Taking the "T" from STEM: Better Serving the Typical English Major with a Curriculum More Closely Related to Contemporary Digital Realities

By

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Abstract

After five years of working in the corporate world, I decided it was time to attend graduate school. I thought I was accustomed to the question *why choose to major in English*, until I found myself in the middle of a crossroad in my career. *We could understand if you chose Business, Journalism, or Broadcast Communications*, I heard from across the General Manager's desk. Baffled at having to answer the question, I realized it might be a legitimate one, not only in that particular office, but one for English departments as well. Technology and new media have provided more than lifestyle convenience; they have provided continued opportunities for English majors. The typical English major curriculum calls for a shift in order to better prepare students for life after graduation. Using digital humanities as an umbrella and utilizing the sub-fields of technical writing and linguistics, the English department can collaborate with STEM disciplines and work alongside them for innovation. A typical English major is better served with a writing curriculum that connects more authentically with contemporary digital realities and STEM.

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Chapter 1: The Influence of STEM in Choosing English as a Major

There are a few determining factors promoting a student's choice of major and concentration of study in higher education. They could feel skilled in an area, enjoy a particular subject, or the chosen major is associated with their desired career. Although there could be many other reasons behind choosing a major, the ultimate goal is for the area of study to prepare students for life after graduation. Ideally, students should graduate with their earned degree confident and ready to enter the workforce as active contributors to society. However, the growing divide of humanities fields and science driven fields in higher education has the potential to divide what it means to be "career ready" and "an active member of society." There has been a push in general education to increase the fields of Science, Technology, Engineering, and Mathematics (STEM), while the Humanities fields continue the path of uncertainty of their existence and significance within the university. Writing pedagogy seems to be the current liaison connecting the disciplines, typically stemming from the English department. Writing is considered a necessary communication skill in all fields; however, with the growth of STEM fields, it would make sense to incorporate more STEM into English studies. A typical English major is better served with a writing curriculum that connects more authentically with contemporary digital realities and STEM.

When discussing *a typical English major,* I want to acknowledge this does not include one who focuses on technical writing. In fact, the sub-field of Technical Writing can play a large role in growing the English department. Technical writing focuses on writing in the business world, aside from the typical English major who studies primarily literature. Because of the professional involvement, it has been necessary to incorporate

STEM into the Technical Writing curriculum. Specifically, and a little obviously, the sub-field pulls from the "T" in STEM – *technology.* According to the executive director of the STEM Education Coalition, James Brown, "The future of the economy is in STEM" which is "where the jobs of tomorrow will be" (Vilorio 3). On November 23, 2009, President Obama launched Educate to Innovate, a campaign encouraging supremacy in STEM education. Innovation within the STEM fields powers the United States economy according to President Obama, who claims the campaign will take part in "reaffirming and strengthening America's role as the world's engine of scientific discovery" (Office of the Press Secretary). This is "essential to meeting the challenges of this century" (Office of the Press Secretary). The goal is to produce more STEM graduates in order to enhance the United States' overall economy.

While encouraging more students to pursue STEM fields is valid, it does not equally promote the skills students gain in the humanities. Rather, they are considered subsidiary. The contributions of talents generally found in humanities fields are not uniformly acknowledged, when they are the building blocks needed for STEM success. Without understanding human nature, behavior, how we operate within communities, or observing the world in which we live, then the need to further growth within society through science, technology, engineering, or math would not exist. There have been proposals to include the arts into STEM curriculum, turning the acronym into STEAM. Michelle Land helps affirm that degrees in STEM "focus on convergent skills whereas art degrees focus on divergent skills," and "Having the ability to execute both at scale can better position our nation for global competitiveness" (Land 547). Of course, adding the *A* for *arts* would rely on the agreed definition of the *arts* representing all humanities

fields, and understanding that an *H* does not make for a good acronym. It is unquestionable that the skills obtained through the humanities are not only necessary for society as a whole, but are fundamental for innovation constructed by STEM fields.

Generating knowledge to be innovative requires not only critical thinking skills, but creative ability. It is often the ones who "think outside the box" who are able to take knowledge to a different level. According to the STEM Coalition's "STEM 101: Intro to Tomorrow's Jobs," the "ability to consider problems in different ways and having the ability to explain a solution clearly is essential for success in STEM occupations" (Vilorio 9). The assumption in STEM curriculum is that creativity be taught in different ways to suit the subjects. Furthermore, good communication skills are needed in order to properly convey ideas and are outlined as "technical writing, public speaking, interpersonal communication, and the ability to explain difficult concepts simply" (Vilorio 10). These particular skills are often taught by English teachers' curriculum. Vilorio devalues the importance of the humanities' pedagogies by suggesting tactics for easy self-learning. He suggests that simply practicing speech in small audiences and perhaps choosing an elective course or two in the Humanities are viable solutions to gain the additional skills, the same skills agreed as a key ingredient for the success of STEM education. There is a dichotomy created by insisting on the need to acquire skills, while not including fields where they are heavily taught.

Before delving more into how STEM should be included in the typical English major's curriculum, it is important to see the different perspectives that continue to be argued while trying to develop and grow the STEM fields. The blending of arts with STEM fields isolates the students who thrive specifically in the humanities fields. The

current mentality of STEM education can be considered as “Some STEM for All” when perhaps it should be “All STEM for some” (Atkinson, Merrilea, and Foundation Information Technology and Innovation 9). If it shifts to “All STEM for some,” the STEM initiation would in fact work to recruit students who are most interested in the “industries that employ STEM workers"(Atkinson, Merrilea, and Foundation Information Technology and Innovation 9). STEM skills, especially technology, are growing in all disciplines, and I believe studies in the humanities also impact the fields of STEM, so it doesn’t seem completely accurate to say “All STEM for some.” The authors’ point, however, shows the harm created by isolating the humanities and separating STEM fields. If STEM fields are growing, then we need to figure out how STEM fits into humanities’ departments. If the English department ignores STEM education completely, it will struggle to survive as a discipline with contributions in a growing economy. Technology is a primary building block in STEM fields, promoting the most economical growth. Therefore, I argue that technology will be the key in unlocking the doors to allow for equal growth in the English department by creating a more hybrid student equipped for a digital world.

Communication is a technology itself and has been evolving since the creation of mankind. With the innate desire for communication, humans developed spoken language, then written language. Later, the invention of the Gutenberg Press allowed written language to be mass-produced, becoming more accessible. Language as technology itself provides insight to connections often overlooked between technology fields and the English department. The value of writing is not questioned in modern day; however, the fathers of rhetoric valued only oral persuasion. They were afraid writing created loss of

memory, which is comparable to some of the current apprehension within the English department. There is the guilt of putting down the old book with the broken binds containing notes scribbled in the side. There is a familiar smell whisking through the aisles of the library, the kind only aged print books can bring. Those passionate about literature have anxiety over losing the uniqueness of the art passed through generations. It is the same art English majors study to apply to the here and now, and that is where we can find the middle ground.

The lingering separation between the arts and the sciences has been around since ancient Greece with the development of rhetoric. Aristotle made a distinction between what he considers persuasion in the human arts, *technē* – rhetoric and poetics – compared to sciences, physic or logic. Aristotle claimed rhetoric should "be able to observe the persuasive about 'the given,'" which is why he claims: "it does not include technical knowledge of any particular, defined genus [of subjects]" (Aristotle 115). Though the argument to keep the disciplines separate continues, it is nearly impossible to disconnect the humanities and the sciences completely. To construct knowledge, innovators of all disciplines need rhetorical skills.

Charles Bernstein offers the suggestion that literary scholarship begin with poetics because poetry allows students to experience literature aesthetically. He argues that in order to connect meaning with the reading, the students need to feel something from the author. He asks, "What is the aim of literary scholarship? What is the purpose of a literature class?" (Bernstein 129). What is suggested is that poetry allows students to see writing as a work of art and encourages students to find meaning through written art and create connections to how it applies to their lives now, rather than taking a thematic

approach. Bernstein claims, "Poetics is an ethical engagement with the shifting conditions of everyday life," allowing dialogue to be spoken, heard, and responded to as discourse. When a student can see meaning through art, literary studies can provide a new role in education by producing active voices.

Bernstein is not trying to undermine literature studies. In fact, he is suggesting an enhancement by explaining the value in aesthetics by connecting aesthetics with pathos, a pillar to the rhetorical triangle. Aristotle, himself, knew and believed in the power of connecting with the individual reader. Therefore, the power of persuasion -- the power of rhetoric -- relies on how a writer uses knowledge of human experience to sway the reader. When teaching composition, whether it be for the writing classroom, or for English majors who will spend their college careers writing essays, aesthetics is a foundation for creating good writers of rhetoric. Rhetoric is everywhere; it is part of daily life. If aesthetics is a way for literary students to create meaning in their studies, does this not also apply to other departments?

Daniel Punday offers a different, but complementary angle on poetics. Punday prefaces his book *Computing as Writing* with a quote from Ian Bogost: "The best artists, writers, programmers, and designers are well aware of how certain platforms facilitate certain types of computational expression and innovation…We believe it is time for those of us in the humanities to seriously consider the lowest level of computing systems and to understand how these systems relate to culture and creativity" (Punday x). The humanities have certainly taken on new media and have embraced how digital realities affect current work. But, if aesthetics is a gateway to a better understanding of literary scholarship, then it would make sense that knowing the aesthetics -- the creativity of

programmers and computer scientists -- at least on a basic level, would better equip English majors in the digital now. Rather than separation, the two fields of writing and computing are "evolving closer together" (Punday xi). Punday explains, "Authors composing for the Web may find themselves including HTML and CSS code for formatting, while programmers often employ simple text editing programs for their day-to day work" (Punday xi). Daily life now requires computing in some way, shape, or form. Neither literary studies nor English as a major should be considered irrelevant in the digital present. I don't believe they are, but I do think English studies require a closer look into the role of computing. It isn't enough to simply use the technology anymore. English majors need to learn the aesthetics of computing, at least to a degree, in order to better connect in the digital now.

