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An interview-based study on writing instruction in engineering programs

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AN INTERVIEW-BASED STUDY ON WRITING INSTRUCTION IN ENGINEERING PROGRAMS

by

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A THESIS

Submitted in partial fulfillment of the requirements for the degree of Master of Arts

in

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to

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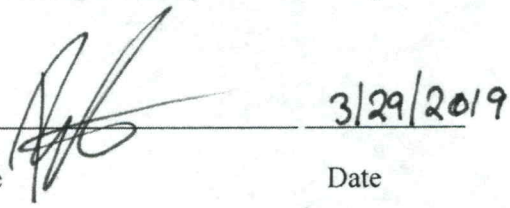

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THESIS APPROVAL FORM

Submitted by Rebecca Avgoustopoulos in partial fulfillment of the requirements for the degree of Master of Arts in English and accepted on behalf of the Faculty of the School of Graduate Studies by the thesis committee.

We, the undersigned members of the Graduate Faculty of The University of Alabama Huntsville certify that we have advised and/or supervised the candidate on the work described in this thesis. We further certify that we have reviewed the thesis manuscript and approve it in partial fulfillment of the requirements for the degree of Master of Arts in English.

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ABSTRACT

The School of Graduate Studies

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Name of Candidate: Rebecca Avgoustopoulos

Title: An Interview-Based Study on Writing Instruction in Engineering Programs

This thesis examines the state of undergraduate engineering student writing skills in the College of Engineering at the University of Alabama Huntsville. Writing pedagogy in many STEM institutions compels engineering instructors to rely on first-year writing courses to prepare their students for the varieties of writing any particular discipline demands. Thus, introductory college writing instructors are faced with the task of integrating strategies specific to various discourse communities in their composition courses. This research aimed to focus on this problem and the effect it has on students. Through interview-based research, I took an inventory of the types of writing assignments engineers at UAH received and how they characterized their writing assignments. The results indicated that although many engineering students acknowledge the value of writing in their discipline, the assignments that were distributed at UAH did not satisfy their expectations. This study describes research-grounded solutions to the students' expectations and points to the existing challenges with attempting to integrate writing into engineering curricula.

Abstract Approval:

Committee Chair _____

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INTRODUCTION

My interest in Writing Across the Curriculum, especially in the STEM fields, started in the fall of 2017, when I was hired as a Graduate Teaching Assistant and a writing tutor at the UAH Student Success Center. During this time, I had the rewarding opportunity to interact with students in the engineering programs at UAH, many of whom struggled with writing. I found that instructing these specific types of students interested me more than any other part of my job for two reasons: 1) I felt extremely rewarded when their skills developed significantly over time and 2) I enjoyed demonstrating to students in engineering programs *why* the need for good writing skills would follow them throughout their careers, despite their insistence that engineers do not need to understand the finer points of rhetoric and composition. The students soon realized that they appreciated writing much more than they had originally expected. At this point, I discovered Writing Across the Curriculum/Writing In Disciplines and began to do research on the state of WAC/WID in institutions across the United States.

The diverse range of concentrations within the engineering discipline alone presents a challenge for freshman college writing faculty. Writing instructors are

expected to make students aware not only of the existence of different discourse communities, but also of the unique principles of writing within those communities. By the end of the freshman writing course sequence, the core faculty expect their students to understand the "strategies for asking the right questions about discourse expectations in their other classes" (McLeod & Thaiss 2014). The real key to effective WAC/WID instruction, however, is in exposing students to Writing in the Disciplines throughout their academic careers. The trouble with the current state of STEM curriculum is that many students in these disciplines receive Writing to Learn instruction at the beginning of their curriculum (i.e. in their introductory composition courses) and Writing to Communicate at the end (i.e. during their senior design projects, internships, and co-ops), with very little practice in-between.

This thesis examines the current state of engineering student writing skills in modern institutions, focusing specifically on the College of Engineering and its undergraduate programs at the University of Alabama Huntsville. The problem with writing pedagogy in many STEM institutions such as UAH is that engineering instructors often rely too heavily on introductory college writing courses to prepare their students' for the amount and the varieties of writing each particular discipline demands. Thus, introductory college writing instructors are often faced with the task of integrating strategies and rhetoric specific to various discourse communities in their general composition courses. This research aims to focus on this problem and the effect it has on the students that complete their degrees at UAH.

While the definition of learning varies across disciplines, proponents of cognitive development research agree that the writing process fosters a deeper mode of learning than other strategies, such as reading, talking, or listening. Janet Emig defends the idea that writing differs from other modes in the unique way that it reproduces knowledge: "Because writing is often our representation of the world made visible, embodying both process and product, writing is more readily a form and source of learning than talking" (1977). In terms of the Taxonomy for Teaching, Learning, and Assessment, Emig's theory suggests that writing is a richer cognitive process than talking, which may only invite the speaker to remember and rehearse information; writing facilitates not only the recollection of information, but also the interpretation and implementation of it (Anderson & Krathwohl 2001). The Writing to Learn pedagogical model puts Emig's research to work in the classroom, encouraging instructors to use writing as a tool to foster the learning process (McLeod & Thaiss 2014). Students are encouraged to discuss problems, rather than simply solve them, and to keep journals of their ideas and designs as they learn the concepts.

The intention of Writing to Communicate, which focuses on writing for an audience or a discourse community outside the self, is to occur synergistically and not necessarily in succession to Writing to Learn (McLeod & Thaiss 2014). Even as students learn how to express their thoughts in writing, they do not often intrinsically learn the skills necessary to communicate within a specific discipline; this knowledge is a product of proper instruction from an experienced member of the discourse community, participation in scholarly conversations between peers, and collaborative working environments where students have access to skilled mentors (McLeod & Thaiss 2014).

Writing to Communicate aims to help students develop the rhetorical skills necessary to participate in the types of reading and writing that they will be expected to practice their scholarly or professional careers.

The Accreditation Board for Engineering and Technology (ABET) formally include criteria in their standards that emphasize the importance of effective communication skills and the ability to function on multidisciplinary teams throughout engineering and technology programs, in an effort to mitigate concerns over the quality of written communication in engineering programs (ABET I.3.d, g). Since ABET does not prescribe courses or mandate other solutions to meet student outcomes, it is the responsibility of individual programs to assess the ABET criteria and implement coursework that satisfies the standards. Individual program instructors left to their own devices do not always integrate enough writing and communication activities in their coursework to accurately represent WAC/WID principles.

Many instructors, especially in the STEM fields, complain that WAC/WID pedagogy is too impractical for their work-intensive disciplines. Departmental committees are reluctant to adopt practices that could potentially add strain to notoriously rigorous programs. Engineering majors are especially arduous, with chemical, electrical, and mechanical ranking the highest in their intensity, even at the undergraduate level. Such intensive curricula leave students unable and unmotivated to integrate more assignments into their workload (Shukman 2017). Yet, this grievance is not limited to students, otherwise perhaps instructors might not be so reluctant; many engineering instructors feel that they are unqualified to provide feedback on written assignments and

that the task itself is unfeasible, due to the high student-faculty ratio (Ekoniak et al. 2015). As a result of this anxiety, writing assignments are given a summative assessment but the process is not practiced formatively (Goldsmith & Willey 2016).

Some instructors reject the need for writing and rely heavily on problem-based assignments, while others may assign work that demands written communication but grade the assignment on a completion basis or provide little to no useful commentary (Sommers 1982). Proponents of WAC/WID pedagogy have proposed peer review activities to mitigate these concerns. The collaborative learning environment relieves the instructors of excess grading, while it also facilitates communication among peers and gives students the opportunity to respond critically to one another's work.

