perspective, as we have previously seen, is the point that invention is appropriately viewed as social in nature even when the primary inventor is an individual” (133). Even if students are convinced that writing does have a place in the sciences, many might still remain reticent to recognize the social nature of their disciplines or the fact that the writing they will do as scientists always already exists as part of a larger scholarly or public conversation. Using LeFevre’s perceptive, engaging, and palatable theory of invention as a social act and incorporating documents such as scientific literature reviews and science communicators such as Neil deGrasse Tyson and Bill Nye as part of in-class discussions and including small-stakes writing assignments in which students seek out the social actions of their disciplines might be a small but significant first step towards helping students better understand the importance of writing in their disciplines, the social nature of these disciplines, and the overall purpose of Writing in the Sciences courses.

Critical Genre Awareness

In addition to better understanding the importance of social interaction and communication within their disciplines, students of Writing in the Sciences should also work towards thinking critically about these social interactions. In her chapter, “Transferability and Genres” in the 2007 collection, *The Locations of Composition*, Amy Devitt argues for a more careful approach to the ways in which we instruct students about genre. Devitt’s conception of genre is highly informed by Carolyn Miller’s definition of genres as “typified rhetorical actions based in recurrent situations” (159). Because of this, Devitt’s understanding of genre and writing, like LeFevre’s, is highly social in nature. Devitt begins the chapter by discussing a common conversation in academic circles in which a senior STEM faculty member challenges her about her teaching abilities, asking why she and others in her department are unable to instruct students

how to more properly write research reports. As Devitt points out, however, in the setting of her own Composition courses, a research report is a completely different genre from the research report of the biology classroom. She argues that many writing instructors attempt to explicitly teach a number of genres assuming those genres will simply transfer into different settings with little to no generic changes. Such attempts at prescriptive genre instruction are inherently flawed because they fail to instruct students in the importance of accounting for rhetorical context, which is necessary for a successful rhetorical exchange. Students instructed in such a way may attempt to transfer existing genre knowledge from previous courses but misapply this knowledge because they fail to think critically about the change in rhetorical situation and how the application of their existing knowledge may be inappropriate for the new situation.

In my own classroom, I have seen these narratives play out over and over again. The students who struggle the most are often those attempting to substitute a genre learned in a previous course for one they're tasked with writing in my course. Devitt asserts that students learn genres not by transferring skills from one situation to another, but by attempting to use their genre repertoires to learn new genres: "The writer moving among locations carries along a set of writing experiences, including the genres acquired in those various locations. That set of acquired genres, that genre repertoire, serves as a resource for the writer when encountering an unfamiliar genre" ("Transferability" 220). A student approaches an unfamiliar genre most effectively by selecting a familiar genre from their repertoire and attempting to use it to learn the nuances of the new, unfamiliar-but-related genre. If a student has no mastery of similar genres, their task in learning a new and unfamiliar genre becomes increasingly difficult. As such, students who learn how to write research reports in a FYC course who simply try to directly transfer the genre of "research report" to their other STEM-based courses may struggle in writing

in those courses because the generic conventions of a research report written for a Biology course are strikingly different from those in an English course.

Writing instructors' immediate reaction to these revelations may be to simply try to teach as many genres as possible in their courses. As Devitt points out, however, this approach does little to help students because it lacks depth. Rather, she argues for a more careful selection of genres to help build an effective genre repertoire for students (223). Though Devitt leaves this selection somewhat vague for the FYC instructor, for the instructor of the Writing in the Sciences course, this task is somewhat easier. Though students in Writing in the Sciences come from a variety of disciplinary backgrounds, there exist several prevalent commonplace genres. Helping students better understand the genres of proposals, progress reports, and IMRAD reports may provide a solid genre repertoire for science students to build from as these are common to many disciplines. In addition, because I agree with Devitt's foregrounding of the need for students to engage in more direct analysis of texts and genres from their disciplines, I incorporate a forum analysis in my own Writing in the Sciences classroom to help students explore how writing in their fields differs from writing for a general public. Devitt observes, "Perhaps general writing skills do not exist, but knowledge and experience do. Carrying with them knowledge of genre and experience with antecedent genres, writers carry baggage that can help them go far" (225). This claim is particularly applicable for those of us instructing advanced undergraduate students. In courses such as Writing in the Sciences, students bring with them not only knowledge gained in their FYC courses, but also knowledge of other writing they've completed for other courses as well as experience of times when that knowledge helped them succeed in writing and when it failed them. If we are careful in our genre selection, our incorporation of new course concepts and texts to build students' knowledge of Rhetoric and Writing Studies, and

we allow space for students to reflect upon their own experiences of success and failure in writing, we can make immense strides towards helping students better analyze the texts of their field, their own rhetorical situations, and the writing tasks set before them.

To best foster this environment, however, we must be attendant not only to students' understanding of how they can best work to transfer genre knowledge from one situation to the next, but also to Devitt's theories of critical genre awareness. Devitt complicates the notion of genres and the transfer of genres by explaining that in creating a genre for a particular writing situation, an author must first successfully construct the context for the writing situation in which the document will exist (*Writing* 21-25). As such, Devitt argues that any approach to teaching genre, "must develop thoughtfully, critically, and with recognition of the complexity, benefits, and dangers of the concept of genre" (191). She advocates for a teaching of genre in which students better understand the connections of contexts and forms, ideologies inextricably linked to genres and writing situations and the limits and possibilities that genres make available to authors (198).

An approach to Writing in the Sciences that foregrounds theory and content like LeFevre and Devitt's work in the way that general education courses in other disciplines foreground their content may worry some because many such courses, by virtue of ease of transmission, have historically been taught in a style heavily dependent on lengthy lecturing by the instructor. Though recent research in active learning has encouraged teachers in all disciplines to reconfigure their courses to focus less on lecture and more on active student participation, my students' own conversations in class indicate that lecture-heavy classes are still alive and well at the university level. Devitt assuages the fears of those worried about incorporating critical genre awareness as a core course concept: "Although I propose teaching such awareness explicitly, I

do not propose that a teacher lecture on these principles. Explicit teaching does not require presentational teaching” (198) Rather, Devitt pushes for “Environmental teaching” which “can most effectively lead students to explore and discover for themselves these principles, which the teacher then helps to articulate and pushes students to practice” (198-99). Assigning students to read Devitt and others’ work for themselves and then spending class time applying what they read and learned about genre awareness to specific concrete examples will likely prove far more effective than spending inordinate amounts of class time lecturing to students about Devitt’s work. Still others may worry that a course steeped in Devitt’s critical genre awareness may succeed in teaching students to have a critical eye for writing, but may through its devaluing of prescriptive instruction, fail to teach students new genres. Devitt posits, however, that in learning to be critical of existing genres, students inevitably learn many prominent features of the genres analyzed, effectively learning the genres through critique of them (202). If prescriptive, how-to approaches to genre have proven ineffective and even problematic in their potential for transfer, an approach concerned more with rhetorical features and social context such as Devitt’s is arguably a better way forward. A critical and socially contextualized understanding of genre helps us learn “what ends we may have [...] to better understand the situations in which we find ourselves and the potentials for failure and success in acting together” (Miller 165). Devitt’s approach to genre helps students better understand the agency genres may provide in authorship as well as the potential for change that exist in writing and pushes students towards a more community-based understanding of genre.

Discourse (Communities)

An important extension to theorizing invention as a social act and educating students in critical genre awareness is increasing students’ understanding of the communities in which they

write and act. Many scholars have proposed their own definition of what constitutes a discourse community (Swales, Johns, etc.). All of these definitions have their respective strengths, but for the Writing in the Sciences classroom, I believe that James Paul Gee's delineation of Discourse/discourse helps students to best understand the important role that these communities play in shaping norms, particularly as they relate to communication. In describing the social nature of writing, LeFevre writes that, "Since neither the individual nor the group invents in a vacuum, we must consider the relationships of inventors to other social groups and institutions, all of which impose on inventors various rules, preferences, conventions, and restrictions" (133). Gee takes LeFevre's view of rhetorical invention and expands it to articulate a view in which one's whole identity is defined by the social. gee defines Discourses as "saying (writing)-doing-being-valuing-believing combinations" or "identity kits" (6-7). One's Discourse shapes not just how one writes and communicates but one's values, beliefs, and being.

Gee's view of Discourse has been critiqued by some as being somewhat ambiguous with its seemingly ill-defined borders and ever-changing rules, but I believe these to be aspects of Gee's concept of Discourse that make it greatly suited for the task of WID instructors. Communities change and overlap, and so too do the rules for communication within these communities, so a model of Discourses that accounts for this somewhat nebulous nature of the communities in which we participate, seems an appropriate fit. In addition, students in the Writing in the Sciences classroom occupy a constant state of liminality in the Discourses they encounter on a daily basis. Students occupy roles as new initiates in their various disciplines, more expert than the general public but still not part of the expert community. As STEM students, they enter the Writing in the Sciences classroom as outsiders exploring new disciplinary territory many of them may believe to be hostile. Their Discursive boundary

crossing doesn't stop at the door to our classrooms; many students are also involved in various extracurricular organizations and many have jobs, families, and faith-based organizations, all with their own attendant Discourses. Depending on socioeconomic status, race, and whether or not a student happens to be a first-generation college student, learning the Discourse of the university itself may be an added complication. For our students then, the messy combinations of Discourses they encounter justify a somewhat messy definition of Discourse such as Gee's to attend to students' complex experiences and interactions.

