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Understanding the rhetorical engineer

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UNDERSTANDING THE RHETORICAL ENGINEER

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For Heather—wife, friend, and companion. You are why I could do this.

For Linda Bergmann—mentor, scholar, colleague, and dearly missed friend.

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ABSTRACT

Koppelmann, Zachery W. Ph.D., Purdue University, December 2014. Understanding the Rhetorical Engineer. Major Professor: Richard Johnson-Sheehan.

The purpose of this dissertation is to describe the development of the Purdue School of Mechanical Engineering Writing Enhancement Program and its definition of good engineering writing. Based on the work with the Mechanical Engineering Faculty and the Writing Enhancement Program, it was determined that good engineering writing is aware of its need to address specific rhetorical contexts and expectations. The Writing Enhancement Program was created to provide additional writing instruction to undergraduate mechanical engineering students Purdue University. Its development did not follow standard writing across the curriculum methods; it was developed following a modified writing center methodology. The modifications stressed collaboration between the Mechanical Engineering Faculty and the coordinator; they also stressed the need for the coordinator to learn how to write like an engineer so he could better understand and describe good engineering writing. This unique development method resulted in a number of important discoveries, specifically that good engineering writing is sensitive to the rhetorical contexts and expectations of not only engineering writing but also engineering practices. It is recommended that the Writing Enhancement Program and its definition of good engineering writing be used as a template to build custom writing programs for engineering schools and departments.

CHAPTER 1. INTRODUCTION

1.1 Introduction

The need for engineers to understand and respond to the rhetorical situation of a bridge design was clearly demonstrated in 1879 after the Firth of Tay rail bridge failure in Dundee, Scotland. At the time of the failure, Sir Thomas Bouch, who had been knighted for the Tay Bridge (Petroski 168) was building another bridge—the Firth of Forth—on the same rail line that headed north out of Edinburgh, crossed the Forth, and proceeded north to the Scottish Highlands. Sir Thomas was immediately removed from the Forth bridge project and his design scrapped—not for engineering reasons, but due to his affiliation with the failed bridge. The project was turned over to Sir John Fowler and his assistant, Benjamin Baker, who embarked on an extensive publicity campaign to reassure the public of their daring cantilever design. They held public lectures, complete with physical demonstrations, to explain and justify the safety of their design. Sir John and Baker clearly understood their rhetorical situation and devised a sound rhetorical strategy to address the needs of their audience (Petroski 169-171): The Firth of Forth bridge was completed in 1890 following Sir John's and Baker's design, and is still in use today.

Engineering, as it emerged as a profession, has been cognizant of the need for clear and effective communication—good engineering writing—for centuries.

One prominent example concerns bridges: “From ancient time to the Industrial Revolution, there has been a long and solid tradition of building bridges of stone and timber…. [However], clear and effective communication, ameliorating the sense of threat and uncertainty that a new material prompted, was a crucial factor in getting [the] Iron Bridge built” (Petroski 160-161). The limiting factor for building bridges out of iron was not technological or economic; it was the social perception that bridges needed to be made of stone or timber. This social perception was overcome when a new bridge was needed in the Severn Valley in England.

In the late eighteenth century, a new bridge was needed to cross the Severn river, and engineers proposed an iron bridge instead of a timber or stone bridge (Petroski 160). The perception that safe bridges were made out of timber or stone was so strong that one of the sketches showed, “the iron cast into stonelike [sic] voussoirs…[or] iron mimicking timber” (Petroski 160). In practice, the engineers evaluated the design needs of the bridge and the rhetorical needs of convincing people that the design would work, and blended the design with an accepted and common look: The final design follows the Roman semicircular stone arch bridge. This is a carefully calculated appeal to the citizens of Severn Valley (Petroski 160-161).

Engineers understood that they had to clearly and effectively convince the public that an iron bridge would be safe: They clearly assessed their audiences’ needs and understood the rhetorical situation in which they were functioning. The engineers built a bridge that looked like the standard bridge that everyone accepted as safe, but it was built out of iron instead of timber or stone. In effect, the engineers showed that iron worked better than timber or stone by mimicking the familiar design.

Other benefits of the iron bridge were soon apparent. Due to the cast iron construction, the bridge was built rather quickly and barely disrupted river traffic. And the iron bridge was the only bridge on the Severn River to survive the 1795 flood (Petroski 161). Based on the success of the iron bridge, engineers were able to start designing and building more sophisticated iron bridges because society trusted iron bridges when they saw and understood how they were better than timber or stone bridges.

Designing and building bridges is not the only engineering task that requires good engineering writing; however, "engineering is a fundamental human process that has been practiced from the earliest days of civilization. Today, its methods have been professionalized and formalized…. But that is not to say that the skills and discipline required to do good engineering are totally different" (Petroski 2). In practice, this means that all engineers require many of the same skills and needs, and that clear and effective communication is one of those needs.

However, being aware of the need for clear and effective communication—good engineering writing—is not the same as internalizing that need into the profession of engineering. Practicing engineers know that they need to sell their designs and ideas, but the act of selling is not seen as part of the actual engineering (Winsor "Engineering Writing/Writing Engineering" 58-60). The need to sell a design on more than just engineering grounds was demonstrated with the design of the Golden Gate Bridge.

In 1914, Charles Evan Fowler proposed a cantilever bridge for what later became the Golden Gate Bridge. Fowler's design closely resembled the Firth of Forth Bridge just north of Edinburgh, Scotland—a safe, widely accepted design (Petroski 167). However, Fowler did a poor job of selling his proposal; it was poorly written and failed to concisely

and explicitly explain the costs and benefits of the bridge, "in terms readily understood by anyone" (Petroski 176). Fowler failed to understand the rhetorical situation of his proposal, possibly because the need for clear communication had become transparent to him, and did not adequately address his audiences' needs. His design was sound, but his writing couldn't justify his bridge.

In her book, *Writing in the Research University*, Martha Patton provides a possible explanation for the need for clear communication becoming transparent to engineers by drawing on Ludwig Wittgenstein's concept of language games and Thomas Kuhn's concept of paradigms. In essence, "[Practitioners] within a paradigm often work without being conscious of the tacit arguments governing the paradigm" (Patton 19). That is, practitioners internalize some of the assumptions within their practice, and those assumptions become transparent to the practitioners. For Fowler, the need to sell his ideas to a broad, non-engineering audience had become so transparent that he failed to explicitly address the issue: "in a mature paradigm, then, the rules tend to be accepted and unquestioned simply because they work for the problems at hand" (Patton 19). The paradigm of building bridges was based on the idea that previously proven designs had been adequately explained because they worked; therefore, a conscious attention to selling the design was not needed if the design was based on a proven structure, a paradigm successfully used for the iron bridge over the Severn River.

1.2 Purpose of this Dissertation

The purpose of this dissertation is to demonstrate that engineers are, on some level, aware of the rhetorical context and rhetorical expectations of their writing. This will be demonstrated through explaining the creation and development of the Purdue

University School of Mechanical Engineering Writing Enhancement Program (WEP) and its definition of "good" [1] engineering writing. The dissertation will detail the development of the WEP's assessment tools, describe what insights were gleaned from the WEP's development, and provide a discussion of how those insights could benefit future writing across the curriculum programs.

This narrative is important because many of the details concerning the WEP's development—and its assessment tools—seem to challenge an assumption about engineering writing posited in rhetoric and composition, writing across the curriculum, and writing center theory and practices; the assumption that engineering writing is not concerned about rhetoric and is devoid of rhetorical expectations.

The non-rhetorical nature of engineering writing did not originate in rhetoric and composition, writing across the curriculum, or writing center literature; indeed, there was a clearly stated rebuke in a 1973 article in *IEEE Transactions on Professional Communication*, in which Barbara Cox and Charles Roland explicitly state that, "rhetoric should be avoided assiduously in scientific writing" (140). Cox and Roland support their statement, saying, "We believe that such rhetoric has no place in the scientific literature. It involves value judgments and not scientific evaluation, and as such concerns social and not scientific issues" (140). Based at least partially on this statement, and others like it, Winsor suggests in *Writing Like an Engineer* that, "engineers usually see their work [writing] as inherently arhetorical" (11). It is important to note that Winsor is not saying that engineering writing is arhetorical—she is saying that engineers see their writing as

[1] I place "good" in quotation marks because the term good is rather vague and imprecise, and because "good" engineering writing may have a different definition at another institution.

arhetorical, a view that Winsor calls, "a fiction" that "can be severely strained" when writing to non-engineers (*Writing* 11). She makes this claim in a section titled "Engineers' Difficulty in Recognizing Rhetoric," which she uses as a starting point for her research. Winsor doesn't think that engineering writing is arhetorical. Indeed, she points out that, "The rhetorical nature of engineering writing and engineering work is not obvious at first glance.… The fact that knowing and doing happen in concert with other people seems like a minor detail" (*Writing* 12). For Winsor, engineering writing and engineering work are rhetorical, but the engineers do not see the rhetorical contexts.

However, experiences developing the WEP challenges the second part of Winsor's claim. While developing the WEP, it was very clear that the engineers were extremely aware of the rhetorical context and expectations of their writing. It was just as clear that the engineers did not use the same terms to describe and discuss the rhetorical contexts and expectations, which suggest a more complex relationship between the Mechanical Engineering (ME) faculty and rhetoric. This complex relationship is demonstrated by the analytic rubric that was collaboratively developed for use by the WEP. The analytic rubric describes "good" engineering writing as being aware of its rhetorical contexts and expectations.[2]

Therefore, understanding this complex relationship between the ME faculty and rhetoric starts with an accurate definition of "good" engineering writing. Only after rhetoric and composition, writing across the curriculum, and writing center scholars and

[2] Chapter 3 will detail the development of the analytic rubric, and Chapter 4 will present and explain the WEP's definition of "good" engineering writing.

engineers agree on an accurate definition of "good" engineering writing can the more nuanced aspects of "good" engineering writing be fully examined and explored.

I hypothesize that engineers see their writing as arhetorical for two reasons: first, they have been told to avoid rhetoric in their writing, and second, the rhetorical contexts and expectations have become transparent within the paradigm of engineering writing. However, there is ample evidence that engineers as a professional community value clear written communication and understand that many engineers lack adequate writing skills (see the National Academy of Engineers *The Engineer of 2020: Vision of Engineering in the Next Century*, and Accreditation Board for Engineering and Technology's (ABET) *Criteria for Accrediting Engineering Programs* 2007 report), so much so that the National Academy of Engineers report, *The Engineer of 2020: Vision of Engineering in the Next Century*, identify communication skills (both written and verbal) as an important attribute of all engineers.

It is true that the term "rhetoric" is not used to explain or discuss the need for communication skills; however, the justification for identifying communication skills as so important puts a heavy emphasis on engineers needing to understand their rhetorical context and effectively communicate with divergent audiences:

> As always, good engineering will require good communication. Engineering has always engaged multiple stakeholders—government, private industry, and the public. In the new century the parties that engineering ties together will increasingly involve interdisciplinary teams, globally diverse team members, public officials, and a global customer base. (National Academy of Engineers 55)

In practice, engineers need to have a clear understanding of what they are communicating and how they are communicating it to different stakeholders or audiences. Interestingly, this is not posited as a new need or a new idea; indeed, it is specifically pointed out as a historical need for good engineering. The report goes on to highlight two more important rhetorical considerations: specifically the idea of rhetorical contexts and expectations, "We envision a world where communication is enabled by an ability to listen effectively as well as to communicate through oral, visual, and written mechanisms"; and the awareness that communication has the power to argue and influence the audience, "The increasing imperative for accountability will necessitate an ability to communicate convincingly and to shape the opinions and attitudes of other engineers and the public" (National Academy of Engineers 55). These needs have possibly become such an ingrained part of "good" engineering writing that engineers can overlook them.

This is as true today as it was in 1914 when Fowler's proposal failed when he failed to sell his design to his audience. In fact, the design that was selected for the Golden Gate Bridge was actually an untried design, one that required special tests to ensure that it would work. This is important because Fowler's proposal had been for a proven design, one for which the engineering was proven and accepted by the community at large. However, the final design for the Golden Gate Bridge used, "two complete suspension bridges in tandem, sharing a common central anchorage (Petroski 182), a design that had never before been used.

Fowler's failed proposal had banked on a proven design as being enough to win the contract, but in the end, it was Michael O'Shaughnessy and Joseph Strauss's 1921 proposal that was selected, at least partially because it was, "a model of salesmanship"

that was, “better written…[and] spelled out concisely and explicitly the costs and benefits in term readily understood by anyone” (Petroski 175-176). Understanding the needs of the audience, the rhetorical context, and writing to address those needs allowed O’Shaughnessy and Strauss to secure the contract.

1.3 The Following Chapters

Chapter 1 has been an introduction to this dissertation and its goals. It has provided a general look into the importance of clear communication—“good” engineering writing—for engineering work, and it has started to suggest the awareness of the rhetorical contexts and expectations of “good” engineering writing. The focus on bridges provides a simple set of examples that provide the needed backdrop for the rest of the dissertation.

Chapter 2 will be a review of the rhetoric and composition, writing across the curriculum, and writing center literature used to develop the WEP. It is arranged in a chronological order to explain the reasoning behind the approach used to develop the WEP and its definition of “good” engineering writing.

Chapter 3 will be a narrative of the WEP’s origins, development, and current state. It divides the development of the WEP into generations based on the assessment tools being used. It culminates with the final version of the analytic rubric used by the WEP to assess ME writing, which is the basis for the WEP’s definition of “good” engineering writing.

Chapter 4 presents the WEP’s definition of “good” engineering writing, and explains the definition in detail by examining sample paragraphs from ME 263 assignments. The examples have been revised by the WEP coordinator following the

WEP's definition of "good" engineering writing. It also highlights how the definition was reviewed and accepted by the ME faculty.

Chapter 5 concludes the dissertation with a discussion on how the development of the WEP and its definition of "good" engineering writing can be used to create new writing across the curriculum programs and to refine existing writing across the curriculum programs. There is specific stress on the fact that the WEP and its definition are only verified and valid for a specific department at a large university—it cannot be transplanted to other departments. Instead, the process of how it was developed can be used with other departments and institutions to build or refine collaborative writing across the curriculum programs.

CHAPTER 2. LITERATURE REVIEW

2.1 Literature Used to Develop the Writing Enhancement Program

The development of the Purdue University School of Mechanical Engineering Writing Enhancement Program (WEP) began as a practical method for efficiently commenting on a large number of mechanical engineering (ME) undergraduate student memos. Initially, Purdue Writing Lab tutors did the commenting, so writing center methodology was used as the basis for the WEP. This resulted in an approach to the ME writing and working with the ME faculty that is different from other rhetoric and composition or writing across the curriculum approaches. The WEP approach assumed that the best way to respond to ME writing was to comment on what the ME faculty expected from good engineering writing. Therefore, for the WEP to efficiently comment on ME undergraduate writing, it needed a definition of good engineering writing. However, because there was no existing definition of good engineering writing for the WEP to use, the WEP needed to develop and verify a definition of good engineering writing based on ME faculty expectations.

The purpose of this chapter is to review the literature used to develop the WEP and its definition of good engineering writing. Due to the nature of the WEP's approach, this literature review will start with a close look at the non-directive methods used in writing centers, move to literature used to teach teachers of writing and to

literature concerning writing across the curriculum, and conclude with literature concerning assessment and rubrics. The literature used was selected based on the immediate needs of the WEP and its development.

2.2 Modern Writing Center Practices

The purpose of this section is to provide a broad review of the role of modern writing centers and specific issues related to the creation and development of the WEP and its definition of good engineering writing. It will start with the earliest known forms of writing centers, trace some of their major concerns, discuss the modern architecture of writing centers, and highlight the accepted practices in contemporary writing centers across the United States.[3]

Peter Carino's "Early Writing Centers: Toward a History" lays out the early growth of writing centers by pointing out that a form of writing centers (which might be called "proto-writing centers") existed prior to 1970 ("Early Writing" 103). While they were not numerous, and often went by names such as writing lab and writing clinic, these proto-writing centers existed in a rudimentary form. Indeed, "writing center discourse, however, has largely ignored early centers or monolithically represented them as deficient" (Carino "Early Writing" 103). In effect, these early writing centers were assumed to be, "the poor cousins of English departments, stereotypical 'remedial fix-it shops' where an unenlightened staff administered current-traditional pedagogy to underprepared and poorly regarded students" (Carino "Early Writing" 103). Carino, however, does not think that this assumption is accurate or fair, so he, "[attempts] to trace

[3] This dissertation looks only at the US writing centers and US writing center practices. Writing centers in Europe, the UK, Africa, and other parts of the world function differently, and do not apply to this work.

the evolution of writing centers to demonstrate how early centers conducted practice in ways which both deviate from and foreshadow writing center practice and theory today" ("Early Writing" 104). He begins with connections to the laboratory method classroom format.

Carino credits Philo Buck with the creation of the laboratory method of teaching writing ("Early Writing" 105). A high school teacher in 1904 St. Louis, Buck asked his students to collaboratively write about topics of their own choice, met one-on-one with each student to discuss his or her writing, and had students read and critique their peers' writing (Carino "Early Writing" 105). This is an arrangement familiar to modern writing instructors and college students. Buck's method was apparently popular and accepted because it was discussed in a 1917 *English Journal* article, and was the topic of a Master's thesis by the end of the 1920s (Carino "Early Writing" 105). In 1934, "the University of Minnesota and the State University of Iowa (now the University of Iowa) established separate facilities for laboratory instruction" (Carino "Early Writing" 106), and the first dedicated proto-writing centers began.

Due to the proliferation of mass education initiatives in the 1930s, state institutions began enrolling large numbers of first-generation students (Carino "Early Writing"). This influx of students coincided with the beginnings of the first writing centers, ostensibly because, "many of these students were considered underprepared" (Carino "Early Writing" 106), which seems to have played a role in the proto-writing centers being remedially focused.

At this point, it is important to explain the evolution of the names used for proto-writing centers. In general, the names "writing center" and "writing lab" are more or less

interchangeable in scholarly work after 1980;[4] however, prior to 1980, most proto-writing centers were called "writing labs" or "writing clinics." The issue concerning the name is important because of the perceived function implied by a specific name. A "writing lab" suggests a location where students experiment with what they have learned in a class, similar to a chemistry laboratory or engineering laboratory. Indeed, many early writing labs were established as part of a first-year English course (Carino "Early Writing" 108-109). The connection between science labs and writing labs cannot be overstated. Labs in lower-level courses are places for students to learn specific protocols and procedures to elicit desired results; it is not until more advanced courses that labs become a place of innovation and true experimentation. Lower-level writing courses often included a "recitation" component that was similar to lab work, but these proto-writing labs were more formalized places to practice grammar skills and to focus on correctness, places for underperforming students to conduct rigorous "skill and drill" remedial training beyond the normal scope of the course.

The name "writing clinic" openly accepted and acknowledged a purely remedial role: A writing clinic was where professors sent a "sick" writing to get "well" (Carino "Early Writing" 106-109). Writing clinics often did not foster any sort of rhetorical development or sophistication of style; they often focused rigidly on correct grammar and punctuation.

Saying that "many" labs and clinics were "often" only focused on correct grammar and punctuation is intentional because there were proto-writing centers that did

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[4] This date is used as a point of reference because it was the year the *Writing Center Journal*—the first widely-accepted writing center journal—was founded (Carino "Early Writing" 103).

not rigidly focus on correct grammar and punctuation. Carino points to the University of Denver, where graduate students, "worked individually with students" ("Early Writing" 107) and instead, "[used] Rogerian nondirective counseling" (Davidson and Sorenson 84). This sort of writing counseling followed the Rogerian model of argument, which seeks common ground between two sides. The Rogerian model is commonly taught in composition courses, and it puts specific emphasis on careful consideration of both sides before making any sort of judgment. The use of nondirective counseling that was based on the Rogerian argument is an indication that the "fix-it shop" model of proto-writing center was not the only model being used.

The difference between the "fix-it shop" model and the modern nondirective model is important for understanding the development of the WEP and its definition of good engineering writing. The "fix-it shop" model assumed that the writer needed remedial training, or more bluntly, that the writer didn't know how to write, and that the tutors knew exactly what the writer needed to fix. The assumption that tutors had all of the answers assumed that tutors possessed an ultimate definition of good writing, and could therefore "fix" the "broken" papers that failed to follow that definition.

In this model, good writing followed rigid grammar and punctuation rules; there was no room for discussion of the rhetorical context, and good writing followed a set of rigid rules regardless of the topic or audience. The Armed Forces English program for officers entering WWII exemplifies this fixation on rigid grammar and punctuation correctness (Carino "Early Writing 107). During the 1940s, programs were established around the United States to promote, "rapid individual mastery for pragmatic purposes in the military" (Carino "Early Writing" 107), essentially intense writing programs designed

to churn out military officers who had mastered a specific manner of writing. Many of these programs morphed into proto-writing labs, which became more common and, "a recognizable part of higher education" (Carino "Early Writing" 107). The Armed Forces Program model of teaching writing is a prescriptive and directive model that assumes the writer does not know how to write, that the writing instructor has the ultimate definition of good writing, and that as long as the writer follows a set of rigid grammar and punctuation rules, his or her writing will be fixed. This model of teaching writing is in direct opposition to the nondirective model currently used in modern writing centers.

The quintessential definition of the nondirective model for writing centers is commonly credited to Stephen North's 1984 statement, "Our job is to produce better writers, not better writing" (438). He stresses that this means, "that any curriculum—any plan of action the tutor follows—is going to be student-centered in the strictest sense of the term" (439). This model shifts the role of tutors to peers working with writers to help them best convey their ideas in writing. Tutors are no longer the arbiters of good writing; they are skilled mentors and guides who work collaboratively with other writers.

North further explains his role of the nondirective writing center as:

> [A] pedagogy of direct intervention. Whereas in the 'old' center instruction tends to take place after or apart from writing, and tends to focus on the correction of textual problems, in the 'new' center the teaching takes place as much as possible during writing, during the activity being learned, and tends to focus on the activity itself. (439)

Most importantly for the development of the WEP, North makes another important statement about the role of writing centers:

> Their [student writers] primary concern is with their material, with some existential context where new ideas merge with old, and suddenly writing is a vehicle, a means to an end, and not an end in itself. These opportunities to talk with excited writers at the height of their engagement with their work are the lifeblood of a writing center. The essence of the writing center method, then, is this talking. (443)

Talking to writers about their writing and directly interacting with their writing process creates a different sort of peer collaborative writing. However, North points out that, "this kind of writing does not substantially change the approach. We [writing center staff] always want the writer to tell us about the rhetorical context—what the purpose of the writing is, who its audience is, how the writer hopes to present herself" (443). In practice, North is establishing a peer collaborative environment in which writers help each other become better writers.

North posited this role in, "The Idea of a Writing Center," an early article in which he fights against the view of all writing centers as nothing more than glorified editing services. According to North, the writing center is about working with writers to help them develop and grow, not to enforce rigid rules of good writing (433-438). For North, "We [writing centers] are here to talk to writers" (440), a drastically different stance than having an ultimate definition of good writing.