The difficulty with integrating writing in the disciplines into one writing course is the diversity of disciplines that exist in modern institutions. A freshman level college writing course at UAH might see a rough average of 33% engineering, 18% science, 15% each of business and nursing, and less than 10% humanities students ("Facts and Figures"). The disproportionately high percentage of engineering students is not unusual in most STEM-intensive institutions. Moreover, engineering students do not represent one broad category; each group of engineering students may represent several distinctive concentrations within the principal discipline. At UAH, for example, approximately 30% of engineering students select Mechanical Engineering as their concentration, 20% select Aeronautical, and 14% select Electrical Engineering; the remainder represent an amalgamation of Chemical, Industrial Systems, and Optical Engineering ("Headcount Enrollment"). [probably need more here]

In the UAH Computer Engineering program, for example, only one required engineering course outside of CPE-495, the senior capstone design project, claims to satisfy ABET's "ability to communicate effectively" outcome (ABET Syllabus). A superficial assessment of the criteria indicates that the course in question, CPE-434, together with the Senior Design project do indeed meet ABET's communication outcome. As of 2017, UAH's accreditation status per ABET's standards remains unchanged. Yet, according to the ABET requirements for accreditation, the students do not meet the communication criterion until the 400 level, or their senior year. Thus, it is unlikely that the Computer Engineering program treats writing as a developmental process, nor does it expose students to diverse writing environments throughout their undergraduate careers. This predicament calls into question whether ABET's criteria do enough to compel program instructors to integrate WAC/WID pedagogy into their course requirements.

Through interview-based research, I aimed to take an inventory of the types of writing assignments engineers at UAH receive and how they characterize their writing assignments, both in terms of how much they enjoyed the assignments and whether they perceived them as practical to their respective careers. The research was structured in the form of individual oral interviews with students in the Electrical, Computer, Mechanical, Aerospace, and Chemical Engineering programs, a survey of the UAH engineering course catalog, and examination of individual course syllabi. The objective was to gather student feedback on discipline-specific courses that feature at least one writing-intensive assignments. I also described research-grounded solutions to the existing challenges with

attempting to integrate writing into engineering curricula. Any gaps I located in the existing research point to areas where more investigation is needed to address the unanswered questions and problems that persist. Ultimately, I aimed to report on the implementation of writing activities in required courses other than freshman composition and suggest avenues for additional research on the value of the writing integration.

The research questions that I composed served as the principal standard for the interview questions that I finalized later in the study. Their purpose was threefold. They were designed to gather student-provided feedback on 1) how the students describe writing, 2) whether the students enjoy writing, and 3) whether they sensed any practicality in writing. Thus, I could structure the interview and questionnaire questions around these three insights and gather a general understanding of how a small cohort of engineering students perceives writing in its discipline.

Main Research Questions:

1. How do seniors in the College of Engineering at UAH characterize the writing assignments they completed in their program of study?
2. How much did they enjoy the writing assignments?
3. To what extent do they perceive these assignments as practical or beneficial to their respective careers?

CHAPTER 2

LITERATURE REVIEW

As part of a dynamic, technologically-driven society, scholars have long shown interest in the role of the humanities, especially writing. The purpose of the Writing Across the Curriculum (WAC) pedagogical approach in its early years was to reintegrate writing across all college disciplines in an era when writing instruction had grown thin and college-level students with diverse educational histories struggled with language and written communication. David Russell attributes this deficit to the sharp rise in higher education enrollment numbers in the 1960s, when the "baby boomers" began entering college; the upsurge contributed to "a host of new institutions," established in haste to meet the new demand for higher education (2012). The institutions had few resources available to account for the massive student body, and so they unsurprisingly experienced "massive cutbacks in general composition courses" (Russell 2012). Between 1969 and 1970, Barbara Walvoord founded the first WAC seminar that would regularly provide support for faculty aiming to address the declining writing skills in college programs. WAC programs sought not only to improve writing skills within the composition classrooms, but also to help students use writing as a medium within their respective disciplines to improve their critical thinking, problem solving, and communication skills (McLeod and Thaiss 2014). The

demand for more ubiquitous writing instruction guided WAC educators to emphasize on Writing in the Disciplines (WID).

By the 1970s, composition scholars began exploring new pedagogical theories that emphasized the importance of writing outside of literature, rhetoric, composition, and other traditionally writing-intensive disciplines. Janet Emig and James Britton both pioneered the movement in the articles they authored in the 1970s that demonstrated how writing functioned as a metacognitive process; writing facilitated the understanding, analysis, and application of information, especially for students in college. Thus, the theories of WAC and WID became commonplace topics among scholars and instructors of composition pedagogy. While WAC and WID explored new avenues for improving the quality of writing in college students, it was not without its complications. The responsibility to prepare students for writing to communicate in their disciplines fell almost entirely on the freshman writing instructors.

The debate between writing faculty and non-writing faculty revolves around the perceived role of writing instructors in students' academic success within their chosen programs. What research demonstrates is that need for academic writing skills emerges in the upper-level discipline courses, where students must often produce written proposals, followed by publication-quality project reports. The responsibility to prepare students for this quality of writing in their respective programs should ideally be shared among all faculty (Snow 1997). Ruth Spack goes so far as to argue that English writing faculty "cannot and should not be held responsible for teaching writing in the disciplines. The best we can accomplish is to create programs in which students can learn general inquiry

strategies, rhetorical principles, and tasks that can transfer to other course work" (1988). The consensus among researchers is that writing is a continuous process that requires constant practice and effective integration throughout an entire program and not just in the general education requirements.

Research on the integration of writing assignments in non-writing disciplines has repeatedly demonstrated that students achieve higher levels of learning when given the opportunity to do one or more writing activities in class (Yalvac et al. 2007). These activities are especially effective in a collaborative learning environment, where the writing assignments form the scaffolding of a larger group project, and thus involve several peer review exercises (Randolph 2000). Students often complain that collaborative projects cause problems, including unbalanced work distribution, irresoluble disagreements, varying levels of commitment to the course, and issues making time outside of class to meet (Kolar & Sabatini 1997). The research on collaborative learning suggests that the benefits of collaborative learning, especially in an engineering classroom, far outweigh the problems most often caused by poor instruction and not the nature of collaborative learning itself (Mourtos 1994, Smith 1993). In fact, one study confirms that "by using an unstructured, project-driven, interdisciplinary team setting, we are developing the students' oral and written communication skills, preparing them to work in groups, and teaching them how to teach themselves" (Kolar & Sabatini 1997). The integration of writing in engineering classrooms thus enhances valuable long-term skills when also practiced as an exercise in teamwork.

Integrating writing activities in everyday classroom instruction facilitates the practice component that not only develops writing skills but also fosters learning on a higher level than lectures or discussions could on their own. Several interview-based research studies on writing specifically in engineering programs have demonstrated that students appreciate the value of written communication in their disciplines. In a study by Anne Herrington in a Chemical Engineering classroom, in which students participated in a writing-intensive "Design" course and a standard "Lab" course, students remarked that the Design course granted them the opportunity to produce more "original" work; they describe this original work as having more "meaning" than standard lab reports because design requires a less structured thought process and more focus on the metacognitive process of researching a design, theoretically constructing it, and communicating it to their professor (Herrington 1985). The students benefit not only from the development of their writing skills but also from the development of their own ideas. Yet writing practices are simply not viewed as a developmental process. The findings from a study that includes interviews with subject coordinators indicates that instructors often view the development of student writing as "ad hoc" at best and "non-existent" at worst (Goldsmith & Willey 2016). Teresa Flateby argued that the entire campus community must participate in the process in order to improve the quality of students' writing (2005). Ideally, writing should be "visible" in the engineering curriculum for the benefit of both the students and their subject coordinators; the development of writing occurs most effectively when instructors are aware of their own students' approximate "level" and of the types of writing students have already familiarized themselves with in preceding courses (Goldsmith and Willey 2016).

Writing activities also facilitate students' understanding of the communication conventions within their disciplines. As students move through their college programs, they encounter new academic territories, and thus must familiarize themselves with the appropriate speech and writing to effectively communicate with their peers in each territory. In a study on writing across various academic disciplines, a student in a Cell Biology course was tasked with summarizing and explaining journal articles. According to an interview with the professor, the purpose of the assignment was "not so much for students to display specific information, but rather for students to become competent in using the thinking and language of their disciplines" (McCarthy 1987). While a summary of an article does not necessarily read like an original piece of work, as with the Design course in Herrington's study, the process still requires students to think more critically and communicate their thoughts to an audience. The process of reading and understanding an important piece of literature and then clarifying the literature in an original summary demonstrates comprehension of a particular discipline's language on a more substantial level than a simple lecture on the same article would demonstrate.