Gee's approach to Discourse echoes Devitt's approach to genre, positioning Discourses as something one cannot learn through explicit instruction but must encounter through immersion or "apprenticeship" (7). Student's primary Discourses are formed by the environments in which they were raised and as students begin to move throughout various social institutions, they encounter unfamiliar secondary Discourses, which students may or may not master. Gee's model of Discourse does not arbitrarily position these primary and secondary Discourses on a level playing field. Rather, Gee accounts for the complex power dynamics that shape the various primary and secondary Discourses one encounters. Gee delineates both dominant and nondominant Discourses. Dominant Discourses are those whose mastery can bring about the acquisition of "social goods" such as employment, money, and status. Nondominant Discourses are not without their social hierarchies and the ability to bring status to an individual within a particular community or network, but mastery of a nondominant Discourse lacks the mainstream status and social goods potential if one masters a dominant Discourse. Dominant Discourses, as Gee describes them, are also constantly imposing various forms of "tests" of individual fluency to re-assert their symbolic power in broader society (8). Students in Writing in the Sciences, of course, come to the course from an array of primary Discourses, but all of them,

in enrolling in some form of STEM major, engage in the act of acquiring mastery of a secondary Discourse (broadly referred to as “science”) that has long held great social sway in Western society. Primary Discourses, as Gee outlines them, can never truly be liberating literacies because one cannot be truly critical of the Discourse into which they’ve been so deeply enculturated. Rather, liberating forms of literacy emerge from one’s mastery of particular, privileged simultaneously secondary and dominant Discourses (10). For example, a student’s mastery of the Discourse of marine biology presents them with the privilege to present themselves with the identity of a marine biologist and the potential to acquire the various social accoutrements that accompany that position.

In order for students’ new literacies of Discourse to be truly liberating, students must do more than simply learn the “moves” of a given Discourse. Rather, they must acquire “a set of meta-elements (language, words, attitudes, values) in terms of which an analysis and criticism can be carried out” (10). Much as Devitt encourages an understanding of genre that is critically aware, Gee espouses an understanding of larger social structures that is critical in nature as well. A student is best prepared to prepare in a Discourse if they have the tools necessary to critique that community. Acquisition of a Discourse is complicated, however, by the fact that acquisition of a particular Discourse implies, at least for a time, that an initiate remain complicit in the various values systems adhered to by that Discourse, even when these values conflict with one’s primary Discourse, which may be problematic for our students who are women, students of color, or members of other disenfranchised communities. Particularly in the Writing in the Sciences classroom, complicity for students from these communities ignores historical injustices perpetuated by various scientific communities against marginalized communities (the atrocities of The Tuskegee Institute, for example). Gee acknowledges the problematic nature of asking

students to be complicit when communities take deplorable actions and calls for action on the part of educators in evincing social change:

Beyond changing the social structure, is there much hope? No, there is not. So we better get on about the process of changing the social structure. Now, whose job is that? I would say, people who have been allotted the job of teaching Discourses, for example, English teachers, language teachers, TESOL teachers, studies-skills teachers. (12)

Re-structuring the social strata is not just a Herculean task for teachers, it is in all likelihood, probably impossible. Instructors must not fight this fight alone, however, Gee encourages teachers to produce “‘mushfaking,’ resisting students full of meta-knowledge” in order to simultaneously produce “successful students and successful social change” (13). Though this may be seen as a move to politicize teaching, the Discourses STEM students are enculturated in throughout their education in their majors are political by their very existence--all systems with values are necessarily political. A move to provide students with the necessary tools to critique the Discourse of their disciplines may be political, but it also provides a humanistic perspective for STEM students to ensure that the values of their home disciplines do not remain unquestioned and unchecked.

Re-framing Writing in the Sciences as a course more dedicated to content and theory, then, is a means by which to produce students with a greater sense of agency. Instructing students in the threshold concepts related to the work of LeFevre, Devitt, and Gee provides them with more than fledgling knowledge of genres that may or may not transfer beyond our classroom. Students instructed in such theory learn about their social situatedness from LeFevre, they learn about the malleability of genres and how to critique them from Devitt, and from Gee

they learn to extrapolate this knowledge out to the Discourses they participate in, gaining meta-knowledge of the power dynamics inherent in Discourses and the tools necessary to analyze, critique, and eventually positively change these power dynamics. In addition to gaining knowledge of how to produce various genres as they might in a skill-and-drill course, students may learn to be more self-aware about their writing and participation in various Discourses. For students in marginalized communities, this provides insight into how they may gain the social goods that come from effective participation in dominant Discourses, and for students from more privileged communities, such an education may encourage them to take a more active approach in allowing for more marginalized voices to be heard in STEM communities. LeFevre, Devitt, and Gee are far from the only texts that provide possibilities for producing a transformative Writing in the Sciences framework, but they are effective in doing so and are accessible reading for undergraduate students. As an added bonus, the content of these authors clearly convey to students a more accurate picture of the disciplinary work available from scholars of English, Writing Studies, and Rhetoric. Providing a clear sense of disciplinary content, by extension, showcases the expertise of the instructors and makes a more substantial sense of ethos possible by highlighting ways in which the content of Writing in the Sciences may directly benefit students. Instructors of Writing in the Sciences likely have their own thoughts regarding readings that could best educate STEM students to think critically about their rhetorical choices and the values of their academic communities, but I offer up LeFevre, Devitt, and Gee as three thinkers who have greatly informed my views of Writing in the Sciences courses and engaged my students in lively discussions.

Countless other authors provide valuable insight for courses dedicated to scientific communication, and I include a partial list of supplemental readings here as a means of

encouraging instructors to be proactive in seeking out the rhetorical texts that might best fit with their particular teaching style and best inform their approach to teaching STEM students. This is by no means an exhaustive list and is based solely on my use of these texts in my own Writing in the Sciences classroom. The texts included were chosen not just for their relevance to the classroom context but also because they served to generate much greater discussion in daily discussions of “scientific” writing, disciplinary values, and generic conventions. While it would be exciting to include all of these texts in every class, I have found that I have had to pick and choose from this list based on the particular needs of my classes from semester to semester.

Suggested Supplemental Readings

Charles Bazerman- *Shaping Written Knowledge: The Genre and Activity of the Experimental Article in Science*

John Angus Campbell- “Scientific Discovery and Rhetorical Invention: The Path to Darwin’s Origin.”

Leah Ceccarelli- *Shaping Science with Rhetoric: The Cases of Dobzhansky, Schrodinger, and Wilson*

Jeanne Fahnestock- “Accommodating Science: The Rhetorical Life of Scientific Facts”

Dilip Parameshwar Gaonkar- “The Idea of Rhetoric in the Rhetoric of Science”

Randy Harris- *Landmark Essays in the Rhetoric of Science*

Thomas Kuhn- *The Structure of Scientific Revolutions*

Carolyn Miller- “Genre as Social Action”

Carolyn Miller- “Kairos and the Rhetoric of Science”

Richard Rorty- “Science as Solidarity”

John Ziman- “Scientific Method and Scientific Argument”

CHAPTER 4: ASSIGNMENTS TO ENGAGE STUDENTS WITH A NEW WRITING IN THE SCIENCES APPROACH

Reforming the content of the Writing in the Sciences classroom as suggested in Chapter 3 may begin to help improve students' abilities to better understand, analyze, and critique the discursive practices and broader values of their disciplinary Discourses. As an added benefit, it may improve the ethos of the instructor by providing a clearer sense of the content and theory the various subdisciplines of English have to offer by providing theoretical concepts that directly apply to the work students see as central to their disciplinary work. This can be seen as a start to the slow process of ameliorating STEM students' perceptions of the ethos of English courses and English as a discipline as atheoretical, impractical, or inapplicable to their majors. To make this content more tangible and present for students, however, it is also important to provide students with assignments that provide them with in-class opportunities for practice addressing a sophisticated audience and also also requiring reflection on key course concepts. Mike Schmoker, who argues for a practical approach to pedagogy, writes that in teaching, the only topic as worthy of discussion as *what* we teach is *how* we teach (50). With an eye to the content we teach and the ways in which we teach it, student responses to this study's surveys indicate that one must also consider student responses to the types of writing we ask them to complete. Much as students reported viewing a course's content as an extension of the teacher, they often decried work that they saw as "pointless" or "busy work." To address such responses, in this chapter, I will outline two writing assignments that aim to help students in Writing in the Sciences better understand those threshold concepts detailed in Chapter 3 and seek to provide our students with something more practical than "busy work."

The Forum Analysis and Popular Discourse Report assignments foreground the Writing Studies concepts outlined in Chapter 3--LeFevre's concept of invention as a social act, Devitt's critical awareness of genres, and James Paul Gee's understanding of Discourse communities--in ways designed to help with transfer and retention but also to engage students with their personal interests in their own disciplines of study. The first assignment, the Forum Analysis, aims to help students better understand the ways in which different forums and publications privilege different types of communication. The Popular Discourse Report, on the other hand, aims to help students better understand what happens when an expert from their discipline leaves their specialized disciplinary Discourse to communicate with the broader public. For both assignments, I will first describe the assignment expectations, its benefits in the Writing in the Sciences classroom, and problems one might encounter in implementing the assignment as well as potential solutions to those problems. The contradictory nature of espousing a critical genre awareness approach in the classroom and then suggesting a set of genres for use in the classroom is not lost on the author, so the chapter concludes with suggestions for means of maintaining critically aware approach to genre when assigning the Forum Analysis and Popular Discourse Report.