Digital Humanities has emerged in hopes of providing solutions to the academic divide, connecting technology fields and humanities fields. The areas of study Digital Humanities covers remain ambiguous as it grows because of attempting to connect fields that have remained separate. The field was born from *humanities computing,* the sub-field meant to “employ computers to study traditional objects of humanistic study” (Reid 15). Other areas that are beginning to connect more with Digital Humanities include “media study and rhetoric and composition, which have long standing practices of studying digital media and technologies that have paralleled those of humanities computing” (Reid 15). Digital Rhetoric was then created, which is the art of persuasion using digital realities. Rhetoric and composition studies usually fall within English departments or stand-alone writing departments, grown from the English department.

Typical English majors attain critical thinking skills through close reading, analyzing, and writing about literature – literary studies. According to the Norton Anthology of Theory and Criticism, theory involves "investigating and criticizing values, practices, representations, and affects embedded in cultural texts and surrounding institutions" (Leitch et al, xxxiv). English students use Literary Criticism to connect with universal discourse. Rhetoric and composition courses prepare writers who can speak to their appropriate audience, contributing to conversations. Rhetoric and composition studies connect disciplines through communication; its pedagogy teaches how to extend the conversation. Discourse is changing because technology has changed how people use language and how they communicate. In order to continue sharing, English majors will be better served with a curriculum more closely related to digital realities.

Though the push for STEM education does not fully incorporate the humanities fields, specifically the English department where writing pedagogy generally stems, it is acknowledged that all students need to learn how to become better communicators. Colleges and universities, recognizing the value of learning effective communication, have then incorporated first-year writing programs as a component of their mandatory curriculum. Required core writing and communication courses are currently the primary entrance into interdisciplinary studies. It is typically professors from humanities departments who teach these courses to all students, regardless of their field of study. As an example, Radford University developed University Core A, which according to its Core Handbook:

> is a series of four courses that develop skills that cut across disciplines. The central focus of the University Core A sequence is how to think

> critically, to write and speak clearly, and to conduct research carefully. University Core A courses will help you enhance your ability to be self-reflective and will allow you to ponder modern issues—for example, the impact of technology and the rise of social media—that affect you. You will also have the opportunity to explore ethical issues that are important in your life. (Radford University Core Handbook 20)

University Core A was designed because Radford University believes "that a university education is most effective if it requires students to take courses not only 'within' but 'without' a major" (Radford University Core Handbook 21). Students who take courses outside of their prospective major receive a well-rounded education, giving them different perspectives. The initial step is teaching them how to enter conversations through composition. First-year writing and communication courses at Radford University include Core 101 and Core 102.

Core 101's objectives are to teach "the writing process, genre, style, audience, and standard written English" (Radford University Core Handbook 27). Students should already be familiar with most of the terms; however, the goals require them to "understand these concepts in greater depth and be able to make more effective use of them" (Radford University Core Handbook 27). In addition, students in Core 101 advance their skills in oral communication, which prepares them for the set objectives of Core 102. Core 102 continues to emphasize composition and communication skills while formally introducing "research, oral communication, and critical thinking skills that will be important for your academic and professional success" (Radford University Core Handbook 88). Core 102 is further explained as teaching:

> the rhetorical principles that inform successful oral and written communication; key concepts in argumentation including informal fallacies; research as inquiry, using both print and digital sources to gather information on a topic, evaluation of the quality of information, and use of information as evidence to support arguments. (Radford University Core Handbook 88-89)

An example of a similar first year writing program is at Virginia Tech, where all students must attain seven set objectives. Their writing program, according to their website, is "designed to address seven specific learning outcomes," five of which are shaped from the Council of Writing Program Administrator's recommendations (*First Year Writing Experience. College of Liberal Arts and Human Sciences*). The seven course goals are outlined as: rhetorical knowledge; critical thinking, reading, and writing; processes; knowledge of conventions; writing in electronic environments; visual literacy; and effective oral presentation skills. The first-year writing courses are designed to prepare students "for dynamic environments" and expose them "to a range of written, spoken, and visual forms of communication, both as audience and as author" (*First Year Writing Experience. College of Liberal Arts and Human Sciences*). Virginia Tech's first-year writing courses are meant to "lay the foundation" for each student "to be a critical thinker, an active learner, and an effective communicator" (*First Year Writing Experience. College of Liberal Arts and Human Sciences*). Though Virginia Tech offers liberal arts degrees, the institution is one that is primarily science-based. In contrast, Radford University is considered to be liberal arts focused; however, the two universities

share value in first-year writing programs. They both believe students should graduate with their prospective degrees having obtained advanced communication skills.

Harvey Mudd College, located in Claremont, California, also agrees on the importance of first-year writing programs, providing a third example of shared university goals. It is a small liberal arts college, consisting of only about 800 students. Unique from both Virginia Tech and Radford University, Harvey Mudd students major in STEM fields, and are required to obtain a concentration in the humanities, social sciences, or arts. The college's president, Maria Klawe, states, "As a liberal arts college, we value students' development as communicators, thinkers and scientists" (Klawe, "Look What Happens When STEM Professors Teach Writing). In 2009, the school launched the WRIT 1 course, which shifted first-year writing instruction from the humanities departments to the faculty of STEM disciplines. Professors of Math and Computer Science engaged in teaching composition to first-year students. Rachel Levy, an associate professor of math, explained, "even before the college implemented WRIT 1, mathematics courses emphasized communication" and assignments called for "clear writing" with "style points" (Klawe, "Look What Happens When STEM Professors Teach Writing"). Mathematics majors were already required to pass a public speaking course because they believed that "Communication skills are like a superpower" (Klawe, "Look What Happens When STEM Professors Teach Writing"). Communication skills will serve the students beyond the classroom in their professions after graduation, as well as life.

Assistant professor of computer science, Colleen Lewis, concurs with her co-worker, Levy, on the importance of communication skills. Lewis describes becoming

more excited about teaching first-year writing after realizing that her "bad writing" and her students' "bad writing" can be compared "to a computer program that doesn't work yet" (Klawe, "Look What Happens When STEM Professors Teach Writing"). She explains further, "When your computer program doesn't work you don't call it a 'bad' computer program—it just isn't done yet. The methods of my arduous process of revision are exactly what I can share with my students" (Klawe, "Look What Happens When STEM Professors Teach Writing"). Both Levy and Lewis discovered that first-year composition courses connected more with their discipline than previously considered. Writing is valuable across the disciplines because "learning to communicate ideas is at the heart of learning across the disciplines" (Klawe, "Look What Happens When STEM Professors Teach Writing"). The connection that Lewis made between writing and computer science highlights the importance of recognizing that the disciplines work together. In regards to the computer science field, she says that "it isn't about hacking together a computer program; it is about communicating an algorithm that needs to be understandable to both computers and humans" (Klawe, "Look What Happens When STEM Professors Teach Writing"). Terminology may be different among disciplines, but understanding effective communication through writing is universal. Students in higher education must learn how to contribute to society through discourse. Understanding rhetoric is essential in all fields and is therefore included in many core or required courses for university students.

The primary argument I want to point out is that humanities assists in providing necessary interdisciplinary education for STEM fields, but knowledge from STEM fields needed for humanities' growth seems to be lacking in support. More technical knowledge

is needed in the typical English major's curriculum in today's economy. The Digital Humanities are evolving, which begins to level the fields by adding STEM into the humanities. The humanities have been "in an apparent state of crisis, with declining majors, fewer jobs for faculty, finding cuts, and a general questioning of their value in a system of higher education that is itself under attack" (Reid 16). Reid asserts that there has been "a paradigm shift wherein scientific discoveries, the emergence of digital media, and the development of new global relations have created new conditions for which traditional humanisitc paradigms, built in the modern, industrial age, are no longer suited" (Reid 17). It is fair to say that education is attempting to acheive equal opportunity with disciplines, but my concern specifically involves the typical English major – the one who is passionate about literature studies, yet struggles to find work after graduation. The English department contributes to STEM learning through writing pedagogy; it is time for the English department to ask for contributions from STEM fields, or more accurately, from technology departments. The typical English major will be better served with a writing curriculm that connects more authentically with contemporary digital realities and STEM.

This chapter has provided some basic history behind the push for STEM education, the acknoweledged need for better communication through writing, how writing and rhetoric have evolved (as well as shown some of the lack of evolution), and has outlined the necessity of better technological education within the typical English major's curriculum, which does not concentrate in technical writing. Chapter 2 will delve more into how Digital Humanities as a field contributes to the English department. It will explain more of the connections between the humanties and technology, which will lead

into how the English department can better serve their students through connecting more closely with contemporary digital realities. Chapter 3 is designed to highlight more specific connections between computing and writing. Brace yourself for some technical information, as it goes more into detail of writing from the eyes of a programmer. As Chapter 3 explains how programming and the writing process taught in composition pedagogy are similiar, Chapter 4 will focus specifically within the English department. There are two sub-fields that can play an active role in departmental growth, usually separated from the typical English major studying literature: Technical Writing and Linguistics. These sub-fields have taken on identities in other fields and should be welcomed back home to the department of English because of their contributions. In Chapter 5, I will wrap up my thoughts and propose final suggestions for a curriculum that more closely relates with contemporary digital realities and STEM for the typical English major.

Chapter 2: What Does It Mean to Embrace Digital Realities in the English Department?

In Chapter 1, I explained how digital humanities has emerged as a hopeful solution in bridging the academic divide between the sciences and the arts. Because of the blending, there are many fields that formulate digital humanities, making it difficult to provide an exact definition of what the exact role of the field may be in the university. It is also important to note that because of the vast amount of information provided to create digital humanities, there are different ideas as to what it should look like in education. Luke Waltzer describes that Digital Humanities has "the capability to invigorate humanities instruction in higher education" and can advocate, "how the humanities can help us understand and shape the world around us" (Waltzer, "Digital Humanities and the 'Ugly Stepchildren' of American Higher Education"). According to Matthew Kirschenbaum, digital humanities "is probably more rooted in English than any other departmental home" ("What Is Digital Humanities and What's It Doing in English Departments?" 1). Uniting Waltzer's and Kirschenbaum's ideas on Digital Humanities indicates the need to observe more closely the relationship of digital realities and the opportunities for the English department.

