AC 2007-1168: DEVELOPING AN ENGINEERING WRITING HANDBOOK – A CASE STUDY

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DEVELOPING AN ENGINEERING WRITING HANDBOOK – A CASE STUDY

Abstract

Effective written communication is one of the most important skills an engineer can have. Yet, growing numbers of undergraduate students leave first-year composition courses without the skills, self-discipline and strategies to write effectively. This is especially troublesome for engineering students as they transition to the writing skills and styles appropriate to engineering at the same time as they struggle to improve their fundamental writing skills. In an effort to develop the writing skills of engineering undergraduates at the U.S. Coast Guard Academy, the Electrical Engineering and Naval Architecture/Marine Engineering programs have developed a close collaboration with the USCGA writing center.

Initially this collaboration focused on how instructors could improve their grading and instruction of writing within engineering courses. As the relationship matured, focus was shifted to the importance of educating the writing center staff on the unique attributes of engineering writing as well as the engineering-specific writing skills expected of students by faculty. Unable to locate a writing guide that specifically met our undergraduate engineering needs, the writing center and Engineering faculty developed a handbook that outlines an effective engineering writing process and style for students, faculty, and writing center tutors.

This paper provides an overview of the challenges the authors have experienced teaching writing within engineering courses and the benefits of collaboration with the writing center. Justification for the development of an engineering writing handbook includes: helping engineering students make the transition from first-year expository writing to upper level technical writing; orienting new faculty to institutional writing conventions; and clarifying expectations for engineering writing among students, faculty, and the existing pool of cross-disciplinary writing center tutors. Importantly, the engineering writing handbook provides a standard that ideally can be applied across all USCGA engineering courses. It thereby reduces the displacement of classroom content resulting from the need to provide extensive writing instruction in each course. Development of the handbook, recent internal applications, its status, and the possible application of USCGA experiences to other programs are discussed.

Introduction

Effective written communication is one of the most important skills an engineer can have. Yet undergraduate students generally leave first-year composition courses without the strategies, skills and self-discipline to write effectively within the engineering disciplines. While all writing has an audience, purpose, form, conventions and style, readers in the humanities may expect to see a narrative expressed with active verbs, diction that appeals to emotions, as well as literary meaning subject to interpretation. By sharp contrast, readers in engineering fields expect straightforward information concisely and unemotionally expressed in passive verbs and clear

sentences. While concepts such as audience and purpose guide writers' choices about form, style and diction within a discipline, the terms for responding to writing and its processes remain the same.[1] For example, while writers learn in their expository writing classes to vary diction, they need to learn in engineering writing to repeat technical terms, as technical terms have few or no synonyms. In electrical engineering "power" and "authority" are not the same thing, no matter what the thesaurus says. Adjusting to opposing disciplinary expectations is especially troublesome for engineering students as they transition to the writing processes, skills and styles appropriate to engineering at the same time as they struggle to improve their fundamental writing skills.

In an effort to develop the writing skills of engineering undergraduates at the U.S. Coast Guard Academy, the Electrical Engineering and Naval Architecture/Marine Engineering programs have developed a close collaboration with the USCGA writing center. Over the past several years, this collaboration has transitioned from the efforts of instructors in two classes to improve technical writing skills for a few students to a long-term initiative with a goal of improving and standardizing writing in all four engineering majors.

This paper will begin with the institutional context in which the Engineering-writing center collaboration developed: a school with a small enough faculty and student body that allowed for close coordination among academic departments and student support services. After a brief discussion of the Engineering Department's model for writing development and the writing center's outreach that led to the collaboration, the paper will turn to the early development of the handbook and its evolution. The discussion will conclude with strategies for engineering programs to adapt the USCGA experience to their own institutions and needs.

The USCGA Challenge

The USCGA is one of four federal service academies and as such is focused on the academic, military and physical development of young men and women as leaders in service to our nation. USCGA provides the U. S. Coast Guard (USCG) with approximately 190 new Coast Guard officers each year. Each graduate earns both a commission (as Ensign, USCG) and a Bachelor of Science degree in one of eight academic majors. Four of these majors are in engineering disciplines: Civil; Electrical; Mechanical; Naval Architecture and Marine Engineering.