It is important to stress North's point about the "rhetorical context." When he says, "We [writing center staff] always want the writer to tell us about the rhetorical context—what the purpose of the writing is, who its audience is, how the writer hopes to present herself" (443), he sets up the role of the writing tutor as a peer who asks writers about the

rhetorical context of their work, which suggests that the rhetorical context is important to the tutoring process. However, as pointed out in Chapter 1, there was a push to remove "rhetoric" from scientific and engineering writing on the early 1970s: Barbara Cox and Charles Roland explicitly state that, "rhetoric should be avoided assiduously in scientific writing…. We believe that such rhetoric has no place in the scientific literature. It involves value judgments and not scientific evaluation, and as such concerns social and not scientific issues" (140). Specifically, they define rhetoric as, "language designed to persuade or impress" (140). According to Carolyn Miller, Cox and Roland were not the only ones making the same sort of claims. In her 1979 article, "A Humanistic Rationale for Technical Writing," she lists a series of descriptions of technical writing:

> Some typical examples: "Technical writing is expected to be objective, scientifically impartial, utterly clear, and unemotional. . . . Technical writing is concerned with facts and the careful, honest interpretation of these facts." Another: "Since technical writing is by definition a method of communicating facts it is absolutely imperative to be clear. . . . The point of view should be scientific: objective, impartial, and unemotional." And again: "Technical communication has one certain clear purpose: to convey information and ideas accurately and efficiently." And finally: "Because the focus is on an object or a process, the language is utilitarian, emphasizing exactness rather than elegance. . . . Technical writing is direct and to the point." These characterizations have in common a conviction that content (that is, ideas, information, facts) is wholly separable from words. (Miller 611)

With this, Miller points out that engineers were explicitly told to remove "rhetoric" from their writing because, "Rhetoric has to do with symbols and emotions, the stuff of uncertain, incomplete appearances. … If language is clear, then we see reality accurately; if language is highly decorated or opaque, then we see what is not really there" (612). Similarly, Winsor claims that, "engineers usually see their work [writing] as inherently arhetorical" (*Writing* 11). However, this definition of "rhetoric" is different from the "rhetorical context" to which North refers, and upon which modern writing center practices rely.

As North points out, the rhetorical context concerns, "what the purpose of the writing is, who its audience is, how the writer hopes to present herself" (443), not, "language designed to persuade or impress" (Cox and Roland 140). This is a very important distinction for the development of the WEP and its definition of good engineering writing. Put bluntly, all writing has a rhetorical context by the virtue of being a communicative event.

What is of specific interest to the WEP is that engineering writing has a different rhetorical context than other forms of writing. When this project began, the WEP coordinator assumed that the ME faculty were the best prepared to explain and define good engineering writing because, "for an engineer to be accepted as an engineer, he or she must write and speak in the already-created forms and tongues of engineering" (Windsor "Engineering Writing/Writing Engineering" 67), or, engineers must display an understanding of the expectations of the rhetorical contexts of writing to other engineers. Therefore, before the WEP coordinator could start commenting on, or training other writing lab tutors to comment on, engineering writing, he needed an understanding of the

rhetorical contexts of engineering writing, which would lead to a definition of good engineering writing.

To develop the needed understanding of the rhetorical contexts of engineering writing, the coordinator adopted a nondirective, peer-collaboration model as he began developing the WEP and its definition of good engineering writing. He didn't know enough about the rhetorical contexts for engineering writing to allow him to effectively comment on ME student writing, so he needed to work collaboratively with the ME faculty to examine what they saw as good engineering writing. Only after the coordinator was able to examine what the ME faculty identified as good engineering writing could he develop a useful definition for the WEP.

The nondirective peer approach was the coordinator's favored method because his writing center training used Paula Gillespie and Neal Lerner's *The Longman Guide to Peer Tutoring*, 2nd edition, and its focus is simple: writing centers are places for writers to sit down with peer tutors and discuss their writing and learn how to make their writing better. One key point is that, "the writer is responsible for being the expert on her subject" (Gillespie and Lerner 27). This means that writers within a field are the best at identifying good writing in their field because they understand the expectations—rhetorical contexts—inherent to their field, even if they cannot explain or describe those expectations. It further means that the writing tutor is not the arbiter of good writing in every field, but that they work with writers in a specific field to understand what is important and what can be improved. Therefore, the coordinator approached working with the ME faculty, and ultimately developing the WEP, from this position.

A definition of good engineering writing was not needed so that the WEP staff could play the role of arbiters of good and bad writing as tutors did in "fix-it shops." A definition was required to ensure that the WEP staff would recognize good engineering writing and be able to make suggestions for turning any writing into that kind of writing. The WEP staff were not building their own definition and enforcing it; they were going to collaborate with ME student writers to address the rhetorical contexts of engineering writing, and to do such, they needed a basis for comparison. As Windsor points out, engineering had, "already-created forms and tongues of engineering" ("Engineering Writing/Writing Engineering" 67), rhetorical contexts that the ME faculty already knew and recognized. However, while the ME faculty already knew and recognized the rhetorical contexts and expectations of engineering writing, the WEP staff could not recognize the rhetorical contexts and expectations of engineering writing. Instead, the WEP staff needed to be trained in good engineering writing before they could provide useful comments and feedback. In practice, the WEP staff needed examples of good and poor engineering writing so they could directly compare the writing and understand how to effectively comment on poor engineering writing.

The need for comparing different qualities of writing is not always explicitly stated in writing center literature. In Jeff Brooks' article, "Minimalist Tutoring: Making the Student Do All the Work," the understanding of good writing is taken for granted. Brooks' main point is that writing center tutors, "should take on a secondary role, serving mainly to keep the writer focused on his own writing" (2). For Brooks, "The student, not the tutor, should 'own' the paper and take full responsibility for it" (2). To take this secondary role and allow students to own their papers, "We can discuss strategies for

effective writing and principles of structure, we can draw students' attention to features in their writing, and we can give them support and encouragement" (Brooks 2). However, before tutors can be expected to discuss "strategies for effective writing," "principles of structure," or "draw attention to features in their writing," tutors need to know those strategies, structures, and important features—they need to know the rhetorical context of the writing because the student writer may not know them.

Others have made this point. In their article, "A Critique of Pure Tutoring," Linda Shamoon and Deborah Burns related an event from Burns' education that highlights the need for tutors to know the rhetorical context of a particular type of writing. Burns was working on her MA thesis in English Literature, and she gave a draft of her work to her director. She was surprised by her director's practices: "he took their papers and rewrote them while they watched," which seemed "authoritative, intrusive, directive, and product-oriented," and, "went against everything she [Burns] had learned in composition studies" (Shamoon and Burns 138). However, Burns points out that, "when the director intervened, a number of thematic, stylistic, and rhetorical issues came together in a way that revealed and made accessible aspects of the discipline which had remained unexplained or out of reach" (Shamoon and Burns 138). The actions of Burns' director went against the writing center practices recommended by Brooks, but his actions showed Burns the expectations and needs, the rhetorical contexts, for writing in her discipline.

Shamoon and Burns point out that prior to Burns' meeting with her director, she had worked with a number of her peers on her draft, and that she and her peers had followed a similar methodology to Brooks' leaving everything to the writer (Shamoon and Burns 136-137); however, her experience with her director helped her more than all

of the previous peer work (Shamoon and Burns 138-139). During his writing center training, the coordinator took this to mean that before he could really follow Brooks' idea of taking a secondary role, he first needed to fully understand the rhetorical contexts of the writing he was reading. The coordinator could only do this if he had someone show him an example of good writing and show him how to take average writing and make it better *for a specific discipline*. For the WEP, this meant that the coordinator needed to have a clear understanding of the rhetorical contexts of good engineering writing before he could effectively comment, or train other writing tutors to comment, on engineering writing for the ME faculty.

The need for this understanding brought up a subtle aspect of the WEP's development: authority. Authority is always a tricky topic in writing center literature, as Carino points out in, "Power and Authority in Peer Tutoring," specifically stating, "the question of tutorial power and authority….had a long and unresolved history in the writing center community" (97). In essence, modern writing centers tend to go out of their way to downplay their power and authority and have, "masked these terms in the egalitarian rhetoric of 'peer-ness'" (Carino "Power" 97). The majority of the writing center literature stresses the importance of working with writers and being their peer, not an evaluator (Carino "Power" 98-99), which creates a paradoxical issue: as Shamoon and Burns point out, tutoring in many disciplines is, "hierarchical: there is an open admission that some individuals have more knowledge and skills than others, and that the knowledge and skills are being 'handed down'" (141). This hierarchical model runs counter to the peer collaboration model that is at the heart of writing center theory and practices, *but the hierarchical is what actually happens*. No matter how it is dressed up as

"egalitarian peer-ness," writing tutors are knowledgeable, skilled writers who have been given additional training to tutor other writers. Writers do not want to work with someone who knows as much or less about writing than they do; they want to work with someone who is a better writer. Writing tutors are skilled writers, so acting otherwise undermines their authority with clients. However, they need to balance their skill against the need to be approachable and non-directive to work from a standpoint of a peer, not an authority figure.

This delicate balance of claiming peer-ness, but functioning as more knowledgeable writers, can create a number of issues in writing centers. Carino highlights these issues with four hypothetical sessions, commenting that:

> Tutorials, then, I would argue, depend on authority and power, authority about the nature of the writing and the power to proceed from or resist what that authority says. Either tutor and student must share authority…or one or the other must have it, and in writing centers the one with it is more often the tutor…. Writing centers should not be ashamed of this fact. Of course there are caveats. In some tutorials, authority may be lacking on both parts, because every tutor cannot be expert in all types of writing. ("Power" 106-107)

Here Carino gets at the exact concern that the coordinator had when developing the WEP—he was not an expert in engineering writing, which meant the WEP would not have the needed authority until the coordinator and ME faculty developed a clear definition of good engineering writing and developed a level of expertise in engineering writing.

Writing center training told the coordinator what he needed to do and the resources he needed to acquire to accomplish the task, but this training did not provide him with the needed understanding of engineering writing. The coordinator's method for finding the needed resources deviated from the typical method used by writing instructors or writing across the curriculum professionals. Starting with a foundation of being non-directive, striving for a collaborative environment, and allowing the ME faculty to be the experts on engineering writing, the coordinator's method was to learn how to produce good engineering writing. After he could replicate good engineering writing, he could train writing tutors to effectively comment on engineering writing.

The next section reviews a broad range of rhetoric and composition and writing across the curriculum literature used by the coordinator as touchstones. The coordinator's method of approaching the idea of good engineering writing from the position of a learner shaped the scope of literature used. In a way the coordinator was approaching engineering writing from an engineering point of view. In rhetoric and composition and writing across the curriculum literature, approaching engineering writing a learner has some connections to assessment, specifically the clear examination of how a document works and what is a marker of good engineering writing versus a violation of rhetorical expectations. In engineering, this approach is similar to the design process and to quality management. Similar to the design process, the coordinator approached good engineering writing by first looking for benchmarks (known, measurable indicators of good engineering writing), second building prototypes (attempts at producing good engineering writing), and third refining the prototypes into working models. The similarities to quality management go beyond the actual analysis of how to compose good engineering writing

into practical methods for teaching good engineering writing to others. Essentially, a well-designed model of good engineering writing can be used to teach engineering students how to produce quality engineering writing.

2.3 The Teaching of Writing: Some Benchmarks

The purpose of this section is to broadly review the literature used to teach teachers of writing. This includes rhetoric and composition, writing across the curriculum, and professional or technical writing literature. The purpose for this broad definition is to create a section that is thematically focused on the benchmarks currently provided for good engineering writing.

In the Purdue Writing Lab, two handbooks are used to prepare teaching assistants for teaching writing classes because they provide a distilled presentation of how the of teaching writing is generally practiced according to rhetoric and composition literature. First, *The Longman Teaching Assistant's Handbook*, by Stephen Wilhoit, devotes an entire chapter to the core principle of teaching writing, "When you respond to your students' writing, keep in mind your primary goal: to help your students become better writers" (76). Responding to writing is the primary role for writing teachers, and Wilhoit provides some guidance for effective responses. Responding is not about editing or finding every error in a paper; it is about, "[encouraging] students to reflect on their writing or thinking" (Wilhoit 77). In a very real way, the act of responding to student writing is intended to help, "students develop their critical thinking skills, and [to teach] them how to produce more rhetorically sophisticated papers" (Wilhoit 77). Wilhoit also advises to, "not take over the student's text" (88) while responding and looking for ways to encourage improvement.

Effectively responding in this way is not always easy, so Wilhoit includes a lengthy heuristic for how to respond to student papers. A few specific questions from Wilhoit's heuristic are listed for closer analysis:

- How has the writer misinterpreted the assignment?
- Is the content of the paper effective?
- Are the claims clearly stated and adequately qualified?
- Has the writer explained the link between his or her claims and support?
- Are the claims and support adequate and appropriate given the rhetorical context of the assignment?
- Is the presentation of ideas or arguments logical?
- Are there problems with jargon?
- Is the essay presented in a way appropriate for the intended audience?
- Does the piece effectively meet the needs of the intended audience? (Figure 5.2 83-85)

The questions listed all require writing teachers to know and understand the rhetorical context and expectations of the writing for an assignment, which suggests that this heuristic is based on the assumption that writing teachers know exactly what good writing looks like for the rhetorical context of a specific piece of writing. This is a fair assumption when writing teachers teach writing within their own discipline, but it becomes less useful when writing teachers are not working with writing in their own discipline.

This leads to a second handbook, Beth Hedengren's *A TA's Guide to Teaching Writing in All Disciplines*, which repeated a great deal of the same material as Wilhoit's

book. Hedengren also devoted a chapter—albeit half as long as Wilhoit's—to commenting on student papers, which focuses more on the mechanics of commenting than on the theory behind the comments. She does point out that when, "Faced with an imposing stack of papers and little time for response, it is easy to fall into the 'rubber-stamp' mode of communication. … [Which] often do not mean anything to our students" (92). At the same time, however, Hedengren's advice for commenting on student papers is not focused towards helping "students develop their critical thinking skills, and [to teach] them how to produce more rhetorically sophisticated papers" (Wilhoit 77); instead, her advice is focused on improving writing skills, "Your purpose is to help students improve their writing skills; the students need your guidance to know how to do this" (Hedengren 93). Interestingly, while Hedengren never uses the term "rhetorical context" or even "rhetoric," her comment implies that writing teachers need to know the rhetorical context of the writing because the students are looking to the writing teachers for guidance. To improve student writing skills, writing teachers need to know what kinds of writing would meet the expectations of the rhetorical context, which necessitates writing teachers knowing the exact rhetorical context expectations for writing in a specific discipline. However, the language used to convey this point—the avoidance of the terms "rhetorical context" and "rhetoric"—suggest a subtle shift in the rhetorical context of the handbooks. Wilhoit is writing to English major writing teachers who teach first-year composition; Hedengren is writing to non-English majors or English majors writing teachers teaching writing outside of their discipline.

This subtle change in how the teaching of writing is taught is important to understanding Winsor's claim that, "engineers usually see their work [writing] as

inherently arhetorical" (*Writing* 11), and this change is important in development of the WEP's definition of "good" engineering writing. In the introduction of this chapter, the idea that scientific and engineering writing should avoid rhetoric was quoted from Cox and Roland. They explicitly state that, "rhetoric should be avoided assiduously in scientific writing" (140). Following that statement, and the deeply ingrained avoidance to rhetoric it fostered in scientific and engineering writing, any lesson designed to teach writing teachers how to teach writing to a scientific or engineering audience would avoid using any terms containing the word "rhetoric" due to the rhetorical context of scientific and engineering writing. Or, using the word "rhetoric" in any form would seriously weaken any statement made concerning scientific or engineering writing to a scientific or engineering audience.

This directly connects to the development of the WEP and its definition of good engineering writing because, as pointed out in the previous section, the coordinator was relying on collaboration from the ME faculty to develop the needed understanding of the rhetorical contexts for engineering writing; however, the coordinator could not use the word "rhetoric" because the word carried too much baggage. Instead, the coordinator had to carefully listen to how the ME faculty explained the purpose, audience, goal, and expectations of engineering writing. He had to find terms that they used when talking about writing.

As a result of this lack of direct correlation between the terms the coordinator used to describe writing and the terms the ME faculty used to describe writing, the coordinator found most rhetoric and composition, writing across the curriculum, and professional writing literature to be of limited value. To be clear, the limitations were not

due to incorrect information, a lack of information, or poorly presented information; to the contrary, the rhetoric and composition, writing across the curriculum, and technical writing literature presented detailed discussions about good writing. However, the information and details that were presented were not specific enough for understanding engineering writing, or they only focused on a narrow scope of writing that was focused on concepts and theory more than practice. Engineering writing is used in a different manner than other forms of writing: Engineering writing is used to effectively and accurately convey information. It is not used to create new information or to explore ideas and concepts.

This difference in purpose and level of detail is similar to the difference between a book discussing Victorian furniture and the directions for assembling a computer desk. The rhetoric and composition, writing across the curriculum, and technical writing literature focused on how the furniture looks, where a style originated, and the subtle differences from one style to the next. Engineering writing focuses on the measurements and assembly of the parts to make a functioning piece of furniture. Due to this difference, rhetoric and composition, writing across the curriculum, and technical writing literature did not offer enough practical details for the development of the WEP or its definition of good engineering writing.

This is not to say that rhetoric and composition, writing across the curriculum, or technical writing literature was not useful; the heuristics, discussions, and pedagogical techniques were helpful, especially the technical writing textbooks. Richard Johnson-Sheehan's *Technical Communication Today*, Mike Markel's *Technical Communication*, and the St. Martin's *Business Writer's Handbook* all contained useful and informative

discussions about the needs of technical writing, the general rhetorical contexts for technical writing, and the production of technical documents. The information was a good starting point, and it pointed the coordinator in the right direction, but none of the literature offered a close enough examination of engineering writing for developing the WEP and its definition of good engineering writing. That examination could only come from careful analysis of good engineering writing, close collaboration with the ME faculty, and recursive revising of prototypes of good engineering writing.

The review of rhetoric and composition, writing across the curriculum and technical communication literature provided some rough benchmarks for learning to compose good engineering writing—which was its job. The production of prototypes relied on sample documents, both published and student work. Determining how the prototypes worked required careful assessment and analysis.

2.4 Assessment and Analytic Rubrics: Ensuring Quality Engineering Writing

The purpose of this section is to present the highlights of the assessment and analytic rubric literature used to develop the WEP and its definition of good engineering writing. Assessment and analytic rubric literature is combined into a single section for the sake of convenience. While there is an enormous body of literature on both topics, in practice, the coordinator used a selection guided by the needs of the WEP.

When selecting the literature that was used, the goal was to get a working system into place for the ME faculty. There was not enough time to conduct extensive research; instead the coordinator needed a working system that could be revised and refined as time progressed. In a very real way, this reflects the engineering practice building a prototype

to have a working model to test. This specific parallel will become more important in Chapter 4, The Writing Enhancement Program's Definition of Good Engineering Writing.

There are two major points concerning assessment pertinent to the development of the WEP and its definition of good engineering writing: the exact definition of assessment, and the understanding that the expectations of mature writing systems—such as engineering writing—have become transparent to many experienced engineers. Brian Huot's *(Re)Articulating Writing Assessment for Teaching and Learning*, in which Huot carefully explains his definition of assessment and its role in teaching and learning.

Early in *(Re)Articulating Writing Assessment for Teaching and Learning*, Huot lays out his overarching goals:

> [W]riting assessment can become a more unified field with a central focus…that grading, testing and assessing student writing are separate acts incorrectly lumped together and that makes us miss the importance of assessment for the teaching of writing…that all assessment contains theoretical implications…that responding to student writing should focus more on the way we read student work and write back to them…and that writing assessment can never be understood outside of its practical applications. (3)

He goes further by saying, "I am specifically interested in neutralizing assessment's more negative influences and accentuating its more positive effects for teaching and learning" (7). In effect, Huot is attempting to draw a clear distinction between assessment for the purposes of evaluating student work and assigning grades or, "to enforce certain culturally positioned standards and refuse entrance [into college] to certain people and

groups of people" (8), and the use of "instructive assessment" used to aid students in understanding how their writing works and functions (10-18). In later portions of his book, Huot shifts to using the term "instructive evaluation," without explanation or definition. Therefore, "instructive assessment" will be used because it is more aligned with the WEP's development. For the development of the WEP and its definition of good engineering writing, it is this idea of instructive assessment that is of greatest importance.

As the previous two sections have discussed, engineering writing exists within a rhetorical context with specific expectations and needs (Winsor "Engineering Writing/Writing Engineering" 67). However, a clear definition of analysis this rhetorical context was not forthcoming, and the literature devoted to the teaching of writing tended to provide more general guidelines and recommendations. Add to this the revelation that the ME faculty do not discuss or describe their writing using the same terms as the coordinator, and the only reasonable method forward was to conduct a direct analysis (or instructive assessment) of writing deemed good engineering writing by the ME faculty.

At its core, instructive assessment is a way, "to help students learn to work as writers" (Huot 62), and an important aspect of this is that students need to understand how their writing needs to work versus how it is working: "Without the ability to know when a piece of writing works or not, we would be unable to revise our writing" (Huot 62), a point that has been stressed multiple times in this chapter. Huot, however, takes this point a bit further when he explains that Sarah Freedman, Professor of the Graduate School of Education at UC Berkley, discovered that, "professional writers receive lower holistic scores than students because professional writing violates the expectations teachers have for student work" (qtd. in Huot 67). This insight into professional writing

versus student work is important to the development of the WEP because the ME faculty intentionally design many of their classes to emulate the professional engineering environment, complete with professional engineering writing expectations. This observation provided further support for my decision to develop the WEP and its definition of good engineering writing based on collaboration with the ME faculty instead of relying on literature aimed at a wider audience of learning writers.

Huot defined his idea of instructive assessment as:

> [involving] the student in the process of [assessment], making her aware of what it is she is trying to create and how well her current draft matches the linguistic and rhetorical targets she has set for herself, targets that have come from her understanding of the context, audience, purpose, and other rhetorical features of a specific piece of writing. (69)

For the development of the WEP, the coordinator was essentially the student trying to be aware of how engineering writing matched its rhetorical targets, for which he relied on samples of engineering writing, conversations with the ME faculty, and field notes from the weekly ME 263 staff meetings. The coordinator specifically asked for a range of engineering writing, from "good" to "poor," so he could build a clear comparison.

It was not possible to simply ask the ME faculty their definition of "good" engineering writing because, as Martha Patton points out in *Writing in the Research University*, aspects of paradigms become tacit and transparent to mature practitioners (19), and the explicit needs of good engineering writing had become transparent to the ME faculty. The ME faculty could point out sentences or paragraphs that didn't work, but they weren't always able to provide clear explanation. As such, the coordinator had to

assess the samples of writing by looking at, “the context, audience, purpose and other rhetorical features of a specific piece of writing” (Huot 69), and compare what he was seeing to what he had been told by the ME faculty or understood from the ME 263 staff meetings. This analysis led to a prototype definition of good engineering writing, one that the coordinator could use a starting point for WEP work. There were, however, two major issues: the coordinator needed an efficient, effective, and reliable method for conveying the definition to a wide audience, and the definition had not been verified by the ME faculty. However, the two issues were inexorably linked, and had to be addressed in a recursive manner.

As Patton points out, “In a mature [writing] paradigm, then the rules tend to be accepted unquestioned simply because they work” (19), and I would identify engineering writing as a “mature” writing paradigm that works in its rhetorical contexts. However, Patton goes further when she says, “If students cannot see much evidence that writing is valued by key authority figures, their engineering professors, students may (mis)appropriate a disdain for writing” (73). While the coordinator agreed with Patton, this is not the case for the WEP; the WEP itself is a clear indication to the students that their ME professors value writing. However, there is a difference between valuing writing and efficiently and effectively explaining the needs of engineering writing.