The typical English major studies literature, works with literary criticism, and researches past and present literature in order to create meaning. Before exploring the world of computing and its similarities with rhetoric and composition, there is a need to address how digital realities affect English majors within the comfort of their world of literature studies. If digital humanities are as closely related to the English department as Kirschenbaum argues, then there is adaption to technology in current curriculum that

cannot be overlooked. Current digital realities that are used should allow the department to grow, not shift gears completely. As already stated, digital humanities is a broad field that attempts to bridge gaps between technology and the humanities. Just so there is no real confusion, I am not arguing that the English department rejects technology altogether. On the contrary, the English department works closely with digitizing literature and working with digital publishing. There is simply room to improve how English majors, specifically, are served in preparation for life after graduation.

Digital Humanities can be viewed from two main perspectives: those who feel passionate about writing research code and those who use various digital tools to assist in research. I want to acknowledge just a few of the various tools used by English majors to highlight Kirschenbaum's argument that digital humanities "is probably more rooted in English than any other departmental home" ("What Is Digital Humanities and What's It Doing in English Departments?" 1). Of course there is digital archiving, such as the project Kirschenbaum references in his article from his time at the University of Maryland. He discusses how his department supported research from what they liked to refer to as "Shakespeare to Second Life" ("What Is Digital Humanities and What's It Doing in English Departments?" 2). The project undertook many tools developed and coded by digital humanists such as: text-analysis programs, programs to develop lists of word frequencies, citation tools, and archiving tools for digital communities. The typical English major who has grown up in the digital world is generally familiar with how to use technology. The obstacle I will continue to address later in Chapter 3 is understanding the mechanics of the tools and how closely related the invention of technology actually is within the English department. My argument is more geared

towards the first perspective I mentioned – digital humanists who are passionate about creating code. As Kirschenbaum also discusses, "digital humanities is also a social undertaking," harboring "networks of people who have been working together, sharing research, arguing, competing, and collaborating for many years" ("What is Digital Humanities and What's It Doing in English Departments?" 2). It is important to remember that English departments have been involved with digital realities and have been collaborating through networks. English departments need to continually evolve with technology.

Digital realities are becoming vital for literary studies in Web 2.0. In an online world full of blogging, social sharing, and immediate access, English teachers and students should be communicating work for collaboration. In their article, "Digitizing English," Jennifer Glaser and Laura R. Micciche ask how English departments can "become more explicitly relevant to twenty-first-century language practices, analyses, and studies" (Glaser and Micciche 202). How can English majors better use digital realities for literary studies? They go on to explain, "thinking like DH practitioners and theorists is a significant part of what we mean by *digitizing English,"* which means embracing digital realities as more than a tool that performs our work. Digital spaces become a work space, a writing space, and a space providing more insight to language, literature, and human connectivity. It is not just about how digital tools assist English majors to become more efficient with work, or the work of archiving literature to study, but *how* digital realities shape and can continue to shape English studies.

To understand better, it might be easier to think of what is familiar in literature studies – literary criticism. It isn't necessary to discuss deeply how criticism has evolved,

but to think of this time, this digital now, as a new evolving criticism. Of course, New Media criticism already exists, but it will continue to evolve as a criticism or morph into another new criticism. In *Constructing Knowledges,* Sidney Dobrin argues against the idea that theory is dying in literature studies, and that it is, in fact, still necessary for English majors. It is important to see that theory "provides a framework within which one can operate, ask questions, even alter or refine principles, which creates fluidity of thoughts and knowledge" (Dobrin 9). Dobrin's assertion validates the idea of theorizing digital realities and using them to not only enhance literary studies, but allow English majors to question and think critically on them. Theory continues to evolve, just as knowledge expands and provides "room for revision" where "universal explanations can be rethought" (Dobrin 9). According to Dobrin, this is the strength behind theory, and it will allow growth beyond literary studies and into composition and rhetoric.

In the introduction of *Rhetoric and the Digital Humanities*, Jim Ridolfo and William Hart-Davidson argue two useful purposes of Digital Humanities for English majors. As Digital Humanities continues to grow, it has more allotted research funds. Therefore, it is suggested "that scholars may want to consider selectively redefining digital projects under the umbrella of DH in order to leverage funding, institutional recognition, and extrafield audiences" (Davidson and Ridolfo 4). This is not to say that just because there is funding that English majors should shift their focus to digital humanities simply for the sake of participating in research. It is a call for attention to the impact digital humanities has within the university because of the focus on STEM fields. Digital humanities can act as a gateway for English students to get their research funded. It is up to the English department to help their students devise new ways of looking at

literary studies in combination with digital realities. Though the umbrella of digital humanities is welcomed to provide funding, the drive to include contemporary digital realities into the English major's curriculum is to better serve them. The digital now provides more opportunities for English majors than ever before, and if the English department does not better serve them now, then it is failing them in future success.

Rhetoric is one of the greatest skills taught to English majors; it is everywhere in daily life. It is an imperative tool, continually taught simultaneously with literature studies, after some initial composition and rhetoric courses. Rhetoric is never-ending for the English major, and they should be comfortable extending knowledge using digital realities continuing to "occupy an increasingly relevant focus within the disciplinary ecology of rhetoric, challenging traditional binaries and boundaries, some of which we have retained since rhetoric's inception" (Brooke xiii). Rhetoric should not be confined to the four walls of a classroom, but rather be a part of a larger conversation—a discourse stretching beyond the classroom. Writers and teachers of writing need new applications for the use of theories, and in turn, will continue building new theories. Rather than wait for engineers to create the technologies used for practice, English majors should engage more in the invention process.

Currently, Dobrin is leading the University of Florida's English department in several digital media projects through their TRACE Innovation Initiative. According to the website, "TRACE works at the intersection of ecology, post humanism, and writing studies. Providing an interdisciplinary forum for scholars, we focus on the ethical and material impact of media" (*ARCs: Augmented Reality Criticisms*). The English scholars utilize a variety of digital media from data mining to gaming, focusing on Augmented

Reality Criticisms (ARCs) as rhetoric. ARC allows University of Florida English "scholars to investigate how multi-modal writing and critical public discourse intersect" through mobile applications using augmented reality (AR) technology (*ARCs: Augmented Reality Criticisms*). English majors are encouraged to create and circulate their writing using AR tools to provoke "social awareness and action" (*ARCs: Augmented Reality Criticisms*). AR writers are taught to design content using current digital realities in order to engage their audience.

One of their current ARC projects is *SeeWorld: Visualizing Animal Captivity Practices at SeaWorld Orlando*, which highlights negligence on SeaWorld's labor and animal captivity practices. In 2013, Gabriela Cowperthwaite released the documentary, *Blackfish*, creating a public uproar on SeaWorld's whale captivity. She tells the story of their famous Orca, Tilikum, who has lived in captivity for over 30 years. As part of the conversation Cowperthwaite started, students in TRACE at the University of Florida are in the process of developing a response using an AR mobile phone application. The app will educate SeaWorld's visitors on some hidden truths of SeaWorld's negligence. The conversation extends beyond the treatment of the Orcas and provides researched information using "multimedia overlays detailing the hazards of aquatic animal captivity" and "the park's history of damaging animal care practices and consistent denial of marine science research" (trace.fl.edu). Park visitors will be able to download the app once it is completed and launched. It will work using trigger images throughout SeaWorld that can be scanned in order to receive information in specific locations.

Not only does the AR application designed by the students enter into a public conversation regarding ethical issues, it tells SeaWorld's real narrative. *SeeWorld:*

Visualizing Animal Captivity Practices at SeaWorld Orlando is literature provided in a multi-media format, which is more likely to reach more people than an academic paper they could have written and published. It also challenges the idea of space and authority within digital realities as writers. The trigger images that will prompt the information within the walls of SeaWorld are images taken by the students and then built into the application. The story is able to be shared without being restricted and confined. There are no laws being broken. The information is thoroughly researched, giving the rhetoric necessary ethos. The students go through each step of the writing process in a creative way using digital realities to reach their audience.

Although the content outlet is shifted, its invention remains traditional in practice. The TRACE website explains that "individuals can explore how writers use AR to modify and transform dominant narratives about objects, subjects, sites, and historical moments" and "are also academic projects that theorize and critique our understandings of materiality, space, and ownership by visualizing and reinventing the discursive boundaries surrounding these concepts" (*ARCs: Augmented Reality Criticisms*). Using multi-modal rhetoric encourages students to effectively communicate and write as active participants in society. English departments need to produce graduates who understand current language use for rhetorical strategies. Brooke contends, "computers and the Internet more generally have helped millions of people forge connections to one another" (Brooke xiv). If composition studies are aimed at teaching societal discourse, then practice needs to reflect the modes students will use to write.

Effective communication motivates others to enter the conversation. The Internet provides a platform where writers have the opportunity to become social agents. Brooke

argues that the second canon of rhetoric, Arrangement, could be considered "Pattern." For example, tag clouds are used in Web blogs to place frequently used keywords into searchable categories. The pattern, or arrangement, of content should create a user-friendly webpage, geared towards the prospective audience. Brooke explains that "new literacies" are "frameworks for both understanding and producing these new messages" and we must disrupt the "static styles and literacies with which we have worked [that] are no longer sufficient" (Brooke 127). Rhetoric and composition pedagogy should include current digital realities to reach the appropriate audience. J. Elizabeth Clark states in her article, "The Digital Imperative: Making the Case for a 21st Century Pedagogy," that "the technology of the time gave rise to some of the most powerful intellectual movements in human history, including the Renaissance, the Scientific Revolution, and the Protestant Reformation" (Clark 27). What we are seeing now with the digital world is "a new ability to interact with the text and to comment on it in a way that is more akin to the age of the scriptorium than the era of the printing press" (Clark 28). She refers to Richard Lanham's idea that "the computer is a rhetorical tool" (Clark 28). It is important to remember technology is a tool for collaboration; the tool itself is not the collaborator. It is scholars who collaborate.