The Forum Analysis

When beginning the semester, I introduce my students immediately to Gee's discussion of Discourse communities and their first assignment--the Forum Analysis. After the basic introduction, syllabus, and housekeeping issues of the semester are taken care of, I engage my students in a discussion regarding their previous experiences in English courses and how writing may relate to their various disciplines. Perhaps because of the newness of the course or perhaps because of the uncomfortable nature of the questions--clearly loaded ones which they can

undoubtedly discern I have a vested interest in--students offer typically canned responses regarding the importance of communication and the need for attention to detail. When pressed further for their experiences in English courses, my students often come forth with responses that are somewhat more muted, but mimic the responses to this study's survey. Students relate that, in their experience English courses are primarily concerned with literature and/or creative writing, prize originality and opinion, and that English teachers are overly concerned with technical aspects of writing such as spelling, grammar, punctuation, and citation. At the end of this conversation, I introduce students to their first reading for the semester, Gee's "Literacy, Discourse, Linguistics: An Introduction." Before dismissing the class, I ask the students, regardless of their previous experiences, to think about the course as based on one of the central principles they will read about in the Gee article: that our understanding of literacy and the primary focus of literacy studies should be social practices rather than language itself (5). Students return to the course having read Gee's text, and we discuss important terminology and central concepts (Discourse/discourse, primary, secondary, dominant, and nondominant) before moving on to a discussion of how students see these concepts playing out in their own lives as well as in their disciplines. The discussion varies from semester to semester, but always centers on Gee's premise that "At any moment we are using language we must say or write the right thing in the right way while playing the right social role and (appearing) to hold the right values, beliefs, and attitudes" (6). Students often struggle to come up with examples of how this plays out in their lives off the cuff, but I ask them to journal about their Discourse experiences as they go about the next few days. Invariably, this helps students begin to see more concrete examples of the Discourses they move among and how social practices and communication change depending on the communities and their roles in them.

After these first few days of Discourse discussion, when it becomes apparent that students have at least a cursory understanding of the concept of Discourse and how it may relate to writing and their discipline, I introduce my students to the Forum Analysis assignment. My version of the Forum Analysis is adapted from that outlined by James Porter in his 1992 text, *Audience and Rhetoric*. The assignment asks students to find two articles on the same topic (climate change, for example) that are written for two very different audiences and purposes--one academic and one more general. Students select articles from prominent journals in their field for their academic text, but have much more leeway in their selection of the popular text. Students often clamor for the low-hanging fruit of articles from publications such as *The New York Times*, which may even link directly to a scientific article the students choose to analyze as their academic article. The more adventurous among them, however, find infographics, social media campaigns, YouTube videos, and other multimodal texts that fit the assignment just as well, if not better, than the traditional newspaper article. The more disparate the texts, I encourage my students, the richer their analysis will be.

After each student has selected two articles, they are asked to perform an in-depth analysis, both of the articles themselves and the forums in which the texts were originally published. Rather than composing their analysis in traditional essay form, I ask students to create their forum analysis as a website. Susan Miller-Cochran and Gierdowski explain that online writing environments help students conceive of writing tasks in different ways and allows for greater flexibility and design than traditional means of composition (51). I argue this more “modern” form of composition helps students better understand the value of writing because it provides students with a practical writing task such as composing a website, that students are likely to encounter in their everyday lives outside the classroom rather than providing a

traditional essay, which many students rarely, if ever, encounter outside the classroom. This helps both in terms of providing students with experience composing in a new medium and also aids in organization as many students struggle when attempting to organize a complex analysis in a more traditional style. When reviewing journals and articles, students are assigned to search for information about audience, genre, content, purpose, and other aspects of the rhetorical situations of the articles chosen building on critical genre awareness knowledge gained through example mini-analyses we perform on texts in class and Porter's prompts for the Forum Analysis (see Appendix E). Students must provide readers with information about their publications that informs the intended audience--other young scholars in their field--about the difference in writing for a popular audience and a scholarly audience and why those differences are important. Analyses include discussions of language use issues such as tone and diction, but students are encouraged to look for other rhetorical choices made by the authors of the text such as organizational values; means of encouraging access to additional information; audio; visual appeals including photographs, videos, logos, and figures; and choices regarding user experience. The hope is that in examining these features, students will begin to discern differences in audience and purpose and how experts shift their communication when moving from Discourse to Discourse.

Benefits

When I began teaching Writing in the Sciences, I was surprised to discover that most of my undergraduate students had little experience in seeking out academic articles in their disciplines, let alone extracting specific information from them or analyzing the rhetorical moves of such articles. One can begin assigning STEM-based research articles for reading and in-class discussion, but the question of which articles to select is a difficult one. Further complicating

students' lack of experience with journal articles and compounding the more general difficulty of teaching students to think critically about writing in their fields is the simple fact that the discursive practices amongst students' disciplines vary greatly from major to major, even in a more specialized course such as Writing in the Sciences. The discursive practices of the discipline of the writing instructor typically differ as well. Students in WID courses often complain about the lack of practical application and/or writing's unrelatedness to their major. Though instructors in these classrooms may see students' complaints as misplaced or inaccurate, students, regardless of discipline, like to see some sort of practical application or "real-world" extension for their work in the classroom (Cass and Fernandes 315). The Forum Analysis can be of assistance in this regard.

In *Writing in the Sciences: Exploring Conventions of the Disciplinary Discourse*, Penrose and Katz provide an insight that may be key to helping students understand the practical applications of their writing courses. They explain that it is essential for students in the sciences "to know the conventions of their fields, to understand the underlying assumptions and attitudes that give rise to those conventions, and to understand how to work within them to be heard" (20). Some have suggested that attempting to explicitly instruct students in these conventions is incredibly difficult, if not impossible and that writing instructors should simply allow students to pick up these conventions as they move throughout their academic careers and into the job market. Penrose and Katz, however, suggest that rather than simply letting an understanding of how scientific communication "wash over" them, students should "actively seek out the distinctive patterns of communication and interaction that characterize [their] field" (20). Any instructor of writing understands that this is easier said than done. One can repeatedly encourage his or her students to strike out on their own in search of a better understanding of disciplinary

conventions, but unless a grade is attached, students—even highly engaged ones—are likely to ignore this encouragement. As such, the Forum Analysis incentivizes student interest in the communication practices of their fields.

The multimodal nature of the assignment also provides students with experience writing in novel, complex ways. Though many students have written traditional papers for courses and likely write on their own various social media platforms, few students have experience in crafting a website, let alone a website that carries out several layers of complex analysis. The website format presents students with new ways to think about the audience. They must consider how a user could best maneuver seamlessly throughout the pages to find necessary information. On a more basic level, students must be audience-centered in considering how a user would even understand the purpose of the website by crafting a clear, but succinct introduction to the website on its homepage. Writing in this new format helps students think about organization and audience engagement in ways that traditional papers do not require. As Alan Bilansky writes in an article about students editing *Wikipedia*, students writing in unfamiliar technological environments must reconsider the technology they are using and must also engage with certain social aspects in new ways as well (348). Because the new genre of the Forum Analysis is generally unfamiliar to most students, some students may express frustration or resentment when completing the assignment. As Amy Devitt notes, however, the process of transference of genres can be facilitated through the use of antecedent genres (*Writing* 202-10). In using antecedent genres, students can be taught to learn new genres such as the Forum Analysis by relating them to more familiar genres such as the rhetorical analysis that many students complete as part of their FYC requirement or even in their high school writing experiences. By showing relations to assignments students have previously completed, instructors can have valuable conversations

about critical genre awareness and transfer. Further, having an unfamiliar, multimodal assignment such as the Forum Analysis at the beginning of the semester creates opportunities for class discussions on writing and audience that hopefully carry through to other assignments as the semester progresses.

Instructors of Writing in the Sciences courses, then, can bolster students' valuation of the course and their own ethos as instructors by integrating assignments such as the Forum Analysis and transparently demonstrating its direct link to students' own disciplines. With limited disciplinary knowledge, however, it is difficult if not impossible for a writing instructor to impart this wisdom to students in a simple lecture or workshop format. This knowledge sometimes comes to students through trial-and-error experience in their field after they graduate, but it may not happen until long after they graduate, and having little to no experience in thinking critically about how communication works in their disciplines may serve as an impediment to students' studies entirely.

Problems Encountered and Potential Solutions

Though the third- and fourth-year students typically enrolled in a course such as Writing in the Sciences have more than likely encountered workshops or lessons in previous classes on researching and selecting academically rigorous sources, some students still tend to struggle with finding or even knowing how to find a credible academic article to use for this assignment. In addition, though most students indicate a preference for writing about topics they personally find interesting, as most writing instructors can attest, when presented with the task of picking a topic to write about, some students inevitably struggle. In an attempt to address both these issues, I encourage my students to begin their search for sources with more public venues and incredibly broad topics before moving on to finding academic articles. To encourage students to think

outside the box about the assignment and to hopefully pique their interest, I suggest students begin looking through trending topics on platforms such as Twitter, YouTube, and *BuzzFeed* even before moving to specific popular publications. In addition, I ask students to start searching with broad terms before moving to a more specific topic of interest to them. Because of the makeup of my university, climate change is always a popular topic students float as an idea for the Forum Analysis. Students may begin searching for the broader term of climate change, but I ask them to find the themes or trends within that broader topic that are of particular interest to them. For example, while it might be difficult to find two articles on the broader topic of climate change on which to perform a Forum Analysis, one could more easily find a pair of articles on the relation of carbon emissions to climate change or the threat of sea-level rise relative to climate change that would be more manageable for such an analysis.