An important aspect of this unquestioned acceptance of the expectations of engineering writing (Patton 19) is that practiced engineering writers may rarely if ever stop to examine how their writing actually functions. In practice, it works, so they use it, similar to non-engineers simply accepting that a modern bridge will be stable. For the WEP, the coordinator had to examine the expectations, and he had to repeatedly verify

that his analysis was correct. This meant his attempts to write like an engineer was based on what he had found examining the writing samples and his observations.

The coordinator's initial examinations and observations were rough and required multiple revisions before the ME faculty agreed that his engineering writing was good engineering writing. Through these multiple iterations of drafting and verification, he began to find patterns and consistent expectations that he could codify into a useful definition. However, even as the coordinator was finding the patterns and expectations, he did not have a reliable method for describing what he was finding to the ME faculty. To a large degree, the coordinator had to come up with a different description for each faculty member, a system that could not be efficiently codified into a reliable definition.

To overcome the lack of reliable definition, the coordinator turned to analytic rubrics. While he initially began with a holistic rubric—with which he was more comfortable and familiar—holistic rubrics did not fit into an established rhetorical context for engineering writing.[5] Analytic rubrics, however, did fit into established rhetorical contexts for engineering writing, and were also described in both Wilhoit and Hedengren's books.

The coordinator's research into analytic rubrics turned up one very consistent and important point: Don't use an analytic rubric designed for another program or course. During his research, he found an analytic rubric created by Melanie Booth. When the coordinator contacted Booth via email to ask permission to use her rubric, she was very clear that he should build his own analytic rubric for his program. She suggested that he

[5] There is more detail regarding this issue in Chapter 3.

use her rubric only as a starting point, and she directed him to some resources for building effective analytic rubrics.[6]

The coordinator relied heavily on Booth's analytic rubric and two of the resources Booth provided: Sandra Allen and John Knight's, "A Method for Collaboratively Developing and Validating a Rubric," and Deandra Little's, "Creating a Rubric" worksheet (See Figure 2-1, Little's Worksheet).

Allen and Knight's article is a practical guide designed to help programs develop rubrics for internal assessment and evaluation with two specific goals, "(1) to formulate and test a rubric as a teaching and learning protocol for a multi-section course taught by various instructors; and (2) to assure that students' learning outcomes are consistently assessed against the rubric regardless of teacher or section" (1). Of most interest to the WEP was the step-by-step process for developing the needed analytic rubric, which included, "formulating the rubric, collecting data, and sequentially analyzing the techniques used to validate the rubric and to insure precision in grading papers in multiple sections of a course" (Allen and Knight 1). Due to the coordinator's limited familiarity with analytic rubrics, their pragmatic and detailed process was invaluable.

[6] Due to a computer failure, the original email exchange had been lost. This is a recreated conversation from field notes.

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CREATING A RUBRIC

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Rubrics can be effective tools to communicate your expectations, feedback and standards to students. A grading rubric can also benefit the grading process, making it more objective, particularly for multifaceted assignments or for assignments graded by a teaching team.

QUESTIONS TO ASK WHEN CONSTRUCTING A RUBRIC:

Questions	Actions
1. What do you want to assess? Why? What do you hope to learn about student learning?	• Be sure your assignment clarifies your expectations for student learning & performance.
2. What criteria or traits must be present in the student's work to ensure that it is high in quality?	• Include these nouns or noun phrases as rows in your rubric. (e.g., Clarity, Organization, Eye Contact with Client, Formulation of Problem, etc.)
3. How many levels of assessment do I wish to illustrate for students?	• Include these as rows or columns in your rubric and label them (e.g., Excellent—Poor, Sophisticated—Not Yet Competent, etc.). Try to use only as many levels as you need: Walvoord & Anderson recommend 3 to 5.
4. For each criterion or trait, what is a clear description of performance or achievement at each level?	• Include descriptions in the appropriate cells of the rubric, starting with the bookends (the highest & lowest) and filling in the middle columns last. Be sure to distinguish clearly between them.
5. What are the consequences of performing at each level of quality?	• Add descriptions of consequences to the commentaries in the rubric.
6. What numerical rating scheme will I use in the rubric?	• Add this to the rubric in a way that fits in with your grading philosophy & the relative weight of each criterion.
7. When I use the rubric, what aspects work well and what aspects need improvement?	• Try out the rubric and revise accordingly.

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Figure 2-1, Little's Worksheet

Allen and Knight's process follows eight steps, with discussion and, if appropriate, statistical data. This was far more detail than the coordinator needed, but the general process identified the major components of developing and validating an analytic rubric

sufficiently for the needs of the WEP. A point that overlapped between Allen and Knight's work and all of the writing center literature was the need for very close collaboration between the involved parties. Allen and Knight repeatedly checked with the involved parties to verify that their rubric was working as needed (7-10), and used this repeated collaboration and interaction to validate their work.

The coordinator combined Allen and Knight's process with a heuristic from Little's "Creating a Rubric" (See Figure 2-1, Little's Worksheet). Little is more focused on developing the exact content of an analytic rubric than on the larger issues of collaboration and validity, but her heuristic was instrumental for the development of the analytic that was developed for the WEP.

The verification of the WEP's definition of good engineering writing was conducted at the same time as the verification of the reliability of the analytic rubric. After an initial analytic rubric was developed and accepted by the ME faculty, it was tested on real assignments. As the ME faculty reported concerns, confusion, questions, or issues, the definition and analytic rubric were revised. After multiple iterations of revision, the definition and analytic rubric were accepted by the ME faculty and the students.

2.5 Conclusion: Putting the Literature Together

The writing center, rhetoric and composition, writing across the curriculum, technical writing, and assessment literature used to develop the WEP provided the needed foundation for the coordinator to effectively collaborate with the ME faculty to built a working system for the WEP, to refine the system into an effective analytic rubric, and to develop a definition of good engineering writing. By using a non-directive, collaborative

approach that regarded the ME faculty as experts in engineering writing and attempting to recreate good engineering writing, the coordinator was able to synthesize an eclectic range of literature and practices into a meaningful and useful method for developing a custom writing program and a definition of a specific genre of writing.

The next chapter details the actual events of the development and refinement of the WEP that resulted in the verified definition of good engineering writing and a reliable analytic rubric.

CHAPTER 3. THE WRITING ENHANCEMENT PROGRAM

3.1 The Writing Enhancement Program

The purpose of this chapter is to chronicle the development of the Purdue School of Mechanical Engineering Writing Enhancement Program (WEP), the development of the WEP's assessment tools, and the development of the WEP's definition of good engineering writing. For simplicity, the development has been divided into generations, which are based on major revisions to the WEP and its assessment tools. The initial tools were prototypes and should be viewed as a pilot study. It is called Generation 1 for clarity.

The WEP is a boutique[7] writing program embedded in a single, required undergraduate course—ME 263—in the Purdue School of Mechanical Engineering (ME). ME 263 is a 200-level design course focused on introducing mechanical engineering undergraduate students to the design process. The course covers more than the engineering aspects of designing a product; it looks at the entire process, which includes brainstorming multiple possible products, selecting one of the products, researching the potential market for the product, researching user needs, modeling the product, determining the cost of the product, and making a

[7] The term "boutique" is used to mean that this is a small, limited-scope, custom-crafted program, similar to boutique manufacturing in engineering. This is to differentiate between larger, college-wide programs.

formal presentation for approval to put the product into production. The products are not actually put into production, but some prototypes have been built.

At the beginning of the course, students are divided into teams and given a prompt designed to mirror a corporate project. The prompt presents the teams with some parameters. A different prompt is used each semester; one of the prompts was for each team to design an assistive aid for people with a disability, and another prompt was to design a product for use in post-disaster environments.

The course is taught in multiple lecture and lab sections. Students attend two lectures a week. The lectures are given by senior ME faculty. There are normally two lecturers, one of whom is the lead faculty member. The students also attend two lab sessions that are led by lab coordinators who are either ME faculty or highly-experienced ME graduate teaching assistants. An ME teaching assistant assists the lab coordinators in each lab. Most of the ME teaching assistants are ME graduate students, but on occasion there are undergraduate ME teaching assistants.

The course includes a number of individual and team writing projects: three individual memos, five team memos, two written reports, and two presentations. The teaching assistants and lab coordinators are responsible for grading the memos. For the remainder of this dissertation, “ME 263 faculty” will be used to refer to the lectures, lab coordinators, and teaching assistants as a group.

The WEP began in the Fall of 2010 when the ME faculty approached the Purdue Writing Lab for assistance on commenting on undergraduate writing. The ME 263 faculty where not happy with the quality of engineering writing being produced by their undergraduates, but the ME faculty did not feel qualified to make effective

comments to improve their undergraduate engineering writing. Therefore, the ME faculty contacted the Writing Lab under the assumption that the Writing Lab's tutors were qualified to comment on, and ostensibly improve, undergraduate engineering writing.

3.2 Writing Enhancement Program Generation 1

To address the needs of the ME 263 students and faculty, four tutors agreed to comment on the undergraduate engineering writing. I was appointed coordinator, and the boutique-writing program, the WEP, rapidly took shape. As part of the new program, the coordinator attended the weekly ME 263 staff meetings to answer any questions and to keep in close contact with the ME faculty. In addition, it was decided by the coordinator and the ME faculty that the WEP would only comment on the ME 263 student memos.

The scope of the program was limited for three reasons. First, the WEP was a totally new concept and the coordinator and ME faculty agreed that it would take time to build a working system for efficiently commenting on ME 263 writing; therefore, the scope was limited to simplify the WEP's development. Second, the size of the longer writing assignments would greatly complicate the task of commenting on the students' writing in a timely manner, so the coordinator and ME faculty limited the scope to shorter memo assignments to help ensure that students would receive comments and grades on the longer writing assignments in a timely manner. Third, the coordinator explained to the ME faculty that the lack of a detailed understanding of writing expectations, and the lack of a usable definition of good engineering

writing, would make it virtually impossible for the tutors to make meaningful comments.

It is important to note that limiting the WEP to only the memos in ME 263 was always intended as a temporary limitation. After the WEP developed and refined a reliable method for commenting on ME 263 writing, developed the needed understanding of the expectations of engineering writing, and developed a usable definition of good engineering writing, the WEP would expand to comment on the longer writing assignments.

3.2.1 Generation 1 Holistic Rubric

Following the Writing Lab's non-directive policy, the tutors did not grade the ME 263 writing assignments. Instead, the coordinator created a holistic rubric (See Figure 3-1, Generation 1 Holistic Rubric) to describe the engineering writing.

Holistic Grammar Score Descriptions
ME 263 Enhancement

Score	Description
5	There are no grammatical errors.
4	There are some minor grammatical errors that stood out to the reader.
3	There are minor grammatical errors that stood out to the reader and caused confusion. The errors interfered with the comprehension of at least one major point
2	There are some major grammatical errors and minor errors that cause confusion. The reader may not be able to comprehend multiple points within the document.
1	There are major grammatical errors that prevent the reader from understanding the document.

These numbers do not directly align with a letter grade. We suggest that work with a 5 or a 4 with few errors should receive full credit. Any work with a 4 and a number of errors should loose some points. We see a 3 being 'average', and a 2 is below average, but still understandable. We reserve a 1 for any work that is contains either so many errors as to distract from the major points or as being unintelligible.

Figure 3-1, Generation 1 Holistic Rubric

The use of a holistic rubric was intended to provide consistent feedback to the ME 263 students without having the tutors assign an actual grade. The goal was to articulate to the ME 263 students and faculty if the writing was meeting the expectations of good engineering writing and to explain the needed revisions. Because the WEP did not have a clear definition of good engineering writing, the initial rubric was very loosely based on the ETS GRE, the ACT, and the SAT essay rubrics, which was assumed to be understandable to both the ME 263 students and faculty and an acceptable, if generic, definition of good engineering writing.

3.2.2 Generation 1 Error-Counting Sheet

In addition to the holistic rubric, the coordinator also built an error-counting sheet (See Figure 3-2, Generation 1 Error-Counting Sheet). By combining the common error lists in *The Everyday Writer* by Andrea Lunsford and *Rules for Writers* by Diana Hacker and Nancy Sommers, and adding an "Other" category for errors that did not correspond to the common error lists, the error-counting sheet addressed the ME faculties' concern about grammar issues.

The use of such a tool is not a commonly accepted practice in writing centers or the wider composition field; however, the error-counting sheet was used because the engineers asked specifically for consistent comments on grammar issues. Even as the error-counting sheet was built, used, and revised, the coordinator was fully aware that its use was not in alignment with rhetoric and composition, writing across the curriculum, or writing center practices and theory, as discussed in Chapter 2.

Grammar Concerns
Quick Reference Sheet
ME 263 Enhancement

1	Missing comma after an introductory element	http://owl.english.purdue.edu/owl/resource/692/1/
2	Vague pronoun reference	http://owl.english.purdue.edu/owl/resource/595/1/ http://owl.english.purdue.edu/owl/resource/645/1/
3	Missing comma in a compound sentence	http://owl.english.purdue.edu/owl/resource/692/1/
4	Wrong word (Provide possible solution. Use a, b, c, etc. for multiple.)	
5	Missing comma(s) with a nonrestrictive element	http://owl.english.purdue.edu/owl/resource/596/1/
6	Wrong or missing verb ending	http://owl.english.purdue.edu/owl/resource/730/1/ http://owl.english.purdue.edu/owl/resource/601/1/
7	Wrong or missing preposition	http://owl.english.purdue.edu/owl/resource/594/01/
8	Comma splice	http://owl.english.purdue.edu/owl/resource/598/01/
9	Missing or misplaced possessive apostrophe	http://owl.english.purdue.edu/owl/resource/621/1/
10	Unnecessary shift in tense	http://owl.english.purdue.edu/owl/resource/601/1/ http://owl.english.purdue.edu/owl/resource/601/1/
11	Unnecessary shift in pronoun	http://owl.english.purdue.edu/owl/resource/595/1/ http://owl.english.purdue.edu/owl/resource/645/1/
12	Wrong tense or verb form	http://owl.english.purdue.edu/owl/resource/730/1/ http://owl.english.purdue.edu/owl/resource/601/1/
13	Lack of subject-verb agreement	http://owl.english.purdue.edu/owl/resource/599/01/
14	Missing comma in a series	http://owl.english.purdue.edu/owl/resource/692/1/
15	Fused sentence	http://owl.english.purdue.edu/owl/resource/598/01/
16	Misplaced or dangling modifier	http://owl.english.purdue.edu/owl/resource/597/01/
17	Its/It's confusion	http://owl.english.purdue.edu/owl/resource/621/01/
18	Unnecessary comma	http://owl.english.purdue.edu/owl/resource/692/1/
19	Unnecessary and missing capitalization	http://owl.english.purdue.edu/owl/resource/592/01/
20	Unnecessary or missing hyphen	http://owl.english.purdue.edu/owl/resource/576/1/
21	Sentence fragment	http://owl.english.purdue.edu/owl/resource/620/01/
22	Other—Explain in detail (Use a, b, c, etc. for multiple)	

Holistic Grammar Score: _____
See Reverse for Details or Multiple Notations

Figure 3-2, Generation 1 Error-Counting Sheet

During the initial meetings with the ME faculty, they repeatedly stressed their concerns about the ME 263 students' grammar issues. When other possible issues were offered, the ME faculty always returned to grammar as the most pressing concern. It is for this reason that the coordinator decided to focus so heavily on grammar during the development of the WEP. This narrow focus on grammar only was the "skill and drill" system North and others fought against, but as a trained and

experienced writing tutor, the coordinator followed writing center training of being non-directive and worked to give the ME faculty what they were requesting. However, the coordinator expected that the strong focus on the grammar would provide enough evidence of other issues to demonstrate that grammar was not the root issue, and open the ME faculty up to a wider view of writing needs.

Basing the development of a writing program on the expectation of evidence was a calculated risk. The coordinator knew it was possible for the evidence for other issues to be vague, and for the vague results to cause the ME faculty to question the WEP, the coordinator, and the Writing Lab. However, the coordinator had worked with enough engineering writers to be confident that the evidence of other issues would be clearly present.

The error-counting sheet listed the errors in a numbered list, with each error having a unique number. The tutors would annotate errors in student writing with the number corresponding the error on the list. The error-counting sheet contained URLs to relevant resources listed next to each error, so students could connect the number corresponding to an error to a specific term and corrective resource.

All of the ME faculty repeatedly stressed to the coordinator that the ME 263 students were extremely grade-conscious. To address this, the coordinator distributed examples of all of the WEP tools to the ME faculty and conducted a training session during one of the ME 263 staff meetings to ensure that they could explain the tools to their students.

3.2.3 Generation 1 Results

Results from the Generation 1 holistic rubrics did not provide any meaningful findings because there was no baseline for comparison.

The Generation 1 holistic rubric was used for only two ME 263 writing assignments before revisions were required. The coordinator and the ME faculty both knew that the development of efficient WEP tools would take multiple collaborative revisions, so the short life of the first generation holistic rubric was not a concern. Any tool for commenting on student writing will need to be customized for each course; both the coordinator and the ME faculty understood and expected this from the very beginning of the WEP.

Results from the Generation 1 error-counting sheets indicated that over 40% of errors fell into the "Other" category (See Figure 3-3, Generation 1 Error-Counting Sheet Results), clearly showing that grammar concerns were not the only issue in ME 263 undergraduate engineering writing. This result was not a surprise to the coordinator—it was anticipated—and the result did not seem to be a surprise to the ME faculty. In fact, during a meeting with the ME faculty, their only surprise was that 40% was more than they expected. They readily admitted and knew that there were other issues in their students' writing; they just didn't know the percentage.

Error-Counting Sheet Results

22	Other	205 (42%)
4	Wrong word	70
19	Unnecessary and missing capitalization	30
1	Missing comma after an introductory element	29
7	Wrong or missing preposition	24
12	Wrong tense or verb form	20
5	Missing comma(s) with a nonrestrictive element	14
10	Unnecessary shift in tense	13
3	Missing comma in a compound sentence	11
6	Wrong or missing verb ending	11
14	Missing comma in a series	9
13	Lack of subject-verb agreement	8
20	Unnecessary or missing hyphen	8
2	Vague pronoun reference	7
18	Unnecessary comma	6
9	Missing or misplaced possessive apostrophe	5
15	Fused sentence	5
21	Sentence fragment	5
16	Misplaced or dangling modifier	4
8	Comma splice	3
11	Unnecessary shift in pronoun	1
17	Its/It's confusion	0
	Total Comments	488

Figure 3-3, Generation 1 Error-Counting Sheet Results

The Generation 1 error-counting sheet was only used for one writing assignment before revisions were required. Again, this short life span was expected by both the coordinator and the ME faculty, so the need for careful, collaborative revision was viewed as an important step in the development of the WEP and not as a weakness.

3.2.4 Generation 1 Concerns

The holistic rubric was designed to allow the tutors to describe how each student paper functioned in relation to the coordinator's—and the ME faculty's—initial assumptions of how engineering writing should function. Each description was numbered to allow the tutors to quickly mark each paper, and to allow students to see how their paper met with the expectations of good engineering writing. The numbers were not designed to be an evaluation of the paper or to be used as an indication of the grade the paper should receive. However, some of the ME faculty and students were attempting to use the description numbers as the writing grade.

In the first and second ME 263 staff meetings, the coordinator received multiple questions from the ME faculty about how the holistic rubric number should be equated to a letter grade. In addition, the ME faculty reported that many of the ME students raised questions about how their grades were being derived and complained that the holistic rubric number did not correspond to their grades. ME faculty also reported that the majority of the ME students were confused by the descriptions and that the ME students seemed to ignore the descriptions. At least three of the ME faculty reported that their students misunderstood the function of the descriptions even after the ME faculty explained the function of the holistic rubric. All of the ME faculty reported having trouble explaining the holistic rubric to their students.

The error-counting sheet was designed to allow tutors to rapidly comment on common errors in a consistent manner, and the number of errors was not designed to correlate to the grade of a paper. The ME faculty reported students being confused by the lack of correlation between the number of errors marked on their papers and their

grade for the paper. At least four ME faculty reported arguments with students who had few errors marked on their papers but who received a B or lower on their assignment. Almost all of the ME faculty reported difficulty explaining the error-counting sheet to their students, and over half of the ME faculty admitted that they were personally confused by the error-counting sheet.

There were also two growing concerns with the use of tutors to comment on the ME undergraduate engineering writing. One concern was logistical—the coordinator was having a hard time getting the results of the WEP assessment to the ME faculty in a timely manner. The coordinator had to wait for the writing to be collected by the ME faculty, pick the assignments up from the ME building, assign the memos to tutors, distribute the assignments to the tutors, and then wait for the tutors to complete their assessment. After the tutors completed their assessment, the coordinator had to re-collect the assignments, organize them, record the results, scan the results, and return the assignments to the ME faculty. At times, this cycle was taking over three weeks for single-page assignments.

A second concern was the tutors' unfamiliarity with engineering writing and engineering in general. The tutors were commenting on, and marking errors of, phrases that were perfectly correct in engineering writing. This unfamiliarity was starting to result in some students reportedly ignoring *all* of the WEP comments, reportedly assuming that the tutors were not qualified to make *any* comments on writing. During the ME 263 staff meetings, no fewer than four ME faculty reported students complaining that the tutors didn't know what they were talking about. Three ME faculty reported that observed students simply throw away the error counting

sheets without a glance. One reported seeing a student simply note the grade before throwing the entire paper in the trash.

3.3 WEP Generation 2

Based on the results and insights from WEP Gen 1, and the body of feedback from the ME faculty and tutors, the coordinator began revising and refining the holistic rubric, error-counting sheet, the program logistics, and tutor training.

3.3.1 Generation 2 Holistic Rubric

After a number of meetings between the coordinator and ME faculty, the holistic rubric was changed from a 5-point scale to a 10-point scale, and the descriptions were revised to focus more on the descriptive qualities of the writing (See Figure 3-4, Generation 2 Holistic Rubric).

The coordinator was wary of the change to a 10-point scale on the holistic rubric because previous experience had shown that the ME faculty and students tended to look for a direct correlation between the holistic rubric score and a letter grade. A 10-point scale more closely resembled a grade (8 of 10 versus 4 of 5); therefore, the coordinator specifically stressed to the ME faculty that the holistic rubric score was not, and should not, be directly equated to a letter grade. To further stress this point, each score was described in more detail. It was hoped that the more detailed descriptions would help the ME faculty and students better understand the function of the holistic rubric score. To aid in better understanding, the coordinator

ME 263 Writing Enhancement Project
Holistic Grammar Score Descriptions

Score	Description
10	There are no errors or concerns.
9	There are no grammatical errors, but there are some format concerns or clarity concerns.
8	There are a few minor grammatical errors, and/or multiple format or clarity concerns.
7	There are some minor grammatical errors that distracted the reader, and/or multiple format or clarity concerns that distracted the reader.
6	There are multiple minor grammatical errors that distracted the reader, and/or major format or clarity concerns.
5	There are multiple grammatical errors that stood out to the reader and caused confusion. The errors interfered with the understanding of at least one major point.
4	There are a few major grammatical errors and minor errors that caused confusion.
3	There are some major grammatical errors that prevented the reader from understanding multiple points/sentences.
2	There are many major grammatical errors that prevented the reader from understanding many points/sentences; however, the overall document is still partially understandable.
1	There are major grammatical errors that prevent the reader from understanding the vast majority of the document.