English majors need to understand how the published tools they use operate. Therefore, English departments must embrace learning and teaching software language and its relation to writing. Understanding at least the basics of software language helps English majors better grasp rhetoric in digital realities, as well as fill a connection gap with STEM fields. Ballentine argues, "Digital humanists interested in participating in the design, development, implementation, and/or critique of digital texts (in short, *all* the

arguments) must be able to expand to the code level" (Ballentine 279). In 1972, computer scientist Butler Lampson argued in his article "Programmers as Authors" that "hardware would become so cheap that 'almost everyone who uses a pencil will use a computer'" (Chandra 3). Forty-four years later, computers are common and used for daily tasks, and vary in design. There are desktop computers, laptops, tablets, and smartphones. Chandra affirms the statement saying, "Computing has transformed all our lives, but the processes and cultures that produce software remain largely opaque, alien, unknown" (Chandra 1). Writers use the tool, but very few understand how it actually operates. An alliance needs to be formed between STEM disciplines and the English department for knowledge expansion and innovation.

Chandra, a writer and software engineer, explains that writing became his niche, his "way to be in the world, to be of it" (Chandra 10). He surrounded himself with books and read continuously. Rather than join the majority of his peers in first pursuing a degree in engineering, he went on to study English. And as many English majors do, he squirmed when answering how he "was going to make a living" with a degree in English. He chose to attend film school in graduate school in hopes of becoming a screenwriter. While in school, he took a job as a scribe. His responsibility was to type doctors' handwritten notes from appointments with patients and print on letterhead for submission as legal documents. He describes the moment when the company bought its first set of personal computers: "I had typed my papers and stories on a terminal attached to the huge mainframe computer at college, and had taken a couple of programming classes" (Chandra 14). Although he did not study programming in college, he gained experience

in learning software language to understand computer operations. His proficiency allowed him to work faster, and he was able to correct any glitches that occurred.

The speed at which he could now do his work left him plenty of time for self-education. The "arcane depths of DOS" became "a complete world, systems and rules" he "could discover and control" (Chandra 15). He would spend more time with various trials and errors creating shortcuts in WordPerfect to make his overall job as a scribe easier. As he continued learning, he turned into "the de facto tech-support guy" for his co-workers, which led to a new venture that helped pay his way through graduate school. The writing jobs he was able to secure were not paying the bills. His understanding of computer code provided revenue, so "as many consultants and programmers do," he continued learning with each job as an independent computer consultant. He educated himself through research and explained, "—if I didn't know how to do something, Usenet and the technical sections of bookstores pointed me in the general direction of a solution" (Chandra 17-18). As his knowledge grew, so did his graduate school business as an independent consultant.

He eventually graduated, published the novel he had been working on and accepted a creative writing teaching position at a university intending to leave his freelance computer work in the past. However, the desire to continue developing and creating computer programs followed him. Chandra describes the joy programming gave him, explaining how "The work of making software gave" him "a little jolt of joy each time a piece of code worked" and "when something wasn't working, when the problem resisted," he continued searching for a solution (Chandra 18-19). Similar to an artist, "the world fell away" and "time receded" (Chandra 18-19). One difference in writing code as

opposed to writing prose was that he could “see cause and effect immediately" (Chandra 198). There is immediate response. He stated, "it either works or it doesn't" (Chandra 198). When writing prose there is not an immediate response; it "has no success or failure" and it "waits to manifest" (Chandra 198). A prose writer must patiently await reader response. Chandra argues that through digital realties, code “shapes the world of the non-programmers and embeds itself into their bodies, into their experience of themselves, into lived sensation and therefore the realm of experience and aesthetics" (Chandra 223). To Chandra, writing software code is as sublime as writing fiction, with instant gratification. Now, all writers are able to receive instantaneous response when writing online.

Chandra benefitted in experience, as well as professional opportunity, because he understood his passions – the mechanics of both writing and computers. He provides a unique experience that other English majors can use as an example. He is not the typical English major; however, Chandra provides reasons as to how understanding digital tools can be helpful to an English major. Of course, he is the ideal—the ideal is not the goal here. What would happen if English majors were provided just a portion of the knowledge that Chandra was able to learn? How many narratives could be unfolded like *SeeWorld*? Students don’t necessarily need to learn the extreme depths of skills such as Chandra’s, but they should be better served with more knowledge relating directly to digital realities.

Digital humanities offers a variety of avenues for the English major to explore, and perhaps a big obstacle in utilizing it is trying to define exactly what it means for the English department, which is difficult to do when the field alone is continuing to evolve.

The English department should take advantage of the opportunities presented through digital humanities, such as funding for research, in order to better define how digital humanities can help grow the department. I will talk more in the final chapter on ways the curriculum may be able to shift in order to better serve English majors, but for now my goal is to present information that better connects English majors to the digital now, while being able to remain unique as an English major. The primary way to understand the digital now, to connect with digital humanities, and to grow as a department is to better understand the parallels with computing.

Chapter 3: Understanding Rhetorical Strategy as a Programmer

Using Chandra as the ideal example, he was able to pave his own path, and created business opportunities using his skills in both traditional writing and computer software, illustrating their artistic similarities. Though he is a unique example, the desire is to have more English majors like him. It isn't the ideal to have English students who are identical, but ones who understand the practical applications involving technology with their English degree. Luke Sullivan explains in his book, *Hey Whipple, Squeeze This*, how writing in digital realities can lead to a successful career in copywriting and advertising. By encouraging "traditional creatives to use, study, and learn the emerging technologies," they can use combined skills in creative business" (Sullivan 135). The first of the five rhetorical canons is invention, from the Latin root word *inventio.* Jarrett explains in "Rhetoric" how the rise of first-year writing courses encourages a shift in teaching "the ways writers compose" (Jarratt 83). She points out that "Aristotle dwells on the power of words to bring images before the eyes," reasoning that rhetoric transforms to a wide range of discourse modes. Rhetorical strategies expand with new digital realities as images, words, and language.

Producing English majors who carve their own path, who are innovative, means looking at technology in the present, rather than analyzing its past, and predicting the future. Part of technology now is Web 2.0. What is Web 2.0 exactly? Gatton explains Web 2.0 as technologies that "have made the creation and distribution of user-generated content easy and free for everybody" (Gatto 208). She attributes the idea to the idea presented by Wesch that the change primarily came from the use of XML over HTML. I'd argue that it is really more of the addition of XML, rather than a choice between using

one of the two. Many programmers use both XML and HTML, as well as a newer mark-up language, XHTML. XML essentially created dimensions to authorship online, such as social media and blogs. HTML is limited in creating content for webpages, rather than interaction. XML paved the way for community online, allowing participation between users. XML changed audience. Gatto deemed the new audience as “prosumers,” rather than consumers and producers. They are one and the same with Web 2.0.

Writing on Web 2.0 as part of and for the “prosumer” audience does not mean the canons of rhetoric disappear. On the contrary, English students need to understand more fully the importance of invention, arrangement, style, and delivery. The connection between academic writing and everyday writing is often lost in the writing pedagogy. With the emergence and continued growth of Web 2.0, it is more important now than ever to include online content as part of the basics in the writing process.

Taking a closer look at the relationship between technology and writing also requires a second look at the definition of audience. When we teach writers "how to write," we teach strategies for reaching their directed audience. By comparing computer programming to writing, *audience* becomes more dimensional in nature. Writers, in any definition of the term *writer*, typically begin the process by asking questions like: "Who am I speaking to," "Who will be listening," "Who will respond," "Who else will respond," and "How do I want them to respond.” When writing code, the initial audience is the machine. Programmers write to communicate commands in hopes that the machine will respond as desired. The other layer of audience the programmer must keep in mind, however, is the user. The output of code requires design in order to be user friendly and provide the expected results from the person using the technology. Just as in literary

writing, the relationship between author, text, and reader is an important element in the writing process.

The internet, specifically Web 2.0, has transformed the more stagnant definition of audience into a mobile definition of audience with many layers. Punday references Lev Manovich in his chapter, Audience Today: Between Literature and Performance, explaining that computer text is a "variable" (Punday 127). Manovich explains, "a new media object is not something fixed once and for all, but something that can exist in different, potentially infinite versions" (Punday 127). Constructing rhetoric with Web 2.0 means the author must be concerned with the first definition of audience, the "who am I reaching," and "how do I want them to respond." Then, the Web 2.0 writer must think of how to design the content to match the language. So far, this is not incredibly different from how publishing has worked over the years, except for the ability to immediately publish and reach the desired audience.

The second-layer audience the digital writer must consider is the tool they are using, and they must be considering this while drafting the content. The digital writer needs to consider how the code they are working with to create text is going to be displayed and therefore must simultaneously communicate correct commands. Programs designed for word processing have made it easy to write text online and not consider what is actually being performed. If a writer can understand the basics of HTML, XML, and even CSS, they will be able to better communicate their thoughts working with the code. In turn, this creates a better piece of work. An English major will be better served by understanding how to communicate as a programmer in order to create their work using digital realities.

It is pretty simple to understand the two levels of machine-audience in comparison with reader-audience, and I don't think there is much argument in knowing the importance of understanding both. The third layer and fourth layer of audience are where Web 2.0 has made the largest impact in the writing process. Both communication layers work with search engines, as well as reader-audience and machine audience. Ultimately, they could be interchangeable. Personally, as an English major, I like to think of my reader-audience first. So how is this reader-audience different than the first? There is a vast amount of literature online thanks to Web 2.0. Anyone and everyone who has something to say can publish it online. The reader-audience is already determined, but the obstacle is the work reaching the right person. Of course, publishing content in the appropriate outlet is key. Knowing if the audience is going to be on a particular website or using a specific form of social media will allow the content to be found by those who come across it using those sites. But reaching beyond those sites requires some additional work.