Beyond these findings, however, the benefits of Writing Across the Curriculum are not limited to knowledge specific to the discipline at hand. Writing activities have also shown to improve the efficacy of communication between student and instructor. The purpose of providing written feedback on student assignments is to allow the instructor, an expert in the field, to support the student's learning and offer suggestions for development. Teacher-student interaction is critical in getting students to more confidently engage with their writing, especially if they feel detached from their own product (Treglia 2009). In one related interview-based study, students with experience in

Writing to Communicate tended to better understand and appreciate instructor feedback on both writing and non-writing assignments than students with no training at all (Taylor 2011). Effective implementation of instructor feedback often yields more productive revisions and more confident writers (Sommers 2006, Stern & Solomon 2006). Mina Shaughnessy affirms that establishing confidence in student writers invites a more successful writing experience (1976).

CHAPTER 3

METHODOLOGY

The purpose of this study was to gather perceptions from one cohort of engineering students at the senior level about the types of writing assignments they completed in the program, to what extent they enjoyed the assignments, and whether they identify the work as practical to their respective careers. Thus, the Grounded Theory approach was primarily used as the methodology for this project. Grounded theory is a general methodology for developing theory that is grounded in data systematically gathered and analyzed. The strategies for conducting grounded theory research include using physical notes taken during the data collection process, probing for concepts within the data, and the defining theories involving the concepts that emerge (Martin & Turner 1986). The analytic process involves coding the qualitative data, sorting it into theoretical categories, and drawing out themes that develop. (Strauss & Corbin 1994). Grounded Theory offered the most practical strategy to code and analyze the large amount of often unpredictable and unique data that the interviews accumulated (Martin & Turner 1986).

The principal research was inductive and qualitative, although the preliminary research involved some quantitative data, such as the Likert-scale questionnaire and statistical information on the UAH student body. This data was used to facilitate the sample selection and interview process. The data was primarily gathered through surveys and records reviews. Qualitative studies allow for smaller sample sizes than quantitative studies, which allowed more time for each student to provide thorough answers to the interview questions. (Connaway & Powell 77).

Preliminary examination of the UAH College of Engineering course catalog and descriptions contained essential details on the learning objectives of the program as a whole. The individual interviews with students in the College of Engineering served to gather data on the students' response to and opinions on the writing instruction they received. Qualitative approaches were most appropriate for this project because the numerical emphasis of quantitative research tends to ignore the subjective aspects human experience and behavior (Connaway & Powell 77). As this project aims to report on students' perceptions of the writing instruction they received at UAH, the best material would be derived from the analysis of interview data, surveys, and review of records.

Selection Process

Interviewees were selected by convenience sampling. Several professors teaching senior-level courses in the College of Engineering were emailed a letter describing the goal and methodology of the study. The letter asked professors to forward the information to their students and encourage participation from any students with senior-

level status interested in providing a response. No incentives were provided for participation.

Sample Size

Two sets of students from two engineering senior design classes were interviewed in one day for a total of ten students. Six students were selected from a Mechanical and Aerospace Engineering senior design course (MAE-440: Rocket Propulsion I) and four students from a Computer Engineering senior design course (CPE-495: Computer Engineering Design). The rationale behind the selection of participants from these two programs is twofold: 1) the Mechanical and Aerospace Engineering program hosts the largest percentage of students in the College of Engineering at UAH and 2) the Computer Engineering program offers courses that are high in demand for Department of Defense contractor employment in the Huntsville and Madison city areas.

Questionnaire

The data collection process began with a Likert-scale questionnaire in which the respondents answered each question by selecting an option from five ordered response levels. The purpose of the questionnaire was to encourage the participants to capture and gauge the intensity of their opinions on a given topic or issue before discussing it in greater detail in the semi-structured interview (Burns 245). The Likert scale format also facilitated in the collection of some quantitative data that provided helpful statistics on the students' level of satisfaction or dissatisfaction with the writing instruction in their respective programs (Likert 1932). To properly design a rating scale for this project, the number of points on this psychometric scale needed to most closely resemble the

spectrum of attitudes the participants were likely to have towards the topic of writing in the engineering classroom. Likert scaling most often uses five points but studies have demonstrated the benefit of scales composed of seven or nine ordered options (Krosnick & Presser 2010; Dawes 2008). Thus, the decision was made to offer the respondents a scale of either five or seven ordered options, depending on the spectrum the question required.

Interviews

The interviews with the students followed a semi-structured format. After the questionnaire, the participants were asked several follow-up questions that allowed them to share their viewpoints verbally and elaborate on their questionnaire answers (Flick 2009). All interviewees answered identical questions, with some exceptions. In some instances, additional follow-up questions were asked in order to clarify responses and/or further expand on a topic. These clarifications were noted in the interview reports and on the transcriptions.

Duration

Each interview lasted approximately twenty minutes. It took the students approximately five minutes to complete the questionnaire on paper. The next fifteen minutes were allocated for the semi-structured interview portion of the study. Each student was verbally asked a series of questions from a predetermined list of open-ended questions and they provided their answers verbally. Some questions required clarification or further discussion. The data collection and transcription process lasted a total of one week.

Interview Bias

As with all qualitative research, the interviewee may exhibit some level of bias during the primary data collection process. Interviewee bias is known to compromise the validity of the research findings. Several measures were taken to prevent interview bias from compromising the results of the study. Each participant was interviewed individually in a private setting. The interviewer avoided phrasing questions in language that suggested emotional involvement in the project and showing excessive interest in any of the interview responses. The interviewer's manner of dress was modest, unobtrusive, and appropriate to the occasion; the overall conduct between interviewer and interviewee was friendly, engaging, and informal (Connaway & Powell 170).

Recording Media

All interviews were recorded audially on an iPhone 8 with a sound recording application. Transcriptions were made by a human and exported to an editable in PDF form.

Data Coding Process

The questionnaire data was entered into an Excel Spreadsheet and coded by assigning a numerical value 1-5 or 1-7 to each answer. In the first column, each participant was entered as a number (e.g. Participant 1, Participant 2, etc.) with one participant per row. The next six columns were dedicated to the questions, which were written out in their entirety in the first row of the spreadsheet with one question per column (Figure 1). The questionnaire responses were entered into the area between the

participant numbers and the questions. The numerical value that corresponded to each participant's answer to a particular question was entered into the intersecting cell.

A	B	C	D	E	F	G
	How important do you believe writing skills are to your program of study? (Critical >> Unnecessary) (5)	How frequently do you write for school throughout your program of study? (Daily >> Never) (7)	How much time did professors spend in class teaching how to complete these assignments? (Every Assignment >> No Instruction) (5)	How clear did you find your professors expectations for written assignments? (Abundantly Clear >> No Clear Instruction) (7)	To what extent do you perceive the writing assignments as relevant and beneficial to your career? (Critical >> Unnecessary) (5)	How much did you enjoy the assignments you completed in your program of study? (Enthusiastically Enjoyed >> Despised) (6)
Participant 1	2	3	4	2	1	5
Participant 2	1	3	5	2	3	1
Participant 3	2	3	3	2	2	4
Participant 4	2	3	4	2	2	4
Participant 5	2	3	3	3	2	2
Participant 6	3	3	3	3	2	5
Participant 7	3	3	4	4	2	6
Participant 8	3	4	4	3	2	2
Participant 9	4	3	3	3	1	3
Participant 10	1	3	2	1	2	3
	2.3	3.1	3.5	2.5	1.9	3.5

Figure 1

Once the raw data was entered, an average was calculated for each question and entered into the last cell of that question's column. Since the spectrum of answers to each question spanned from a negative outlook to a positive outlook, these cells were shaded in green, yellow, and red to determine the general positivity, neutrality, or negativity of each average response. For example, Question 1 on the questionnaire offered options from 1 (Positive) through 5 (Negative). It demonstrated an average response of 2.3, which falls just into the positive section of the response options (1 and 2); it was shaded in green. Question 2 demonstrated an average response of 3.1 out of 7, which falls into neutral territory; it was thus shaded in yellow.