- **Format and clarity have been added to allow for greater nuance in rating. Any major formatting or clarity concerns earn a 6, no matter how well the grammar is done.**
- **To award a 10, the paper needs to be perfect—no clarity concerns, no format concerns, no grammar concerns. NONE.**

Figure 3-4, Generation 2 Holistic Rubric

spent great time explaining the holistic rubric to the ME faculty and stressed the importance of the ME faculty explaining the holistic rubric to their students.

3.3.2 Generation 2 Error-Counting Sheet

The error-counting sheet was revised to group errors into thematic groups, to remove errors that weren't being observed by the raters, to add errors not found on the published common error lists that were being observed by the tutors, and to expand the "Other" category to delineate between commonly observed errors that could not be categorized into purely grammar issues (See Figure 3-5, Generation 2 Error-Counting Sheet).

Student Name:_____

Grammar Concerns
Quick Reference Sheet
ME 263 Enhancement

Area One—Punctuation

1	Comma—Missing or extra	http://owl.english.purdue.edu/owl/resource/692/1/ http://owl.english.purdue.edu/owl/resource/596/1/ http://owl.english.purdue.edu/owl/resource/598/01/
2	Sentence boundary	http://owl.english.purdue.edu/owl/resource/604/01/ http://owl.english.purdue.edu/owl/resource/598/1/
3	Possessive apostrophe	http://owl.english.purdue.edu/owl/resource/621/1/
4	Hyphen—Wrong or missing	http://owl.english.purdue.edu/owl/resource/576/1/
5	Semicolon	
6	Colon	

Area Two—Grammar

7	Verb—Tense, conjugation, or tense shift	http://owl.english.purdue.edu/owl/resource/730/1/ http://owl.english.purdue.edu/owl/resource/601/1/
8	Preposition—Wrong or missing	http://owl.english.purdue.edu/owl/resource/594/01/
9	Shift in pronoun	http://owl.english.purdue.edu/owl/resource/595/1/ http://owl.english.purdue.edu/owl/resource/645/1/
10	Lack of subject-verb agreement	http://owl.english.purdue.edu/owl/resource/599/01/
11	Misplaced or dangling modifier	http://owl.english.purdue.edu/owl/resource/597/01/
12	Unnecessary and missing capitalization	http://owl.english.purdue.edu/owl/resource/592/01/
13	Article—Wrong or missing	http://owl.english.purdue.edu/owl/resource/591/01/ http://owl.english.purdue.edu/owl/resource/540/1/
14	Vague pronoun reference	http://owl.english.purdue.edu/owl/resource/595/1/ http://owl.english.purdue.edu/owl/resource/645/1/
15	Plurals	

Area Three—Form

16	Format—Explain on back
17	Wrong word—Provide possible solution. Use a, b, c, etc. for multiple.)
18	Other—Explain in detail (Use a, b, c, etc. for multiple)

Holistic Grammar Score: _____
See Reverse for Details or Multiple Notations

Figure 3-5, Generation 2 Error-Counting Sheet

These categories were strictly based on collaborations between the coordinator and the ME faculty—they were not based on any rhetoric and composition, writing across the curriculum, or writing center theory or practice.

3.3.3 Generation 2 Logistics

The issue of logistics was difficult to address because the entire WEP staff were students with widely varied class schedules, course loads, and extra-curricular commitments. For Gen 2, the coordinator recruited more tutors and began using one of the tutors as an assistant to collect, sort, scan, and return the memos. This sped up the process, reducing the turn around time 7-9 days instead of two weeks.

3.3.4 Generation 2 Writing Lab Tutor Training

To address the concerns of tutors' unfamiliarity with the needs of engineering writing, the tutors participated in multiple training modules and a norming session.

The training modules were a mix of ad-hoc meetings, informal emails, and formal training meetings. The coordinator compiled a list of common complaints from the ME faculty, and used the modules to address the complaints. Many of the common complaints required fairly minor additional training:

- In engineering writing, the passive voice is acceptable, if it is done correctly. This topic came up frequently during the weekly ME 263 staff meetings, and the coordinator found it to be an interesting case. The ME faculty said they didn't want to see the passive voice, but the corrections they provided were still in the passive voice. To the coordinator, it seemed that the issue with the passive voice was when it became confusing to the reader. Indeed, many of their examples of good engineering writing contained many sentences correctly using the passive voice. To address this, the tutors were told to not assume that passive voice was wrong, but were told to provide suggestions on

how to use the passive voice correctly. This was different from their Writing Lab training, which treated all passive voice as incorrect.

- In engineering writing, using "I" and second person is unacceptable. The tutors were told to mark such occurrences, and to provide comments on which pronouns were acceptable.
- In engineering writing, the use of plural first-person pronouns and some referents is not always acceptable. There was a rather lengthy debate about the use of "we," "us," "our," "the team," and proper team names in weekly ME 263 staff meetings, and a clear set of guidelines was not forthcoming. The tutors were informed of this debate, and they were told to indicate the debated usages and to provide comments to help the writer understand which pronouns and referents to use. Because there was no clear consensus among the ME faculty, tutors were told to steer the writers towards more general referents and to verify with the ME faculty.
- In engineering writing, concision is highly valued. Many of the memos were vague and rambling, but the tutors were suggesting adding extraneous details. The tutors would commonly suggest adding details about why a test was conducted or how a test was conducted. However, during the weekly ME 263 staff meetings and individual meetings with the ME faculty, it became clear that the results and implications of the tests were more important. This was different from the tutors training, which stressed describing the why and how of a test over the result. Therefore, the tutors were told to suggest that the why

and how of a test should be condensed, and that it should be secondary to the actual results and implications of the results.

The norming session was conducted in a formal meeting of all of the tutors and the coordinator. During the norming session, all of the tutors read, marked, and rated the same papers. The marks and ratings were compared and discussed until all the tutors agreed on the marks and ratings. This process was repeated with three different papers, after which all of the tutors marks and ratings corresponded without discussion.

3.3.5 Generation 2 Results

Results from the Gen 2 holistic rubrics suggested an improvement in student writing over the course of the Fall 2010 semester; however, because of the change to a 10-point scale, the Gen 2 results could not be compared to the Gen 1 results. Furthermore, the results did not display a clear pattern, possibly because the majority of the memos assessed during the Fall 2010 semester using the Gen 2 holistic rubric were team memos, which the ME faculty reported as being written by the strongest one or two writers in a team. The ME faculty also reported that they were not sure that the same writers wrote every team memo, which rendered any meaningful analysis useless.

The Gen 2 holistic rubric was used for 9 memo assignments spanning three semesters: the latter portion of the Fall 2010 semester, the entire Spring 2011 semester, and a portion of the Fall 2011 semester.

The results of the Gen 2 error-counting sheet were used to repeatedly revise the error-counting sheet, which resulted in a gradual evolution of the error-counting sheet (See Figure 3-6, Evolution of Generation 2 Error-Counting Sheet).

Student Name:_____

ME 263 Writing Enhancement Project
Grammar Rubric

Area One—Punctuation

1	Comma—Missing or extra	http://owl.english.purdue.edu/owl/resource/692/1/ http://owl.english.purdue.edu/owl/resource/596/1/ http://owl.english.purdue.edu/owl/resource/598/01/
2	Sentence boundary	http://owl.english.purdue.edu/owl/resource/604/01/ http://owl.english.purdue.edu/owl/resource/598/1/
3	Possessive apostrophe	http://owl.english.purdue.edu/owl/resource/621/1/
4	Hyphen—Wrong or missing	http://owl.english.purdue.edu/owl/resource/576/1/
5	Semicolon	
6	Colon	

Area Two—Grammar

7	Verb—Tense, conjugation, or tense shift	http://owl.english.purdue.edu/owl/resource/730/1/ http://owl.english.purdue.edu/owl/resource/601/1/
8	Preposition—Wrong or missing	http://owl.english.purdue.edu/owl/resource/594/01/
9	Shift in pronoun	http://owl.english.purdue.edu/owl/resource/595/1/ http://owl.english.purdue.edu/owl/resource/645/1/
10	Lack of subject-verb agreement	http://owl.english.purdue.edu/owl/resource/599/01/
11	Misplaced or dangling modifier	http://owl.english.purdue.edu/owl/resource/597/01/
12	Unnecessary or missing capitalization	http://owl.english.purdue.edu/owl/resource/592/01/
13	Article—Wrong or missing	http://owl.english.purdue.edu/owl/resource/591/01/ http://owl.english.purdue.edu/owl/resource/540/1/
14	Vague pronoun reference	http://owl.english.purdue.edu/owl/resource/595/1/ http://owl.english.purdue.edu/owl/resource/645/1/
15	Plurals	

Area Three—Form

16	Format—Explain on back
17	Wrong word—Provide possible solution. (Use a, b, c, *etc.* for multiple.)
18	Unclear—Explain in detail (Use a, b, c, *etc.* for multiple)
19	Indirect—Explain in detail (Use a, b, c, *etc.* for multiple)
20	Passive—Explain in detail (Use a, b, c, *etc.* for multiple)
21	Other—Explain in detail (Use a, b, c, *etc.* for multiple)

Holistic Grammar Score: _____
See Reverse for Details or Multiple Notations

Figure 3-6, Evolution of Generation 2 Error-Counting Sheet

3.3.6 Generation 2 Concerns

Even after the revisions, extra explanations, and stress on taking more time to explain the holistic rubric to the students, ME faculty still reported widespread

misunderstanding, mistrust, and frustration towards the holistic rubric. Many ME faculty reported hearing students call the holistic rubric "useless," "a waste of time," and "an unfair burden on grades." At least four ME faculty reported difficulties explaining holistic scores when students disputed their grade.

The ME faculty were pleased with the revisions to the Gen 2 error-counting sheet, but they did not feel that their students were using the resources on the sheet to develop their writing. The tutors also reported seeing the same pattern of errors in multiple memos from the same student or team. One ME faculty reported talking to a student about the error-counting sheet and discovering that the student did not realize that the URLs on the sheet were to resources concerning specific errors. Further questioning by the same ME faculty indicated that their students were ignoring the URLs and still trying to find a direct correlation between the number of errors and their grade.

During the Spring 2011 semester, the WEP logistics totally fell apart. Fewer than half of the assignments were actually seen by the tutors, and the turn around time hit three weeks. This break down was a direct result of schedule conflicts among the tutors. New tutors were recruited, but the slow turn around persisted.

The additional training for the tutors did not seem to have a great effect. ME faculty still reported frequent complaints from their students, and almost all of the ME faculty reported seeing their students throw the error-counting sheet and comments away without a glance.

3.4 WEP Generation 3

The coordinator and the ME faculty began widespread revisions to the WEP during the Fall 2011 semester. These revisions resulted in abandoning the holistic rubric, the error-counting sheet, and using tutors. Instead, the coordinator collaborated with the ME faculty to craft an analytic rubric, which was used by the ME faculty instead of tutors.

3.4.1 Generation 3 Analytic Rubric

The holistic rubric was never fully understood by the ME students or embraced by the ME faculty. The assumption that using a system similar to the GRE, ACT, and SAT essay rubrics test was incorrect. Instead, ME faculty indicated that they—and their students—were more familiar with analytic rubrics, because they commonly used analytic rubrics in other courses. Therefore, the coordinator and ME faculty decided that the WEP should use an analytic rubric.

To build an analytic rubric for the WEP, the coordinator followed Allen and Knight's article and personal advice from Booth. Allen and Knight and Booth recommended against using a pre-made rubric, and instead recommended collaboratively constructing a custom rubric focused on specific goals. Booth suggested using one of her rubrics (See Figure 3-7, College-Level Writing Rubric) as a starting point, but stressed the importance of customizing the WEP's analytic rubric through close collaboration with the ME faculty.

College-Level Writing Rubric

	Masterful	Skilled	Able	Developing	Novice	(Way Off)
Focus, Purpose, Thesis (Controlling Idea)	Engaging and full development of a clear thesis as appropriate to assignment purpose.	Competent and well-developed thesis; thesis represents sound and adequate understanding of the assigned topic.	Mostly intelligible ideas; thesis is weak, unclear, too broad, or only indirectly supported.	Mostly simplistic and unfocused ideas; little or no sense of purpose or control of thesis.	Ideas are extremely simplistic, showing signs of confusion, misunderstanding of the prompt; thesis is essentially missing or not discernable.	Shows complete confusion about the topic or inability to grasp it; thus conspicuous absence of thesis and lack of purpose.
Ideas, Support & Development (Evidence)	Consistent evidence with originality and depth of ideas; ideas work together as a unified whole; main points are sufficiently supported (with evidence); support is valid and specific.	Ideas supported sufficiently; support is sound, valid, and logical.	Main points and ideas are only indirectly supported; support isn't sufficient or specific, but is loosely relevant to main points.	Insufficient, non-specific, and/or irrelevant support.	Lack of support for main points; frequent and illogical generalizations without support.	Clear absence of support for main points.
Structure, Organization	Organization is sequential and appropriate to assignment; paragraphs are well developed and appropriately divided; ideas linked with smooth and effective transitions.	Competent organization, without sophistication. Competent paragraph structure; lacking in effective transitions.	Limited attempts to organize around a thesis; paragraphs are mostly stand-alones with weak or non-evident transitions.	Organization, while attempted, was unsuccessful. Paragraphs were simple, disconnected and formulaic. No evident transitions or planned sequence.	Organization, if evident at all, is confusing and disjointed; paragraph structure is weak; transitions are missing, inappropriate and/or illogical.	Paragraph structure does not exist; or is a single rambling paragraph or series of isolated paragraphs.
Audience, Tone, and Point-of View	Clear discernment of distinctive audience; tone and point-of-view appropriate to the assignment.	Effective and accurate awareness of general audience; tone and point-of-view satisfactory.	Little or inconsistent sense of audience related to assignment purpose; tone and point-of-view not refined or consistent.	Shows almost no awareness of a particular audience; reveals no grasp of appropriate tone and/or point-of-view for given assignment.	Lacks awareness of a particular appropriate audience for assignment; tone and point-of-view somewhat inappropriate or very inconsistent.	No evident awareness of audience as appropriate to assignments; tone completely inappropriate to assignment.
Sentence Structure (Grammar)	Each sentence structured effectively, powerfully; rich, well-chosen variety of sentence styles and length.	Effective and varied sentences; errors (if any) due to lack of careful proofreading; syntax errors (if any) reflect uses as colloquialisms.	Formulaic or tedious sentence patterns; shows some errors in sentence construction; some non-standard syntax usage.	Sentences show errors of structure; little or no variety; no grasp of sentence flow.	Simple sentences used excessively, almost exclusively; frequent errors of sentence structure.	Contains multiple and serious errors of sentence structure: *i.e.*, fragments, run-ons. Unable to write simple sentences.
Mechanics and Presentation	Virtually free of punctuation, spelling, capitalization errors; appropriate format and presentation for assignment.	Contains only occasional punctuation, spelling, and/or capitalization errors. Few formatting errors. Most errors likely careless.	Contains several (mostly common) punctuation, spelling, and/or capitalization errors. Several errors in formatting or formatting is inconsistent,	Contains many errors of punctuation, spelling, and/or capitalization. Errors interfere with meaning in places. Formatting incorrect in most places.	Contains many and serious errors of punctuation, spelling, and/or capitalization; errors severely interfere with meaning. Formatting weak.	Frequent errors in spelling and capitalization; intrusive and /or inaccurate punctuation, communication is hindered. No formatting as appropriate to assignment.
Vocabulary and Word Usage	Exceptional vocabulary range, accuracy, and correct and effective word usage.	Good vocabulary range and accuracy of usage.	Ordinary vocabulary range, mostly accurate; some vernacular terms.	Errors of diction, and usage, while evident, do not interfere with readability.	Extremely limited vocabulary; choices lack grasp of diction; usage is inaccurate.	Diction and syntax make communication meaningless or very confusing at best.
	Masterful	**Skilled**	**Able**	**Developing**	**Novice**	**(Way Off)**

Saint Mary's College ~ School of Extended Education (Melanie Booth, Learning Resource Program)

Figure 3-7, College Level Writing Rubric

Following this advice, the coordinator collaborated with the ME faculty to build the WEP's first analytic rubric (See Figure 3-8, Generation 3 Analytic Rubric).

Mechanical Engineering Writing Enhancement Program

Rating	5 **Mastered**	4 **Skilled**	3 **Acceptable**	2 **Developing**	1 **Marginal**	0 **Unacceptable**
Organization	– Purpose is clearly stated. – Scope is clearly defined. – Document is connected logically. – Details are logical and encompassing.	– Purpose is clearly stated. – Scope is clearly defined. – Document is connected logically. – Details are **logical and acceptable.**	– Purpose is clearly stated. – Scope is **understandable.** – Document is **mostly connected.** – Details are **presented for some points.**	– Purpose is **understandable.** – Scope is **unclear.** – Document is **partially connected.** – Details are **presented on at least one point**.	– Purpose not **easily understandable**. – Scope is unclear. – Document is **marginally connected.** – Details are **scarce.**	– Purpose is **missing or not understandable**. – Scope is **missing.** – Document is **scattered and illogical.** – Details are **omitted.**
Style	– Sentence length and complexity is varied. – Uses appropriate vocabulary, names, and/or definitions.	– Sentence length and complexity is varied. – Uses **some appropriate vocabulary, names, and/or definitions.**	– Sentence length and complexity is varied. – Uses **some inappropriate definitions and/or uses few specific names and/or definitions.**	– Sentence length **is choppy or long-winded.** – Uses **undefined jargon, relies on inside knowledge, or lacks specific names and definitions**.	– Sentences **lack complexity.** – Depends on **jargon, or inside knowledge.**	– Sentence **length and complexity lacks control.** – Depends **exclusively on jargon or inside knowledge and/or few or no specific names and details.**
Tone	– Uses appropriate level of formality. – Audience needs are expertly met.	– Uses appropriate level of formality. – Audience **needs are met.**	– Uses **some formality.** – Audience **needs are misunderstood and/or only partially met.**	– Uses **some informality.** – Audience **needs are poorly met.**	– Uses **multiple informal terms.** – Audience **needs are poorly met.**	– Uses **many informal terms.** – Audience **needs are not met.**
Fundamentals	– No noticeable grammar errors. – No noticeable punctuation errors.	– No noticeable grammar errors. – One or two **noticeable punctuation errors.**	– One or two **noticeable grammar errors.** – One or two **distracting punctuation errors**.	– One or two **distracting grammar errors.** – One **sentence boundary error.**	– Multiple **distracting grammar errors.** – Multiple sentence **boundary errors or distracting punctuation errors.**	– Grammar **errors prevent understanding.** – Punctuation **errors prevent understanding.**
(4 Categories X 5 Possible Points) / 2 = Total Points						

Figure 3-8, Generation 3 Analytic Rubric

The coordinator was surprised about how sensitive the ME faculty were to subtle word choices to name the ratings, the level of specific detail required for each description, and the extreme attention to parallel structure among the descriptions.

The move to having the ME faculty use the analytic rubric to comment on student writing solved the logistic and training issues. Instead of writing assignments being passed around between three or four people over a period of a week, the ME faculty completed the analytic rubric as they graded and made a copy of the completed analytic rubric for the WEP coordinator. Also, the ME faculty were intimately familiar with engineering writing expectations, and they were completing analytic rubrics for memo assignments they helped teach. This meant that they knew exactly what students had been told, so there was perfect consistency between what was assigned in class and how a memo was graded.

The ME faculty did, however, need to be trained on how to use the analytic rubric. To complete this training, the coordinator conducted a norming session with the ME faculty.[8] During the norming session, the WEP coordinator explained the analytic rubric before presenting the ME faculty with a sample memo assignment from a previous semester. The ME faculty then compared their marks and comments, discussing what they marked and why.

In a departure from typical norming sessions, the WEP coordinator did not assume the role of arbitrator. Instead, any disagreements were worked out by the ME faculty. This was done because the ME faculty were the experts on engineering writing—they were engineers. The coordinator took notes and requested clarification of each decision. The analytic rubric was then revised to reflect what the ME faculty expected and wanted, not what the coordinator might impose.

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[8] Not all of the ME faculty participated in the norming sessions. The lab coordinators and the teaching assistants were required to participate, but the lecturers were not. This was done because the lecturers did not grade the memo assignments.

This method had three major benefits:

1. All of the ME faculty could confidently and clearly explain their marks to their students. They were using an analytic rubric they helped build, so they knew exactly how it worked.
2. Because the ME faculty built and revised the analytic rubric, they developed the confidence they needed to comment on writing. Many of the ME faculty were nervous about commenting on writing, and for roughly half of the ME faculty, American English was not their first language.
3. The ME faculty were the experts on engineering writing. While the coordinator did not have a definition of good engineering writing, the ME faculty know what good engineering writing looked like.

From the very beginning, the coordinator struggled to find a useful description of good engineering writing, and many of the guidelines that had been found proved to be flawed, overly general, or totally incorrect (see Chapter 2).

One such guideline was the idea that engineers were more concerned with hard data than with writing.[9] This turned out to be so overly generalized as to be wrong. Through the ME 263 staff meetings and meeting with the ME faculty, the coordinator learned that engineers knew that hard data was not self-evident and that data was only as good as its presentation. A common statement was that data without explanation was useless. One ME faculty member put it more bluntly; “I don’t care

[9] This guideline is repeated in almost every textbook reviewed concerning teaching writing to engineers in specific or to STEM in general. It is also a common refrain in writing center theory and writing across the curriculum literature.