Readers search for the content they want; they seek out information to help build their knowledge. The readers are seeking content to respond to, and now the first place readers search is online. Search engines, specifically Google, study language and how it is used. Google actually hires linguists to help build their algorithms. When writing for Web 2.0, it is helpful to understand the desired audience and the language they are using. Google has actually helped make this a fairly easy process by providing tools to look up popular keywords, trending keywords, and behaviors of demographics. By studying natural language used over content online, Google helps writers better understand their audience. Of course, this requires the writer to understand the technology. Once a writer

understands their online audience, they can use particular keywords that are being used within their content in order to be found by the targeted audience. This layer of audience will be discussed in more detail in Chapter 4 in regards to linguistics within the English department.

The fourth layer of audience, then, is another layer of machine-audience. The writer has designed the content for the reader-audience, using tools to help build the content language so that it can be found. To be found, though, requires the content and design to work with search engine algorithms. The content can be published and be visibly beautiful through correct communication using the code, but that does not mean the algorithm codes will agree. Web crawlers, spiders, and bots crawl content online in order to match the search engine user with appropriate content. They have to be able to read the content on the backend. They don't read text as the reader-audience; they read code.

Web 2.0 includes more than social media, blogs, and general online content. Cloud computing is becoming a more prominent working model, providing additional instant collaboration. When looking at computational linguistics, Gatto believes that cloud computing will "play an important role in the way corpus resources are produced" (Gatto 209). She refers to "collective intelligence," a term she uses for collaborating knowledge using networking resources. There is opportunity to share information, to continue to grow and impact the way English students and writers can share knowledge – learn from each other. Software is continually developed, increasing opportunities to use cloud computing for more virtual work than before; however, businesses have been using cloud computing to store data for years in order to improve storage and performance.

Programmers have been networking together for years for what Gatto calls, "Collective programming." Programmers use cloud computing to exchange code and work together to create and build code. Gatto explains it "could never have worked without the emergence of new tools for sharing and cooperating" (Gatto 209). Collective programming relies on networking, using connected servers to communicate through a screen. Because programmers have been able to connect and share code, others are able to look at the code and build from it, add to it, and change it in order to enhance it. Imagine if English majors did more of this with their research and their writing. There seems to be many overlaps within the technology field and humanities that I feel are too commonly overlooked.

There seems to be more in the separation of the fields than simply the difference in studies. It seems there is some anxiety with moving from classic rhetoric, but it is quite opposite. We are still building from knowledge shared from Aristotle. The canons of rhetoric are just as important as they were when *Rhetoric* was written. The rhetorical triangle plays an active part in overlapping Computer Science with English departments. In his book *Code: The Hidden Language of Computer Software*, Charles Petzold discusses how ancient Greek rhetoric connects with technology through logic. He explains logic using Aristotle's famous syllogism as an example: *All men are mortal; Socrates is a man; Hence, Socrates is mortal* (Petzold 86). He reasons, "In a syllogism, two premises are assumed to be correct, and from these a conclusion is deduced" (Petzold 86). Syllogisms are another connection of the humanities and STEM. A syllogism is philosophical logic; algebra is mathematical logic.

George Boole created Boolean Algebra, a type of algebra that is similar to "conventional algebra" in appearance and function, but “more abstract by divorcing it from concepts of number." (Petzold 87-88). In Boolean Algebra, *Operators*, usually symbols like + and x, dictate how *operands*, typically letters, create equations (Petzold 87). Relating Aristotle's syllogism to Boolean algebra, Petzold uses the letter P as an operand representing *persons*, rather than *men* for gender-neutral language. He uses the letter M as the operand to represent "the class of mortal things," and the letter S as the operand representing "the class of Socrates" (Petzold 91). The equation P x M = P is "the intersection of the class of all persons and the class of all mortal things is the class of all persons" and can be used to answer the question: "What does it mean to say that 'all persons are mortal'? (Petzold 91). Petzold further explains Boolean algebra using conventional algebraic laws.

The operands, or variables, M and P cannot be interchanged because "all mortal things" can include animals and plants, whereas, *persons* can only represent human beings. Using linguistic terminology, the equation P x M = P would be considered grammatical, but would not make any sense. However, the equation S x P = S can be used to represent the statement: "'Socrates is a person,' means that the intersection of the class containing Socrates (a very small class) and the class of all persons (a much larger class) is the class containing Socrates" (Petzold 91). Furthermore, as represented in his first equation, "P equals (P x M)" can be substituted "into the second equation: S x (P x M) = S" or "(S x P) x M = S" (Petzold 92). Since it has already been stated that "(S x P) equals S," the equation can be simplified to: "S x M = S." (Petzold 92). The conclusion then can be proved that Socrates is in fact mortal because the "formula tells us that the

intersection of Socrates and the class of all mortal things is S" (Petzold 92). Of course, Socrates did actually prove he was mortal some time ago, but what Boolean algebra allows is to prove it logically as a fact.

When comparing the technicalities of computing in relation to classic rhetoric, language, and humanities in general, I want to go back to something mentioned in Chapter 1 in order to further connect with English studies. Bernstein asserted that poetics could be the key in helping English students better connect to literary studies. He argued that the visual mechanics of poetry, along with the aesthetic value, urged the student to connect meaning. Very few English majors will ever think identically to programmers. If they did, well, then they would have chosen computer science as a major rather than English. What English majors can do, however, is step back and visualize computing as they would poetry in order to better understand the tools they use, the tools which create digital realities.

In his article, "Procedural Literacy and the Future of the Digital Humanities," Brian Ballentine discusses the necessity of learning code within the humanities. He, like Daniel Punday, quotes Ian Bogost in his argument that "a robust understanding of how computers execute processes and how coded procedures make arguments" is a missing link for humanities students (Ballentine 277). There is a need for "a theory of procedural rhetoric" in order to fully apprehend knowledge about "the software systems we encounter every day and to allow a more sophisticated procedural authorship with both persuasion and expression as its goal" (Bogost qtd in Ballentine 277). Ballentine's argument delves more in detail of how to build the theory, which will be discussed more in the final chapter. The relevance of his argument now highlights the necessity for

English majors to learn coding on some level, and to learn basic mechanics of computing in order to understand the contemporary digital realities directly related to their work, be it literary studies or rhetoric and composition.

Computer Science developed through knowledge shared by mathematicians, as well as syntactic structure stemming from linguistic work, illustrating the significance of not only collaborating across disciplines, but acquiring knowledge that aids in communication. English majors can better understand the mechanics of computing by relating it to what they know. For example, Boolean algebra played a big part in the evolving computer. The symbol representing a union in an equation, +, is replaced with the variable "OR" in programming language (Petzold 92). The symbol representing an intersection in an equation, x, is replaced with the variable "AND" (Petzold 92). The replacement variables for unions and intersections from Boolean algebra are known as *coordinating conjunctions* in the English language.

The Turing machine is most recognized for receiving the credit as the first computer; however, Charles Babbage had long before set the process in motion with his Analytical Engine in the mid 1800's (Petzold 240). Petzold acknowledges the use of mathematical equations in the Analytical Machine, and then quotes Ada Byron, an Italian mathematician, using her notations on Babbage's Analytical Engine saying, "We may say that the Analytical Engine weaves algebraical patterns" (Petzold 240). He explains that Babbage, however, understood "a *cycle* of operations" equals "*any set of operations* which is repeated *more than once*" (Petzold 240). Babbage's Turing Machine was built by using his more extensive knowledge in mathematics, but he still could not have done it without first having the Analytical Engine. In relation to the English major, I want to note

how disciplines can work together by understanding each other's operations. A way to connect the Analytical Engine and the Turing Machine with English studies is the emphasis placed by Petzold on Byron's support is the occurrence of *repetition* (Petzold 240). The continual repetition of *a cycle of operations* relates directly to human language. To quote an earlier chapter of CODE: The Hidden Language of Computer Language and Software, "human language is heavily redundant" (Petzold 71). It makes sense considering humans, who innately follow rules of grammar in their own language, design computer and software language. If English majors understand the use and structure of language, it is easier to understand the operations of computing.

The Analytical Engine now allows a shift in perspective to view the computer as a communication tool. Computer language, similar to human language, uses methodologies of mathematics to formulate logic, which crosses the path of Philosophy. According to Petzold, "The next challenge must be text" (Petzold 286). Text can be viewed as symbols for letters, which create words, in turn creating sentences. To code symbols to text there must "be some kind of system in which each letter corresponds to a unique code" (Petzold 286). *Alphanumeric* characters are often "known as a *coded character set*" with "individual codes…known as *character codes*" (Petzold 286). What Petzold sets out to define for his readers is to explain how many bits are needed for these codes.

Computers ultimately only understand numbers, which means the base of text is coded using bits. Petzold urges his readers to view text as "a one-dimensional stream of letters, numbers, and punctuation marks" (287). He emphasizes, "code appears as handwritten characters or printed in newspapers, magazine, and books. We call it 'the written word' or 'text'" (Petzold 5). He uses the sentence "I have 27 sisters" to explain the

process of converting code to text, which will "be represented by a series of codes, each of which is a certain number of bits" (some letters, some punctuation marks, and for spacing; Petzold 287). Comparing the syntax of both computer and human language, bits form code, which translate to text, where phonemes form morphemes that translate to words (text). According to Petzold, "a strong correspondence exists between speech and text" in many languages (Petzold 5). For instance, in English, "letters and groups of letters correspond (more or less) to spoken sounds" (Petzold 5). Morphemes, in this case, can be viewed as the individual characters used to produce "consecutive character codes" which produce *text strings*, coded sentences (Petzold 287). Each language also follows a standard guide for order and general understanding. The International Phonetic Alphabet is the standard guide for the English language; the American Standard Code for Information Interchange (ASCII) is the guide for computer language.