Students in Writing in the Sciences are also well-known to have strong adherence to assignment guidelines and attention to details. While this may be helpful in many regards, it can be a detriment to students' production of quality documents when drafting the Forum Analysis. Because each topic and rhetorical situation addressed by the articles students choose to analyze are different, the topics covered in these analyses should necessarily be different as well. However, as Amy Devitt points out, "There is danger, though, in providing samples of genres. Students easily turn samples into models, and models easily turn writing into formula," and students often tend to see one example of a genre as the prototype for that genre (209). It has been my experience that many students try to mimic the topics covered by whatever student samples I provide for them. For example, if a student sees that the student example talks explicitly about how an article explicitly addressed topics such as "bias" or "ethical considerations," the student seeing this example will likely try to analyze these topics within

their own articles of choice even if they do not feature prominently. Addressing this problem is somewhat difficult as students often reject my inquiry of “What seem to be the important rhetorical features in this document” with a look that seems to plead, “Just tell me what you want me to do.” This, of course, has less to do with any fault of the students and more to do with simple disciplinary difference. Providing a variety of student examples that analyze broadly different topics such as word choice, use of statistics, organizational values, and visual rhetoric may not be a panacea for this problem, but it does help students better understand that in the Forum Analysis all rhetorical features are fair game for analysis.

One additional problem encountered has been students’ concern with formatting when drafting a highly complex, multimodal text such as a website. Some students concern themselves so much with the visual aspect of the site that they neglect the content of their writing in an attempt to make the site appear more visually appealing at first glance. As with many problems in writing courses across the spectrum, implementing multiple drafts of the assignment and peer workshops of the Forum Analysis help to assuage students’ fears somewhat. They feel more comfortable seeing the work produced by their peers, and workshops serve as generative exercises in which students see new potential design features other students have implemented as well as new topics for discussion they may be able to integrate in their own analyses. Reminding students that the design of their page is evaluated purely on the merits of its accessibility to its audience and likewise, the central concern of the document is its overall content in terms of its attempts at analysis is paramount.

The Popular Discourse Report

The Forum Analysis helps to introduce students to writing about Discourse and social practices, but as research on transfer has shown, presenting students with a concept once and

then abandoning it is unlikely to produce desirable results. As such, the Popular Discourse Report assignment encourages students to think about Discourse each class period throughout the course of the semester, reinforcing English scholars' focus on various aspects of the social, and thereby the ethos of its' disciplines as ones concerned with highly practical matters. This assignment asks students to find a discursive moment wherein a scholar from your discipline leaves his or her own disciplinary discourse (e.g. journals, workplace communication) and enters into the larger public discourse. "Discursive moments," as I define them for students, are simply considered instances and may be interpreted quite broadly. Students have presented on Twitter exchanges, social media campaigns, interviews, written articles in the popular media, documentaries, and even local university events hosted by their own professors. The assignment requires students to summarize and analyze these interactions both in writing and in a short, oral presentation to the class. The analysis can take many forms, but students are encouraged to highlight why this interaction is important for both their disciplinary discourse and the public discourse as well as explicating why it was an effective or ineffective discursive moment rhetorically.

The Popular Discourse Report is explained and assigned early in the semester. The assignment consists of both a written report and an oral presentation, and the assignment itself has a rolling due date. Students sign up for their presentation dates during the second week of the course, and after the first three weeks of class are complete, each successive class period begins with a Popular Discourse Report from a different student. Once given the assignment, students seek out a discursive moment within their own discipline wherein an "expert" or group of experts from their disciplinary discourse community addresses another group of "non-experts" from the popular discourse community (typically the broader American public, though reports

sometimes focus on a more regional issue). I choose to have students seek out this particular type of interaction because of the importance of the relation between the public and the scientific community (Penrose and Katz 201). For those in the scientific professions, public outreach can be important for securing funding, political support, and addressing social concerns (Sayer et al. 65). As such, I feel it is important for students to better understand not only that scientists interact with the public, but the reasons behind these instances of communication. More importantly, however, I agree with Penrose and Katz that the interaction between disciplinary experts and the broader public can be deemed important simply because it serves a purely educational purpose: “Scientists can help citizens understand and continue to appreciate science” (201). Education of the public can serve as a means to the ends of financial support and political gain but also as an end in and of itself, education for education’s sake. I believe that if students view themselves as scientists and also as educators of the general public, it can help improve their ability to communicate in various Discourses and will hopefully lead to better relations between the scientific community and the general public.

Once students locate a particular discursive moment, they are asked to draft a 300-word paper that summarizes the discursive moment in order to provide context, articulates the importance of the discursive moment within their own discipline, and explains the relevance to an audience outside of the students’ own discipline. I allow for a great amount of freedom in how students approach formatting the paper, but stipulate that it must at least complete these three basic moves. In addition to drafting a short written response, students are asked to provide an in-class oral report of 4-6 minutes on the topic covering the same facets explored in the written version. Given the inherently different nature of the written and spoken word, students are encouraged to use their written version of the report as a starting point, but told that they should

develop an oral presentation that mimics rather than follows verbatim the written report. During their in-class report, students are also required to implement a visual aid of some sort to keep their audience engaged with the presentation.

As with the Forum Analysis assignment, an important part of the Popular Discourse Report is providing students with a stronger metaknowledge regarding the concept of Discourse communities and improved ability to examine interactions between interlocutors both within their own Discourses and when they move among outside Discourses. Part of this task necessitates cultivating a productive conversation about each presentation. In order to do this, before each presentation, two students are appointed to provide feedback—one student asks a question regarding the presentation and one student responds with something they saw as effective in the presentation. After each of the students provides their feedback and question, I provide feedback and a question of my own, and then open up the floor for other questions and responses. Admittedly, the first few post-presentation discussions about Popular Discourse Reports are rather quiet. Students are typically unsure how to respond to the presentations and have a difficult time determining what feedback is appropriate. After a few weeks, however, students become used to the process and more adept at commenting and making connections between various presentations and their own disciplines. During the next class period, the student who presented the previous class period receives a rubric with limited comments and suggestions for improving presentations. Using a minimalist rubric reinforces the low-stakes nature of the assignment and helps students to conceive of the assignment as an exploratory, generative conversation rather than an assessment of their public speaking abilities.

Benefits

One of the major benefits of the Popular Discourse Report as an assignment is that it provides students in scientific disciplines with an opportunity to explore specific interests within their home disciplines. Often, students are given such opportunities in their earlier general education courses, but beyond these settings, their options for exploring their own interests are somewhat limited and courses follow a fairly linear and codified trajectory. The Popular Discourse Report affords students an opportunity to “veer off the path” so to speak, explore unfamiliar territory, and bring this information back to the class as an “expert” from their particular Discourse. Placing students in the position of expert in the classroom creates a unique opportunity for reinforcing the central threshold concepts of the Writing in the Sciences classroom. Cousin notes that learners exploring threshold concepts often occupy liminal states (“Introduction” 4). Students in the Writing in the Sciences classroom, in fact, occupy several liminal spaces—two of which are particularly important to note. Students not only occupy a territory somewhere between expert and non-expert in their field, but they also occupy a liminal space within the class itself, somewhere between the confines of their own discipline and the discipline of Composition and Writing Studies.

Fortunately, threshold concepts, Cousin argues, can exist as neither teacher nor student centered and “open up discussions among subject specialists, students and educational researchers, creating forms of transactional curriculum inquiry between these three parties” (“Neither” 7). The Popular Discourse Report allows students an opportunity to move somewhat beyond their potentially problematic liminal states into a space where they occupy the role of expert on a given topic. Students teach their classmates and instructor about a topic and step into the role of expert to guide their audience through said topic. Discussions open about the

importance of the topic to the discourse community of the speaker's particular discipline and the larger societal importance of the topic outside of its discipline. Thus, learning with the Popular Discourse Report becomes collaborative.

As Meena Balgopal, et al. note, the more opportunities a student has to write, expand, and modify different types of writing, the more knowledgeable they become within their own discipline (73). This is certainly true and easily visible as students work through written papers in an iterative, recursive manner, drafting successive versions of research reports and the like, but it is arguably true with the smaller writing and speaking tasks that students complete on a daily basis. The more opportunities we provide students to explore the communication happening amongst experts in their disciplines and between experts and the public, the more we ask them to consider what they know, and the more opportunities they have to improve their skills in the realm of both writing and speaking in their own disciplines. Because of the conversational nature of the assignment and the back-and-forth communication between the student presenter and his or her peers, the Popular Discourse Report serves as a means of helping students become more comfortable interacting with one another and providing feedback. In my Writing in the Sciences course, students constantly engage in various interpersonal interactions such as daily small-group and large group discussions and periodic workshops wherein students comment on one another's work. The Popular Discourse Report is intended to make students more comfortable in these smaller, "low-stakes" scenarios as a stepping-stone to higher order writing and speaking situations.