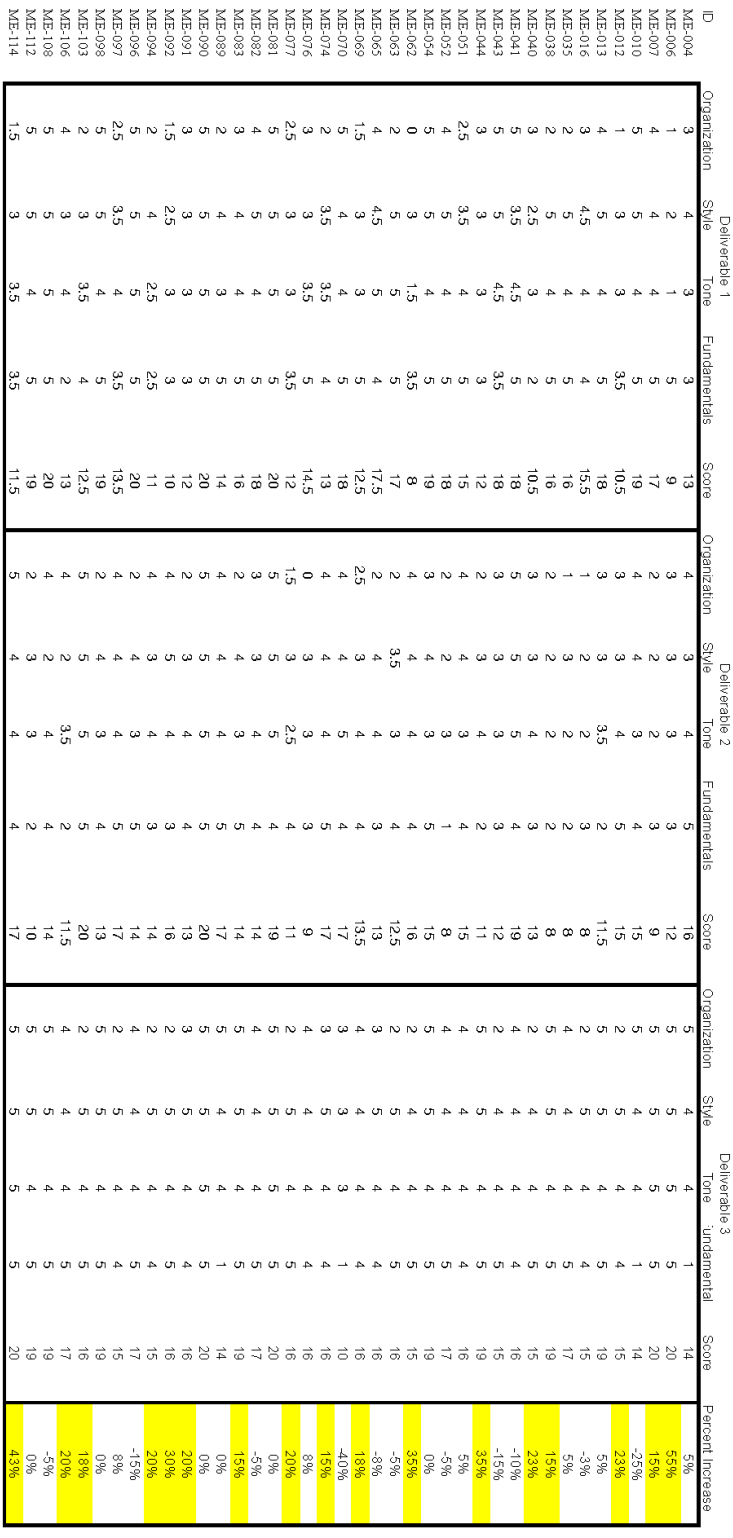
what they found [hard data] if they don't tell me why it [the hard data] is important to their recommendation" (Anderson, personal communication).

Therefore, by the time the WEP had progressed to Gen 3, the coordinator had realized that the ME faculty knew exactly what they wanted in engineering writing, even if they didn't explain it in the terms used in rhetoric and composition, writing across the curriculum, or writing center practices and theories.

3.4.2 Generation 3 Results

The analytic rubric introduced for Gen 3 was an immediate success. The results were easy to compare, and even though it was only used for a single semester a clear pattern emerged—over 40% of the students and groups showed an improvement of at least 15% over the course of the semester[10] (See Figure 3-9, Generation 3 Analytic Rubric Results).

[10] Please note that these results are based on incomplete data. A number of files were lost in a computer issue, which means the data set for these figures is incomplete. These figures are a rough indication of the results, but will not stand up to more rigorous analysis.



ID	Deliverable 1						Deliverable 2						Deliverable 3						
	Organization	Style	Tone	Fundamentals	Score		Organization	Style	Tone	Fundamentals	Score		Organization	Style	Tone	Fundamentals	Score	Percent Increase
ME-004	3	4	3	3	13		4	3	4	5	16		5	4	4	1	14	-5%
ME-006	1	2	1	5	9		3	3	3	3	12		5	5	5	5	20	55%
ME-007	4	4	4	5	17		2	2	2	3	9		5	5	4	5	20	15%
ME-010	5	5	4	5	19		4	4	3	4	15		5	4	4	1	14	-25%
ME-012	1	3	3	3,5	10,5		3	3	4	5	15		5	5	4	4	15	23%
ME-013	4	5	4	5	18		3	3	3,5	2	11,5		5	5	4	5	19	5%
ME-016	3	4,5	4	4	15,5		1	2	2	3	8		2	5	4	4	15	-3%
ME-035	2	5	4	5	16		1	3	2	3	8		4	4	4	5	17	5%
ME-038	2	5	4	5	16		2	2	2	2	8		5	5	4	5	19	15%
ME-040	3	2,5	3	2	10,5		3	3	4	3	13		2	4	4	5	15	23%
ME-041	5	3,5	4,5	5	18		5	5	5	4	19		4	4	4	4	16	-10%
ME-043	5	5	4,5	3,5	18		3	3	3	3	12		2	4	4	5	15	-15%
ME-044	3	3	3	3	12		2	3	4	2	11		5	5	4	5	19	35%
ME-051	2,5	3,5	4	5	15		4	4	3	4	15		4	4	4	4	16	5%
ME-052	4	5	4	5	18		2	2	3	1	8		5	4	4	5	17	-5%
ME-054	5	5	4	5	19		3	3	3	5	15		5	5	4	4	19	0%
ME-062	0	3	1,5	3,5	8		4	4	4	4	16		2	4	4	5	15	35%
ME-063	2	5	5	5	17		2	2	3	4	12,5		2	5	4	5	16	-5%
ME-065	4	4,5	5	4	17,5		2	4	4	3	13		3	5	4	4	16	-8%
ME-069	1,5	3	3	5	12,5		2,5	3	4	4	13,5		3	5	4	4	16	18%
ME-070	5	4	4	5	18		4	4	5	4	17		3	3	3	1	10	-40%
ME-074	2	3,5	3,5	4	13		4	4	4	5	17		3	5	4	4	16	15%
ME-076	3	3	3,5	3,5	14,5		0	3	3	3	9		4	4	4	4	16	8%
ME-077	2,5	3	3	3,5	12		1,5	3	2,5	4	11		2	5	4	5	16	20%
ME-081	5	5	5	5	20		5	5	5	4	19		5	5	5	5	20	0%
ME-082	4	5	4	5	18		3	3	4	4	14		4	4	4	5	17	-5%
ME-083	3	4	4	5	16		2	4	3	5	14		5	5	4	5	19	15%
ME-089	2	4	3	5	14		4	4	4	5	17		5	4	4	1	14	0%
ME-090	5	5	5	5	20		5	5	5	5	20		5	5	5	1	20	0%
ME-091	3	3	3	3	12		2	3	4	4	13		3	5	4	4	16	20%
ME-092	1,5	2,5	3	3	10		4	5	4	3	16		2	5	4	5	16	30%
ME-094	2	4	2,5	2,5	11		4	3	4	3	14		2	5	4	4	15	20%
ME-096	5	5	5	5	20		2	4	3	5	14		4	4	4	5	17	-15%
ME-097	2,5	3,5	4	3,5	13,5		4	4	4	5	17		2	5	4	4	15	8%
ME-098	5	5	4	5	19		2	4	3	4	13		5	5	4	5	19	0%
ME-103	2	3	3,5	4	12,5		5	5	5	5	20		2	5	4	5	16	18%
ME-106	4	3	4	2	13		4	2	3,5	2	11,5		2	4	4	5	17	20%
ME-108	5	5	5	5	20		4	2	4	4	14		5	5	4	5	19	-5%
ME-112	5	5	4	5	19		2	3	4	2	10		5	5	4	5	19	0%
ME-114	1,5	3	3,5	3,5	11,5		5	4	4	4	17		5	5	5	5	20	4,3%

Figure 3-9, Generation 3 Analytic Rubric Results

It was not known if this improvement was the result of just the analytic rubric, or if it was a result of the normal student development over a semester; however, the analytic rubric did show a clear pattern of improvement.

In addition, almost all student complaints and ME faculty concerns ceased. The only complaints and concerns were about the exact descriptions for each rating on the analytic rubric. Specifically, there were a number of questions about what was a "noticeable error."

3.4.3 Generation 3 Concerns

There were three concerns regarding the Gen 3 analytic rubric. First was the question about "noticeable errors." This question had not come up in the training session, but as the ME faculty used the analytic rubric, they began to run into confusion, and some ME faculty reported student confusion as well.

Second, while guidelines for composing a memo had been published online and provided to students (See Appendix A, Memo Writing Handbook), there were still an unacceptable number of basic layout and formatting errors. The instructions required specific information to be placed in specific parts of the memo; however, students were not consistently following the guidelines, and there was no convenient way to indicate this on the analytic rubric.

Third, the ME faculty requested that the Fundamentals category be divided into two categories. They did not feel that it was fair or useful to combine grammar and punctuation into the same category because they would often have what they felt was a grammatically sound memo have numerous punctuation errors, which would result in a lower rating than they felt was correct.

3.5 WEP Generation 4

The WEP coordinator began collaborating with the ME faculty to make revisions to the analytic rubric to address their concerns. These revisions included a training session, the addition of an M&M test to the analytic rubric, and the division of the Fundamentals category into a Grammar/Format and a Punctuation category. These revisions resulted in the Gen 4 analytic rubric (See Figure 3-10, Generation 4 Analytic Rubric).

Purdue Mechanical Engineering Writing Enhancement Program Memo Writing Rubric

Student Name: _____ **Student Team:** _____
Deliverable Number: _____

Memo Elements and Formatting

Score		Mastered 2	Acceptable 1	Unacceptable 0
	Header and Routing Information	Header and Routing Information is clear, complete, and properly formatted.	Header and Routing Information is complete, but is not clear and/or not properly formatted.	Header and Routing Information is incomplete, and/or unclear, and/or improperly formatted.
	Subject Line	Subject Line is unique and informative and includes the Deliverable number.	Subject Line is unique and informative but does not include the Deliverable number.	Subject Line is not unique, is not informative and may or may not include Deliverable number.
	Introduction	Introduction is clear and direct.	Introduction is clear or direct, but not both.	Introduction is neither clear nor direct.
	Contact Information	Clearly indicates who to contact for questions and provides contact details.	Indicates who to contact for questions, but doe not provide contact details.	Contact Information is missing.
	Signature Block	Signature Block includes actual signature and the typed name of the signer.	Signature Block includes either an actual signature or the typed name of the signer, but not both.	Signature Block is missing.
	Attachment List	Attachment List contains all mentioned attachments and all attachments in the list are directly mentioned. **OR** No attachments used.	Attachment List contains **some** of the mentioned attachments and/or **some** of the attachments in the list are directly mentioned.	Attachment List is missing.

Organization, Style, and Mechanics Subtotal: _____ / 12

Organization, Style, and Mechanics

Score		Mastered 5	Skilled 4	Acceptable 3	Developing 2	Marginal 1	Unacceptable 0
	Focus	Focus of the memo is clearly and directly stated.	Focus is stated and understandable.	Focus is understandable.	Focus is unclear or incomplete.	Focus is not understandable.	Focus is not stated.
	Sentence Clarity	All sentences are clear and concise.	Most sentences are clear.	One or two sentences are not concise.	One or two sentences are confusing.	Three or more sentences are confusing.	The majority of sentences are confusing.
	Audience Needs / Context	Adequate details are used in a logical manner.	Many details are used, but there are some imprecise points.	Details are used and the major points are understandable.	Details are used, but one or two major points are difficult to understand.	Insufficient details are used; one or two major points are unsupported.	Insufficient details are used; majority of points are unsupported.
	Formality	Expertly uses a professional level of formality.	Uses an appropriate level of formality.	Uses a generally acceptable level of formality.	Uses a weak level of formality.	Uses a generally informal level of formality.	Uses an inappropriate level of informality.
	Grammar / Format	No grammar / format errors.	No noticeable grammar / format errors.	One or two noticeable grammar / format errors.	One distracting grammar / format error.	Multiple distracting grammar / format errors.	Grammar / format errors prevent understanding.
	Punctuation	No punctuation errors.	No noticeable punctuation errors.	One or two noticeable punctuation errors.	One distracting punctuation error.	Multiple distracting punctuation errors.	Punctuation errors prevent understanding.

Deliverable Writing Subtotal: _____ / 30
Combined Total _____ / 42
Percentage: _____ %

Figure 3-10, Generation 4 Analytic Rubric

3.5.1 Generation 4 Noticeable Error Training

A major concern for the ME faculty was the exact definition of a "noticeable error," a term used multiple times in the analytic rubric. To address this, the coordinator held a training session to describe how he intended the term to be used, to compare it to how the ME faculty were using it, and to develop a consistent definition for the ME faculty to use.

When developing the analytic rubric, the WEP coordinator intended the term "noticeable error" to be a fairly minor error that did not distract the reader—a missed comma after an introductory phrase, a misused apostrophe, or an extra comma before a prepositional phrase. However, the ME faculty were having a difficult time differentiating between "no errors" and "no noticeable errors." They reported having a hard time explaining the difference to students, and during weekly ME 263 staff meetings it became clear that they were not using a consistent definition.

The solution was to meet as a group and collaboratively define the term so all of the ME faculty used it in the same manner and could explain its use to students. This meeting was a unique experience for the coordinator and served to highlight the observations that engineers were actually quite concerned about the details of their writing. Again, the coordinator did not assume the role of arbitrator. Instead, the coordinator asked questions, requested clarification of statements, and kept notes. In the end, the ME faculty created impressively sophisticated definitions:

- A score of 'No Noticeable Errors' for Grammar / Format means that the memo may not display any technical errors, but that at least one sentence is confusing, poorly worded, or violates a disciplinary convention.
- A score of 'No Noticeable Errors' for Punctuation means that the memo may not display any obvious errors, but at least one punctuation mark is questionable.

These definitions were published to the ME faculty in a memo (See Appendix B, Better Distinction Between 'No Errors' and 'No Noticeable Errors').

3.5.2 Generation 4 M&M Test

ME students had been given a set of guidelines for writing their memos in ME 263, but it was clear to the ME faculty and the coordinator that some of the students were ignoring the requirements. To address this, the coordinator added an M&M test to the Gen 4 analytic rubric.

An M&M test is so named because of a famous contractual rider that the rock band *Van Halen* added to their contracts for performances (Kreps). In general, contractual riders were commonly used to define the personal needs and requests of the band—how much food for meals, what food for meals, how to stock the bar, the number of rooms, and other creature comforts. However, the band included one provision that there should be a bowl of M&M candies on the table in one of the bands' preparation rooms without any brown M&Ms. This seemingly frivolous request was actually a rather smart way for the band to ensure that all of their other needs and requirements had been met. If they walked into the room and there wasn't a bowl of M&Ms or saw that the bowl contained brown M&Ms, they knew they needed to check every requirement in the contract, including not-so-frivolous ones such as the load capacity of the stage, the electrical systems, the security arrangements, and ticketing. It was a way for the band to instantly tell if their contact had been followed.

For the Gen 4 analytic rubric, the M&M test took the form of six additional categories taken from the published memo writing guidelines. Each category focused on a specific aspect of the guidelines, and the rating on the M&M test was calculated into the score for the entire memo assignment.

3.5.3 Generation 4 Division of the Fundamentals category

The ME faculty expressed a concern about grammar and punctuation being combined in the Fundamentals category on the Gen 3 analytic rubric, so the Gen 4 analytic rubric was revised to remove the Fundamentals category and replace it with a Grammar/Format category and a Punctuation category.

This revision required additional training because the ME faculty wanted clear guidelines on what constituted a Grammar/Format error and a Punctuation error. As with the discussion revolving around the term "noticeable error," the discussion during the training session concerning the differences between Grammar/Format and Punctuation was far more detailed and nuanced than the coordinator expected. Again, experience showed that engineers were far more aware and concerned with the details of writing than was portrayed in rhetoric and composition, writing across the curriculum, or writing center literature.

Two examples demonstrated this careful attention to the details of writing. The first was the different between Sentence Clarity and Grammar/Format. The ME faculty correctly pointed out that some errors could be a result of either a clarity issue or a formatting issue—specifically faulty parallel structure and long chains of subordinate prepositional phrases.[11] They wanted to know if these were a clarity issue of a format issue, a distinction the coordinator again left up to them. In the end, they decided that a Sentence Clarity error was an error that made them have to reread the

[11] The ME faculty did not use these terms; they provided examples. Instead of repeating the examples, which were rather long, rhetoric and composition terms are being used.

sentence, while a Grammar/Format error was an error that didn't cause them to reread the sentence but was poorly constructed.

The second example was if the incorrect use of semicolons, the use of run-on sentences, or the use of fused sentences were Grammar/Format errors or Punctuation errors. Again, the coordinator left the decision up to the ME faculty, who eventually determined that an incorrect semicolon or two sentences connected with a comma but no coordinating conjunction was a Punctuation error and all other sentence boundary issues were Grammar errors.[12]

3.5.4 Generation 4 Results

The Gen 4 analytic rubric results continued to show the same pattern of improvement as the Gen 3 analytic rubric. The ME faculty reported a marked increase in students following the memo guidelines and the disappearance of any student complaints concerning the analytic rubric.

3.6 Generation 5 and Beyond

The coordinator left the WEP at the end of the Spring 2014 semester, after training a new coordinator to take over. At the time of his departure, the Gen 4 analytic rubric had been used without structural or significant revision since the Fall 2012 semester. There had been minor changes to the wording on the Gen 4 analytic rubric, but nothing significant enough to prevent accurate comparisons of the results, the measure used to define the beginning of a new generation.

Before he left, it was understood by the incoming coordinator and the ME faculty that the Gen 4 analytic rubric wasn't the final version and that future changes

[12] Again, the ME faculty did not always use these terms, but instead used examples. Rhetoric and composition terms are being used for the sake of brevity.

should be made as the needs of the ME students changed. It was further understood that future generations would be developed to comment on the larger reports and to incorporate some level of English Language Learner (ELL) support.

3.7 Key Highlights and Lessons

Throughout the development of the WEP and its definition of good engineering writing, the coordinator discovered two key ideas and learned three important lessons. The first key idea was that the ME faculty knew exactly what good engineering writing looked like. They could easily identify good engineering writing and point to weaknesses in poor engineering writing, but they didn't always know how to explain the weakness or how to fix it. The coordinator saw this happen time and time again during the entire development of the WEP, which is one of the reasons for his non-directive approach—they were the experts, he just needed to carefully examine and compare the good and the poor engineering writing to find the differences.

The second key idea was that the ME faculty understood the rhetorical contexts for their writing, but they didn't seem to be able to explain them to their students. For each assignment, they could explain the rhetorical context and expectations—not using those terms—to the coordinator, but the ME faculty were not explaining the rhetorical context and expectations to their students. Over time, the coordinator discovered that this lack of explanation appeared to stem from a lack of confidence and a lack of vocabulary. By Gen 4, the coordinator's suspicions were confirmed as the ME faculty began using the terms from the analytic rubric to explain the rhetorical context and expectations to their students.

The first lesson the coordinator learned was that a non-directive approach to building a writing program was not only enormously successful, but also uncommon. During numerous meetings ME faculty would tell the coordinator that the previous writing experts they had consulted spent more time telling the ME faculty how their writing was wrong and that they needed to change their entire system of writing. Instead of learning how to write like an engineer, the previous writing experts apparently assumed they already knew the best way to write.

The second lesson was that the ME faculty were eager to learn more about writing. This was not what the coordinator had expected from his research. The coordinator's research had led him to expect the ME faculty to be resistant to any discussion about writing beyond grammar. This was not the case. As soon as the coordinator began working with the ME faculty and attempting to learn how to write like an engineer, the ME faculty became very excited and eager to talk about writing and how to improve their own writing. Two of the ME faculty asked the coordinator to review their personal work, and one ME faculty member repeatedly contacted the coordinator for writing advice and advice for commenting on student papers.

The third, and most important, lesson was that the ME faculty were *extremely* concerned about the quality of their writing and their students' writing. Again, the coordinator's research suggested that the ME faculty would only grudgingly accept that writing was important to engineers. Instead, the ME faculty sought help to improve their writing, and were willing to fund an entire program—albeit a small program—to help their students. They even made the coordinator a half-time ME TA-ship that paid over breaks and over the summer. This level of concern and willingness

to build and fund a program shocked the coordinator, and motivated him to ensure that the WEP would continue to collaborate with the ME faculty and continue to grow and develop.

The next chapter will describe the WEP's official definition of good engineering writing, which was developed over the course of the WEP's development, and codified by the Gen 4 analytic rubric. The definition parallels the Gen 4 analytic rubric, and is described and explained using sample of engineering writing from ME 263 reports that have been revised by the coordinator.

CHAPTER 4. DEFINITION OF GOOD ENGINEERING WRITING

4.1 Definition of Good Engineering Writing

From the beginning of the development of the WEP, a definition of good engineering writing was a central goal. After the evolution of the WEP through Gen 1-Gen 4, a reliable definition of good engineering writing for the ME faculty at Purdue University was developed. While the final definition has some similarities to the various definitions provided in the rhetoric and composition and writing across the curriculum literature, the WEP's definition is more detailed and nuanced. Furthermore, the usefulness of this definition had been demonstrated through multiple iterations of revisions and collaborative reviews. After presenting the official WEP definition of good engineering writing, this chapter will examine and explain this definition, and its connections to good engineering, in detail.

The official WEP definition of good engineering writing:

> Good engineering writing is writing to an engineering audience that meets the following rhetorical expectations:
>
> 1. The document has a clear and direct focus;
> 2. The document follows a logical overall flow;
> 3. The document uses clear, concise, coherent sentences;
> 4. The document provides the audience with adequate background;

5. The document uses a professional tone and the appropriate level of formality;
6. The document is free of formatting errors;
7. The document is free of obvious grammar and punctuation errors.

These rhetorical expectations are derived from the Gen 4 analytic rubric, as well as the collaborations with the ME faculty members. Please note that the rhetorical expectations do not directly align with the Gen 4 analytic rubric: for the definition, format stands alone and grammar and punctuation are combined. The rationale for this change will be explained later in the chapter.

This chapter will examine and explain each rhetorical expectation in greater detail, and how they connect to good engineering practices. The direct connection to good engineering practices—discovered during the close collaboration with the ME faculty—was neither made in any of the literature reviewed in Chapter 2, nor in any literature the coordinator could locate. As such, before going into the examination and explanations of the rhetorical expectations of good engineering writing, the next section will review a broad definition of good engineering practices.

4.2 Good Engineering Practices

The purpose of this section is to provide a broad review of good engineering practices, which are central to understanding the WEP's definition of good engineering writing. The connection between engineering practices and engineering writing was absent from the literature. This absence is strange because a core concept of rhetoric and composition is that the rhetorical context dictates what writing should

or should not do. Given that engineering practices have their own rhetorical contexts, it is logical to assume that those rhetorical contexts would directly affect engineering writing.

To fully understand the WEP's definition of good engineering writing, it is important to look at the role of engineering and some of the hallmarks of good engineering. According to Petroski, "Engineering is the art of compromise, and there is always room for improvement in the real world. But engineering is also the art of the practical" (3). In essence, engineering is about making some aspect of life better in an appreciable way: "[Engineers] have to think and scheme about nature and existing artifacts and figure out how they can be altered and improved to better achieve objectives considered beneficial to humankind" (Petroski 2). Good engineering, therefore, is a method for efficiently and effectively working through this mandate to benefit people.

Good engineering, however, is not just concerned with the mathematics of an engineering project: "there are questions of economics, politics, aesthetics, and ethics. Furthermore, each engineering project is highly dependent upon the availability of raw materials of varying quality" (Petroski 1). And no matter how skilled an engineer is, "the immutable laws of nature are forever constraining the engineer as to how those rearrangements [of materials and nature] can or cannot be made" (Petroski 1). In practice, good engineering is about understanding an existing artifact, understanding the societal needs, understanding the limits of materials, understanding the natural laws, and understanding the options available for redesigning the artifact to make it better. Put another way, good engineering is understanding the rhetorical

context, understanding the expectations, and understanding the available options for making some aspect of life better. This is where good engineering and good engineering writing conflate.