Systematic rules and patterns formulate languages; computer language and natural language are both semantic. It is known that “Languages are rule-based–they consist of thousands of patterns governing what can and cannot be said or written at any given point” (Baker 47). Binary codes are not numbers, “rather they are numerals-symbols for numbers…manipulating those symbols according to rules” (Smith 11). Understanding the correlation between human language and computer language depends on "becoming familiar with the nature of codes” and “is an essential preliminary to achieving a deep understanding of the hidden languages and inner structures of computer hardware and software" (Petzold 5). Jay Walter Bolter asserts: "All computing is reading and writing. The computer is therefore a technology for all writers—scientists and engineers as well as scholars, novelists, and poets" (qtd in Stolley 266). If “all computing is writing” then

information interpreted “within conventional computers by a code that has just two units, usually designated by the symbols 0 and 1” creates communication (Smith 9). And according to Petzold, "most codes must be well understood because they're the basis of human communication" (Petzold 5). In essence, the English language can be considered code because "The sounds we make with our mouths to form words are a code intelligible to anyone who can hear our voices and understands the language that we speak. We have other code for words on paper" (Petzold 5). Phonemes represent units of sound that make up spoken words that form meaning; computers use numerical representations of our sounds, which are bits.

A bit is a binary digit. John Wilder Tukey, the American mathematician, coined the one syllable term "to replace the unwieldy five syllables of *binary digit*" in relation to computers (Petzold 68). In sticking with the use of poetry as a gateway to connect meaning, Petzold uses Henry Wadsworth Longfellow's poem on the night Paul Revere warned the American colonies of British invasion as an example of how human language can be converted to binary code. He says, "while he may not have been historically accurate…he did provide a thought-provoking example of the use of bits to communicate important information:

> He said to his friend "If the British march
> By land or sea from the town to-night,
> Hang a lantern aloft in the belry arch
> Of the North Church tower as special light, --

Petzold points out that Longfellow did not discuss "a *third* possibility, which is that the British aren't invading just yet" (Petzold 70). According to Petzold, "Longfellow implies

that this possibility will be conveyed by the absence of lanterns in the church tower" (Petzold 70). Petzold decodes Longfellow's prose as illustrated in Figure 1 by asking his reader to "assume that the two lanterns are actually permanent fixtures in the church tower. Normally they aren't lit:"

Figure 1

Following Petzold's logic, if no lanterns are lit then, "the British aren't yet invading" (Petzold 71). But, as in Figure 2, "if one of the lanterns is lit, the British are coming by land" (Petzold 71)

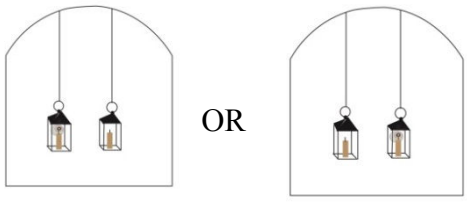

Figure 2

Lastly, as shown in Figure 3, "If both lanterns are lit," "the British are coming by sea" (Petzold 71).

Figure 3

Petzold encourages his reader to view each of the lanterns as a bit, explaining "A lit lantern is 1 bit and an unlit lantern is a 0 bit" and "only one bit is necessary to convey

one or two possibilities" (Petzold 71). Analyzing Longfellow's poem, Petzold uses the implication that Longfellow didn't "explicitly" mention "all the possibilities," (70) and "If Paul Revere needed only to be alerted that the British were invading (and not where they were coming from)," then only one lantern would have been necessary (Petzold 72). If there were an invasion, the lantern would have been lit; if there were no invasion by the British, the lantern would remain unlit (Petzold 72). Therefore, the addition of the second lantern is necessary in order to convey "one of three possibilities:" no invasion, invasion by land, or invasion by sea (Petzold 72). As Figure 2 helps visualize, it doesn't matter if the left lantern is lit, or if the right lantern is lit. The two variations in Figure 2 have the same meaning, which is "the British are coming by land" (Petzold 71). So according to Petzold's logic as he compares Longfellow's poem to binary code, having two bits (two lanterns) allows four possibilities to convey the three meanings:

> 00=The British aren't invading tonight.
>
> 01=They're coming by land.
>
> 10=They're coming by land.
>
> 11-They're coming by sea. (Petzold 72)

Petzold breaks down a stanza of Longfellow's poem "Paul Revere's Ride" to explain how the language of poetry can be compared to the language of binary code. In poetry, a common term used is *metrical foot*, which "plays an important role in scansion" (Akmajian, Demers, Farmer, and Harnish 130). As defined in *Linguistics: An Introduction to Language and Communication*, a metrical foot is "a structural unit that organizes syllables" (Akmajian, Demers, Farmer, and Harnish 590). In English, there are three types of feet: unary, binary, and ternary. However, metrical feet are present in

"every English word" either "with a metrical foot or a sequence of metrical feet" (Akmajian, Demers, Farmer, and Harnish 131). When looking at a foot in the English language, it is the leftmost syllable of the foot that "carries some degree of stress" and "every non-leftmost syllable in a foot is unstressed" (Akmajian, Demers, Farmer, and Harnish 131). Although binary code and metrical feet both use the term *binary*, their connection is actually the methodical systems used constructing meaning from code. Petzold offers an explanation of the rules in counting in binary:

> When you count in binary, the rightmost digit (also called the least significant digit) alternates between 0 and 1. Every time it changes from a 1 to a 0, the digit second to right (that is, the most significant digit) also changes, either from 0 to 1 or from 1 to 0. So every time a binary digit changes from a 1 to a 0, the next most significant digit also changes, either from a 0 to a 1 or from a 1 to a 0. (Petzold 67)

The importance in understanding the connection between the writing of code and the writing of rhetoric is to see the similarities in the invention process, the arrangement, and the style produced. Chandra also explains, "the poems you write, the pictures of your family, the music you listen to—all these are converted into binary numbers, sequences of ones and zeros, and are thus stored and changed and recreated. Your computer allows you to read, see, and hear by representing binary numbers as letters, images, and sounds" (Chandra 37). The use of aesthetics is an ongoing theme that will help English majors better connect to a subject they know little of, but are trying to understand.

The computer programs that are truly beautiful, useful, and profitable must be readable by people. So we ought to address them to people, not machines" (Knuth qtd. in

Computing as Writing 61). Codework poetry provides an example of authorship both with programming and writing students. John Cayley explains codework poetry: "Potentially *codework* is a term for literature which uses, addresses, and incorporates code: as underlying language-animating or language-generating programming, as a special type of language in itself, or as an intrinsic part of the new surface language or 'interface text,' as I call it, of writing in networked and programmable media" (Punday 128). Karl Stolley asserts, "programming is writing," meaning "writing source code right alongside and in service of acts of communication, including visual and interaction design" (Stolley 266). Regarding "the study of digital rhetoric, design, and development" the kind of digital humanities that Stolley visualizes is "research *through* programming…that creates knowledge that pushes the digital humanities toward a rhetorical theory of symbolic action at the source level" (Stolley 270). Computing is comparable to English studies. How English majors are taught to connect will be key in their understanding of contemporary digital realities. It is necessary to have communication between the technology fields and the English department; we cannot communicate appropriately without understanding each other. Therefore, it is vital for English majors to acquire more knowledge of computing operations in order to be better served, and have a curriculum that more authentically connects with contemporary digital realities.

Chapter 4: The Prodigal Children of the English Department: How Technical Writing & Linguistics Aid Curriculum Shift

Part of better serving English majors is ensuring they are well equipped to enter the professional world after graduation. The skills English majors develop through analyzing literature, using theory, reading criticisms, and studying rhetoric are valuable across the disciplines because they work together creating knowledge. English majors understand the rhetorical strategy, persuasion, and effective communication. Now, imagine an English major who also understands basics of computing and is comfortable working in the digital now. There are two sub-fields within the English department that I would now like to "welcome home:" Technical Writing and Linguistics. Both of these sub-fields seem to generally be included in the English department, yet excluded because they don't intertwine easily with literary studies.

Because both technical writing and linguistics are included/excluded, they are also found teeter-tottering with other fields. In turn, this seems to separate them even more. However, what would occur within the English department if it opened its arms back up and embraced the two sub-fields back as their own? Think of them like prodigal children who had to leave in order to learn, but were able to come back to share and promote growth. The typical English major only takes a course or two within technical writing, leaving a large portion of technical learning independent of their studies. The same is true with linguistics; most typical English majors only take one course, maybe two, studying the use and structure of language.

Collaboration in disciplines promotes life-long learners, which leads to students who are equipped to be innovators. They will be team players with a well-rounded

education who work well with other fields in order to combine knowledge, building on strengths. They will be able to "work smarter, not harder" and bridge the divide of "those who are good at math or science" and "those who are good at English." Faber and Eilola mention Robert Reich's parallel between "the geek" and "the shrink" (Faber and Eilola 1067). "The geek" is the technical savvy individual, the one who is "not only extremely skilled in computer technologies but also able to learn new technologies with great speed, to gather, filter, and recombine technologies in unique ways" (Faber and Eilola 1067). "The shrink" is the one who "excels at understanding people within particular contexts, at learning their backgrounds, their abilities, and their needs" (Faber and Eilola 1067). Reich's description of "the geek" and the "shrink" demonstrate the division, not just of disciplines, but also as types of learners.

In 2004, Susan Hockey was awarded the Roberto Busa Prize for her work within humanities computing. Her acceptance speech, "Living with Google: Perspectives on Humanities Computing and Digital Libraries," discussed linguistics co-existing as part of humanities computing, or Digital Humanities, along with the internet, more specifically, Google. The web has changed the way people live, communicate, and learn. Hockey reminds her audience, "text is still fundamental because it provides the means of describing and locating the objects," regardless of the evolution of computers and digital media (Hockey 10). She makes an interesting comparison with Google and libraries, referencing Google as a "digital library" (Hockey 10). The suggestion is that students should be able to analyze online literature just as they have been doing for years. She recognizes the separation of archiving texts, computational linguistics, authors, and literature students.