In addition to benefitting students, the Popular Discourse Report offers several benefits for the instructor as well. The Popular Discourse Report can provide a consistent but engaging means of beginning each class period. This helps to ease students into each day and acts as a

warmup to prepare them for the learning tasks at hand. Students become comfortable with the routine of the assignment and quickly come to know what to expect at the beginning of the class period. While the assignment provides a consistent beginning to the class period, it is anything but boring. The varied majors of students ensures that the topics of the presentations remain novel, diverse, and engaging. The Popular Discourse Report also provides an opportunity for instructors to gather some insight regarding students' knowledge of communication practices as well as some of the basic disciplinary concepts students may learn about in their other courses. In my own class, examples from the Popular Discourse Report presentations are often recalled throughout the semester during discussions and used to make abstract concepts more concrete. This helps students build a sense of community and shared history, strengthens connections between concepts, and can also boost the instructor's ability to cultivate a more substantial sense of ethos amongst a community of young science scholars. Lastly, but still of some consequence, is the fact that the Popular Discourse Report, as a short presentation/paper combination is very manageable in terms of time dedicated to assessment. The assignment is complex and requires highly skilled work on the part of the students, uncovering and analyzing an appropriate and interesting discursive moment, but is limited in both scope and time, which helps instructors provide highly focused feedback on a smaller assignment.

Problems Encountered and Potential Solutions

Though the Popular Discourse Report has many benefits in the classroom, it is not without its potential for problems. I shall now attempt to outline some of the problems I have encountered with the assignment and to suggest potential solutions one might use to combat these problems. Just as the Forum Analysis allows students a great degree of freedom when picking a topic and discursive moment to discuss, the Popular Discourse Report is also very

open-ended by nature. Because of this, though students report a great affinity for choosing their own topics, they sometimes struggle to begin the process of finding a discursive moment to analyze. Some students struggle with this because they simply don't know where to start. Others struggle because they misunderstand the goal of the assignment. Usually, when this happens students forego finding a specific instance of communication and instead attempt to present on a broad topic. For example, students may attempt an informative presentation to their classmates about a topic related to their discipline such as influenza vaccinations or eating disorders rather than an analysis of a specific discursive moment such as a CDC Official addressing the public on vaccinations in a press release or public appearance or a psychologist being interviewed on a popular television program about factors contributing to eating disorders. Such a presentation is not problematic in and of itself as students still gain practice researching and presenting about an issue from their respective disciplines, but it veers from the assignment's original intention of exploring and analyzing specific instances of communication to better understand Discourse conventions.

In order to combat this problem, I attempt to provide students with sufficient examples of potential discursive moments for analysis when first explaining the assignment. The first semester I provided examples, a particularly timely instance of communication came in relation to the release of the film, *Gravity*. Upon the film's initial release, astrophysicist and popular science communicator Neil Degrasse Tyson took to Twitter to live-tweet his response to details of the film. Tyson praised the film's cinematography in many regards, but lambasted the filmmakers for failing to accurately portray certain scientific aspects of the film. True to Twitter's form, Tyson's followers and others responded strongly to his tweets. Some praised Tyson for pointing out the inaccuracies, adding their own comments about the films flubs, but

the majority of users chose to critique Tyson for taking the film too seriously. They argued that the film was a work of art and not a scientific document and, as such, should not be held to rigid standards of accuracy. Similarly, an appearance of Bill Nye on CNN's *Crossfire* debating the topic of climate change with a panel of political pundits shows and various examples of dietitians, nutritionists, and food scientists appearing on daytime talk shows help students understand that the discursive moments they analyze need not be a direct address to the public, but may instead be something more like a debate or even something as simple as a conversation. A popular viral YouTube clip in which actual doctors diagnose and assess the injuries sustained in the popular film *Home Alone* shows students that even in the most self-absorbed corners of the internet, curiosity regarding scientific topics persists. Ultimately, providing such examples demonstrates to students what constitutes a discursive moment, and shows that their presentations can and should be related to topics within the popular cultural milieu as these best demonstrate the importance of scientists communicating across Discourse lines and engaging with the general public.

A slightly more nuanced problem arises when students report that they have no problem finding important issues or topics wherein their discipline interacts with popular discourse but rather encounter problems when searching for specific expert-to-non-expert discursive moments of particular interest to their own particular disciplinary interests. This particular issue can be slightly complicated to remedy, but it is indicative of the fact that students see the assignment as an opportunity to deeply engage with a topic of interest to them. As such, with proper proactive measures the issue of students' inability to successfully seek out a discursive moment of particular interest to them can be largely avoided. In addition to providing students with several examples of expert-to-non-expert discursive moments, when assigning the Popular Discourse

Report at the beginning of each semester, I briefly discuss how one might seek out specific instances of such communication in an in-class discussion of online searching. Early on, I encourage students to explore popular media outlets such as *The New York Times*, *Science*, and even online aggregators such as *The Huffington Post* and *Buzzfeed*. Similarly, I encourage students to explore social media as a means of discovering discursive moments. In particular, I demonstrate the ease with which one might use Twitter to find potential topics for a Popular Discourse Report. On the overhead projector, in front of the class, I pull up my own Twitter account, on which I follow *The New York Times*, *The Atlantic*, and other popular media outlets. I then scroll through searching for headlines featuring terms such as “researchers,” “scientists,” or even simply “science.” Often, I find three or four examples fitting our requirements within about a minute. I then click on a few of the hyperlinks for these posts to seek out further information and to demonstrate how one might expand their search. For the students who have specific topics in mind, however, this discussion is broadened to encompass the topic of searching itself. Though students spend a lot of time online, as Lucy Holman relates, students, particularly millennial students, lack the sophisticated meta-knowledge necessary to perform successful online searches when researching projects (20). As such, spending time in class to familiarize students with effective online search practices may help them become more effective in finding a particular discursive moment that is interesting to analyze and also fits with students’ specific disciplinary interests. As with most assignments, even if students have difficulties in finding discursive moments to talk about on their own, the assignment can still be successful as long as students know that their instructor is willing to help and brainstorm with them, provided the students actually ask for this help, of course.

The Popular Discourse Report within my classroom serves as part of a larger goal to work with students to understand the roles of varied Discourse communities within both scientific and broader societal discourse. The complex interrelation of different Discourse communities is difficult for many students to fathom. If the concept of Discourse communities is explicitly introduced to students as a threshold concept in the Writing in the Sciences course, one central to their understanding and success in their disciplines, and the concept is reinforced by the daily implementation of the Popular Discourse Report as a tool for encouraging analysis I believe instructors can better assist their students in engaging and exploring their discipline's Discourse. In addition, the Popular Discourse Report can be used as a stepping stone assignment, which explores the importance of public outreach in the scientific and health professions and how one changes rhetorical roles and moves from community to community. It will certainly not serve as a panacea solving the complex problem of how we teach students to "write in the sciences," but it can help open a dialogue with students about that process.

Maintaining Critical Genre Awareness

Both the Forum Analysis and the Popular Discourse Report assignments ask students to think critically about specific instances of communication and the entrenched communication practices of students' disciplines. To suggest a critical genre awareness approach and then suggest specific genres for use in the classroom may appear counterintuitive at first, but these assignments based on their intentions can exist harmoniously in a critical genre awareness framework. Transfer researchers have long been critical of explicit genre instruction in writing classrooms. Herrington and Moran assert that in-school writing and genre instruction are problematic because they occur in a vacuum and focus on school-related tasks rather than true acts of communication (4). They observe that most genre-based approaches to writing attempt to

“freeze-dry” genres and the writing process into textbooks, but it’s not immediately clear which genres students should be learning, and writing instructors only have a limited amount of time with their students. Similarly, David Russell and others trivialize the attempt to teach transferable genres as equivalent to requiring athletes to engage in endless exercises in “ball-handling” (57). In addition, regardless of the scholarly discussion on the transferability of genres. Many STEM students fail to see the skills they learn in English courses as transferable outside of the context of the English classroom (Bergmann and Zepernick 125). These students then, regardless of where the scholarly conversation on transfer stands, come into the classroom feeling that the genres they may learn from us will have no real-world purpose outside of our classrooms.

The use of the Forum Analysis and the Popular Discourse Report assignments, though they are specific genres, represents an approach to writing far-removed from explicit, skill-and-drill genre instruction. The genres themselves are likely very different from any students may encounter in their future studies and careers, so their use in the classroom is not an attempt to encourage rote memorization of generic features and prescriptive approaches to writing. Rather, the focus of the assignments is less on generic conventions of the document being written and more on the content that goes into the document, which may well discuss generic conventions but encourages the writer to engage with them critically and refrain from focusing on whether or not they are crafting the technical elements of either the Forum Analysis or Popular Discourse Report in the “correct” manner. Just as providing a variety of examples of potential discursive moments when introducing students to the Popular Discourse Report is essential, it is important for the instructor to introduce students to a wide variety of student examples for both assignments, demonstrating different approaches students take in completing the assignments.

Students often choose not only to make different choices in terms of the content they include--one student including a section on visual rhetoric and another including a section on audience interaction in the Forum Analysis. Just as important, I find, is that providing students with a variety of examples encourages them to experiment with the technical and generic conventions of the assignment itself--students including different ways of navigating the website, titling sections differently, etc. Providing and discussing how these student examples attend to different rhetorical situations in different ways reinforces the importance in understanding the ways one can use genres for different purposes and that students should be looking to the available possibilities in a rhetorical situation rather than simply mimicking static generic conventions when writing.