This confluence was demonstrated to the WEP coordinator multiple times. In ME 263, the ME faculty were always pushing their students to understand that good engineering was a confluence of good design, quality production, and useful products. The ME faculty would stress that good engineering would care about the production, and good engineers would care about the humanitarian use of a product, but that the initial focus was on the pyhsical requirements for a functional system.

During one ME 263 staff meeting, the senior ME faculty member expressed a concern that many of the students failed to understand that their work went beyond computer models and prototypes. She said that the students seemed to view their work as something they would "throw over the wall" when the calculations were done. She explained that this is a common phrase in engineering to express the idea of highly-segregated fields of responsibility. For this meeting, she was referring to the idea that after the calculations were done, the students assumed that the engineering stopped and that the project was turned over to other engineers or non-engineers. In other words, she was saying that the students were displaying a narrow understanding of engineering that assumed other people would take care of the "non-engineering details." They were failing to see that the engineering details directly affected the entire project.

The ME faculty wanted their student to see and understand that being a good engineer meant more than being about to perform calculation, build prototypes, and

testing ideas—good engineering means understanding the entire context surrounding a project. Just like good engineering should account for non-engineering details that affect a project, good engineering writing should be aware of its rhetorical contexts and expectations. Good engineering writing is not a list of facts and figures; good engineering writing is being able to explain those facts and figures in a manner appreciable to the reader and understanding the context in which the text is being used.

4.3 Clear and Direct Focus

A "clear and direct focus" is perhaps the most important rhetorical expectation of good engineering writing, and it was one of the hardest to clearly codify.

The basic concept of a "clear and direct focus" is widely expected and understood for most forms of writing. Typically, this expectation is described as using simple sentences with well-defined subjects, strong actions, and straightforward objects. This basic description is valid for good engineering writing, but it is too indefinite to be of service to engineers. Good engineering writing has a rather specific goal: To convey technical information in a meaningful manner to managers, other engineers, technicians, contractors, sub-contractors, and the general public. Each of these audiences has different expectations for clear and direct prose. For example, the following sentence would be clear and direct for two engineers who are working on the same project:

> The current HVAC system fails to meet the minimum CFM needs.[13]

[13] This sample sentence is based on discussions from ME 263 staff meetings. It is neither from student work nor from the sample documents provided by the ME faculty.

This sentence is very direct, and it may not be clear enough for other audiences. However, a revised version of the same sentence that is clear enough for the general public is not direct enough for another engineer on the same project:

> The building is hard to keep warm enough in the winter and cool enough in the summer because the heaters and air conditioners aren't powerful enough.[14]

This sentence is clear enough for the general public, but it is too long and wordy for another engineer on the same project, and it may not be technically correct. It may not be that the heaters and air conditioners aren't powerful enough; the issue may have to do with the number of vents, the locations of the vents, the sizes of the vents, the locations of the sensors, or there could be a blockage or damage to the air ducts. In the sentence written for the general public, the use of the phrase "aren't powerful enough" is problematic because that could mean that the systems do not have the capacity to heat or cool the required space, or it could mean that the ventilation system fans do not have the needed capacity or are not working at maximum efficiency. In other words, by providing more information in an attempt to "clarify" the sentence, the writer would have only made it more ambiguous and harder to understand for another engineer.

The first sentence, written for engineers, highlights a specific issue concerning a complicated system in a manner that another engineer on the same project will understand. The other engineer will also be able to appreciate the value and purpose of the information. In contrast, the second sentence, for the general public, points out

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[14] This sample sentence is based on discussions from ME 263 staff meetings.

a general issue in less exact terms while failing to explain the value and purpose of the information. For good engineering writing, the reader needs to be able to quickly understand the information and appreciate the value and purpose of the information. This means that when composing good engineering writing, engineers need a rather specific understanding of their readers and how their readers will use the document.

An issue the WEP ran into is also an issue in this dissertation: simple examples such as these two sentences make the need for a clear and direct focus look like a sentence-level concern. This is not the case. The entire document should meet the specific needs of the audience in a manner that is clear enough to be understood and direct enough for the audience to appreciate the value and purpose of the information. To demonstrate, Figure 4-1, Sample for Project Manager,[15] includes a sample paragraph from a ME 263 student executive summary.

[15] The sample paragraph is a version of a student executive summary that was revised by the WEP coordinator. The revisions followed the WEP's definition of good engineering writing.

> The purpose of this report is to describe the qualitative and quantitative engineering requirements for a post-flood water filtration system (PFWF) and to provide a recommendation to continue this project as scheduled at the current funding level. The basic engineering requirements were determined by the customer requirements and the engineering standards established for this project. The customer requirements were derived from consumer research. The basic engineering standards were established as part of the course. More detailed engineering requirements were derived from researching patents of relevant water filtration systems and establishing initial benchmarks for the proposed PFWF. The review of patents and initial benchmarks prompted a second, more refined round of customer research. The more detailed engineering and consumer requirements resulted in the details needed for conducting useful market research. All of the engineering requirements, customer requirements, benchmarks, and market research date were entered into a House of Quality to establish adequately detailed engineering requirements for the proposed PFWF. Based on the results of the research and the House of Quality analysis, it is recommended that the PFWF project continues as scheduled at the current budget.

Figure 4-1, Sample for Project Manager[16]

This example is the first paragraph of an executive summary submitted to a simulated project manager. It does not follow the traditional definition of a paragraph as taught in a college writing course because the paragraph covers too many topics. If this paragraph were to be read and assessed by a writing center tutor who does not have experience with engineering writing, the tutor would recommend dividing the paragraph up into multiple paragraphs, each focusing on one major point. Also, the tutor would recommend adding in more details for each major point. Those suggestions would result in a document with a clear and direct focus for non-engineers, but it would seem vague and rambling to engineers.

In practice, engineering writing is concerned with the rhetorical context of a document, perhaps more concerned than many scholars of writing would assume. It is

[16] The House of Quality is a model used in ME 263 to derive engineering needs from the gathered data.

perfectly possible for an engineer to compose multiple versions of the same report to meet the needs of many different, but needed, audiences. Engineers are aware that their writing fulfills a purpose and that they need to fulfill that purpose for different audiences. If an engineer needed to explain the same information from Figure 4-1, Sample for Project Manager, to the possible consumers of a post-flood water purification system, the paragraph would be much longer and rather different (See Figure 4-2, Sample for Consumers).

The purpose of this report is to describe the engineering requirements for building and producing a water filtration system for use in a post-flood environment. After a flood, natural or otherwise, obtaining clean drinking water can be very difficult for those affected by the flood. Floodwaters will wash contaminants into the regular water supplies and stir up sediment, which can clog normal water treatment systems and contaminate water supplies. To address this, a team of student engineers at Purdue University is researching a water filtration system that can be used effectively in areas affect by floods. This research is being done as part of ME 263, a mechanical engineering course, so the professor has determined some details.

The team, Search for Pure, was given the basic engineering standards by the professor, but Search for Pure did have to research customer requirements, patents of similar water filtration systems, industry benchmarks, and the current market for water filtration systems. To research the customer requirements, Search for Pure collected data from three sources: Amazon reviews of similar products, reviews from blog posts by survivalists and rescue workers, and questionnaires emailed to backpacking experts at popular backpacking and hiking magazines. Search for Pure determined that Amazon reviews and the survivalists and rescue workers' blog posts were too inconsistent to be of primary use; however, they were useful for developing the questionnaires sent to the experts. As a result, the majority of the initial customer requirements were from the questionnaires sent to backpacking and hiking experts.

More refined customer requirements were developed through a second round of research. One of the members of Search for Pure had a contact with a backwoods trail-guide company that operates close to the Canadian border with Montana. Through that contact, Search for Pure was able directing question seven potential customers. The seven were selected because they had used their backwoods experience to assist in search and rescue efforts after natural disasters around the world. Three of the seven had worked as aid workers in post-flood areas. Search for Pure determined that these seven would be ideal resources to best understand the customer requirements for a post-flood water filtration system.

Search for Pure used the data from the Amazon search to identify nine products with similarities to the proposed system. Each member of Search for Pure researched three of the products, specifically

looking at any patents related to their product. This patent research identified a number of specific engineering issues and requirements that were not immediately obvious to the team. The most important finding of the patent research is that water filtration systems have more stages than initially anticipated.

Search for Pure began this project assuming that a water filtration system was single or possibly double stage system: water flowed through a filter or series of filters to be cleaned. However, the patent research demonstrated that the best systems were far more complicated, many including multi-stage pumps, specific pressure requirements, and careful calibration for flow rate. To simplify the project, which was required due to course restrictions, Search for Pure decided to design a product that would use a widely available filter cartridge. Search for Pure was then able to use the specification from the existing filter cartridge to establish a number of the engineering requirements.

The data from the Amazon searches, the questionnaires, and the interviews allowed Search for Pure to determine benchmarks for the products performance. Search for Pure specifically looked for benchmarks that measured common concerns or issues with existing products. This was done to ensure that Search for Pure's product would be markedly better than other filtration systems on the market.

Finally, Search for Pure combined all of the data from the searches, questionnaires, interviews, and benchmarks to examine the potential market share of their product. It was determined that if the Search for Pure's product could outperform other filtration systems on two of the most critical benchmarks, Search for Pure's product could reasonably expect to capture 20-40% of the current market.

The data from the searches, questionnaires, interviews, patents, benchmarks, and market analysis was combined into a standard engineering model used for the course—the House of Quality. The House of Quality is a spreadsheet in which Search for Pure entered all of their data to determine the exact needed engineering requirements.

Based on Search for Pure's research and the results of the House of Quality, Search for Pure recommends that work on the post-flood water filtration system continue on the current schedule and at the current budget.

Figure 4-2, Sample for Consumers[17]

The consumer version not intended for an engineering audience, and thus does not follow the official WEP definition of good engineering writing, but a careful

[17] This sample was revised by the WEP coordinator to more closely follow traditional college-level technical writing expectations. The WEP coordinator only had access to the executive summary, so the details of exact steps and methods were derived from ME staff meeting notes.

review of the consumer version demonstrates some important facets of the clear and direct focus needed for good engineering writing.

To begin, the consumer version is nine paragraphs, contains different details, and flows in a different order than the project manager version in Figure 4-1. The project manager version focuses on the engineering requirements and the recommendation, while the consumer version focuses on the engineering requirement for building and producing a product. This seemingly minor difference in the first sentence immediately sets the two versions apart.

For the project manager version, the term "engineering requirements" automatically incorporates many of the needs for building and producing a product, and the project is not actually at the construction and production stage. Based on the information, this text is recommending that the project progress to building a prototype, which means a production model is not ready. Also, this text is an executive summary, which means it needs to be focused on the recommendation.

The ME faculty repeatedly expressed concern about their students not being able to produce acceptable executive summaries. According to the ME faculty, the executive summary was often the most important part of a document due to its prominent role. An executive, often a non-engineer, uses the executive summary to determine if a project was worth funding. At times, millions of dollars were at stake. As a result, the ME faculty had a very specific idea of how an executive summary should work. After hearing this in multiple ME 263 staff meetings and meetings with senior ME faculty, the WEP coordinator took a special interest in understanding how an executive summary should work. An executive summary should be long enough to

demonstrate the rhetorical expectations of the WEP's definition of good engineering writing, but short enough to be easily read and discussed.

The audience and purpose of the executive summary creates a specific rhetorical context, which dictates how the entire summary needs to function. As seen in Figure 4-1, Sample for Project Manager, only the barest of details are provided. Research was done in a specific order and results were used in expected manners that lead to a direct recommendation. An executive reading the summary would be able to quickly process the information, see that the needed steps were taken, and be able to make a decision.

On the other hand, the longer version (Figure 4-2, Sample for Consumers) takes longer to read and digest, brings up information and details that might distract, and requires reading the entire two pages to find the recommendation. In addition, detailing the exact steps taken opens the summary up for more questions and slows down the decision-making process.

It is important to point out that the function of the executive summary is very different from the rest of the report. The executive does not need to know the exact steps—that is what engineers are paid to figure out and do. However, that does not mean that the exact steps are not important or that they should be ignored. The exact steps are included—with more detail and reasoning—in the body of the report. According to one ME faculty member, "the executive summary is for your bosses' boss, the body is for your boss and other engineers, the citations are to connect your work to rest of the world, and the appendices are for when you get hit by a bus, so your work can be replicated" (Murphy, personal communication). The body of a

report is for explaining the exact procedures and steps taken, the reason for those procedures and steps, and the support for those procedures and steps.

The rhetorical expectation of maintaining a clear and direct focus requires an understanding of not only the purpose of the document, but also how its audience will use it. This is why this expectation is so important and yet so hard to explain to non-engineers and engineering students. It requires a confluence of understanding the rhetorical context of the document and the needs and expectations of the engineers who write and use it. This confluence results in the engineers acting in a rhetorical way, even if they would not embrace the term rhetoric.

4.4 Logical Overall Flow

A logical overall flow is valued in almost all writing, especially in technical and professional writing, and this rhetorical requirement was not a surprise to the WEP coordinator. However, a logical overall flow for engineering writing is different from a logical overall flow for many other forms of writing.

The most common logical overall flow for writing is to arrange information in chronological order, and this is the order most of the ME students initially used in their writing. According to the ME faculty, chronological order is not always the best logical arrangement for good engineering writing. During almost all of the ME 263 staff meetings, the ME faculty would discuss the design process not in terms of chronological order, but in order of need for the project. For example, when discussing the ME 263 prompt to design a product for post-disaster environments, the ME faculty determined the logical limits of possible products (speculation about final designs) before they determined the range of post-disaster needs (establishing the

general needs of a product). In effect, it looked like they started with the limits to the final product before they began exploring the possible products.

While it looked like the ME faculty were starting with the final product, the WEP coordinator realized that they were in fact establishing the broader context for the entire project. By determining the logical limits of possible products, they were narrowing the assignment into a manageable project for their students.

Another example of this was the stress on executive summaries to chain information into a concise order to support a recommendation. In Figure 4-1, Sample for Project Manager, the details about the consumer requirements are explained before the general engineering requirements, even though the general engineering requirements were established before any consumer requirements were collected or examined. This is because of the rhetorical expectations and needs of an executive summary. Executives use the summary to make decisions about funding, which means that consumer requirements are more important than general engineering requirements. Therefore, the consumer requirements are discussed first.

As with having a clear and direct focus, good engineering writing requires authors to have a clear understanding of their audiences' needs, which dictate the order in which information is discussed and provided. This non-chronological order of information seemed to initially confuse the ME students, but after the ME faculty began explaining the audiences' needs and using the analytic rubric, the ME students started to see the purpose of the non-chronological overall flow.

The need for a logical overall flow of a document is really just an extension of having a clear and direct focus. Good engineering writing needs to apply the same

awareness of rhetorical context and expectations to the entire flow of a document, which requires recursive revision and carefully editing.

4.5 Clear, Concise, Coherent Sentences

Clear, concise, and coherent sentences are valued in almost all writing, especially in any form of technical or professional writing. As such, the need to incorporate this rhetorical requirement wasn't a surprise to the WEP coordinator. However, the necessity for clear, concise, and coherent sentences did require a bit of additional training for the engineering students. In this study, the ME 263 students often ran into issues of clarity related to not fully understanding their audience, misunderstanding the requirement of concision, and the crafting of overly complex sentences.

The ME 263 students did not always fully understand the purpose of their writing, mainly because the purpose is so closely related to how the writing is used in a professional environment. They seemed to understand academic writing well enough, but they struggled with transitioning from the practices of college composition to the rhetorical contexts of engineering writing. These issues were most commonly displayed through their failure to comprehend what their audience needed to know and could be expected to know.

According to the ME faculty during ME 263 staff meetings, students did not realize that much of their writing would be to non-engineers—they seemed to assume that every manager would be an engineer and that everyone on a project would also be an engineer. The ME faculty know this assumption to be incorrect; however, they did not always make this aspect of engineering writing clear to their students. After a

number of ME 263 staff meetings, the ME faculty began explaining that a significant number of the managers will not be engineers—or will be engineers from other fields—which means they have different knowledge, expertise, and needs.

After the ME faculty began explaining to the students the different backgrounds and needs of the varied audiences, their student's writing began to show more awareness of the function of their writing, which led to better engineering writing.

The ME faculty reported that most of the engineering students (and some of the ME faculty) interpreted "concise" as "short," which isn't exactly correct. For good engineering writing, concise means using specific terms and names, favoring strong verbs, and relying on fairly simple sentence structures. Looking back, Figure 4-1, Sample for Project Manger, used specific subjects, active verbs, and clearly stated objects. It also used compound sentence structures, but they were parallel and didn't include embellishment.

Lack of coherence was the most common issue in student writing. Student writing displayed a pattern of using long chains of prepositional phrases or long, non-parallel lists. Often these long chains or lists would be prefaced by an introductory phrase, with the subject buried in the middle or towards the end of the sentence. The ME faculty could not explain this tendency, but the WEP coordinator suspected it resulted from the lack of revision.

In addition to the fairly common rhetorical expectations of placing the subject at the beginning of the sentence, striving for parallel lists, and avoiding chains of prepositional phrases, good engineering writing will present lists in a specific order.

Most of the time, students would order lists chronologically, but for good engineering writing, lists should be ordered by relevance and logical progression. In Figure 4-1, Sample for Project Manager, three of the sentences read:

> More detailed engineering requirements were derived from researching patents of relevant water filtration systems and establishing initial benchmarks for the proposed PFWF. The review of patents and initial benchmarks prompted a second, more refined round of customer research. The more detailed engineering and consumer requirements resulted in the details needed for conducting useful market research.

This information is not presented in chronological order because benchmarks are established at anytime during this process, and some are even established as a result of the second round of customer research. In this example, the benchmarks refer to specific criteria for the quantitative performance of water filtration systems. Such benchmarks can easily be established fairly late in this process. However, the benchmarks are presented in the way they are used—to determine engineering and consumer requirements.

This logical ordering again highlights the need for engineers to not only understand the function of their writing but also the engineering process. Good engineering writing needs to blend the rhetorical needs of the audience with the practical actions of engineering, a complicated rhetorical task.

4.6 Adequate Background

The need for adequate background demonstrates that there is a degree of overlap in the rhetorical expectations of good engineering writing. According to the ME faculty and the WEP coordinator's observations, the term "adequate background" was highly dependent on the exact rhetorical context. Broadly speaking, it meant providing readers with enough basic information to:

- Inform readers if they needed to actually read the document;
- Inform readers of the project name;
- Inform readers of the purpose of the document.

In practice, adequate background for a project manager could look like:

> This is a weekly status report on Project Search for Pure for the week of April 7, 2014.

This sentence clearly indicates who needs to read the document, the name of the project, and the purpose of the document. The example also demonstrates that it is impossible to determine the adequate background without a clear understanding of document's audience, the purpose of the document, and how the audience will use the document.

While student writing contained the most flagrant occurrences of inadequate background, the ME faculty reported that this a common error in published articles. Confirming this point, the WEP found many examples of inadequate background in the sample articles the ME faculty provided for analysis. Due to this common occurrence, the WEP added adequate background as a specific rhetorical expectation of good engineering writing.

For good engineering writing, adequate background means providing readers with enough information and details for them to understand why they should read the document. In the case of the project manager, adequate background means including the name of the project or, as in the example, providing the highlights of the project at the very beginning of the document.

In general, engineers and engineering supervisors do not have a great deal of time or patience to dig through a document to find the need-to-know information. The ME faculty reported seeing supervisors merely scanning documents and throwing out any that did not immediately tell them what they needed to know about a project. As such, good engineering writing immediately informs the audience of the highlights of the project so other engineers know if they need to read the document.

The ME faculty reported that their students did not understand that their supervisors would be working on multiple projects. Illustrating this lack of understanding, the students seemed surprised when the ME faculty wouldn't be able to recall the details of their specific project. An engineer is more often than not working on multiple projects, but the ME faculty reported that their students apparently assumed they would only work on one project at a time, and that their supervisor would be dedicated to working with them on the same project. The reality, confirmed by the ME faculty, is that engineers and engineering supervisors work on multiple projects, so the ability to scan through documents is very important. A document that doesn't immediately demonstrate its value is easily overlooked, which can be detrimental to a project. Therefore, providing adequate background at the very beginning of a document helps prevent misunderstandings and errors. After the ME

faculty began explaining this reality to their students in greater detail, the WEP coordinator observed a slight improvement in ME 263 students providing adequate background.[18]

4.7 Professional Tone and Appropriate Level of Formality

The rhetorical expectations of professional tone and formality for good engineering writing are similar to any type of professional writing, just like the rhetorical expectation of clear, concise, coherent sentences. As with the sentences, good engineering writing imposes a slight nuance to the general expectations.

For good engineering writing, a professional tone and appropriate level of formality concerns three points: avoiding the use of first and second person pronouns and team names, using proper names and terms, and limiting jargon and acronyms. Good engineering writing displays a peculiar pattern of removing people as subjects but also shunning passive voice constructions. This pattern creates issues for engineering students who attempt to explain what was done without ever saying who did it, while also not falling into the passive voice. The most common remedy attempted by students was to shift to first person plural pronouns or to use variations of "the team," but these shifts aren't always appropriate in good engineering writing. For good engineering writing, engineers have to be more creative: "The results show," "The specifications state," and "It is recommended." Figure 4-1, Sample of Project Manager, does contain passive voice sentences, but in practice the WEP coordinator

[18] This observation was not based on data analysis; it was based on anecdotal comments from ME faculty and reading student memos. It was not clear if the improvement was due to the WEP, the ME faculty explaining more, or the natural progression of the ME 263 students becoming better engineers and engineering writers.

found the passive voice to be more acceptable to the ME faculty than the use of a first person plural pronoun or a variation of "the team."

Using proper names and terms overlaps with the rhetorical expectations of being clear and direct and using clear, concise, coherent sentences because it is possible to use clear, direct, concise, and coherent language that is unprofessional and informal: "The client wasn't all that thrilled with the results of the botched tests." This sentence violates both the rhetorical expectations of using a professional tone with an adequate level of formality and of providing adequate background. Ultimately, the appropriate tone would depend on the audience, which means that professional tone and adequate level of formality are dependent on their needs.

The issue of the adequate level of formality was discussed during the training sessions with the ME faculty.[19] The issue of formality was of specific interest for the international students, because the WEP coordinator observed that formality followed cultural norms. The American ME faculty were more likely to be less formal while the international ME faculty were more likely to be more formal. This difference led to a fairly general guideline for the ME faculty to determine the correct level of formality. In general, the higher up the hierarchy the audience, the more formal the expectation. In practice, the appropriate level of formality was a very hard determination to make. During one training session, the WEP coordinator asked the ME faculty to compare the expected level of formality when writing to a project manger in a different department to the expected level of formality when writing to

[19] There were no questions or issues about the definition of being professional, which led the WEP coordinator to speculate that the ME faculty shared a common definition of being professional that had resulted from their course and experiences.

their boss's boss. The only consensus the ME faculty could reach was that the expected level of formality depended on the personal relationship with the audience, the importance of the information, and the likelihood of the information being positive or negative. The closer the personal relationship between the engineer and the reader, the less formal the document could be—unless the information was important or negative. If the information was important or negative, the expected formality increased.