This table served as the quantitative basis for six graphs. The number of times a response was selected for each question was recorded in a new table and consolidated

into a bar graph (Figure 2). These bar graphs visually illustrated the students' collective opinion about each topic.

	How important do you believe writing skills are to your program of study?
Critical	2
Important	4
Moderately Important	3
Of Little Importance	1
Unnecessary	0

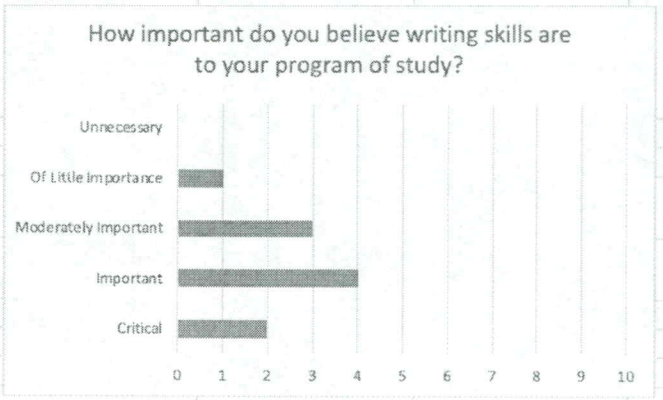


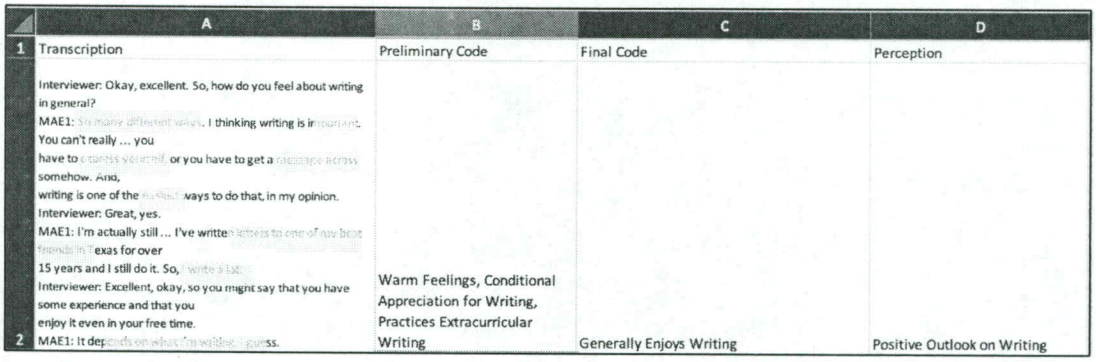
Figure 2

The interview data was coded inductively so as to draw out themes as they emerged from the participants' responses. The interviews were transcribed and exported to PDF documents with one document per interview. Participants' were identified only as a number (1-10) and their program of study (Computer Engineering or Mechanical/Aerospace Engineering). The transcriptions were separated into segments that each comprised one question and its corresponding answer. The transcription segments were then recorded and coded in a Microsoft Excel spreadsheet with one transcription per sheet.

The transcripts were copied and pasted into the first column of the spreadsheet with one segment per row. (Braun & Clarke, 2006). Segments were then assigned one or more concepts, which were referred to as preliminary codes (Kashfi et al 2017). The

codes were drawn mainly from verbal responses and nonverbal expressions that were relevant to the research questions. Verbal responses were defined as sentences and phrases that involved specific choices in vocabulary, the inclusion of personal stories, and the quality of descriptions. These phrases were highlighted in yellow in the transcriptions (Figure 3).

The preliminary codes were entered into the cells in the second column adjacent to each segment. If a segment required multiple preliminary codes, each code was delineated with a comma (e.g. "Negative Feelings, High Perceived Value"). When final codes emerged, they were assigned to the next column (Kashfi et al, 2017).



	A	B	C	D
1	Transcription	Preliminary Code	Final Code	Perception
2	Interviewer: Okay, excellent. So, how do you feel about writing in general? MAE1: So many different ways. I thinking writing is important. You can't really ... you have to express yourself, or you have to get a message across somehow. And, writing is one of the easiest ways to do that, in my opinion. Interviewer: Great, yes. MAE1: I'm actually still ... I've written letters to one of my best friends in Texas for over 15 years and I still do it. So, I write a lot. Interviewer: Excellent, okay, so you might say that you have some experience and that you enjoy it even in your free time. MAE1: It depends on what I'm writing, I guess.	Warm Feelings, Conditional Appreciation for Writing, Practices Extracurricular Writing	Generally Enjoys Writing	Positive Outlook on Writing

Figure 3

Most segments included multiple preliminary codes, which varied depending on the participant's response to each question. Examples of preliminary codes included "Negative Feelings," "High Perceived Value," and "Writes for Personal Enjoyment" among others. The level of vagueness or specificity of each response to a question was taken into consideration and coded as well. Examples of vagueness included students who struggled to describe a writing skill or couldn't find the words to explain the goal of an assignment. Nonverbal expressions were treated differently from responses in that

they included sounds, utterances, hesitations, and body language. Expressions played a role in determining a student's involuntary response to a question. Expressions were often coded as emotions, such as "Anxiety" or "Eagerness."

Sorting the lengthy transcriptions into preliminary codes aided in the formation of final codes, which most often gave way to a unifying theme that corresponded to the participants' perceptions. Perceptions were listed in the column adjacent to the final codes and eventually shaded when certain perceptions were observed across more than three interviews. Themes that emerged from common perceptions throughout the interviews were consolidated and listed in a separate Microsoft Word document. A flowchart was drawn to construct and illustrate the levels of data abstraction (Figure 4).

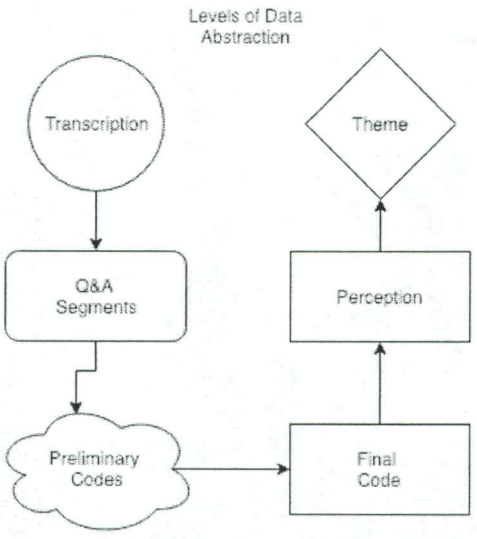


Figure 4

CHAPTER 4

RESULTS AND DISCUSSION

Questionnaire Data

Over half of the participants answered "Moderately Important" or higher when asked if they believed writing skills were important to the engineering program at UAH (Figure 5). None of the students believed that writing skills were unnecessary. In addition, 7 out of 10 students agreed that writing skills are beneficial and relevant to their future careers in engineering along with 2 more claiming these skills are "critical" (Figure 6)

Figure 5

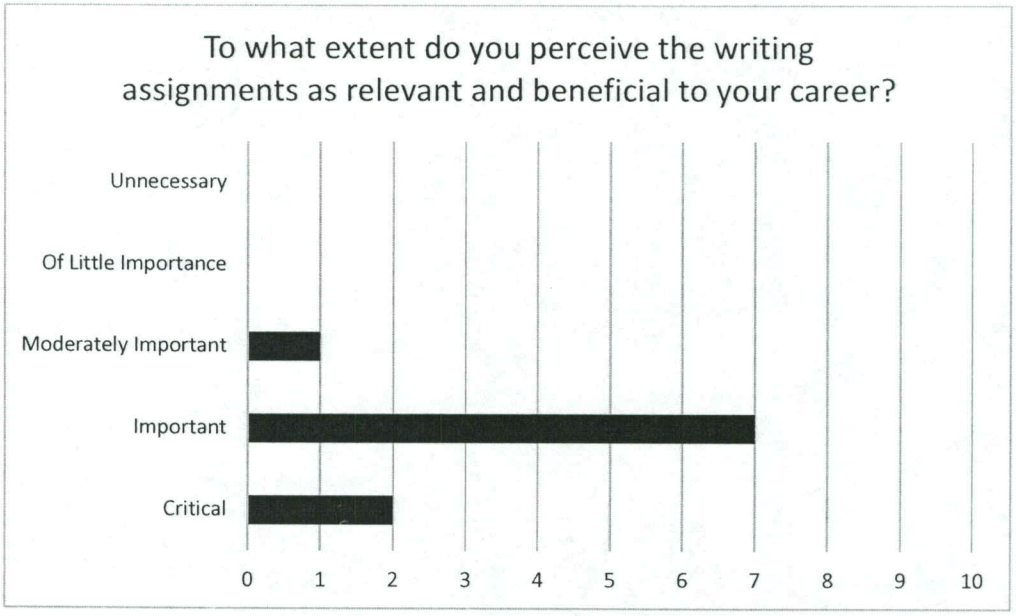


Figure 6

Despite this strong leaning in favor of writing, the data did not indicate any strong feelings towards the writing assignments that they were issued as students in the

engineering programs. When asked to what extent they enjoyed the assignments they completed as students of engineering at UAH, the responses were a nearly even distribution among all answer choices between "Enthusiastically Enjoyed" and "Despised" (Figure 7).