Using the Forum Analysis and Popular Discourse report assignments helps to reinforce the central Writing Studies threshold concepts of the course and may additionally help to improve the ethos of the writing instructor. Both assignments emphasize the necessarily social nature of rhetorical invention in STEM fields by introducing students to varied approaches of communicating with one another and with the general public. Similarly, the assignments reinforce the importance of critical genre awareness by demonstrating the varying ways scientists as communicators adapt their genres for different audiences and purposes and de-emphasizing the importance of generic conventions in students' own writing by emphasizing content over structure. Lastly, the assignments both foreground the concept of Discourse communities, asking students to outline the communicative practices, social structures, and values at play in their disciplines. As opposed to simple enculturation to these practices through their major courses and apprenticeship in their eventual careers, these assignments ask students to step into the role of critical expert of their own disciplines in order to communicate their findings and analyses

back to the Writing in the Sciences students and instructor. Engaging students in using their skills to seek out different situations provides a clearer content for Writing in the Sciences classroom rather than a set of seemingly arbitrary generic knowledge that may or may not transfer back to students' other courses or careers.

CHAPTER 5: THE REFORMED WRITING IN THE SCIENCES CLASSROOM

English, with all of its attendant subdisciplines, is a particularly difficult subject to teach because of its inherently subjective nature, and scholars and teachers are always looking for the best, most broadly appealing approach to pedagogy, though one size never fits all. Since the inception of the discipline of Composition, scholars have advocated for different approaches--generative approaches to rhetoric, Expressivist approaches that valued self-expression, genre-based approaches, approaches that repositioned writing as a process rather than a product, and so many more. One may easily anecdotally claim that a particular approach to teaching works in a given setting, but these claims are given more power if one has some concrete data rooted in actual classroom experience to back these claims. Assessing whether or not particular teaching practices such as those outlined in the two previous chapters improve educational outcomes remains an incredibly contentious topic. A series of articles in the *Chronicle of Higher Education* in the winter of 2016-2017, penned by Joseph Teller and Doug Hesse, respectively foregrounded an argument regarding whether or not the reporting of teaching “lore”--teaching prescriptions based on “ideas and assumptions that are grounded in local experience” (Hesse) has any real worth in the field of Composition. Hesse, the more skeptical of the two authors, claims, “The teaching of writing happens—or should—within a deep field of practice, theory, and research.” Hesse believes the field does itself a disservice when researchers rely on pure anecdote to report what worked in their classroom as an innovative technique to be implemented by all in the field. To do so is to give support to those who would claim the various subfields of English are fundamentally atheoretical.

Despite his clear skepticism of purely anecdotal evidence, Hesse readily concedes, “Lore is a form of knowledge in every field. In pointing to the best practices of teaching writing—

indicated by extensive research in composition studies—I don't ignore the experience of individual teachers..." (Hesse). With Hesse's trepidation in mind and the understanding that my findings are not conclusive, this chapter reports the findings of an end-of-the-semester survey distributed to students in a Writing in the Sciences course built upon the Writing Studies theory and assignments outlined in the two previous chapters. In the course, students read the texts of LeFevre, Devitt, Gee, and other Writing Studies scholars and focused on the Writing Studies threshold concepts of invention as a social act, critical genre awareness, and Discourse communities rather than focusing primarily on conventions of how to craft certain popular scientific writing genres. In addition, students completed the Forum Analysis and Popular Discourse Report assignments throughout the semester to reinforce the course's selected threshold concepts. Though I can attest anecdotally to the success of the practices I have outlined, assessing students' responses to such a course through self-reported surveys provides an arguably more objective understanding than my own anecdotal evidence and provides useful data regarding whether or not such an approach can be effective.

As with the pre-test study outlined in Chapter 2, IRB approval for the project was secured for the project from the primary investigator's home institution in the Summer of 2016. All appropriate IRB protocols were followed regarding providing informed consent information for participants, and participation in the study was completely voluntary. Post-test surveys (Appendix C) were administered to two sections of Writing in the Sciences students who enrolled in a Writing in the Sciences course at the end of the fall semester of 2016 at the same mid-size state university in the Upper Midwest as those students surveyed at the beginning of the fall semester of 2016 and spring semester of 2017. The surveys were distributed through the course e-mail listserv during the last two weeks of the semester, and participation was entirely

voluntary Students received no compensation for their participation in the study aside from potential extra credit points totaling no more than 1% of a student's overall grade in the course. The student surveys were adapted from Nancy Driscoll's (2011) surveys outlined in her article "Connected, Disconnected, or Uncertain: Student Attitudes about Future Writing Contexts and Perceptions of Transfer from First Year Writing to the Disciplines" (See Appendix A). Driscoll's surveys were chosen because they dealt closely with students' attitudes and expectations of FYC courses upon entering the course and how these attitudes and expectations changed throughout the course of a semester.

Attitudes and expectations, though semantically different from the concept of ethos are closely related to the socially constructed, consubstantial understanding of ethos used for this study. In addition, a pre-test/post-test study of students allowed for an evaluation of how students at a later stage in their academic career (upper-division writing as opposed to FYC) react to a pedagogy they would likely find unfamiliar in the context of the experiences reported by students in the pre-test surveys and the pedagogies outlined by instructors in the instructor survey responses. Driscoll's study revealed that students in FYC report a fairly high rate of belief in the applicability and possibility for transfer of content learned in their Composition course to other university and workplace settings, but this belief declined throughout the semester. By the time students reach their upper-division Writing courses such as Writing in the Sciences, this belief may decline further as students are often further removed from their general education courses and more deeply involved in the coursework for their particular major. Better understanding how student attitudes evolve throughout a semester in Writing in the Sciences can provide a better understanding of students' valuation of English courses and writing more broadly.

Initial Results

The post-test surveys revealed initially promising results. Though the results are not conclusive as only 39 students completed the survey, I believe further research could reveal similar results. A few responses indicated either an aversion to the course or, at best, ambivalence. For example, one student, when asked to identify three purposes of the course indicated that he or she thought it was designed to, “improve writing, [...] learn new ways to write, [...] earn the college more money by requiring English classes to graduate.” Despite this response and one additional outlier, students exiting the course seemed to value the course and could more clearly articulate the purpose of the course and its core concepts. At the beginning of the semester, students were asked to articulate what they thought the focus of the Writing in the Sciences course would be in order to assess student expectations regarding course content. Not surprisingly, many students (45%) offered a response that the course would be somehow related to writing scientifically. A few students offered that the course might have something to do with analysis or learning new genres, but beyond this, students were typically unable to provide anything beyond articulating that the course would have something to do with writing. Conversely, in post-test responses, far fewer students (12.8%) indicated directly that the course was geared specifically towards “scientific” writing. That said, students did not entirely remove the STEM-based nature from their descriptors of the course. Rather, many students provided a slightly more nuanced response, changing their verbiage to indicate that the course was geared towards teaching one how to write either for different disciplinary settings or designed to help students understand how to learn to write in a variety of situations: “To become aware of Discourses and other important writing conventions”. Additionally, students listed other purposes for the course absent in the pre-test surveys: “How to give and receive constructive

criticism on different works,” “How to read a scientific paper and dissect and understand the contents of it,” and “To give students the opportunity to further their researching skills.” One would expect students at the end of the semester to better articulate the purpose of a course they had already taken, but the difference in the expectations of students at the end of the semester are demonstrative that students exited the course with a view of the course more complex than a simple relation between writing and science.

Similar to reflecting on the course’s purpose, the end of the semester, students were asked to reflect back upon and articulate core course concepts. As with their understanding of the overall purpose of the course, they did so fairly effectively. A full two-thirds of students indicated that the course was primarily focused on communicating either in different Discourses and/or for different audiences. Interestingly enough, students seemed to prefer to talk about the importance of one’s audience (43.6% of students) over Discourse (30.7%) when talking about course concepts. This may potentially be an example of transfer from student’s knowledge of FYC and other writing experiences into the Writing in the Sciences course, or it may represent a preference for more familiar language over the technical language of the course itself. Students at the end of the semester, when asked to define the course’s purpose and its core concepts were able to articulate more specific skills gleaned from the course than students responding at the beginning of the semester--giving and receiving constructive criticism, dissecting and analyzing documents, furthering one’s research skills, and better understanding the concept of Discourse communities. Students’ ability to articulate a course’s purpose and core concepts may seem a very low bar to set for success, but given students’ inability to explain a purpose/content for the course beyond “scientific writing” at the beginning of the semester, a small victory such as this shows that students are able to articulate an actual content for the course. Additionally,

many of the concepts students articulated are directly or indirectly related to the threshold concepts outlined for the course in Chapter 3 (invention as a social act, critical genre awareness, Discourse communities). Such a result indicates that the desired outcome of the course to help students better understand these threshold concepts was achieved at least to a certain extent.

Students in both pre-test and post-test groups were asked whether or not they believed their English course would help them to write in other college courses. 84.3% of students in the pre-test group and 84.2% of students in the post-test group either agreed or strongly agreed. These numbers Students also responded to a question which asked them whether or not their Writing in the Sciences course would help them write in their career and other situations beyond the classroom. 86.6% of students in the pre-test group responded favorably as compared to 86.8% in the post-test group. These numbers are noticeably statistically insignificant in their difference, remaining relatively unchanged throughout the semester. Such a change may suggest that the course had no real effect. However, directly comparing these results to Driscoll's results paints a somewhat optimistic picture.