A typical cadet day at USCGA involves academics, leadership and military training, and some sort of athletic activity (NCAA division III or intramural). At least once each semester, each cadet is required to participate in an outside community service project either individually or as a group. All cadets must complete the academic requirements for their chosen major while participating in the equivalent of two full sports seasons (in addition to 7 semesters of physical education), in parallel with a 200-week training program. The academic workday runs from 0600-1540 and 2000-2200 (late lights beyond 2200 permitted with excusal). The general education requirement ("core curriculum") for all cadets involves 17 courses and 57 credit hours.

The Faculty

The faculty at USCGA is composed of three different types of teaching faculty. Approximately 30% are permanent tenured or tenure-track civilians with PhD degrees. Another 30% are active-duty Coast Guard officers with PhD degrees, permanently assigned to USCGA. The remaining instructors are active-duty Coast Guard officers who are assigned to the Academy for four-year periods before rotating back out to more traditional jobs in the Coast Guard. The rotating military instructors who are assigned to teach engineering courses have Masters degrees in their disciplines.

The advantage of the rotating component of the faculty is that they can provide students with current fleet perspectives and challenges, which the students can use to contextualize the classroom engineering theory. The difficulty of a significant rotating component to the faculty is the need for the permanent faculty to help them refine their teaching skills while also aid in their knowledge development and continued learning.

Approach to Technical Writing

The environment described herein is a time-critical, pressure-packed experience that requires solid time management and task prioritization skills on the part of each cadet. These challenges are exacerbated for those in the engineering majors by the wide scope of content and huge array of analytical capabilities that each cadet must master. Within these institutional constraints, the formal writing education that students receive is limited to first-year English courses focused on expository writing, composition and literature. These English courses must be broad-based enough that they can serve as foundation courses for all eight majors. While these courses provide exposure to the writing process, thesis development, sentence structure and grammar, they do not necessarily help the student transition to the skills necessary for engineering and scientific technical writing.

Since effective communication skills are as important to engineers as their technical skills, students need guidance from department and institutional support teams to help them understand the complexities of the engineering writing processes and products. Writers need to understand and appreciate the investment of time required for informal writing, such as writing to learn course content. They also need to value audience expectations and learn the forms in which to express content knowledge, such as laboratory reports and design projects. Further, they need to learn the conventions of sentence-level expression within those forms. This includes developing a clear style that meets reader expectations for sentence length and rhythm along with graphs that are properly labeled and formulas that are clearly explained. To determine if their writing meets reader expectations of content, form and style, or helps to ensure the funding or safety of a project, is a complex process. Instructors who require effective written communication should expect institutional support to guide them and their students to address the complexities of writing in and across disciplines.[2]

Despite the desires of some engineering faculty, it is probably inappropriate to expect that a long-term solution to improved technical writing at USCGA is the replacement of one of these

first-year courses with a true engineering writing course. In addition, there is not room elsewhere in the engineering curricula to insert such an independent writing course.

In an effort to resolve some of these issues teaching technical writing to engineering students, the Engineering-writing center collaboration began with individual instructors. The Engineering-writing center collaboration is informed, in part, by research that supports the writing center as one among several sites, including academic departments, for effective Writing Across the Curriculum programs. The center's practice allows mutually beneficial dialogue among faculty, tutors and writing program administrators.[3]

The Cadet Writing and Reading Center

The Cadet Writing and Reading Center was established in 1986 to support USCGA's shared learning outcome for Writing Across the Curriculum (WAC). Funded by the Alumni Association from the John and Erna Hewitt Endowment, the center supports writers at all class levels and abilities. The Hewitt fund also supports an annual competition that requires all students to write substantial researched arguments during each of their four years. During their third-year, students write a paper as part of a required class in their major.