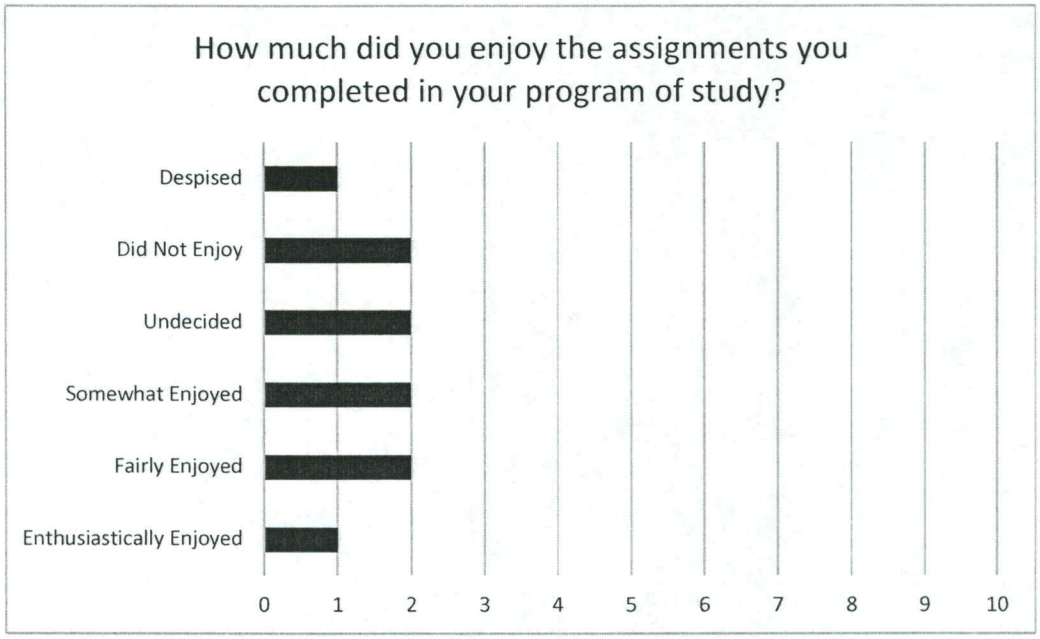


Figure 7

This unsettled attitude appears especially pointed towards the writing assignments that these students completed during their time at UAH. Their opinions shed some light on the overall state of writing instruction therein, especially when it comes to the types of writing that were assigned and the level of instruction that was provided. The responses to writing frequency were almost absolute: the students were tasked with a written activity at a rate of least one per week to one every two weeks (Figure 8). Studies on the value of integrating writing in non-writing classrooms indicate that at least one written activity per classroom session is ideal (Hawkins et al 1996; Yalvac et al. 2007).

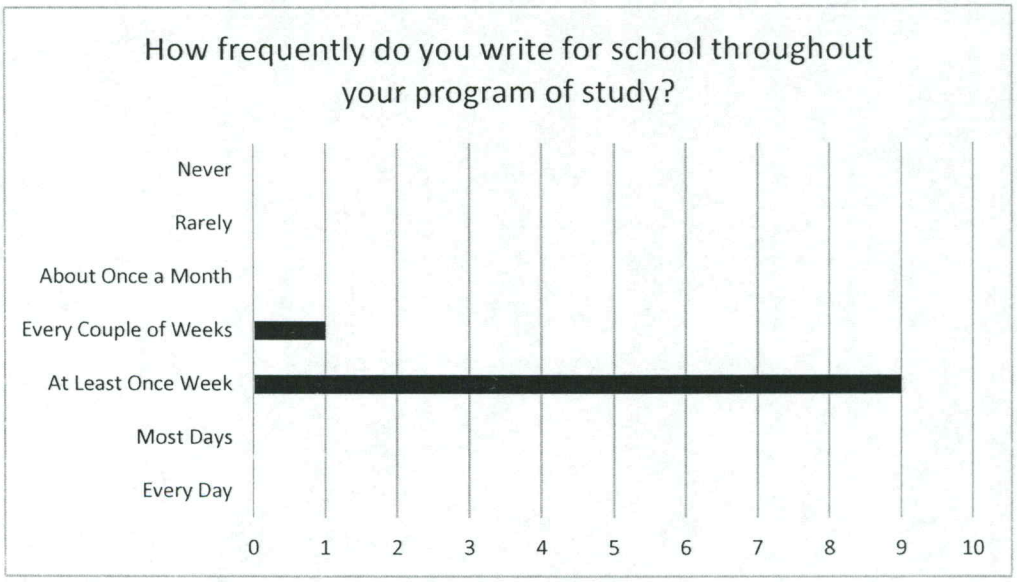


Figure 8

Moreover, nine of ten responses indicated that professors did not spend adequate time in the classroom teaching students how to complete the written activities they assigned. As [study] indicates, many professors in the STEM fields avoid teaching writing in non-writing classrooms. This is either because they do not feel qualified to provide writing instruction or because they are challenged by students' resistance to writing (Ekoniak et al. 2015; Martinez et al. 2011).