When asking students whether or not their English course would help them write in varied situations, Driscoll found that students' average valuation of English courses declined quite dramatically throughout the semester. For example, when Driscoll asked students whether or not their English courses would help them write in their majors, the average score declined 5% from the beginning to the end of the semester. Student ratings of whether or not the course would prepare them for college writing declined 8.8% over the semester, and student ratings of whether or not the course would help with writing in their major courses decreased 9.5%. Similarly, 45.9% of Driscoll's respondents expressed explicit uncertainty or disbelief regarding whether or not their writing class would help them to write in contexts outside of the course

(“Connected”). While students’ valuation of the course seemed to remain relatively unchanged, the ways in which they view themselves as writers changed noticeably. When asked at the beginning of the semester whether or not they viewed themselves as good writers, 67.9% of students either agreed or strongly agreed with the statement. For students in the post-test group, by the end of the semester, this number increased to 81.5%.

To supplement quantitative data related to students’ valuation of whether or not they would use material from Writing in the Sciences in other courses and in their future careers, two qualitative questions asked students to provide open responses to the questions, “How much of what you have learned in this course will help you with other courses? Why is this so?” and “Do you think any of this course’s content will help you with writing beyond college? Why or why not?” Students readily provided responses indicating their belief that the course material would be helpful in other academic settings: “Virtually all of it [will be helpful]. I’ll need to write more in whatever field of biology I end up in,” “It will help me a lot. For many of my other courses I will have to write reports as well as read and interpret reports. This course has given me many of the skills required to do this well,” “Some of this was utilized right away. I had to do a ‘research paper report’ in one of my classes, and I was able to analyze the report more formally because of this course. I also hope to take graduate school classes, and I know in dietetics, grad school requires a lot of research.” Unlike Driscoll’s post-test interviews with students, these students are especially optimistic about the possibility that content learned in their Writing in the Sciences course will be useful in other arenas. In addition, they are able to articulate not only that the information will help them in other settings, but also articulate several specific settings such as other courses, graduate coursework, and the job market that suggest transfer of skills from Writing in the Sciences far beyond the classroom.

Another question asked students to provide specific examples explaining whether or not and how the content had been useful to them thus far: “Think back to a time when you used something you learned in this writing class in another situation. What was it that you used?” A very small proportion of the students (8.8%) indicated that they had not yet used concepts from Writing in the Sciences in other situations, but most were able to provide at least one example. One student explicitly acknowledged the Forum Analysis as an assignment that had been useful in another course:

I used my skills that I practiced when writing my forum analysis. The forum analysis helped me to work on my ability to deeply analyze written work. I used this in a different class when we were asked to analyze an article and share with the class what we found to be significant. Being able to recognize the information that was important was something I had learned while doing my forum analysis assignment.

Most other students were not as thorough in their response to the question, but still provided a vivid and diverse selection of situations in which they had used concepts from the course. One student--recalling the use of design concepts from Robin Williams' *The Non-Designer's Design Book* noted that they had used design principles from the course: “CRAP [Contrast, Repetition, Alignment, Proximity], making my work visually appealing.” This response indicates that this particular student was able to take material from in-class readings and discussions and transferred the material to another course. More importantly, the student is able to identify particular skills to be transferred and articulate how those skills helped this student address a writing task in another context. Such a task may seem like a baseline expectation, but student responses to the pre-semester survey showed that many students, despite having enrolled in a

genre-intensive First-Year Composition course at the university did not identify basic concepts such as genre and ethos, pathos, and logos as concepts central to the study of English. These students' ability to identify key concepts of the Writing in the Sciences course in the post-test survey suggests a step in the right direction in terms of students' knowledge retention and capacity for transfer.

Other students discussed the influence the course's focus of Discourse and audience had on their work in other settings: "Writing to a general audience vs a scientific audience in my senior capstone course," "When emailing professors, I am always professional in the email for example I start with Dear And end with thank you for your time." Such responses reveal that students understand the writing they're doing in other contexts as inherently social and bound by the conventions of the Discourses in which they're participating. The response regarding the capstone course is a broad one, but directly shows how one student transferred the concept of Discourse from the Writing in the Sciences course to an advanced course in his or her own discipline. The student detailing changes to his or her emailing behaviors provides a much simpler example, but one that is arguably just as important. In conversations with professors across the disciplines, I've heard many bemoan the rudeness of students in their e-mail practices, ignoring salutations and closings and providing little to no context for the e-mails. Perhaps this problem is not one of rudeness, but rather a lack of understanding of discursive conventions. The closing, "Thank you for your time," that the student lists is, admittedly, the way that I close all of my e-mails to my students. The topic of e-mail etiquette as a discursive convention is one that comes up in my Writing in the Sciences course throughout the semester, and this student appears to have internalized these discussions, understood the social nature of university e-mail and its necessity for politeness, and put this into practice in his or her daily life. If this student

understand the social nature of e-mail in a university context and takes the time to imagine an audience receiving the e-mail, it is not too far a leap to assume that the same student would be able to make these same rhetorical moves in a more professional setting.

Respondents indicated that abilities in reading and analysis were improved by the course: “I learned how to think critically in an English class, and I use that skill whenever I write papers because I try to back up my claims using research and evidence from reliable sources,” “I remember having to read a journal article for my Evolution class and I remember being able to pick out certain important points fairly easily based off of exercises done in class,” “In other classes I have had to cite different sources and explain how some aren’t as credible as others because they weren’t in the field of study [sic].” Instructor surveys revealed a desire on the part of instructors that students gain skills in critical thinking and analysis in their Writing in the Sciences courses. As such, the explicit goal of the Rhetoric and Writing Studies content-heavy course was to help students in this regard. Rather than simply identifying particular genres that the course introduced students to or even particular skills, these responses show that students shifted from a belief at the beginning of the semester that the course would be about genre instruction and “scientific writing” to a deeper belief that the course has just as much to do with reading and, in particular, reading and analyzing with a critical eye.

Though students complete several more traditional genre-based assignments in my Writing in the Sciences course such as proposals, progress reports, and research reports, few students articulated these genres as the key components of the course. 26.5% of students articulated primarily taking knowledge of how to write a specific genre away from the course: “I had to write a research report for another class and I used the format that we learned in class on my report,” “I have previously created proposals but this is the first time that I was able to

incorporate research to make a full research report [sic].” Such responses do not necessarily mean that students saw genre as the only focus or content of the course. However, students foregrounding the learning of specific genres in this way would seem to imply a certain amount of belief amongst students that the Writing in the Sciences course is primarily intended to instruct them how to create a number of genres central to scientific work. Encouragingly, however, 61.7% of students in the course responded in a way that did not privilege genre as the central focus of the course. In addition, some students who did mention specific genres discussed being able to craft certain genres in other settings not because the genres were covered in class but because other course content helped them learn how to write in these new genres. For example, one student described, “Writing to a veterinarian for a job application I used professional tone and words common to the profession [sic].” Similarly, another student related that organizational concepts practiced in the course helped in crafting a résumé when applying for a job. These student responses implicitly acknowledge an awareness of audience, Discourse, and a critically aware genre approach attune to the possibilities of revision and experimentation with different genres, which are all integral to the central threshold concepts of the course.

Not all students necessarily leave Writing in the Sciences with the same knowledge and understanding of the course’s content. Some responses indicated that students still saw writing as relegated solely to English courses: “Some of it [will be helpful], since a lot of my courses don’t necessary involve along of writing it won’t be as helpful, but I think just overall in the rest of my life it will help me a lot because I truly believe I am a better writing having taken this course [sic].” This student’s response is promising in that he or she believes that the course helped improve writing skills and that these skills will be useful in some other form of life writing, however, the response simultaneously indicates the student sees skills in writing as largely

irrelevant to their major. This student sees value in writing, but doesn't see it as a part of what experts in his or her field do on a regular basis. Another student made a similar observation: "Well i am finished [with] english classes now. But if i ever need to reseach anything for a science class, possibly [sic]." This student's response is interesting not only because it removes writing from the purview of science but also because it seems to indicate that the student doesn't consider "research" a part of the sciences. One can only speculate, but it would seem this student is likely referring to the practice of pursuing secondary research rather than conducting primary research as most of the students report seeing science as a generally more active discipline than English. Another student also brought up the topic of secondary research as being separate from science but closely aligned with English: "I don't think it will help in my other courses because it is not writing-heavy. It will help me write for my research projects though." It is interesting to note that the student reports not believing the Writing in the Sciences content will help in the context of other courses, but then immediately follows that response with the claim that the content learned in the course will help them when conducting research projects, which are ostensibly part of the very courses that the student just reported being unrelated to the content of the Writing in the Sciences course.

These responses reflect an interesting and deeply entrenched divide that the students seem to perceive as existing between the acts of writing and "research" (understood as secondhand research) , and the work of their major. Students providing such responses craft reflections that suggest two dichotomous trajectories of English and the Sciences. English, these students imply, is a discipline concerned with linking the past to the present. The discipline, as students perceive it, looks back to texts of the past to bring them into the present to tell us about where we've been as a culture, particularly with regards to literary history. On the other hand,

science, being the more practical of the two disciplines in students' minds, is concerned with the present and the future. Scientists, unlike those who study English look at the problems of now and apply the scientific method to make discoveries in order to craft a better future. Because of this divide, writing and secondary research of past findings become disconnected in students' minds from the processes of science. One may write about the past, or write about the present; but, as students see it, one couldn't possibly write about the future, at least not in any way that would be truly objective as they believe science to be.