In 2003 USCGA hired a full-time director and moved the center from the Department of Humanities to the Department of Academic Resources to support WAC more effectively. Prior to 2003, the center was staffed by ten faculty members, primarily from the Department of Humanities, and three civilian tutors, each with a humanities background. It operated 12 hours per week during the evening and conducted 200 tutorials per semester. Most students sought only editing assistance the night before a paper was due. Currently, the center is staffed by 13 faculty members, evenly represented by each academic department, and seven civilian tutors, two of whom have technical writing skills. The center has the same evening hours along with traditional business hours. A satellite center operates in the engineering building. The number of tutorials has grown to over 1,200 per semester, and many students start their papers well before the due date.

The growth in requests for tutorials across the disciplines required the center to provide new levels of support. The center worked with faculty members to create assignments, address student needs throughout their writing and learning processes and assess writing in its various stages and forms. Growing numbers of faculty members embedded due dates for drafts into their syllabi to encourage students to visit the writing center, and they began to incorporate the director's main project into their classes: developing a common language for the writing process and written product adaptable to each discipline.[4] The project's goal was to help writers, faculty and student support personnel to see the connections between the expository first-year writing and the technical writing expected of engineering students. In addition, as faculty members supported the project, training for the center's tutors needed to expand so that they could address more effectively the departmental expectations of writing in and across the disciplines. Once the basic commonalities are understood, the engineering students can then develop the engineering specific style and format conventions that are expected within the engineering disciplines. This was the main goal for developing the handbook.[5]

Initial Engineering Faculty Outreach

Technical writing education that the students receive at USCGA has been historically embedded within existing engineering courses, often at the expense of classroom engineering content. This method of teaching technical writing was effective at the micro-scale (within individual courses) but also resulted in student confusion and frustration due to the lack of uniformity in the writing instruction that they receive from one engineering course to the next.

The initial outreach to the writing center was initiated independently by individual engineering instructors in an effort to further improve technical writing instruction at the micro-scale level. These individual efforts progressed into collaboration between the EE and NA&ME senior design course instructors and the director of the USCGA writing center. This collaboration, at first, focused on improving the technical writing instruction within individual courses. It included, as previously mentioned, the development of technical writing grading rubrics, refinement of the instructors' writing skills and pedagogy and placing writing tutors within the engineering building.

As engineering instructors required student participation with the writing center, writing center tutors had to understand what the engineering instructors meant by technical writing – as many tutors associate "technical writing" with either business communications or writing user manuals. The collaboration helped the writing center tutors realize that the technical writing the engineering department was expecting was focused on effectively communicating technical data and results to an engineering audience. An overview of this collaboration between EE, NA&ME and the writing center was presented at the 2006 Writing Across the Curriculum conference held at Clemson University on 18 May.[6]

Development of Informal Writing Guide

Another result of these efforts was that the EE and NA&ME instructors began sharing the written guidance they were providing their students. Eventually, the instructors merged their individual writing handouts into one document that was then distributed to senior-design students in both the EE and NA&ME majors. This three-page document provided a general guidance for the papers as well as some hints and expectations for technical writing, including issues of grammar, sentence structure, audience, format, document structure and visual presentation of data. This document not only provided guidance to the students but also to the writing center tutors on the expectations of the engineering department faculty. Specifically, it provided information on the style and conventions of engineering and scientific technical writing that the students, and most of the writing center tutors, were not familiar with based upon their past experiences.

The writing center director helped refine this document by bringing in a common language to discuss writing across disciplines. These discussions also helped clarify the commonalities between the expository writing taught in the first-year courses and the technical writing expected in the upper division courses. Based upon student feedback and continued discussions among the collaboration team, the instructors realized that this document was insufficient for the USCGA instructor and student needs.

Developing the Handbook

The perceived limitations of the EE/NA&ME writing handout led to a search for an existing published textbook. Initially, composition books such as *A Manual for Writers of Term Papers, Theses and Dissertations* by Kate L. Turabian and the *MLA Handbook for Writers of Research Papers* by Joseph Gibaldi were considered and had even been used by other engineering instructors. These books were typically used in the Academy's English courses and were considered because the students usually owned or had access to them. However, they did not address the concepts of technical writing and so were unsuitable for our purposes.