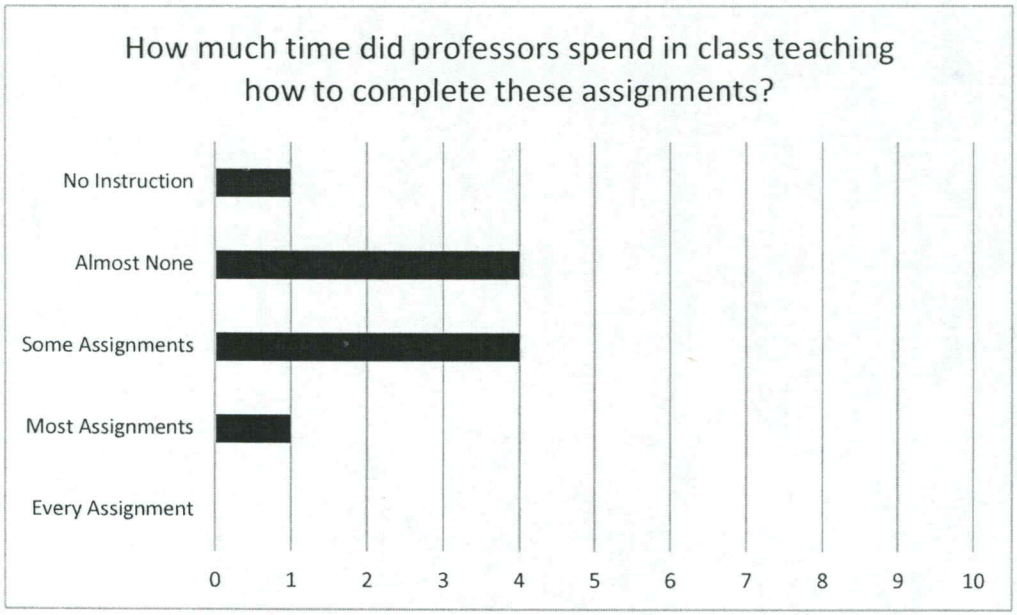


Figure 9

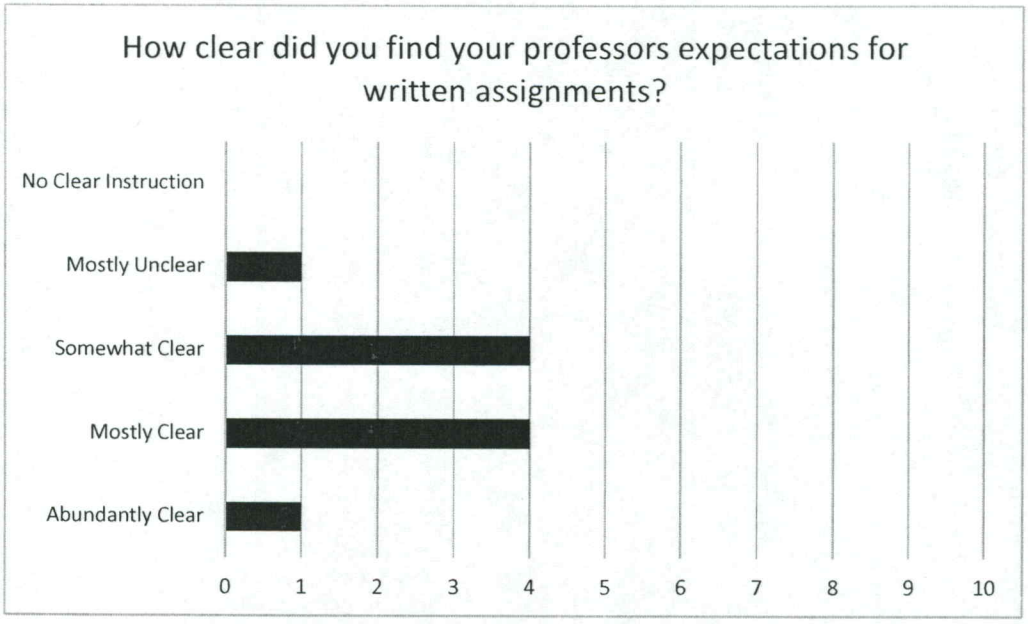


Figure 10

Interview Data Themes

This section presents five themes that emerged from the interview data. These themes are described and supported by the quotations taken from interview transcriptions. Quotations are credited to their respective participant number (1-10) and program, coded either as CPE or MAE to reflect the program of study, Computer Engineering or Mechanical & Aerospace Engineering respectively, to which the participant belongs. These details help better define the distinctive opinions of students from two academic perspectives.

Theme 1: Positive Outlook on Writing

Both the MAE and CPE students demonstrated an overwhelmingly positive outlook on writing in general. Remarkably, the questionnaire indicated that the students had mixed feelings about whether or not they enjoyed the writing assignments they completed in their program. Only 1 out of 10 participants selected "Enthusiastically Enjoyed" and 5 out of 10 selected choices between "Undecided" and "Despised." However, the participants' answers to the first interview question revealed that their lack of enthusiasm for the writing assignments they completed at UAH was incongruous with their optimistic feelings towards writing as a general interest. For example, one MAE student indicated on the questionnaire that he was "undecided" about his feelings on the writing assignments he completed in the Mechanical Engineering program. During the interview, he suggested that his feelings about writing in general leaned far more towards optimism than ambivalence.

Interviewer: How do you feel about writing in general?

MAE 10: I enjoy it. I do it fairly regularly on my own.

The student admitted not only to enjoying writing but also to practicing writing on his own time outside of the classroom. Research on the value of extracurricular writing suggests this practice has beneficial positive outcomes; there are instructional implications and possibilities that can help teachers anticipate and create moments of learning that occur when students produce "interest-driven" writing intended for audiences outside the classroom (Schmier et al. 2018). This dedication to his skills as a writer aligns with at least one argument by Kevin Roozen suggesting that a writer's school tasks are "profoundly shaped by an extensive network of non-school practices, artifacts, and activities," namely poetry, journalism, and comedy-sketches written outside the classroom (Roozen 2008). Roozen insists that professors should "situate the full range of basic writers' literate engagements" into their writing pedagogies. Thus, students may find that they might in fact be more inclined to say that they "Enthusiastically Enjoy" writing assignments both within their academic programs and beyond them.

Theme 2: Writing as a Necessary Skill

The data on both the questionnaires and the interviews indicates that most of the participants fully appreciate the importance of writing skills, especially in the engineering fields, regardless of their personal feelings on the matter. The questionnaire data indicated to an especially strong degree that the participants saw writing skills as important to both their program of study and their careers. While only 1 participant felt that writing skills held "little importance" in the field of engineering, the other 9

participants insisted that writing skills were between "critical" and "moderately important" to their work.

The participants' level of enjoyment towards writing, even if it leaned strongly towards negativity, had little bearing on whether they felt that writing was important to the engineering program. Seven of the ten interviewed students were able to isolate their personal feelings about writing or written assignments and acknowledge an objective appreciation for writing as an essential professional skill. These seven students definitively answered "Yes" when asked if they believed writing skills are important to their program and nine out of ten were able to clearly prioritize specific skills. One student (MAE 5) in the Aerospace Engineering program who demonstrated a positive outlook on writing went so far as to state that writing was "extremely" important to the field. Another student (CPE 3), who admitted to practicing writing "as little as possible" due to his perceived lack of skill, stated that he still considered it a "very useful tool" in Computer Engineering. Similarly, a MAE student who indicated on the questionnaire that he "Did Not Enjoy" the writing assignments he completed in the Mechanical and Aerospace Engineering program stated that he believed writing is "necessary" if disliked.

Interviewer: How do you feel about writing in general?

MAE 7: I find it to be a necessary evil.

Interviewer: Do you believe that writing skills are important to Mechanical and Aerospace Engineering?

MAE 7: Yes.

His negative feelings towards writing were abundantly clear before the interview started, as he was in fact the only student to select "Did Not Enjoy" as his answer to Question #6 on the questionnaire. While he also exhibited the same negativity in the interview by characterizing writing as "evil" and offering little else, he did not allow that negativity to interfere with his understanding that writing is valuable to his field.

One student remarkably alleged that while writing is important to the professional engineering field, it is not necessarily important to the engineering curriculum.

Theme 3: Perceived Lack of Skill in Writing

One theme that emerged from the interview data especially was the students' lack of confidence in their writing abilities. Many students in fact correlated their feelings about writing in general to their perceived lack of proficiency in the skill itself. For example, one student in the Computer Engineering claimed to see the value of writing but avoided the practice for personal reasons.

Interviewer: How do you feel about writing in general?

CPE 3: I think it's a very useful tool. I try to use it...as little as possible because I'm not the best writer and my handwriting isn't the best.

The same student later declared outright that he is unintelligent in general and that this limitation affects his writing capacities as well. Interestingly, he still credits practicing writing with helping him overcome some of his setbacks.

> Interviewer: Do you think that the writing assignments in your classes helped you become a better engineer?
>
> CPE 4: Yes and no. I think it's definitely helped me with organization. In my personal opinion, engineering is – I think – not about intelligence, but about organization, because I am not a smart person. I've come very far by doing things ahead of time and organizing my time well and I think the same applies to my writing.

Finally, another student did not necessarily refer to himself but volunteered the idea that his peers tend to perform poorly in literacy and highly in mathematical tests. According to CPE 2, these students thus avoid activities that could improve their reading and writing skills.

> CPE 2: That's one of the issues that a lot of people have, I think. It's like people have low reading and writing scores but they have high science or math scores on their SAT. Then, they just don't put enough emphasis on it. But they've got to be able to communicate when they enter the workforce and whatever else.