For many STEM students then, until we as instructors are somehow able to demonstrate the applicability of English, Rhetoric, and Writing Studies concepts to the scientific world, the gap will remain for these students, and some will continue to view English courses as obstacles and impediments to a degree rather than actual opportunities for learning. In addition to those students who may still be reluctant to recognize the worth of skills learned in an English course, several students expressed an uncertainty regarding whether or not the material would be useful because as one student put it, "I have not had the opportunity to use the skills gained in this class in other situations yet because I just completed this course." The response is amusing because it suggests that one may not use skills currently being learned and must wait until a course is completed to begin using skills learned in a course. Such responses may reflect a certain lack of metacognition on this particular student's part--believing the course could not be useful until after it was completed--rather than inadequacies of the course, but the fact remains that for this student, it wasn't immediately clear how the material related to their broader study outside the Writing in the Sciences classroom. This still leaves the onus for articulating the usefulness of English courses with instructor. If the instructor fails to demonstrate the practicality of these

skills and the potential for immediate and everyday application, one can hardly expect students to identify these benefits on their own.

Conclusions and Future Research

Crafting consubstantial ethos in the Writing in the Sciences classroom and any classroom, for that matter, is a difficult task. In many Writing in the Sciences classrooms, however, the task is a herculean one because the instructor at the front of the classroom comes from a disciplinary background quite different from his or her students. Somehow, this instructor must teach students how to write in their respective disciplines. Aside from the fact that the instructor of these courses often is a scholar of English rather than a scientific discipline, the diversity of students' own disciplines under the umbrella term of science prohibits an approach in which the instructor may simply teach genre explicitly. In addition, results of this study's pre-test surveys indicated that students have very strong opinions regarding English classes before they even enter our classrooms. Students carefully consider the instructor of the course and the disciplinary content when formulating opinions of a course or socially constructing what will be a course's ethos. Many students, this study indicates view discipline as an atheoretical discipline and felt that many of their previous experiences in English classes had been negatively impacted because they believed an instructor did not have their best interests at heart.

In response to these results, this dissertation made suggestions for improvements to course content and assignments that would help demonstrate that English and its related disciplines have a true content, that the content of these disciplines has everyday applications for STEM students, and that instructors in Writing in the Sciences do have their students' best interests at heart in order to move towards crafting a sense of consubstantial ethos in the classroom. The initial post-test results of this study are promising. Students' valuation of writing

remained relatively stable throughout the semester rather than declining as it did in Driscoll's study of first-year students. Students were also able to more readily identify key course concepts and possible applications for those concepts in their majors, future careers, and everyday writing. Students' ability to identify these items points to the possibility that students in the course recognize its usefulness and the possibility for transfer of skill from Writing in the Sciences to the world outside the classroom.

The sample size (39) of this course is noticeably small and self-reported, so this data may not be broadly generalized to any and all writing situations. The self-reported nature of the post-test responses in particular may be biased because they ask students to reflect upon a classroom experience, and students may believe negative responses could potentially offend the instructor/primary investigator. The anonymous nature of the surveys and the presence of a number of negative or ambivalent responses to the course do indicate that the data are genuine and students were honest in their responses. If nothing else, students' ability to identify key course concepts and identify potential for transfer provides hope for the potential of the approaches to Writing in the Sciences outlined in Chapters 3 and 4. Using these approaches and evaluating their efficacy in different settings with a larger data set will tell us more about whether or not a Rhetoric and Writing Studies content-heavy approach can be transported to different classrooms. In addition, further scholarship on the knowledge that students bring into the Writing in the Sciences classroom will help the field to better understand what students actually know about writing rather than the highly subjective opinions they have, which may be difficult to articulate.

Regardless of the limitations of the study and the need for future research, the results of the study, particularly the pre-test student surveys should be heartening to scholars and

instructors of English. We speak anecdotally in meetings and in conferences about the fact that STEM students hate writing. The results of the survey, however, paint a more nuanced picture. The majority of STEM students entering the Writing in the Sciences classroom professed a belief that writing was a useful activity and were willing to believe that the knowledge gained in the course would help them in other classes and in their future careers. Their opinions on this matter were highly dependent on two factors—their perceptions of whether or not an instructor had their best interests at heart and the content and assignments of the course. Both of these factors, this project has argued, closely connect with our ethos as instructors and the ethos of our discipline. Initial results of student post-test surveys suggest that if we are up front about the content of our course, about student and instructor roles and responsibilities, and about the everyday applications of skills learned in Writing in the Sciences, we may take a step in the direction of creating a clearer sense of consubstantial ethos and showing students that we truly are in this together.

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APPENDIX A. DRISCOLL’S PRE- AND POST-TEST SURVEYS

Survey of Writing Issues – Beginning of Semester

Survey ID# _____

Gender(circle one): Male Female

Major _____

Year (circle one): Freshman Sophomore Junior Senior

I am a good writer.	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
What I have learned in my ENGL 106 course will help me with other courses.	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
My ENGL 106 course has prepared me for college writing.	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
I enjoy writing.	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
All English courses are the same.	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
I will be able to use the information I learned in this course in many other college courses.	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>

What do you think a college “English” class is about?

What do you expect to learn in this class?

What do you think the overall purpose of your ENGL 106 course is?

My ENGL 106 course taught me how to write in my major.	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
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Why or why do you not expect what you learn in this course to help with writing in your major?

I expect my ENGL 106 course content to help me with writing beyond college.	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
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Why or why do you not expect what you learn in this course to help with writing beyond college?

Survey of Writing Issues – End of Semester

Survey ID# _____

Gender(circle one): Male Female Major _____

Year (circle one): Freshman Sophomore Junior Senior

I am a good writer.	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
What I have learned in my ENGL 106 course will help me with other courses.	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
My ENGL 106 course has prepared me for college writing.	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
I enjoy writing.	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
All English courses are the same.	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
My ENGL 106 course taught me how to write in my major.	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
I expect my ENGL 106 course content to help me with writing beyond college.	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>

I will be able to use the information I learned in this course in many other college courses.	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
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What are three things that this course focuses on? (i.e. literary analysis, writing persuasively, etc)

List what you believe to be three overall purposes of ENGL 106?

How much of what you have learned will help you in your other courses? Why is this so?

Think back to a time when you used something you learned in this writing class in another situation. What was it that you used?

Do you think any of this course's content will help you with writing beyond college? Why or why not?

What do teachers look for when they're grading writing? That is, what do they base their grades on? Is this the same in every class?

When you're in a new class, how do you figure out what the professor is going to be looking for?

APPENDIX B. BEGINNING OF SEMESTER SURVEY FOR STUDENTS

Survey of Student Perspectives on Writing

Gender: Male Female

Major _____

Year: Freshman Sophomore Junior Senior

I am a good writer.	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
I enjoy writing.	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
All English courses are the same.	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
I will be able to use the information I learned in this course in other college courses.	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
I expect my English course content to help me with writing beyond college.	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>

What previous experiences do you have in English classes? Based on this experience, what opinions do you have about English classes?

What do you expect to learn in this class?

What do you think the overall purpose of your English course is?

How do you think this course will differ or resemble English courses you have taken in the past?

Do you expect what you learn in this course to help with writing in your major? Why or why not?

What do you envision as your role in the class? The instructor's role?

APPENDIX C. END OF SEMESTER SURVEY FOR STUDENTS

Survey of Perspectives on Writing—End of Semester

Gender: Male Female

Major _____

Year: Freshman Sophomore Junior Senior

I am a good writer.	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
What I have learned in my English course will help me with other courses.	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
My English course has prepared me for future writing situations.	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
I enjoy writing.	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
All English courses are the same.	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
My English course taught me how to write in my major.	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
I expect my English course content to help me with writing beyond college.	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
I will be able to use the information I learned in this course in many other college courses.	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>

What are three things that this course focuses on?

List what you believe to be three overall purposes of your English course?

How much of what you have learned will help you in your other courses? Why is this so?

Think back to a time when you used something you learned in this writing class in another situation. What was it that you used?

Do you think any of this course's content will help you with writing beyond college? Why or why not?

What do teachers look for when they're grading writing? That is, what do they base their grades on? Is this the same in every class?

When you're in a new class, how do you figure out what the professor is going to be looking for?

APPENDIX D. SURVEY FOR INSTRUCTORS

Survey of Instructor Perspectives on Writing

Gender(circle one): Male Female

Which courses do you currently teach?

My students are good writers	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
My students enjoy writing	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
All English courses are the same.	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
My students will be able to use the information they learn in their Writing in the Sciences course in other college courses	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
The Writing in the Sciences course content will help my students with writing beyond college.	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>

What previous experience do you think students have with English courses? Based on this experience, what do you think their opinions are of English courses?

What do you expect students to learn in your Writing in the Sciences course?

What do you think the overall purpose of your Writing in the Sciences course is?

How do you think this course differs from or resembles other English courses?

Do you expect what students learn in this course to help with writing in their majors? Why or why not?

What do you envision as your role and students' roles in the class? Do you convey this in any way to students?

Which texts (textbooks, articles, handouts, etc.) do you have students read in your course? Why do you choose to use these texts?

What major writing assignments do you require students to complete in your Writing in the Sciences course?