Several excellent books that teach engineering or technical writing were then reviewed by the collaboration team[7, 8, 9, 10]. The problem the team saw with these manuals was that they were designed to be used within a formal "technical writing" course and were narratives of technical writing guidance. These books included so much information that they were not practical for inclusion in the USCGA engineering curricula and, based upon instructor knowledge of student behavior, would not be used by the students.

Most of these manuals are designed for a technical writing course; they include information, such as grammar, style and punctuation, which is covered in the first-year writing courses. They also include information about writing proposals, emails, resumes and formal letters. This information, while valuable, was not part of the team's vision for the USCGA technical writing guide. This additional information makes these books excellent references, but arguably drives the cost up more than the instructors wanted for a book that was only going to serve as a supplementary text book.

Concurrently with this search, the engineering instructors saw the need for a common report format across the engineering disciplines. This common format would help the engineering students since it would provide a standard they would apply no matter what engineering course they were taking. Instructors would save class time normally spent reviewing individual technical writing expectations. Particularly for the rotating faculty, it would provide a clear standard they could use in class and quickly orient them to USCGA expectations for technical writing. The writing center tutors would benefit from the standard format as it would allow them to focus on the student's expression rather than trying to understand the format for each individual assignment.

The team then realized if the two documents were combined – the existing technical guidance and the proposed common format – it would meet the needs of the students, the instructors and the writing center tutors. The advantage of this specialized document would be it could include the technical writing skills and conventions that the students need and provide the specific USCGA formats they would use in all engineering classes. This specialization would eliminate the duplication of efforts of multiple faculty members in multiple courses and make unnecessary the need for students to learn a different format for each course. It also has the advantage over existing textbooks in that it can focus on the reports used in USCGA engineering courses and avoid the generic treatment of report formats that textbooks must adopt to appeal to a wide variety of colleges.

It is important to note that this guide was not envisioned as a replacement for the first-year writing courses, but rather as a way to build upon writers' existing skills and focus on the specific conventions required in engineering writing.

Until the guide was finished, the team decided to use *An Engineer's Guide to Technical Communication* by Sheryl A. Sorby and William M. Bulleit in the classroom. The advantages the team saw in this book over the others were that it was compact so the students might use it and it included oral communication skills, a topic covered in the senior design courses. In addition, this book supported several conventions, such as advocating passive voice in technical documents, that the team had agreed was going to be included in the technical writing guide.

The Writing Handbook

The handbook uses the analogy that developing technical communication is similar to going on a journey. This analogy works on two levels. First the author is the tour guide, showing all of the interesting features associated with that work. As with any good tour guide the author should, as the old adage says (slightly paraphrased):

> "tell them what you are going to tell them,
> show them and tell them what it means,
> tell them what they saw"

The goal of a well-written technical report should be the same as the goal of a good tour guide. First, it should be readily apparent why the readers went on the journey – why the report was written. All the questions going into the journey should be answered – effective presentation of the material. Finally, the readers should arrive at the same conclusions the author had – the information was clear, thorough and well presented.

This analogy also works for the student as author. Writing can be, and should be, considered a journey towards self-discovery and continued improvement. Within the academic world, a primary objective of most writing assignments is to have students develop a deeper understanding of the material and hopefully make connections during the writing process while also becoming technical writers. Also, the writing process is a journey, as authors have to take multiple trips over the same ground during the revision process in an effort to communicate their ideas more effectively and to improve the technical quality of their paper.

This "journey" analogy is carried throughout the handbook with the section titles. The first section is entitled "GOING ON A JOURNEY". This section describes the "journey" analogy and, as most engineering students dislike writing, briefly explains why good writing is a critical skill for engineers to possess. This is also where commonalities, and important differences, that exist between expository writing and technical writing are discussed. It also describes the writing center's common language for effective communication.

"PREPARING FOR THE JOURNEY" discusses the USCGA writing center's "Common Language" in terms of the drafting and revising processes and the importance of understanding the audience, developing a purpose and anticipating and theorizing about an end result before putting "pen to paper". This section also provides the common format for the two types of engineering documents expected from students – laboratory reports and design reports. These formats

provide the titles and basic descriptions of the required sections for each report. This is also where important topics such as plagiarism, formal writing style and a discussion on the relative importance between content and quality of form and expression occur.