According to Albert Bandura's social-cognitive theory, academic performance is significantly correlated to students' perceived self-efficacy (Smith & Fouad 1999). People's perceived self-efficacy is defined as the "beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect

their lives" (Bandura 1994). Self-efficacy can not only predict a student's capacity to succeed academically and choose a productive career path; it may also be an accurate indicator of students' subsequent ability to make industrious decisions within their chosen careers (Betz & Hackett 2006). Thus, students who perceive themselves to be poor writers or unintelligent need to be given writing tasks or scored using methods that are more conducive to improving their confidence as writers. This proposal does not necessarily imply that academic expectations should be lowered or that grades should systematically be curved so as to offer the illusion of better performance. Stephen Krashen suggests that students with low self-efficacy can be given more "leisure-writing" activities, which includes reading content that they might enjoy (1984). Examples of enjoyable content, besides fiction, may include news reports that surround current events in their field or scholarly articles that offer solutions to research problems relevant to a specific course. Reading, according to Krashen, improves a writer's competence, or his "subconscious feel" for written language. Students who read for personal enjoyment tend to perform better at writing activities, which could compel them feel more confident with their writing capabilities.

Theme 4: Vague Understanding of Effective Writing

When asked about the qualities of effective writing, six out of ten students demonstrated some level of unfamiliarity or outright difficulty in their efforts to describe what they believe to be good writing and specific skills they would prioritize. The other four were able to communicate at least one skill at various levels and typically in broad language. Five out of ten students stressed the importance of concision and what they

described as "simple" or "understandable" writing in some manner. However, the language they used to describe these skills was remarkably nonspecific.

Interviewer: What do you think are the qualities of good or effective writing?

MAE 7: So, the ability to use small simple words that everyone understands.

Interviewer: Mm-hmm (affirmative).

MAE 7: And the ability to write concisely.

Interviewer: Mm-hmm (affirmative).

MAE 7: But without omitting details.

One student, an outlier, held to opposite opinion to the rest of the respondents. He alleged that good writing should be "complex" not "simple," but he had trouble defining "complex" writing and clarifying what makes "complex" writing more effective than "simple" writing.

Interviewer: What do you think are qualities of good or effective writing?

MAE 8: Being able to be thorough with having to present what it is, and doing it in a professional manner, in complex and compound sentences. Not just simple, "This is what I did, this is what happened."

In one instance, a CPE student was only able to affirm that effective writing should "convey" what needs to be "conveyed."

Interviewer: What do you think are the qualities of effective writing?

CPE 1: Really, as long as you get the point across, I think that...it might not flow as well as it could, but for it to truly be effective, I just think you have to…like…whatever you are trying to convey needs to be conveyed.

In another instance, the student demonstrated a better understanding of at least one quality of effective writing, but his ability to describe the quality was still fairly limited.

Interviewer: What do you think are the qualities of effective writing or good writing?

CPE 2: Writing in general or writing in this field?

Interviewer: Let's say in this field.

CPE 2: Can you rephrase…Can you say the question again?

Interviewer: What do you think are the qualities of effective writing or good writing? Even if it's beyond just this field. Talk about writing in general.

CPE 2: I don't think I understand properly what [crosstalk 02:23].

Interviewer: Like if you were to say, "Wow, this is good writing," what would the qualities of that writing be?

CPE 2: Good word choice.

Interviewer: Good…okay.

CPE 2: It's not just jargon.

Theme 5: Dislike Towards Formal Writing

Almost unanimously (i.e. in nine out of ten responses), the students agreed that formal writing, namely lab reports, were both disliked and unrewarding. The students typically grouped these reports up into one large category and rejected in their entirety, leaving almost no room for a type of lab report that was perhaps more bearable or appreciated among them. One student, in fact, admittedly recognized the importance of learning how to complete lab reports but had utterly no tolerance for them.

Interviewer: Can you think of a writing assignment that you really didn't enjoy?

MAE 10: Any lab report.

Interviewer: Any lab report.

MAE 10: I don't like it. Like "Delta X" kind of research. Granted, I know it's useful and you have to learn that, but…

Another student had enough forbearance in his opinion to single out only the lab reports from one field, but he hated them to such a degree that he described them as "torturous."

Interviewer: So how about an assignment that you really did not enjoy?

MAE 9: All of the aerodynamics labs were just awful because they were bulky to the point of being torturous.

A particularly verbose student in CPE was helpful in providing data on what specific qualities of lab reports caused them to be such a disreputable experience for both CPE and MAE students.

Interviewer: What about one or several [assignments] that you didn't enjoy?

CPE 4: Yeah, we had to do lab reports on one of our electronics labs. Basically, every lab report was read the material from the book, paraphrase the introductory paragraph, slap a bunch of figures from Excel in the data, and then post the same generic conclusion about how "results are experimental, it generally makes sense, and error can be attributed to error."

Interviewer: I see.

CPE 4: They were very procedural. Every report looked the same. Nobody read them. They were turned in simply because he told us that we had to.

The most tolerant opinions on formal writing were limited to two students, one in CPE and one in MAE. The MAE student was the outlier, as he contended that he enjoyed specifically Physics I lab reports for their "technical" quality. The CPE student singled out lab reports as a point of contention, but mainly because he disagreed with minimum word requirements

Interviewer: What about maybe a writing assignment you did not enjoy?

CPE 1: Well, I had…I'm not a fan of minimum word, especially lab reports. But really anything, because I'm one of those people who is like…if I can do it in less words and you still get all the information you need.

This student was not alone in his dislike for minimum word requirements. [X] out of ten respondents agreed, in some manner of response or another, that they would prefer if their writing was not measured by a word requirement.

It is not a coincidence that the students at UAH had trouble valuing formal writing such as lab reports, as research tends to agree that it does not contribute to a higher level of learning. A study at the University of Washington demonstrated that although formal writing is "appropriate for communicating the results of this process, formal writing tends to be less effective at helping students master the design concepts presented in the class" (Hawkins et al 1996). The researchers found, in fact, that "incidental writing," or informal writing that students do throughout the course of a project, proved more beneficial to their understanding of the design process. The students kept journals that were analyzed at the end of the course. The results demonstrated that these journals improved both the students' writing skills and comprehension of the material they were tasked to learn. In addition, the informal writing process enhanced their problem-solving abilities and enabled them to "monitor their thinking and learning strategies" (Hawkins et al 1996).

CHAPTER 5

CONCLUSION

The research gathered throughout this study points to a number of conclusions. First, it was clear that although many of the engineering students interviewed do acknowledge the value of writing in their discipline and demonstrate a willingness to implement it in their work, the assignments that were distributed at UAH did not satisfy their expectations. Most students would rather do more incidental writing activities than formal ones and would especially like to focus on elements of technical communication. Second, the same students often struggled to demonstrate that they could clearly and specifically describe the elements of "good" or effective writing; a majority struggled to describe skills they even considered to be important to a good writing ability. Finally, the interview data suggested, although a bit marginally, that a lack of self-efficacy could be preventing a number of students from performing as well as they could be performing at writing assignments. Without the confidence to complete assignments to the best of their abilities, students cannot be expected to respond well to an increase in writing across the curriculum or in the disciplines.

While research on the theory behind WAC/WID pedagogy suggests promising results in terms of bridging the gap between the humanities and the sciences, there is still plenty of room for additional research on its practical applications. ABET has taken enormous strides in furthering the value of communication and rhetoric by encouraging STEM programs to integrate more communication skills and collaborative learning environments in their curricula. Kristin Walker, among many other WAC/WID scholars, advocates that "such integration is necessary in order to prepare students to work successfully in a global, diversified workplace" (Walker 2000). This perspective is not unique to writing instructors, as engineering faculty tend to agree that the cultivation of writing skills is extremely important to tailoring professional engineers (Zhu 2004). Yet STEM program leaders are still reluctant to adopt WAC/WID pedagogy in their own disciplines, usually because the concern over creating undue burden on the instructors persists (Ekoniak et al. 2015). Research on peer review and collaborative learning activities proves promising in terms of shifting the burden of feedback away from the instructors, but it does not resolve the issue of writing assignments creating additional work for the students in already work-intensive disciplines.

Regardless of how and to what extent STEM programs finally choose to adopt WAC/WID solutions, writing programs in higher education must consider the academic needs of students outside of the humanities, namely engineers and scientists, in order to keep human advancement in motion. Writing instruction helps foster a strong and healthy relationship between the STEM fields and the humanities. Communication between STEM and the people whose lives it aims to improve is the key to its growth and development. The research on rhetoric, composition, and communication is inevitably a

process as persistent as the growth of technology itself; as long as instructors are willing to recognize the importance of the humanities in a technological society, WAC/WID pedagogy should continue to thrive.