Hockey also recognizes the long-standing divide between the sciences and the humanities. She argues “that both need to incorporated in the curriculum” and students’ understanding of the “principles [is] key” (Hockey 19). English majors should not be required to master knowledge of other disciplines, but should be able to understand and think critically on the components of other fields in order to converse with each other more productively. Even more “important is for the students to reflect critically on the technology and its implications” so they can also “evaluate their work” (Hockey 19). It is necessary for students to understand how to use the technology because it is constantly changing. The call to action in Hockey’s acceptance speech is for students to be able to use digital text as they have been taught to use books. Additionally, a greater understanding of linguistics allows students to better use and find digital texts.

Linguists study language as communication science; they study words and how people use them to communicate. The internet has allowed content to be published by anyone, providing a greater opportunity for linguists to study natural language. This opens doors to study the invention of digital writing, as well as providing more literature that can be analyzed as discourse. Then, what is being studied on many levels is a collection of compiled texts. Corpus Linguistics is defined as "an empirical approach to the study of language based on the observation of authentic data" (Gatto 9). Natural language is represented through a group of texts. Recently, the Internet has been sanctioned as a corpus for linguistic study. Using the web as corpus provides “countless instances of repeated ‘social’ and ‘shared’ linguistic behaviour” where the evolution of language can be observed (Gatto 7). The Internet is “A place where we encounter the language we use, a body of texts that "seeks to represent a language" (Gatto 10). By

seeing the Internet as a corpus, linguists are able to form a deeper understanding of local and global communication, how language may define perceptions, how human connections are made digitally, how local and global language develops, and how digital realities affect written language.

Corpus Linguistics equates to studying groups of texts and "corpus builders" usually "employ some form of annotation scheme to their text files" (Baker 38). Standard Generalized Mark-up Language (SGML) became the universal mark-up language, providing a "standardized coding system" for electronic texts (Baker 39). The internet uses HTML as the standard mark-up language, which consists of a "pre-defined set of codes that are based on the general SGML rules" (Baker 39). There is software that encodes the data to text for writers and "corpus builders," but it is important to be able to recognize "the existence of such codes and what they look like in case they are encountered in other corpora" (Baker 39). If students obtain a general understanding of the principles of coding, then they can better understand the work they do and be part of a larger discourse.

It is becoming increasingly important for writers to understand written language use online because of search engines, primarily Google. The term *Google* is now considered to be a verb in the English language: "I *Googled* the weather to plan my trip." Google monetizes by studying the everyday use of language, creating categories by geography, behavior, age, gender, race, and interests. Google creates and updates algorithms based on their discovery of current search language, as well as webpage content, to provide the best possible matches in search results. By analyzing language details, Google generates revenue through targeted advertising. There is display

advertising, which is images or videos, and there is content advertising. Both forms depend on language use to reach specific audiences.

Businesses depend on Google to present their information in front of their ideal customer and desire to rank high in the search results. Leith emphasizes how capitalism has helped English majors who have mastered rhetoric, saying, "The great forward gallop of industrial capitalism has brought new tasks for the rhetorician's tool kit" (Leith 18). Search Engine Optimization (SEO) is performed on individual websites both technically on the back-end and in HTML converted to text, using content to increase rankings on Google. In August 2013, Google released the Hummingbird algorithm, which evolved how Google interacts with websites and their audiences.

The Hummingbird algorithm introduced what is referred to as "long tail keyword strategy," meaning that the algorithm can analyze the digital writing by using "mathematical comparison and algorithms to determine this [how well it is written] based on vocabulary usage, word orientations, grammar, spelling, and various other factors" (Adams, *Crafting SEO Content*). Therefore, digital writing requires knowledge of the algorithms, as well as the use of keywords. They are updated frequently, which requires a content manager for a website to consistently monitor their site's use of language comparing with Google's reports to reach their audience. Troy Hicks, author of *Crafting Digital Writing*, speaks on his search experience, "when I do a Google search for a particular topic, as long as I am logged in under my user name, my results will be skewed based on my previous search history" (Hicks 33). As Google gains knowledge, they update algorithms to become more specific. Professional writing has moved primarily

online, making it imperative for writers to understand the science behind search engine algorithms.

Luke Sullivan described the ideal employee, the one who understands digital realities, writing, and is creative. Since Google ranks based on website content, website designers need rhetorical skills. Google performs A/B testing, a technique analyzing variations of design and content on a website that "influence the users' behavior—how long they stay on a page, the way they move their cursor about the screen, what they click on, what they don't click on, where they go next" (Carr 151). Search engine algorithms use language to learn. They determine behaviors, connecting user keywords to an index. The search engine then displays the results based on the searcher's query with meta-descriptions, summarized website content, and links to matching web pages. Meta-descriptions are written on the back-end of a webpage as part of SEO. If the content writer does not understand the technical side of SEO, then the webpage risks negatively ranking in search results. The same would be true if the website designer does not understand their audience's use of language.

Linguistics offers professional opportunities for writers when combined with technical education and a writing curriculum more authentically connected with digital realities. The science of language offers a variety of opportunities digitally beyond understanding search engine optimization, but an English major who understands more computing mechanics in combination with their rhetorical skills is desired. There is a strong desire for writers in the professional world – technical writers who are creative and who understand language structure and use in order to connect with their targeted audience. Web 2.0, yes, has created a digital publishing forum for anyone who has access

to a computer and a network. But, this has also created a medium where news is created and shared, where business is performed, shopping is completed, and most anything else imaginable. Businesses struggle to find someone who can design a great website and also have the ability to create good content for their customers. News stations hire digital content writers and managers. Advertising continues to be digitized. Public relations seem to revolve around Twitter. If writing curricula included more education on contemporary digital realities, English majors will be better served and have more professional opportunities because of desired skills that Web 2.0 has created.

Usually, technical writing itself is separated from the other English department sub-fields. The separation suggests technical writing pedagogy is different than rhetoric and composition pedagogy and digital rhetoric is separate from traditional literature. However, in her article Winsor points out, **"**Traditionally, invention has been regarded as relatively unimportant in technical writing because of the widely held notion that technologists generate their ideas prior to writing" (Winsor 843). Winsor explains that by looking at the process of invention as an engineer, the "technical work replaces invention for writing" and "invention for writing, invention through writing, and technical invention itself heavily" overlap (Winsor 843). Winsor recognizes the similarities in the writing processes and the need for collaboration. Acknowledging the correlation between rhetoric, technical writing, and STEM writing will create the needed collaboration. Sullivan agrees with Winsor's point from a copywriting perspective stating: "The thing is, when you can become at least conversant in these other more technical disciplines, you'll be a better creative and a better team member" (Sullivan 135). Winsor's point is well-taken because English majors are already well-versed in rhetoric and can think both

critically, and, generally, creatively. To better serve English majors for future careers, more technical education should be incorporated into the typical English major's curriculum.

Employers seek to hire versatile staff. The boost of STEM education is a solution for employers seeking "people with stronger fundamental skills, deeper knowledge of at least one discipline, and roots in at least two disciplines" and the demand of "people who are not only so well grounded they can generate new ideas, but people who also have the skill set to move their ideas into products, i.e., to be entrepreneurs either inside or outside of corporate walls" (Atkinson, Merrilea, and Foundation Information Technology and Innovation 13). STEM education advocates that graduates from STEM fields "are our innovators" (Atkinson, Merrilea, and Foundation Information Technology and Innovation 13). STEM scholars are the ones with "strong fundamental skills, who are 'Deep Divers,' 'Interdisciplinary Connectors' and 'Entrepreneurs'" who will drive the economy (Atkinson, Merrilea, and Foundation Information Technology and Innovation 13). Although the argument is valid, STEM graduates cannot succeed without skills learned inside the humanities.

Sullivan discusses how the business of advertising and copywriting has morphed through time because of increased use of technology. He explains, "Today, a creative person is expected to be able to come up with everything from an ad to a website, a mobile application to a TV show, and a tweet to a radio spot" (Sullivan 134). Digital media has advanced advertising to where "creating for a world that includes digital requires more skill sets than just copywriting and art direction" (Sullivan 134). He explains that advertising businesses "want the creative people sitting really close to the

programmers and the information architects" (Sullivan 134). There is a need for the hybrid scholar who is skilled in more than just humanities, and also one who expands knowledge beyond science. Employers seek scholars who understand the applications of digital realities. They want the employee who can communicate, persuade, and lead.

These are the employees who understand how to effectively use the tools because they also understand their operations. Sullivan remembers only “wanting to recruit only the most techno-geeked-out, mobile-ready, code-slinging Web brats” (Sullivan 125). Yet, he also needed “writers or art directors who knew how to take a blank sheet of paper and make something interesting and beautiful happen” (Sullivan 125). He expresses: “The place where these two skills overlapped was the sweet spot. The ones who can do both of these things? They're the creatives of the future" (Sullivan 125). These are the graduates who are essential; they are the English majors of the future. The ideal employees Sullivan describes can be found in the English department if the technical writing curriculum, along with the linguistic curriculum, is re-evaluated to better serve English scholars.

The technical writing sub-field has already been evolving with technology because businesses evolve with technology. Linguistics has taken on roles in sociology, psychology, and technology departments as students of all fields work to understand human language for their work. The question is, why are the two sub-fields who seem to be treading the open waters of innovation separated from the English department? Now, there are certainly variants in departments with separation, so I want to clarify that I’m not asserting the English department is pushing the two sub-fields away, but rather suggesting an opportunity to work more closely with fields that have trod more outside the department and can help familiarize digital realities more appropriately. If language

structure and use is so important in the technical writing world, then it makes sense to strategize a plan to incorporate these sub-fields more into a typical English major's curriculum in order to better serve them with contemporary digital realities and a curriculum more closely related to STEM.