Neither the ME faculty nor the WEP coordinator could craft clear, consistent guidelines for being professional or using the appropriate level of formality; however, the ME faculty was extremely consistent in identifying student writing that was unprofessional or too informal. The WEP coordinator speculated that the expectations of professional formality were intricately entwined in the rhetorical context of engineering and being an engineer, entwined to the point that the WEP coordinator was not able to fully explain the expectations in a useful manner.

The use of jargon and acronyms is also part of tone and formality. The engineering students commonly used jargon and acronyms without understanding that their audience may not understand what was being said. The engineering students also failed to realize that using jargon and acronyms could be unprofessional and informal if the jargon and acronyms were not properly defined. If they were composing a document to the general public, a non-engineer manager, or an engineer from a different field, the undefined jargon and acronyms would indicate that the author was not aware of the purpose of the document or how it was going to be used.

To better understand this point, here is the first example sentence from Section 4.3:

> The current HVAC system fails to meet the minimum CFM needs.

This example uses two undefined acronyms: HVAC (heating, ventilation, and air conditioning) and CFM (cubic feet per minute—a measurement of how much air a fan moves). For readers familiar with the project or familiar with HVAC systems, this sentence professionally uses the undefined acronyms because HVAC and CFM are commonly understood by readers familiar with HVAC systems. For readers not familiar with the project or familiar with HVAC systems, this sentence is unprofessional because it fails to meet the readers' needs. The example is clear, direct, concise, and coherent to a specific audience, but it would be unprofessional to other audiences.

Changing the audience changes the rhetorical needs of the sentence. To make this example clear, direct, concise, and coherent to a more general audience, it would need more explanation and details, as demonstrated by the second sample sentence from Section 4.3:

> The building is hard to keep warm enough in the winter and cool enough in the summer because the heaters and air conditioners aren't powerful enough.

As discussed in Section 4.3, this sentence would not be considered good engineering writing if it were written to another engineer; however, it does match the rhetorical context and needs for a general audience.

4.8 Free of Formatting Errors

The WEP determined that good engineering writing follows a direct and common format: State the purpose of the document, provide justification for the actions, and make a clear recommendation of what to do based on the results. This format was most important for executive summaries, a document or a partial document with a specific audience and extremely specific purpose.

The audience for an executive summary in good engineering writing is an executive of a company. In examples reviewed by the WEP and in follow-up discussions with the ME faculty, it was clear that many students did not understand how having an executive as the audience changed the rhetorical needs.

For a good executive summary in engineering writing, the introduction should be much shorter than is commonly expected. Most of the examples of good executive summaries examined by the WEP contained introductions that were two or three sentences long—some were a single sentence. The sentences followed the same expectations of being direct, clear, concise, and coherent, and they provided just enough background to identify the project. The reasons for doing the project were usually not explained in-depth, just that a project was being done. After this very concise and direct introduction, a good executive summary very quickly moved through what was actually done. This description of the methods was often little more than a list of tests, experiments, and benchmarks—results were not included. Figure 4-1, Sample for Project Manager, is an example of a slightly longer executive summary introduction.

The main portion of the executive summary was focused on how the results of the actions directly and clearly justify a recommendation. This building of justification followed the same expectations of being professional and formal, including the order in which details were presented. The recommendation was expected to be direct, almost blunt. The recommendation in Figure 4-1, Sample for Project Manager is:

> Based on the results of the research and the House of Quality analysis, it is recommended that the PFWF project continues as scheduled at the current budget.

Nuance and hedging were only used in subsequent sentences, not in the same sentence as the recommendation.

This format is used for a simple rhetorical reason: executives are reviewing dozens of projects and have to be able to skim the summary and make an informed decision concerning a larger amount of resources—at times millions of dollars and scores of employees. Adding to this that many executives have little or lapsed engineering training, which means the details of why a test was run, who ran it, or how it was run aren't the primary concerns. When they do have questions, executives have managers to examine the details.

The second formatting requirement for good engineering writing is being consistent, which is often a function of the rhetorical expectations of being direct, clear, concise, and coherent. Consistency also concerns the labeling of figures, scaling of drawings, and physical layout of the document. The ME faculty told the WEP that when they first review a student paper, they skim it looking for inconsistent

layout, font face, font size, and margins. Any difference indicates the need for closer examination and is often viewed as an error or mark of haphazard work. In this way, the WEP's definition of good engineering writing closely aligns with good technical and professional writing.

The final formatting requirement for good engineering writing is clearly indicating the intended audience and an avenue for follow-up questions. The WEP was told that reports are often copied to other supervisors and engineers who are sometimes not always directly concerned with the report's project. As such, outside supervisors and engineers need to be able to glance at a document and immediately determine if they need to read the document, save it for future consideration, or archive it for review or verification purposes.

Each of these formatting requirements can seem arbitrary in a casual review, but they are key for defining good engineering writing. The formatting requirements also display a careful and nuanced understanding of the rhetorical context and function of the writing.

4.9 Free of Obvious Grammar and Punctuation Errors

The final rhetorical expectation of good engineering writing is that the writing is free of obvious grammar and punctuation errors, which is the marker of almost all good engineering writing. The WEP uses the term "obvious" for an important reason: the ME faculty did not expect good engineering writing to be totally free of any possible grammar or punctuation error because they did not consider themselves experts in grammar and punctuation. Instead, they expected good engineering writing

to be free of any obvious errors. This expectation reflects a subtle difference, but one that has a rhetorical basis.

The ME faculty reported that good engineering writing demonstrated that the author cared enough to do a good job, which means that any obvious error indicates a lack of care. This is the M&M test for good engineering writing. Obvious errors mean that everything in the rest of the document is suspect. The WEP found that a complex error was not seen as a lack of care but as a violation of clear, concise, coherent sentences. For example, a run-on sentence indicated a lack of care, but a missed comma before a dependent adverbial was either ignored or viewed as an error of clarity. A shift in verb tense indicated lazy work, but a misplaced modifier was an error of clarity or cohesion.

The only exception to this distinction between obvious and no obvious grammar errors was the use of less common punctuation: semicolons, colons, em-dashes, and parenthesis. The WEP found that any use of such punctuation marks was always carefully scrutinized and normally found to be unnecessary or inappropriate—even when used correctly. While there was never any clear reason given for this targeting of uncommon punctuation, the WEP speculates that this wariness of more stylistic punctuation was a result of the general avoidance of "rhetoric."

4.10 Good Engineering Writing

This chapter has presented the WEP's official definition of good engineering writing. Based on the WEP's findings, good engineering writing is more sensitive to rhetorical contexts than some college composition texts and scholars suggest. However, as discussed in this chapter, the rhetorical contexts are often strongly

shaped by factors beyond the writing in a typical college writing course: Good engineering shapes good engineering writing. Because the students in ME 263 are learning to be engineers, they struggled to produce good engineering writing. The ultimate goal of the WEP is to help the ME 263 students become better engineering writers, and the WEP's official definition is a central part of the success of the WEP.

The WEP's official definition of good engineering writing is:

> Writing composed by engineers to other engineers that has a clear and direct focus, that follows a logical overall flow, that uses clear, concise, coherent sentences, that provides adequate background, that is professional, that uses an appropriate level of formality, that follows expected formats, and that is free of obvious grammar and punctuation errors.

This definition shares broad similarities with good technical and professional writing, but a detailed examination of the rhetorical contexts governing the interpretation of the WEP's definition demonstrates subtle, but important, distinctions.

The next chapter returns to the historical need for engineers to be aware of their rhetorical contexts and expectations. It will then summarize the entire dissertation and highlight some key points. Finally, it will discuss how the WEP's findings and definition should be used, and it will provide a framework for using the WEP's development process at other institutions.

CHAPTER 5. MOVING FORWARD

5.1 Moving Forward

The purpose of this chapter is to return to the historical need for engineers to be aware of their rhetorical contexts, which will be done by returning to the bridges from Chapter 1 and by introducing the idea of rhetorical engineering, or applying engineering methods to writing. After this return and introduction, the highlights of the development of the Purdue University School of Mechanical Engineering Writing Enhancement Program (WEP) will be reviewed, and some key points will be discussed. Finally, this chapter will conclude with a discussion of using the WEP's definition and development process as a model for building other custom writing programs.

5.2 Bridges and Rhetorical Engineering

This project began with a seemingly simple request: the mechanical engineering (ME) faculty asked some writing tutors to help improve ME student writing in a single course. That simple request resulted in the development of a custom writing program and a unique method for collaboratively building custom writing programs.

As discussed, engineering is about taking an existing aspect of nature and re-arranging it to make life better. That is how the ME faculty approached helping their students become better engineering writers, and that is how I approached working

with them. As the coordinator, I examined the existing models for helping engineering students become better engineering writers and I re-arranged and adapted the existing models into a program that helps the ME students become better engineering writers. In effect, I engineered a rhetorical solution to make life better for the ME students and ME faculty.

My actions were no different from the design and construction of the bridges discussed in Chapter 1. Bridges solve one of the most basic problems faced by society—how to get goods and people from one place to another. Rivers and other natural features impede this movement, and bridges are an effective solution. When Sir Thomas Bouch designed and built the failed Firth of Tay rail bridge, it was to allow trains to cross a body of water and shorten the trip to Dundee Scotland and beyond. Instead of traveling inland to a narrower section of the Tay River, the Firth of Tay rail bridge removed miles from the trip. The failure of his bridge didn't indicate that all bridges were unsafe, and it didn't mean that Sir Thomas couldn't design a safe bridge for the Firth of Forth rail bridge, but it did drastically change the rhetorical context for engineers designing and building bridges, especially bridges on the same rail line. Sir John Fowler and Benjamin Baker fully understood the new rhetorical context surrounding their bridge design, and they took proactive steps to directly address the expectations inherent to the more critical rhetorical context.

There is a historical need for good engineering writing, as demonstrated by the iron bridge over the Severn River in England, the Firth of Forth rail bridge north of Edinburgh, and the Golden Gate Bridge in San Francisco. This need is repeated in *ABET* reports, National Academy of Engineering reports, and by the ME faculty

requesting assistance. This project, and the resulting dissertation, is a rhetorical engineering solution to this need.

The title of this dissertation refers to this idea of applying engineering methods to writing, as was done to create and develop the WEP. I approached the problem—ME students needing to be better engineering writers—not as a scholar of rhetoric and composition, of writing across the curriculum, or of technical writing, but as a writing tutor, someone who was focused on collaboration and practical solutions. This role is very much like engineering: Writing tutors carefully examine writing artifacts and look for ways to re-arrange and adapt the existing materials to create a better writer. Just like engineers build bridges to help society grow and develop, writing tutors help other writers craft better writing. The rhetorical engineer, therefore, steps beyond working with individual writers and expands to working with courses and programs beyond rhetoric and composition and technical writing.

5.3 Reviewing the Writing Enhancement Program

From the beginning, the development of the WEP was unlike the development of other writing across the curriculum programs. The ME faculty requested assistance for a single course from a handful of writing tutors. The goal was not for a school-wide program or a formal partnership with the English Department. Instead, the goal was more limited, which resulted in its development being done in a unique manner.

The exact writing needs of the ME students and ME faculty's timeframe guided the literature used by the coordinator. He quickly found that the definitions and guidance in the rhetoric and composition, writing across the curriculum, and technical writing literature were too vague and seemingly missing an important aspect

of engineering writing. Therefore, the coordinator set out to build his own definition of good engineering writing that would be used by the WEP to provide the ME students with the writing skills they needed.

All of this was being done while the WEP was attempting to provide assistance to the ME students and ME faculty. The concurrent development of a working definition of good engineering writing and a working system for commenting on student writing required the coordinator to resort to a different methodology than is common for writing across the curriculum. This methodology was heavily based in his writing center training, but it also incorporated observations of how the ME faculty approached the issue. This hybrid of writing center training and engineering observations resulted in a highly collaborative methodology that assumed the ME faculty knew how to produce, and could readily identify, good engineering writing and that placed the coordinator in the role of learning how to produce and identify good engineering writing.

The results have been a detailed definition of good engineering writing that has been accepted by the ME faculty, a custom writing across the curriculum program that is fully supported by the ME faculty, and evidence of ME students becoming better engineering writers, both empirical and anecdotal.

This project highlights three important points. First, the ME faculty are aware of the effects of their writing, the expectations of their writing, and the purpose of their writing. In short, they are aware of the rhetorical nature of their writing. They may not embrace or even use the term rhetoric or other terms used by scholars of

rhetoric and composition, but they are nonetheless aware of the rhetorical contexts and nature of their writing.

Second, ME faculty are keenly aware that they need to produce effective communication—both to other engineers and to non-engineers. To this end, the ME faculty were willing to build a custom writing program to teach their students the importance of effective communication and how to produce good engineering writing.

Third, good engineering writing is a confluence of the engineering process and the writing process. They are intertwined and directly affect each other. Attempting to separate the two processes—as many scholars of rhetoric and composition, writing across the curriculum, and technical writing have attempted—ignores a portion of the rhetorical context of the writing, resulting in an incomplete understanding of engineering writing.

Combining the WEP's unique rhetorical engineering methodology with these key points will allow others to develop programs similar to the WEP in other departments and schools, and at other institutions.

5.4 Using the Definition

The development of a definition of good engineering writing and the process for developing the WEP were not intended to be a single occurrence. The experience of actually defining good engineering writing and developing a functioning program resulted in a critical realization: The definition is generalizable across institutions and departments, but no program can be directly transplanted from one institution or department to another institution or department. There are too many variations from institution to institution or department to department. Instead, the WEP's definition

should be used a generalized, starting definition for collaboratively developing programs within interested institutions and departments.

The WEP's definition of good engineering writing is based on collaboration, analysis, and verification at a single institution in a single engineering department. However, the process used to build the WEP's definition, is not limited to any one location or discipline.

From the beginning, the coordinator assumed a specific role: collaborator. His collaboration was based on writing center training and experience and on observations of how the ME faculty approached projects. It also stressed the importance of writers being the expert on their writing. Instead of assuming that the ME faculty didn't know how to write or that they needed to learn how to write correctly, the coordinator assumed that the ME faculty knew what they wanted and expected, even if they couldn't articulate it in terms that scholars of rhetoric and composition and technical writing would find familiar.

The coordinator soon found that the ME faculty did know what they wanted and expected, but that they had a hard time explaining it to others. The coordinator did not assume this difficulty was due to an inability to write or an unawareness of the importance of writing; instead the coordinator speculated that the difficulty in explaining good engineering writing came from a lack of terminology and from the ME faculty not being aware of the direct connection between engineering practices and good engineering writing—they did not see the full rhetorical context of good engineering writing. To overcome this lack of terminology and awareness of the rhetorical context, the coordinator assumed the role of an analyst attempting to

replicate the examples of good engineering writing provided by the ME faculty. From this position—the position of a rhetorical engineer—the coordinator was able to successfully collaborate with the ME faculty to define good engineering writing.

The role of analyst replicating good engineering writing is a shift from the typical writing across the curriculum approach. This shift was clearly demonstrated to the WEP coordinator when the ME faculty repeatedly commented that the coordinator was the first person they felt was working with them instead of telling them what to do. The ME faculty had approached other writing professionals over the years, and the ME faculty reported that the others hadn't attempted to collaborate or learn how to write like an engineer. Instead, they had told the ME faculty how they needed to change their writing and their teaching of writing to be "correct." These comments concerned the WEP coordinator, who made a concerted effort to avoid a directive, prescriptive approach.

For a WEP-like program to be developed within another institution or department, the writing professional needs to approach the faculty as experts in their own field and their own writing. Engineering writing is different from economics writing, literature writing, mathematics writing, and even other disciplines within engineering. The writing professional needs to become an analyst who examines the writing the faculty identifies as good writing. The writing needs to be analyzed without assumption or bias, and, based on that careful examination, the writing professional needs to try to develop a working model of the writing. Essentially, by learning to write like the interested faculty, the writing professional understands the rhetorical contexts and the rhetorical expectations of the writing. It is a learning

process for both the writing professional and the faculty, and the WEP's definition should be used as a generalized starting point for this learning process. The development process needs to be recursively repeated and checked until the writing professional can accurately replicate the writing the faculty defines as good writing. Only then can useful program for that institution or department be created.

This process is a departure from the common view that writing professionals are fluent in all forms of writing, a view that is often assumed by the very faculty seeking their help. This process is also time consuming, difficult, and frustrating for everyone involved. As such, the writing professional needs to be very clear of what is going to happen, why it is going to happen, what to expect, and that it will take more time and effort than anticipated.

5.5 Using the Process

The process for developing a WEP-like program for another institution or department is very similar; however, there is one major difference. The development of a program can start with the WEP's definition and be through collaborative relationships.

Any program like the WEP is based entirely on the relationship between the person building the program and the faculty for which the program is being built. Developing a program requires close collaboration between all parties. The writing professional must be immersed into the institution or department as to fully understand the rhetorical contexts and expectations; therefore, a full understanding of an engineering program's writing needs cannot be learned through the examination of

documents alone. It is learned through direct observation, questioning, and interactions.

A program goes beyond the text or images on the page or the screen; it is part of the entire learning and teaching process, which is comprised of faculty members and students, each with their own views and goals. For a program to work, the writing professional needs to have an understanding of those views and goals, which allows the writing professional to understand the rhetorical contexts, and make informed comments, ask informed questions, and present informed suggestions.

The coordinator of the WEP learned this very quickly during the weekly ME 263 staff meetings. The coordinator was used to meetings in writing centers or English departments, which are commonly egalitarian and informal. A brand new tutor can make suggestions and ask questions about pretty much anything in the meeting. Literature professors can question composition professors about their methods or theory. A medievalist can challenge a poet concerning pedagogy. The ME 263 staff meetings did not function in this manner.

During the ME 263 staff meetings, the WEP coordinator learned that the meeting was run in a more formal fashion. The senior ME faculty ran the meeting following an agenda, and the ME TAs and other ME faculty spoke in turn about their own area of expertise. It was not democratic, and people had their own responsibilities. The meeting was a place to provide information and clarify details. Any time there was a question of how to perform a specific task, a brief discussion would follow, and the ME faculty member running the meeting would either make a determination at that moment or assign people to look into further options. If a

writing-related question came up, everyone turned to the coordinator, who was expected to give a brief answer or conduct research outside of the meeting. They did not want to know the theory or concept behind the coordinator's answer; they wanted a practical way to move forward.

This expectation of interaction was further demonstrated when the coordinator met with a senior ME faculty member and another writing professional. The coordinator had already developed a good working relationship with the senior ME faculty member, but the other writing professional had not. During the meeting, it became clear to the coordinator that the ME faculty member was ignoring what the other writing professional was saying or suggesting. Due to the close working relationship between the coordinator and the ME faculty member, which had been cultivated over months of collaboration, the ME faculty member was looking to the coordinator for all of the answers. That relationship had taught the coordinator what information was most important, and what information was brought up only if the ME faculty member had specific questions. The other writing professional did not know this distinction, which resulted in the ME faculty member ignoring the other writing professional's suggestions.

The only reason the coordinator was able to work so well with the ME faculty was due to the close relationship they had built through their collaboration and interactions. That relationship allowed the coordinator to better explain the needed revisions and the unexpected delays because the ME faculty respected the coordinator.

For writing professionals to develop programs similar to the WEP, they need to build a relationship with the faculty in the institution or department, and they need

to take the time to learn how that institution or department really works. Writing professionals need to become rhetorical engineers who carefully analyze the rhetorical contexts and expectations of the institution or department's field. It is not enough to have a plan and a model of a working system—writing professionals need to be able to connect with the faculty and their needs in a meaningful and respectful way. Writing professionals need to learn the rhetorical context so they can engineer a functioning program that is based on collaboration and respect. Just like engineers building bridges needed to justify and sell their designs to the public, writing professionals need to justify and sell their ideas to the faculty. Writing professionals who want to build custom writing programs need to become rhetorical engineers.

WORKS CITED

WORKS CITED

Accreditation Board for Engineering and Technology. *Criteria for Accrediting Engineering Programs*. Baltimore: ABET, 2007. PDF file.

Allen, Sandra, and John Knight. "A Method for Collaboratively Developing and Validating a Rubric." *International Journal for the Scholarship of Teaching and Learning* 3.2 (2009): n. pag. Web. 18 Feb. 2011.

Alred, Gerald, Charles Brusaw, and Walter Oliu. *The Business Writer's Handbook*. 10th ed. Boston: Bedford/St. Martin's, 2011. Print.

Booth, Melanie. "College-Level Writing Rubric." N.d. PDF file.

Brooks, Jeff. "Minimalist Tutoring: Making the Student Do All the Work." *Writing Lab Newsletter* 15.6 (1991): 1-4. PDF file.

Carino, Peter. "Early Writing Centers: Toward a History." *The Writing Center Journal* 15.2 (1995): 102-115. PDF file.

---. "Power and Authority in Peer Tutoring." *The Center Will Hold*. Ed. Michael Pemberton and Joyce Kinkead. Logan, Utah: Utah State UP, 2003. 96-113. Print.

Cox, Barbara, and Charles Roland. "How Rhetoric Confuses Scientific Issues." *IEEE Transactions on Professional Communication* 16.3 (1973): 140-142. PDF file.

Gillespie, Paula, and Neal Lerner. *The Longman Guide to Peer Tutoring*. 2nd ed. New York: Pearson Longman, 2008. Print.

Hacker, Diana, and Nancy Sommers. *Rules for Writers*. 7th ed. Boston: Bedford/St. Martin's, 2012. Print.

Hedengren, Beth. *A TA's Guide to Teaching Writing in All Disciplines*. Boston: Bedford/St. Martin's, 2004. Print.

Huot, Brian. *(Re)Articulating Writing Assessment for Teaching and Learning*. Logan, UT: Utah State UP, 2002. Print.

Johnson-Sheehan, Richard. *Technical Writing Today*. 4th ed. New York: Longman, 2011. Print.

Kreps, Dan. "Van Halen's Infamous 'No Brown M&Ms' Tour Rider Emerges." *Rolling Stone*. 11 Dec. 2008. Web. 19 Aug. 2012.

Little, Deandra. "Creating a Rubric." N.d. PDF file.

Lunsford, Andrea. *The Everyday Writer*. 4th ed. Boston: Bedford/St. Martin's, 2009. Print.

Markel, Michael. *Technical Communication*. 10th ed. Boston: Bedford/St. Martin's, 2012. Print.

Miller, Carolyn. "A Humanistic Rationale for Teaching Writing." *College English* 40.6 (1979): 610-617. PDF file.

National Academy of Engineering. *The Engineer of 2020: Visions of Engineering in the New Century*. Washington, DC: National Academies Press, 2004. PDF file.

North, Stephen. "The Idea of a Writing Center." *College English* 46 (1984): 433-446. Print.

Patton, Martha. *Writing in the Research University*. New York: Hampton Press, 2011. Print.

Petroski, Henry. *Invention by Design*. Cambridge, MA: Harvard UP, 1996. Print.

Shamoon, Linda, and Deborah Burns. "A Critique of Pure Tutoring." *The Writing Center Journal* 15.2 (1995): 134-151. PDF file.

Wilhoit, Stephen. *The Longman Teaching Assistant's Handbook*. New York: Pearson Longman, 2008. Print.

Windsor, Dorothy. "Engineering Writing/Writing Engineering." *CCC* 41.1 (1990): 58-70. PDF file.