A common language that names concepts for effective communication helps writers make the transition more easily from writing in first-year composition to writing in core, major and professional studies courses: concepts such as audience, purpose, form and style (Appendix 1). Students who understand the components of successful writing can more confidently develop strategies to address an audience, achieve a purpose,[11] develop a strong thesis, structure ideas and express them with an appropriate voice, tone and stance in various disciplines and forms. Armed with a language that names writing-related concepts, students can more readily approach the complex processes of learning and expressing disciplinary knowledge within new structures, forms and conventions. Students are more likely to be able to express difficult course content with effective writing strategies.

As with any journey, once the students know why they are going on the trip and have prepared for it, they can then move on to "STARTING THE JOURNEY". The formal and conventional requirements for a written report's *title*, *abstract*, *introduction* and *background* are covered in this section. These sections should encourage a targeted audience to start reading the paper (the title and abstract) and then provide enough information to keep them reading. Why the author should have a concise, but descriptive, title is explained as well as the purpose and importance of an effective abstract. The handbook reviews the information that is required in a technical report's "introduction" and "background" sections, as well as what specific USCGA reports require in these sections.

The section entitled "TAKING THE JOURNEY" has two subsections: "Signposts – Directing the Way" and "Scenery – Getting Your Ideas Across". The "signpost" section describes the titles and information that are the heart of the paper. The purpose and information within the *objective*, *design* and *results and analysis* sections are each briefly described here. These "signposts" sections help the audience contextualize the information they will be reading. The tables, figures, charts and mathematical equations are described within the "Scenery" section. Just like the scenery on a journey, this is how a technical writer can most effectively communicate complex information to the reader. This section contains the same information found in most other technical writing manuals on proper format, referencing, etc. What it adds is conventions that the team has agreed upon over the course of discussion that may be too specific to an institution for a textbook audience – when to use "Greek" symbols or specifically stating our students must use 10^6 and not 10^6 or 10E6. Such clarifications, though they may seem obvious, frequently trouble students, the rotating military instructors and writing center tutors.

"FINISHING THE JOURNEY" contains the rest of the sections of our standard report – *conclusion*, *bibliography* and *appendices*. As with any good journey, these sections must review the trip the reader has just made and provide the readers with a final explanation on why they went on the journey and what made the journey worthwhile.

One final section, "REVIEWING THE JOURNEY" is again focused on the writing process as a journey for the author. It discusses the importance of the revision and self-assessment processes

and how the writing center can help. A discussion on the grading philosophy of the engineering department – a generic policy on what constitutes an A, B, C and F paper is under development.

Using the Handbook

The following discussion shows some examples that have been included within the Engineering Writing Handbook and how they have been used within a classroom setting.

The sample language charts (Appendices I and II) distill key terms that most professional writers use to discuss and guide the processes and products of communication for student writers and themselves. Practice in understanding and applying the terms in various contexts in first-year composition – class discussion, instructor and peer response, consultations with the center's tutors and self-assessment – allows writers to develop a solid foundation with the terms.[3] As writers progress into their major courses, they appreciate that all writing appeals to an audience and has a purpose, and these concepts can be adapted to their engineering writing.

The charts organize the terms based on the writing and learning processes:[3] from larger concepts of audience, purpose and topic; to formal and structural choices about organization and development; to sentence-level choices about style, diction, editing and sentence-level conventions. The charts are not intended to suggest that composing is a linear process. Rather, they point to the broad stages of the writing process and the expectations that readers of academic or professional writing have of a finished product.[1] At the same time that the chart appears basic in its distillation of the key terms, it also helps writers grasp the complexities of the composing process and the assessment processes that instructors apply to writers' various products of communication.

Appendix II shows the language in the first column, its relationship to the drafting and revising processes in the second column and its relationship to the product in the third column.[3] For example, in the second or "process" column the audience in the early stages of writing can be "the writers themselves," as they write to learn the material and start to grasp the demands of communicating the ideas or material that they are in the process of learning. As writers develop control over the ideas, material and forms of writing, they can then attend to the needs of audiences other than themselves. As the third "product" column suggests, the finished product requires attention to audience in ways that are different from audience in the "process" column. In other words, while the chart establishes a basic set of terms, it also suggests a basic process and set of strategies to apply the terms to various stages of writing.