APPENDIX

Interview Questionnaire:

1. How important do you believe writing skills are to your program of study?
    a. Critical
    b. Important
    c. Moderately Important
    d. Of Little Importance
    e. Unnecessary

2. How frequently do you write for school throughout your program of study? Examples of writing include essays, responses, lab reports, research proposals, etc.
    f. Every Day
    g. Most Days
    h. At Least Once Week
    i. Every Couple of Weeks
    j. About Once a Month
    k. Rarely
    l. Never

3. How much time did professors who assigned writing intensive assignments spend in class teaching how to complete these assignments?
    m. Every Assignment
    n. Most Assignments
    o. Some Assignments
    p. Almost None
    q. No Instruction

4. How clear did you find your professors expectations for written assignments?
    r. Abundantly Clear
    s. Mostly Clear
    t. Somewhat Clear
    u. Mostly Unclear
    v. No Clear Instruction

5. To what extent do you perceive the writing assignments you completed in your major as relevant and beneficial to your career?
    w. Critical
    x. Important
    y. Moderately Important
    z. Of Little Importance
    aa. Unnecessary

6. How much did you enjoy the assignments you completed in your program of study?
    bb. Enthusiastically Enjoyed

cc. Fairly Enjoyed

dd. Somewhat Enjoyed

ee. Undecided

ff. Did Not Enjoy

gg. Despised

Semi-Structured Discussion Questions

1. How do you feel about writing in general?
2. If you believe writing skills are important to your program of study, what specific skills would you prioritize?
3. What do you think are qualities of effective writing?
4. Do you believe that the classes in your major helped you improve those skills?
5. How many of your classes involved writing assignments?
6. [Values Writing]: Tell me about some of the writing assignments you completed in your program of study that you believe are examples of valuable or effective writing. What qualities make them valuable to you?
7. What is your opinion on the amount of writing opportunities you received?
8. How do you believe that writing relates to engineering?
9. Do you think the writing assignments in your classes helped you become a better engineer? Why or why not?
10. Tell me about a writing assignment you enjoyed the most. What did you enjoy about it?
11. Tell me about a writing assignment you didn't enjoy. What made it not enjoyable?
12. Overall do you enjoy doing writing assignments?

THE UNIVERSITY OF
ALABAMA IN HUNTSVILLE

October 14th 2018

☐ Expedited (see pg 2)
☒ Exempted (see pg 3)
☐ Full Review
☐ Extension of Approval

Rebecca E. Avgoustopoulos
Department of Computer Science
University of Alabama in Huntsville

Dear Mrs. Avgoustopoulos,

The UAH Institutional Review Board of Human Subjects Committee has reviewed your proposal, *An Interview-Based Study on Writing Instruction in Engineering Programs,* and found it meets the necessary criteria for approval. Your proposal seems to be in compliance with this institutions Federal Wide Assurance (FWA) 00019998 and the DHHS Regulations for the Protection of Human Subjects (45 CFR 46).

Please note that this approval is good for one year from the date on this letter. If data collection continues past this period, you are responsible for processing a renewal application a minimum of 60 days prior to the expiration date.

No changes are to be made to the approved protocol without prior review and approval from the UAH IRB. All changes (e.g. a change in procedure, number of subjects, personnel, study locations, new recruitment materials, study instruments, etc) must be prospectively reviewed and approved by the IRB before they are implemented. You should report any unanticipated problems involving risks to the participants or others to the IRB Chair.

If you have any questions regarding the IRB's decision, please contact me.

Sincerely,

Bruce Stallsmith

Bruce Stallsmith

IRB Chair
Professor, Biological Sciences

Expedited:

☐ Clinical studies of drugs and medical devices only when condition (a) or (b) is met. (a) Research on drugs for which an investigational new drug application (21 CFR Part 312) is not required. (Note: Research on marketed drugs that significantly increases the risks or decreases the acceptability of the risks associated with the use of the product is not eligible for expedited review. (b) Research on medical devices for which (i) an investigational device exemption application (21 CFR Part 812) is not required; or (ii) the medical device is cleared/approved for marketing and the medical device is being used in accordance with its cleared/approved labeling.

☐ Collection of blood samples by finger stick, heel stick, ear stick, or venipuncture as follows: (a) from healthy, nonpregnant adults who weigh at least 110 pounds. For these subjects, the amounts drawn may not exceed 550 ml in an 8 week period and collection may not occur more frequently than 2 times per week; or (b) from other adults and children, considering the age, weight, and health of the subjects, the collection procedure, the amount of blood to be collected, and the frequency with which it will be collected. For these subjects, the amount drawn may not exceed the lesser of 50 ml or 3 ml per kg in an 8 week period and collection may not occur more frequently than 2 times per week.

☐ Prospective collection of biological specimens for research purposes by noninvasive means. Examples: (a) hair and nail clippings in a nondisfiguring manner; (b) deciduous teeth at time of exfoliation or if routine patient care indicates a need for extraction; (c) permanent teeth if routine patient care indicates a need for extraction; (d) excreta and external secretions (including sweat); (e) uncannulated saliva collected either in an unstimulated fashion or stimulated by chewing gumbase or wax or by applying a dilute citric solution to the tongue; (f) placenta removed at delivery; (g) amniotic fluid obtained at the time of rupture of the membrane prior to or during labor; (h) supra- and subgingival dental plaque and calculus, provided the collection procedure is not more invasive than routine prophylactic scaling of the teeth and the process is accomplished in accordance with accepted prophylactic techniques; (i) mucosal and skin cells collected by buccal scraping or swab, skin swab, or mouth washings; (j) sputum collected after saline mist nebulization.

☐ Collection of data through noninvasive procedures (not involving general anesthesia or sedation) routinely employed in clinical practice, excluding procedures involving x-rays or microwaves. Where medical devices are employed, they must be cleared/approved for marketing. (Studies intended to evaluate the safety and effectiveness of the medical device are not generally eligible for expedited review, including studies of cleared medical devices for new indications).

☐ Research involving materials (data, documents, records, or specimens) that have been collected, or will be collected solely for nonresearch purposes (such as medical treatment or diagnosis).

☐ Collection of data from voice, video, digital, or image recordings made for research purposes.

☐ Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Exempt

☒ Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as (a) research on regular and special education instructional strategies, or (b) research on the

effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods. The research is not FDA regulated and does not involve prisoners as participants.

☒ Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interviews, or observation of public behavior [1] in which information is obtained in a manner that human subjects cannot be identified directly or through identifiers linked to the subjects and any disclosure of the human subject's responses outside the research would NOT place the subjects at risk of criminal or civil liability or be damaging to the subject's financial standing, employability, or reputation. The research is not FDA regulated and does not involve prisoners as participants.

☐ Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement) survey procedures, interview procedures, or observation of public behavior if (a) the human subjects are elected or appointed public officials or candidates for public office, or (b) Federal statute(s) require(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter. The research is not FDA regulated and does not involve prisoners as participants.

☒ Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects. The research is not FDA regulated and does not involve prisoners as participants.

☐ Research and demonstration projects which are conducted by or subject to the approval of department or agency heads, and which are designed to study, evaluate, or otherwise examine: (i) public benefit or service programs; (ii) procedures for obtaining benefits or services under those programs;(iii) possible changes in or alternatives to those programs or procedures; or (iv) possible changes in methods or levels of payment for benefits or services under those programs. The protocol will be conducted pursuant to specific federal statutory authority; has no statutory requirement for IRB review; does not involve significant physical invasions or intrusions upon the privacy interests of the participant; has authorization or concurrent by the funding agency and does not involve prisoners as participants.

☐ Taste and food quality evaluation and consumer acceptance studies, (i) if wholesome foods without additives are consumed or (ii) if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the Food and Drug Administration or approved by the Environmental Protection Agency or the Food Safety and Inspection Service of the U.S. Department of Agriculture. The research does not involve prisoners as participants.

[1] Surveys, interviews, or observation of public behavior involving children cannot be exempt.

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