---. *Writing Like and Engineer*. New York: Routledge, 1996. Print

APPENDICES

Appendix A Memo Writing Handbook

(Image from the Mechanical Engineering Ambassadors Home Page)

TO: All Students in ME 263

FROM: Zachery Koppelmann, Coordinator ME Writing Enhancement Program

DATE: 20 August 2012

SUBJECT: Memorandum Writing Assignment Guidelines

The purpose of this memorandum is to introduce the Memorandum Writing Assignment Guidelines you are to follow when writing memorandums for ME 263. This memorandum also serves as an example of what a properly written and formatted memorandum should look like.

Memorandums need to be very direct, specific, to-the-point documents. They should clearly identify the subject at hand, use proper names, and provide the highlights of the subject. Memorandums are meant to be short, rapid means of communicating important points.

The attached Guidelines contain a mix of directions and suggestions. There is no single way to write a memorandum. However, for ME 263, your memorandums will be graded against these guidelines, so it is in your best interest to read them carefully and follow them closely.

If you have any questions, please contact you ME TA. If needed, they will contact me.

Regards:

<Zachery Koppelmann>

Zachery Koppelmann

Attachment:

Memorandum Writing Assignment Guidelines

Memorandum Writing Assignment Guidelines
Purdue University ME 263
Version Fall 2012

Purpose of Memorandums

The purpose of memorandums (memos) is to rapidly convey specific information. They are often used as a cover sheet to introduce longer, more in-depth material or documents. That is how the memo for these Guidelines is working. It directly introduced the Guidelines, provided very specific and concise details, then closed.

At times memos will be over a page in length. They still need to be very specific and direct, but addressing more complex topics requires greater length. In this way memos are different from reports and longer documents because memos need to be focused on specific details, and they need to answer specific questions. Memos should not include detailed graphs, charts, or other data sets; memos should focus on the most pertinent points from the data.

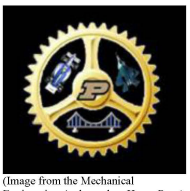
Memos are not meant to be major documents; they are meant to introduce your audience to the particulars of your project and provide specific concise details. This is done through using specific names and terms, direct and concise sentences, and not getting into details or minutiae.

The audience of your memos is not going to be part of your team. Instead, they will be reading multiple memos concerning multiple teams and projects. This means you need to clearly identify who you are, what the memo is about, and use proper names to 'situate' your audience. By 'situate,' you need to introduce yourself and the project in an informative manner. This is best done by naming your project and using unique subject lines. Saying 'our project' is useless because your audience will be reading about multiple projects, some of which might be similar. Using the subject line 'Memo 1' is useless because it tell your audience nothing about what the memo is going to be about. Your audience needs you to situate them by defining who you are, defining your project, and defining why you are sending them a memo.

Physical Layout

The physical layout of a memo needs to follow a specific pattern. This allows your audience to quickly scan a memo and pick out important details without reading every line. On the next page is an image of the memo preceding these Guidelines with each needed section of a memo labeled. Detailed requirements and descriptions for each section follow the image.

Header and Routing Information



(Image from the Mechanical Engineering Ambassadors Home Page)

TO: All Students in ME 263

FROM: Zachery Koppelmann, Coordinator ME Writing Enhancement Program

DATE: 20 August 2012

SUBJECT: Memorandum Writing Assignment Guidelines

Introduction

The purpose of this memorandum is to introduce the Memorandum Writing Assignment Guidelines you are to follow when writing memorandums for ME 263. This memorandum also serves as an example of what a properly written and formatted memorandum should look like.

Body

Memorandums need to be very direct, specific, to-the-point documents. They should clearly identify the subject at hand, use proper names, and provide the highlights of the subject. Memorandums are meant to be very short, rapid means of communicating important points.

The attached Guidelines contain a mix of directions and suggestions. There is no single way to write a memorandum. However, for ME 263, your memorandums will be graded against these guidelines, so it is in your best interest to read them carefully and follow them closely.

Footer and Signature Block

If you have any questions, please contact you ME TA. If needed, they will contact me.

Regards:

<Zachery Koppelmann>

Zachery Koppelmann

Attachment List

Attachment:

Memorandum Writing Assignment Guidelines

Header and Routing Information

This is the first thing you audience will see, so it is important that the header and routing information is correct and easy to understand. Make sure you use the correct logo and use it consistently. That means always use the same alignment and size of logo. Any variation is distracting and draws attention away from the rest of the memo.

The TO: line needs to be specific. Use proper titles and names. If the memo is to multiple people, each person should have their own line. Make sure to properly align the names. Your TO: line should look like this:

TO: Prof. Dave Anderson
Prof. Galen King
Zachery Koppelmann, WEP

How to align names will be discussed in the **Formatting Directions** section.

The FROM: line also needs to be specific. For an individual memo, the FROM: line should look like this:

FROM: Zachery Koppelmann, Team 42

For a team memo, the FROM: line should look like this:

FROM: Team 42 [Zachery Koppelmann, Hawkeye Peirce, Frank Burns, Sherman Potter]

The DATE: should be self-explanatory. Use the same date format for all of your memos.

The SUBJECT: line is the most difficult. It needs to be specific enough for your audience to understand what they are reading, but short enough to be rapidly read. The following examples are useless and should NEVER be used:

SUBJECT: Memo 1

Or:

SUBJECT: Deliverable 1

These examples tell your audience nothing about the memo; they are too generic and assume that your audience will only ever read one Memo 1 or Deliverable 1. Instead, the SUBJECT: line needs to be unique to your project and have a clear purpose. For example:

SUBJECT: Team 42's Problem Definition, Schedule, and Estimated Costs (Deliverable 1)

This example is unique and informative without being too long. Your audience can glance at this SUBJECT: line and instantly understand what the memo is about and what to expect within the memo.

Introduction

The introduction of a memo should immediately introduce the point of the memo. The sample memo does this be stating, "The purpose of this memorandum is…." This is a perfectly acceptable and easy to use opening. Clearly and directly state what the memo is about, mention any major topics, and move on.

Body

There is no single way to write a memo because the body of a memo cannot be easily generalized. Basically, the body needs to provide specific details without going into more detail than is needed. How much detail is needed is variable and based on the memo's purpose, the exact project, any requested information, the exact audience, and your specific involvement in the project. Instead of a set of rules, the body is governed by general guidelines and expectations. What follows is list of guidelines and rule's of thumb:

- A paragraph needs to focus on one point and only one point. Short paragraphs are perfectly acceptable.
- Use specific names and terms. Name your team, name your project, define the aspects of the project, and be consistent in using those names. You need to guide your audience through your document—names help keep your audience from getting lost or confused.
- Report only the most needed information. It is perfectly acceptable to say, "Based on the market research, Project MASH needs to reduce production times by 50% (Market Research Schedule)." It is not needed to explain why the 50% reduction is needed; that information should be included in the *Attachment* Market Research Schedule so your audience can look up the exact numbers if needed.
- Memos need to be direct and concise. You don't write a memo about *Hamlet* or *Moby Dick*, so you don't write a memo the same way you write about literature. Not all paragraphs will require transitions. Make your point and move on. This is why it is so important to use specific names and to be consistent with names and terms. A single sentence paragraph may be all that you need to introduce your memo, which means your audience only has that bit of information to navigate the rest of the memo. Using vague terms prevents your audience from following your line of reasoning.
- Memos do not need concluding paragraphs. Instead, end by specifically stating any questions or recommendations. This is important: specifically state questions and recommendations. Saying, "At this point the Project MASH team is not sure of the next step," is too vague and weak. Instead say, "The Project MASH team needs authorization to conduct a second round of tests before the project can move forward." This is stronger because it directly states what is needed.

Footer and Signature Block

All memos need a footer and signature block. The footer explains where questions should be directed, and it often contains telephone numbers, email addresses, contact names, date ranges, deadline dates, and other time frames. This is where you tell your audience how to find you for more information.

The signature block is a formality that tells your audience exactly who sent the memo. This is one of the origins for the term "to sign off" on something. When you sign a memo, you are putting your name on it and taking responsibility for what it contains. Make sure to always

include your typed name under your signature so your audience has your name and its correct spelling.

Attachment List

Not all memos will have an attachment list; however, if your memo refers to any attachments or datasets, they need to be listed. At the same time, if you are going to attach anything to a memo, you need to specifically state in the body that it will be attached and what it is for. This is done to prevent your audience from separating the memo from the attachments, and it helps ensure that your audience knows to look for—and at—the attachments.

Data is not self-evident. If you include an attachment, you are going to need to add an introduction and description to the beginning of each attachment.

You indicate an attachment as was done in the example or in the *Body* section of these Guidelines.

Formatting Directions

The format of a memo should help your audience quickly read your memo. Your audience should not need to stop and re-read or hunt around in your memo for information.

The format of a memo indicates how much effort you put into the memo. A misaligned memo looks sloppy, which is similar to wearing dirty, faded clothes to an interview. You want your work to be trusted and respected. If you don't take the time to format a memo neatly, it says that you don't care enough to bother, which suggests that you don't care about the project.

It is a good idea to build the header and routing information in a table so you can keep names, dates, and subjects neatly aligned. If you use a table, make sure to remove all borders.

There is no need to use double-spacing. Instead, add some space between paragraphs, as was done in the example and in these Guidelines.

Do not use wide margins or large spaces. A one-inch margin on all sides is very common, and a single extra line is sufficient between paragraphs.

Use a standard font that is either 10 or 12 point. Times New Roman and Arial are the best because most scanners easily recognize them.

Use **bold**, *italics*, and underlining (or any other formatting) sparingly. It is often best to only use them to make section headings.

Questions

If you have any questions, please contact your ME professor, ME TA or the ME Writing Enhancement Program Coordinator. The ME Undergraduate Office front desk staff has current email addresses and office hours.

Appendix B Better Distinction Between 'No Errors' and 'No Noticeable Errors

TO: All Professors, Instructors, Lab Coordinators, and TAs for ME 263, Fall 2012

FROM: Zachery Koppelmann, Coordinator ME Writing Enhancement Program

DATE: 10 October 2012

SUBJECT: Better Distinction Between 'No Errors' and 'No Noticeable Errors' on ME 263 Grading Rubric

The purpose of this memorandum is to provide a better distinction between 'No Errors' and 'No Noticeable Errors' on the ME 263 grading rubric for Grammar / Format and Punctuation. Currently this distinction is highly subjective and varies from grader to grader; therefore, a more definitive distinction is needed.

The initial goal of using a 'No Noticeable Errors' score was to allow for writing conventions that are not technically incorrect. For example, beginning a sentence with 'And' is not technically incorrect, but there is a strong convention against its use. Scoring a memo as 'No Noticeable Errors' would mean that no technical errors were made, but some conventions might have been broken. This very narrow distinction was meant to apply to grammar, format, and punctuation—each has conventions that vary from discipline to discipline.

This intended use is not specific enough to allow for consistent scoring.

To correct this subjectivity in the rubric, the following revised distinction should be used:

> A score of 'No Noticeable Errors' for Grammar / Format means that the memo may not display any technical errors, but that at least one sentence is confusing, poorly worded, or violates a disciplinary convention.
>
> A score of 'No Noticeable Errors' for Punctuation means that the memo may not display any obvious errors, but at least one punctuation mark is questionable.

This new distinction provides an objective basis for awarding a score of 'No Noticeable Errors' in that the scorer can point to a specific sentence or punctuation mark as being the justification for the lower score.

If you have any questions, please contact me at zkoppelm@purdue.edu.

This memorandum is approved for student distribution.

Regards:

Zachery Koppelmann

VITA

VITA

Education

PhD English — **December 2014 (Expected)** — **Purdue University**

Rhetoric and Composition — GPA: 3.88

Dissertation: *Understanding the Rhetorical Engineer*

Committee: Prof. Richard Johnson-Sheehan (Chair), Prof. James Jones, Prof. Irwin Weiser, Prof. Jennifer Bay

My dissertation first details the conception, design, and refinement of the Purdue University School of Mechanical Engineering Writing Enhancement Program (ME WEP), a custom writing program, started at the request of the Purdue Mechanical Engineering (ME) faculty, with the purpose of assessing ME undergraduate writing in ME 263 (a required design course for all ME undergraduates attending Purdue University), designed to identify common weaknesses in the writing, and develop effective methods to improve undergraduate mechanical engineering writing. To fulfill this role, I collaborated with the ME faculty to design, build, and refine an assessment tool (an analytic rubric) to assess undergraduate mechanical engineering writing.

After describing the creation of the program and the assessment tool, my dissertation evaluates the accuracy of my assessment and the assessment tool, via an experiment. After statistically analyzing the results of the evaluation, I will be able to further refine the assessment tool and provide recommendations for future refinements of the program, including recommending a system for building similar programs for other schools and universities.

MA English — **May 2009** — **Boise State University**

Rhetoric and Composition — GPA: 3.83

Thesis Project: *Implementing Audio Consultations in the Writing Center*

Committee: Prof. Michael Mattison (Director), Prof. Devan Cook, Prof. Karen Uehling

My thesis project was a test of using asynchronous audio consultations to supplement the services already offered by the Boise State University Writing Center. The goal was to create a method for more rapidly providing writers with high-quality writing comments that fully aligned with writing center theory and practice, but that took less time to produce than the methods already in use. I was able to demonstrate that the method could provide more quality comments in alignment with writing center theory and practice in a fraction of the time required for written comments. The system was never fully integrated into the Boise State University Writing Center due to my graduation and the departure of the then Writing Center Director.

BA English — **May 2007** — **Boise State University**

Writing — GPA: 3.69, Cum Laude

Teaching Experience

Professional Writing Teaching Assistant *Fall 2010-Present* **Purdue University**

ENGL 42100, Technical Writing, 5 Sections

In 421, students learn to evaluate, analyze, and produce technical documents. In my courses, I focus on clarity of ideas, specificity of details, and efficacy of presentation. All assignments are sequenced and are modeled on writing tasks taken from professional environments, and include a hands-on construction project and formal team presentation.

ICaP Teaching Assistant *Fall 2009-Fall 2010* **Purdue University**

ENGL 10600, First-Year Composition, 2 Sections

This course focuses on the myriad contexts of academic writing. I sequence the assignments to develop student awareness of their rhetorical situation, their audiences' needs and expectations, and the rhetorical options useful to meeting those needs and expectations while maintaining their own writing style and ideas.

Teaching Assistant *Fall 2008-Spring 2009* **Boise State University**

ENGL 101, Introduction to College Writing, 2 Sections

This course introduces students to the basic concepts of college writing, the rhetorical context for their writing, and how to craft nuanced descriptions of readings and selected topics. It is a portfolio-graded course, and it incorporates extensive, recursive revision and reflection.

ENGL 102, Introduction to College Writing and Research, 1 Section

This course extends the work from ENGL 101 and incorporates research and group work. It is also portfolio-graded and incorporates recursive revision and reflection. I expanded my course to include proposals and an argument assignment in which students followed the Toulmin method of argument.

Writing Center Experience

Graduate Tutor Assistant *Fall 2010-Spring 2011* **Purdue Writing Lab**

As a Graduate Tutor Assistant, I conducted one-on-one writing consultations with both graduate and undergraduate writers, answered emailed writing questions, hosted class visits to the Writing Lab, answered telephoned in writing questions, assisted with English conversation groups, and mentored junior graduate and undergraduate writing tutors.

Writing Consultant *Fall 2005-Spring 2009* **Boise State University Writing Center**

As a Writing Consultant, I conducted one-on-one and group writing consultations with faculty, staff, graduate, and undergraduate writers; conducted email consultations; hosted class visits to the Writing Center; presented about the Writing Center in classes; and mentored junior graduate and undergraduate writing consultants.

Graduate Assistant *Fall 2007-Spring 2008* **Boise State University Writing Center**

As the Graduate Assistant, I assisted in training and mentoring graduate and undergraduate writing consultants; conducted one-on-one and group writing consultations with faculty, staff, graduate, and undergraduate writers; conducted email consultations; managed the email consultation system; assisted with scheduling consultants; staffed the Writing Center table at University functions; and assisted in recruiting and interviewing potential writing consultants.

Conference Coordinator *May 2007-April 2008* **15th *Rocky Mountain Peer Tutoring Conference*, Boise ID**

As the Conference Coordinator for the 15th Annual *Rocky Mountain Peer Tutoring Conference*, I was responsible for developing the conference theme, revising and finalizing the call for proposals, evaluating and ranking the possible venues, and sorting submissions. In addition, I worked closely with the Writing Center Director to select the venue, arrange the conference schedule, and select the conference artwork. I also produced the conference program, coordinated the rooms and A/V needs, assigned mediators, and prepared registration packets.

Administrative Experience

Coordinator, Writing Enhancement Program *Fall 2010-Present* **Purdue University School of Mechanical Engineering**

I built the Writing Enhancement Program at the request of the Purdue University School of Mechanical Engineering to address their faculties' concerns about undergraduate mechanical engineering writing. Building and coordinating the program involved close collaboration with mechanical engineering faculty and Writing Lab administration. The program assess undergraduate mechanical engineering writing, provides consistent feedback to the writers, tracks writers with lower scores, and provides custom supplemental writing instruction in the form of video tutorials and an interactive website.

As of May of 2013, over 50% of students assessed by the program displayed statistically significant improvement in their engineering writing over the course of a semester.

Publications

"Rhetorical Strategies for Working with Institutional Review Boards," *Computers and Composition Online—Special Issue on Ethics and Digital Media* (Fall 2011). Web.

Review of *(E)Merging Identities: Graduate Students in the Writing Center*, ed. Melissa Nicolas. *The Writing Lab Newsletter* 33.1 (2008): 12-13.

Conference Participation

"Contesting Spaces and Ethics in Writing Research: The IRB, Collaboration, and Claiming the Future." *Conference on College Composition and Communication*, Atlanta, GA. April 6-9 2011.

"Sounding in the Open Sea: Connecting Writer and Consultant in Spoken, Asynchronous Response." *International Writing Centers Association/National Conference on Peer Tutoring in Writing*, Baltimore, MD. November 3-7 2010.

"Traveling Down Audio Avenue: Audio Responses in the Writing Center." *International Writing Centers Association/National Conference on Peer Tutoring in Writing*, Las Vegas, NV. October 29- November 1 2008.

"Writing the Intimate Out Loud: When Writing Makes Writer or Consultant Uncomfortable." *South Central Writing Centers Association Conference*, Norman, OK. March 2007.

"Virtual Spaces: Peer Review in the Online Writing Center." *Rocky Mountain Peer Tutoring Conference*, Ogden, UT. March 2007.

"Putting Paragraphs in Their Place." *Rocky Mountain Peer Tutoring Conference*, Ogden, UT. March 2007.

"Should We Get Personal? An Earnest Look at the Personal Essay, Greenhorns, and the First-Year Writing Course." *Sigma Tau Delta International Convention*, Portland, OR. March 2006.

"The Peer Tutoring Looking Glass." *Rocky Mountain Peer Tutoring Conference*, Provo, UT. March 2006.

"The Shredder is Not Hungry." *National Undergraduate Literature Conference*, Ogden, UT. March 2005.

Purdue OWL YouTube Videos

Purdue OWL: *Layering Reports—The Executive Summary A Closer Look Part 1*, 26 April 2012

Purdue OWL: *Layering Reports—The Executive Summary 1*, 16 February 2012

Purdue OWL: *Title Page for Reports*, 17 November 2011

Purdue OWL: *Layering Reports*, 28 September 2011

Purdue OWL: *Mechanical Engineering 263 Memo Writing Guidelines*, 22 August 2011

Purdue OWL: *An Introduction to Writing Across the Curriculum*, 14 June 2011

Purdue OWL: *The Semicolon (Parts 1, 2, and 3)*, 14 June 2011

Purdue OWL: *Memo Writing Part 3*, 20 April 2011

Purdue OWL: *Memo Writing Part 2*, 20 April 2011

Purdue OWL: *Memo Writing Part 1*, 20 April 2011

Purdue OWL: *90-Second Semicolon Advanced*, 18 April 2011

Purdue OWL: *90-Second Semicolon Part 2*, 18 April 2011

Purdue OWL: *90-Second Semicolon Part 1*, 18 April 2011

Other Projects

Beutler Meats and Catering Website	*August 2012-August 2013*	**Beutler Meats and Catering, Lafayette, IN**

Beutler Meats and Catering is a local family owned meat-processing facility that has been serving the Greater Lafayette, IN area for over 60 years. I volunteered my time and expertise to rebuild their company website. A former student assisted me in the coding as a non-credit internship. In addition to using HTML and CSS, I also took the majority of the images, recorded and arranged the video, and provided documentation for the owners to be able to maintain their own website. The final website—www.beutlermeat.com—has resulted in almost doubling the company's weekly business.

Professional Activities

International Writing Centers Association Summer Institute	*July 20-25, 2008*	**University of Wisconsin, Madison**

Honors

William H. and Ruth E. Crouse Scholarship	*Summer 2011*	**Professional Writing Scholarship**
Quintilian Award	*Fall 2010*	**ICaP Teaching Award**
Muriel Harris Tutor Development Fund	*Fall 2010*	**Writing Lab Scholarship**
Sigma Tau Delta	*Fall 2006-Spring 2009*	**English Honor Society**
Eugene and Lois Chaffee Scholarship	*Fall 2006-Spring 2007*	**Scholarship**
Coors Veterans Scholarship	*Fall 2004-Spring 2005*	**Scholarship**

Service

Cover letter Workshop Presenter	*Fall 2011*	**Purdue Professional Writing Club**
Thesis Workshop Presenter [Three part Series]	*Spring 2011*	**Purdue Official Mechanical Engineering Graduate Association**
Reviewer	*February 2007-Spring 2011*	***Writing Lab Newsletter***
Personal Statement Workshop Presenter	*Fall 2010*	**Purdue Women in Engineering Program**
Invited Presenter	*Fall 2008*	**Boise State University English Graduate Organization**
Essay Judge	*Fall 2005-Spring 2009*	**Boise State University's President's Writing Award**
Essay Judge	*Fall 2005-Fall 2008*	**Academic Decathlon**
Student Representative	*Fall 2007*	**Graduate Student Advisory Committee**
Student Representative	*Fall 2007*	**Promotion and Tenure Committee, Boise State University College of Arts and Science**
President	*Fall 2005-Spring 2006*	**English Majors' Association**

Relevant Course Work

Professional Writing	
ENGL 515 Advanced Professional Writing	Prof. Michael Salvo
ENGL 589 Writing Postindustrial Landscape	Prof. Michael Salvo
ENGL 505 Professional Writing Practicum	Prof. Michael Salvo
ENGL 590 Teaching Engineering Writing	Prof. Michael Salvo
ENGL 590 Assessing Professional Writing	Prof. Irwin Weiser
Rhetoric and Composition	
ENGL 505 Teaching First-Year Composition	Prof. Richard Johnson-Sheehan
ENGL 591 Composition Theory	Prof. Samantha Blackmon
ENGL 680 Kenneth Burke and Contemporary Rhetoric	Prof. David Blakesley
ENGL 624 Modern Rhetoric	Prof. Patricia Sullivan
ENGL 680 Rhetoric and Ethics	Prof. Michael Salvo
ENGL 622 Classical Rhetoric	Prof. Thomas Rickert
ENGL 625 Empirical Research Methods	Prof. Patricia Sullivan
ENGL 626 Postmodern Rhetoric	Prof. Jennifer Bay
Writing Program Administration	
ENGL 680 Writing Across the Curriculum	Prof. Linda Bergmann
ENGL 502 Writing Lab Practicum	Prof. Linda Bergmann
ENGL 680 Writing Program Administration	Prof. Karen Bishop-Morris