More importantly, the chart helps writers to grasp more fully the complexity of college-level thinking and writing. It also suggests that writers (with guidance by their instructors and student support services) need to plan time in order for an audience to emerge to the writer as a genuine presence that can guide and shape their ideas. Because the chart helps writers locate themselves in their own composing process, in the world of ideas and among a community of readers, writers are less likely to just "fix grammar" on a draft or decide that they "just can't write." With a basic language and a growing sense of the time required to produce a college-level engineering project, writers gain a growing sense of "authority" over their processes and products of communication.

The next sections include peer response (Appendix III) and self-assessment forms (Appendix IV) to guide writers through the process to the final product, reinforcing the terms and concepts in a new discipline. Instructors can respond to the writer's self-assessments as well as the finished product.

Finally, Appendix V shows the basic language applied to an upper-level engineering course. With exposure to the terms and concepts in first-year courses, writers can see the same concepts, language and transportability of skills. Instructors can design assignments and assessments with the same concepts and terms as they guide writers to make connections in and across academic disciplines.

Conclusion

In an effort to improve the technical writing skills of their engineering students, instructors from the USCGA Electrical Engineering and Naval Architecture/Marine Engineering majors have developed a close working relationship with the writing center. Initially this relationship focused on helping these instructors improve how they taught and graded the existing written assignments within their individual classes. As their relationship matured, this collaborative effort identified the need to teach technical writing throughout the students' development as engineers, not just within individual classes. Due to institutional constraints, such as required academic load and the size and nature of the faculty, this development needed to leverage the writing center faculty's expertise and build upon, not replace, the expository writing instruction received by all students during their first-year English classes.

Initially the efforts to create this unified approach to technical writing within the EE and NA&ME majors focused on identifying an existing technical writing textbook that could be used to supplement the classroom instructions. However, the technical writing books reviewed primarily were designed to be used in an independent class and subsequently provide a breadth of information applicable to a full course. Since our plan was to build upon the foundation of the USCGA existing English courses, we determined these books would not work for our purposes. Instead the team decided to develop the technical writing guidance already provided to the students into a small Engineering Writing Handbook.

Since this handbook builds upon the pre-existing knowledge gained in the first-year level courses, it has the advantage of being able to focus on the aspects of technical writing the students do not appreciate. Developing this handbook also enabled the inclusion of the USCGA writing center's standards to discuss writing and the Engineering Department's standardized formats and requirements for technical reports. Having this information in one place has several advantages: it helps engineering students make the transition from first-year expository writing to upper-level technical writing; it orients new faculty to institutional writing conventions; and it clarifies expectations for engineering writing among students, faculty and the existing pool of cross-disciplinary writing center tutors.

Institutions with similar academic scheduling and faculty constraints as USCGA could use a similar approach to solve their concerns with technical writing. First, by developing a relationship with the writing center, the instructors can improve their own writing pedagogy and,

as a result, their students' writing skills. Encouraging, and even requiring, students to use the writing center will help the students to develop their own skills. Although good writing is "good writing" no matter what the discipline, to be effective, the students and writing center tutors must understand what makes technical writing different from the expository writing. Therefore the engineering instructors must be able to articulate the requirements and expectations of technical writing.

The approach outlined in this paper is to create an Engineering Department Handbook that articulates the technical writing requirements at USCGA. This handbook can be given to all students as they enter the engineering majors, writing center tutors and new faculty when they first begin teaching. It can also be available on the Engineering Department and writing center's websites. It could easily be envisioned that a similar book can also be provided to teaching assistants or aides at an institution to help both in teaching and evaluating technical writing. Once this common guide is in use, the engineering faculty can focus on the technical content, knowing that the style and format are understood by all individuals associated with the writing process. This uniformity at all levels across the institution will help improve student writing.