Chapter 5: Shifting Curriculum for the Not Too Ideal, Hybrid English Major

I'd like to begin the final chapter with some final thoughts from previous chapters in order to see how each chapter connects with the other to better present the necessary shift in English major curricula to better serve and prepare them in the digital now. The first chapter introduced some basic history information on STEM education initiative, and the value placed on the fields within the university. There seems to be an understanding that the economy is solely driven by STEM fields and therefore more graduates in those fields should be produced. However, the reality is that STEM fields cannot thrive without the humanities. The irony also seems to be that the humanities will not be able to thrive without the STEM fields, specifically the *T*—technology. In result, digital humanities emerged as a way to network technology fields with the humanities. Digital humanities has been openly embraced by the university, and has created opportunities for the English department to utilize for growth.

In order to utilize digital humanities to its full potential, it is necessary for the English department to expand its curricula for English majors in order to better serve them in the digital now. I spent some time in Chapter 3 explaining how some basic computing mechanics can be used in relation to English majors in order to connect meaning and provide understanding necessary to communicate with other disciplines, which will assist in innovation and building knowledge. After learning the importance of contemporary digital realities and STEM education as part of the English major's curriculum, I wanted to highlight two sub-fields that I believe are easily forgotten. Technical Writing and Linguistics are both sub-fields of the English department that will be able to enhance digital learning in the English curricula should the department

“welcome these two-subfields back home.” My goal now is to offer strategies for shifting the English curriculum to better serve English majors through contemporary digital realities and STEM education.

The typical English major is well equipped in literary studies, as well as rhetoric and composition studies. Sidney I. Dobrin suggests that the rising digital world and new media “call for nothing short of a methodological shift, which serves as part of the motivation for the move from composition studies to writing studies post composition” (Tinnell 125). To also include Dobrin’s argument from *Constructing Knowledges,* composition studies should continue to rely on literary theory. A possible way to include contemporary digital realities is to include digital theories in the literary criticism courses. Just as Glaser and Micciche urged, digital media allows literary studies an opportunity to evaluate how new media is utilized, as well as opportunity to examine its effects within English studies. Improving the English major curriculum requires more than the use of digital realities; English majors should examine its role in society, just as they do literature.

English majors also have a duty to society to provide rhetoric associated with the meaning derived from analyzing works of art. According to Robbins, "our job is not to change the world, but to interpret it" (Robbins 312). Robbins encourages scholars to reflect on "the scholar's affiliations with society” (Robbins 312). English majors have an opportunity to redefine their scholarship by using multi-modal tools to reach audiences with new communication modes. Many English majors now have grown up in what I continue to refer to as “the digital now,” but what I think is forgotten in pedagogy strategies is that just because students have grown up in a world, does not mean they

know how to critically think about that world. Teachers of English should be better equipped with knowledge on digital realities in order to "re-teach" the use of technology in an English classroom, both with literary studies and rhetoric/composition studies. By taking the first step in theorizing digital realities, there will be a foundation that can be used to think critically.

In order to create criticisms, an English major needs to have a basic understanding of the operations. Again, I am not saying that every English major should be the ideal hybrid English graduate who can do it all, like Chandra. What the English major needs is enough understanding to perform basic computing and coding operations in order to more efficiently perform their work. And, English majors need to learn how to effectively communicate across the disciplines in order to be part of innovation. One easy transition into this curriculum model would be through the Technical Writing sub-field. As a part of the department already, technical writing students have already embraced the use of technology and understand writing in digital realities. Technical writing using digital media needs to be a required course for all English majors.

Another easy transition that can be added into English curricula is through the sub-field of linguistics. As mentioned in Chapter 4, many English majors only take one linguistics course in their educational career. However, the study of language structure and use seems to be on the rise in many departments, specifically now technology. Visiting Google's research site, it is easy to see the appeal the linguist brings when building algorithms designed to provide search results to specific audiences. Perhaps it is time for English majors to learn more on language structure and natural language use in order to write appropriate content for desired audiences. Composition courses already

teach the importance of audience and strategies to write for them. Perhaps there is solution in creating hybrid courses of linguistics and technical writing as part of the required composition course tier. Digital realities as addition to the curriculum or not, I do believe as an English major myself, I would have benefited more by having a mandatory linguistics course earlier in my education. There is a certain understanding of literature and communication that occurs after learning the basics of linguistics. Why not learn more in depth on language when English majors learn how to use language to create rhetoric?

Notably, by incorporating more mandatory course work within linguistics and technical writing, the English department welcomes back in two sub-fields who hold vitality in keeping the department alive in the digital now. If the department wants majors who will graduate career-ready and equipped to be successful in their chosen profession, then English majors need to be served through information that is relevant both outside and within literary studies. The typical English major is one who studies literature, but literature studies are changing with digital spaces. And if digital humanities has a specific role within the English department through digitizing work, collaborating in digital spaces, and analyzing in digital realities, then students need to be more prepared to work within those spaces.

More courses should be designed around writing in digital spaces for community discourse and sharing scholarly work. For example, I used Nicholas Carr's, *The Shallows: What the Internet is Doing to Our Brain* as a guide book in a core writing course required for all students. The students were asked to keep blogs for mandatory, graded free writes. This was a basic approach to using digital realities for writing, but

what it aimed to accomplish was more with how the students used this space. How did they design their page and how did it represent their work? How did they choose to use language online? How did their peers choose to use language online? How did working closely in digital spaces affect the way they learned to write? Keep in mind, this was for a basic freshman writing course. What I challenge is a writing course designed similarly specifically for English majors in literary studies. English majors should learn how to write academically in Web 2.0 spaces because these are the digital realities being used.

Learning to write online should be a larger focus in curriculum. Brooke forwards Lloyd Scott DeWitt's argument in *Writing Inventions*, which discusses using "networked technologies" in the classroom, explaining: "Students in networked classrooms…are able to access not only the Web, but each other (and each other's' texts), in a way that works directly against the notion of an individual, abstracted inventor" (Brooke 66). Conversations create collaboration and shared ideas to construct knowledge. The Internet provides opportunity to respond in conversations immediately. English departments should encourage their scholars to be active in conversations, teach them how, and take advantage of possible opportunities. English departments need to realize "the time has come to think differently about some of our terms: literature, composition, production, interpretation, reading, writing" (Brown 21). English majors need a curriculum that includes online scholarship beyond formal paper submission.

Online scholarship also requires the addition of computer languages to technical writing curriculum. Hypertext Mark-up Language (HTML) and Extensible Mark-up Language (XML) should be included in technical writing curricula. HTML is the standard way of encoding digital text using codes. XML is coded text that relies on

categories, allowing online content to be considered user-friendly. Technical writers often create content for webpages, but as Sullivan detailed, employers seek creative writers who also have the technical skills; they desire the hybrid employee. Understanding mark-up language makes technical writers more valuable in their careers because they better understand the operations.

English majors who choose writing as a career option need to understand how to craft content online. Whether the writing is technical, business communication, or creative, writing online requires attention to more than one audience. The first-layer audience is the one their content means to attract, the audience whom they are writing for in meaning. The second-layer audience is the computing tool they are using for communication. The third-layer audience is the reader audience using search engines. And lastly, the fourth-layer audience is another machine audience, attracting web crawlers and search engine bots that writers rely on to deliver their content to the right audience. Digital writers need an understanding of how search engine algorithms obtain information, analyze language, and present results.

They need more technical education in computer operations, and perhaps even software language. Leith explains, "Linguists talk about the phenomenon of 'accommodation' -- which is the way in which we seek to adapt our own language to fit into a speech community" (Leith 122). English majors who choose a form of writing will have to use digital realities. Their rhetoric and composition curriculum needs to adapt in educating the uses of current writing technology. English majors do not need to become programmers; they are English majors and not engineers. A better understanding of programming languages, however, is important. There are several hundreds of

programming languages and each of these languages is considered to be "formal language" with definite "rules for its syntax and semantics" (Chandra 4). Programming language is less forgiving than natural language, which uses definite grammar rules to produce an infinite number of sentences; however, the syntax used to form meaning is comparable. Acquiring knowledge of basic programming languages allows English majors to not only collaborate in their scholarship, but also work more closely with computer scientists. It opens up doors for English majors to engage in innovation, rather than rely on others to develop the tools.

There needs to be an insistence on not only the survival of the English department, but increasing the value of English scholars's contributions. Under the umbrella of digital humanities, English departments can make themselves "indispensible" using "creative activity of all kinds, both within and beyond the unviersity" (Glaser and Micchiche 202). English departments can stand alongside the STEM departments in innovation, specifically with technology if they consider the "standpoints and practices that have led to divergences in these two communities' understanding of collaboration, writing, and technology" (McGrath). If the English department can strategize to better serve their majors with a curriculum that is more closely related to contemporary digital realities and STEM, then perhaps there is a solution to the long-time anxiety of a dying department. There should be more opportunity in literature classes to utilize digital publications, and work with digital humanities in archiving. We must strategically implement technical information into curricula that is targeted to suit the needs of the typical English major who lives in the digital now, and who will work in the digital now.

Technology has grown at an overwhelming speed; sometimes, it is easy to get anxious in digital overload. It is easy for *a lover of books* to want to feel a book in their hand and smell the print pages. It is easy to get wrapped up in a digital world and forget the meaning literature seeks to find. It is for those very reasons that I also stress keeping the English department unique in traditional literary studies pedagogy. English departments do not need to redefine themselves completely. The curriculum simply requires an adjustment in order to better serve English majors who live and work in a society driven by technology. More linguistics earlier should be incorporated as part of composition and rhetoric simply because, "Rhetoric is everywhere language is, and language is everywhere people are. To be fascinated by rhetoric is to be fascinated by people, and to understand rhetoric is in large part to understand your fellow human beings" (Leith 279). The addition of technology education and learning to better understand computing operations does not prevent English majors from discovering, connecting, creating, and collaborating as they always have. In fact, it provides gained opportunities through a curriculum more closely related to the needs of English majors living in the digital now. English curriculum requires a shift to include education and critical thinking more closely related to contemporary digital realties and STEM in order to better serve English majors, and to prepare them for a successful life after graduation. English majors should demand an education that lends them copious professional opportunities.

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