While the Handbook currently includes outlines, drafts and projects that demonstrate successful engineering writing, plans include compiling self-assessments from successful writers along with their advice on writing successful design reports. Plans also include maintaining the handbook as a fluid document, easily updated as students provide better examples of successful writing, as faculty solicit feedback from students and their peers on the value and clarity of the handbook, and as faculty assess writing outcomes and the degree to which the writing quality of students improves. Both the EE and NA&ME majors are participating with the handbook, but the team hopes to expand to the other two engineering disciplines. USCGA's writing center also plans on collaborating with the Marine and Environmental Science Department faculty to help writers understand the similarities and differences between expectations for writing in their first-year composition course and their first-year laboratory reports in Chemistry I and II. The idea is to ease transition from first-year writing of chemistry laboratory reports to second-year writing of engineering laboratory reports.

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APPENDIX I: Sample Language: Thinking about Communication for First-Year Writers

I.   Higher order skills at the "Essay" level
      A. Appeal to **Audience** (knowledge, values and attitude toward topic)
          1. The instructor
          2. Community of peers
          3. Community in a particular discipline
          4. Academic or military community
      B. Achievement of **Purpose**[7]
          1. Information
          2. Expression
          3. Argument or Persuasion
          4. Literary
      C. Expression of **Thesis** and Topic
          1. Focused statement or paragraph
          2. Stated or unstated depending on Audience, Purpose, and Topic
      D. Appropriateness of **Voice, Tone, and Stance**

II.   Structure and Coherence at the "Paragraph" level
      A. Effective Strategies for **Organization**
          1. Introduction
          2. Body paragraphs with transitions
          3. Conclusion
      B. Effective Strategies for **Development**
          1. Definition
          2. Explanation
          3. Examples
          4. Analysis of Cause and Effect
          5. Analysis of a Process
          6. Comparison and Contrast (analogy)
          7. Classification and Division
          8. Narration

III.   Structure and Coherence at the "Sentence" level
      A. Effective **Style**
          1. Sentence length, rhythm and clarity
          2. Appropriate syntax
          3. Concise expression
      B. Effective **Diction**
          1. Precise word choice
          2. Control over the language of the topic and discipline
      C. Effective **Grammar, Punctuation and Mechanics**
      D. Effective adherence to **Conventions**
          1. MLA or appropriate format
          2.   Attention to the requirements of the assignment

APPENDIX II: Sample Language: First-Year Writer's Self-Assessment of Writing Process and Product

	Writing Your Notes and Drafts	**Writing Your Final Paper**
Audience	Is yourself as you take notes, outline and learn about your topic and the assignment[12]	Is a reader whom you show that you have control over the material and the elements of writing
Purpose	Is to inform yourself about the material and assignment; to begin to persuade or inform a reader	Is to inform your reader about your knowledge of the material or argue / persuade a point convincingly
Thesis	Is a "working thesis" that will start generally and get more specific as you read, draft and revise	Is a clear, focused statement of your main point or argument and your method to prove your point
Voice	Is casual, tentative, speculative	Is authoritative
Tone	Is informal	Is formal; factual for informative papers; varies for the argument
Stance	Is close to the writer as reader	Is professional, distant from reader for informative; varies for argument
Organization	Follows the order of the assignment question or directions	Follows clear introduction; body paragraphs have topic sentences and transitions; conclusion is clear
Development	Follows the specific language of the assignment, e.g., compare, define, give examples	Each paragraph develops with evidence and relates to the thesis and assignment
Style	Is informal	Sentences are clear; for information transactional; for argument sentence length and rhythm vary to create a clear effect
Diction	Is informal	Shows mastery of the language of the subject and formal writing
Editing	All choices about paragraph organization and development and sentence construction relate to the assignment and to the audience, purpose and "working thesis"	Every element of organization, development, style, diction, editing and conventions relates to audience, purpose, thesis and the assignment
Conventions	Adequate enough to draft	MLA or other required format

APPENDIX III: Sample Application of the Language in a Peer Review

Considering the place of your peers in the engineering problem-solving, engineering research, and/or engineering design processes, please respond to the laboratory report or design report based on the following questions:

(Please note that the audience for the peer assessment is your peer and the technical writer she or he is striving to become, but as you answer the following question about audience, you are speaking about the audience of your peer's project draft.)

1. *Who do you take to be the audience of this report? Be specific in your description of this group.*

2. *What do you take to be the purpose of this piece of technical writing? Do more than restate the assignment: again, be specific about what you see the writer trying to offer her or his community by producing this report. Is the purpose primarily to inform, to argue?*

3. *What is the thesis or main engineering finding or result? Does this work offer new information or insight to the audience that they did not have before?*

4. *Describe the writer's apparent degree of knowledge in relation to the audience and topic.*

5. *Comment on the quality of organization and development of each portion of the project.*

6. *Assess the style. Point to areas of the project that you think are stylistically sound, explaining why, and point to others that do not strike you as being as clear as they need to be.*

7. *Point to striking differences in grammar, editing and conventions relative to those you learned in your first-year English composition courses.*

8. *Evaluate the overall strengths and weaknesses of this draft report. What are the two or three most important areas to revise?*

APPENDIX IV: Sample Application of the Language to a Self-Assessment

When you submit your final project and drafts, include a typed self-evaluation that addresses the following questions. You may answer each question individually, or you may cover the topics in a short essay.

(Please note that the audience for the self-evaluation is your instructor and the technical writer you are striving to become, but as you answer the following question about audience, you are speaking about the audience of your project -- not necessarily just your instructor.)

1. *Who is your audience? Be specific in your description of this group.*

2. *What is your purpose in developing this written report? Do more than restate the assignment: again, be specific about what you are trying to offer to the engineering community. Is your purpose primarily to inform, to argue?*

3. *What is your thesis or main engineering finding? From what specific, distinguishing or original work did your thesis emerge?*

4. *Describe your stance in relation to your audience and topic. (Are you a peer to the audience? Do you have specialized knowledge that needs to be discussed before the reader can follow your work? What information are you assuming is known by the audience?)*

5. *What particular strategies did you use to form and develop each section of your design report?(Focus on the purpose of each section. What are the expectations of the engineering audience in each section?)*

6. *Assess your style. Point to an area of your paper that you think is stylistically sound, explaining why, and point to another that is not as sound as you would like.*

7. *Discuss your strategies for proofreading for grammar, punctuation, editing and sentence-level conventions.*

8. *Are the visual parts of your document integral to your written work (captions, references from text, etc.)?*

9. *Evaluate the strengths and areas to improve in this project. What would you do if you had more time? Be specific. Discuss your progress from the last submission and your goal for the next.*

APPENDIX V: Sample application of the language to a technical report

1. *What is the most important message you anticipate sending to your audience?   What are the most important questions about your topic (not the research process) that you ask yourself as you begin work on this design project or component of a design?*

2. *What is your purpose in writing the report? To what degree are you informing your audience about your topic, and more importantly, do you also have to persuade them your solution or idea is the best solution?*

3. *Describe your audience for this project and how that will impact your writing. To what degree are they knowledgeable about your topic? To what degree might they resist your ideas regarding this topic? What is their likely "counter argument" to your ideas and approach? How do you plan to respond? Note your submitted work and language and level of description will be very different if you assume that your instructor or project advisor (who taught you some of the material and therefore is quite familiar with it) is the reader than if you are told to write for a college-aged general engineering audience.*

4. *Describe your stance in relation to your audience and topic. (Are you a peer to the audience? Do you have specialized knowledge that needs to be discussed before the reader can follow your work? What information are you assuming is known by the audience?)*

5. *How do you plan to organize and develop each section of your project?   How might you introduce your findings, inform your audience, shift from providing information to offering the argument and address audience concerns or questions?*

6. *What particular strategies did you use to form and develop each section of your design report? (Focus on the purpose of each section. What are the expectations of the engineering audience in each section?) How will you most effectively communicate your data – charts, figures, tables, text, equations, etc.*

7. *Even though you are still in the early stages of your project, what conclusions do you anticipate drawing, based on your initial problem statement, project goals and potential design solutions?*

8. *List your sources, and include a brief statement on the source's role in your project.*

9. *What are your plans regarding your work with a Writing Center or peer tutor?*