12 English and Engineering, Pedagogy and Politics

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It is impossible, without giving offense to college authorities, to express one's self adequately on the English production of the engineering students…Most of them can be described only by the word "wretched." [1]

—English for Engineers

While some engineering schools have tried to manage their own writing programs, this chapter concerns itself with a professional and technical writing course created for junior-level engineering students at Case Western Reserve University, but housed, directed, and staffed from the English department. Although the course is a core requirement for all Case engineering majors, including aeronautical, biomedical, chemical, civil, computer, electrical, mechanical and software, it is administered from outside the school of engineering, automatically complicating staffing and curriculum.

These complications do not present insurmountable obstacles, however. To contextualize how we have established a workable system at Case Western, I begin with a discussion of the relationship between English departments and engineering schools in general. I then turn to the specifics of Case University's professional and technical writing course (English 398N). As I explain in more detail, one must be careful to present the course to students as a core engineering skill, one that has direct application to the engineering workplace. Given that audience awareness is key to success in technical writing, I address an effective and successful assignment on audience.[2] Finally, because our course is so large (over 350 students distributed into 18 sections each year!), I discuss the structure and goals of our graduate pedagogy seminar for PTW teachers, English 506. I end by discussing how this symbiosis of graduate and undergraduate courses functions without unnecessary complication, integrating well with the English department's rhetoric program yet distinguished from the required graduate composition pedagogy course.

ENGINEERING SCHOOLS AND ENGLISH DEPARTMENTS

As the professional field of engineering continues to grow, engineering schools frequently reassess core requirements and course curricula for their majors. Under these conditions, adding or even retaining courses focusing on "English production" becomes increasingly difficult. Engineering programs feel pressure from industry as well as competing institutions to produce graduates trained in the latest technology and engineering trends.[3] While an English department might consider an engineering school a unified monolith, the school's needs, wants, and ideas regarding a professional and technical writing program are actually fragmented. This fact should not be interpreted entirely as a fault, considering how varied fields of engineering attach varying degrees of importance to different types of communications.

As a result, engineering schools raise a number of concerns with English programs, the first of which is constructing a curriculum that can best meet the needs of a diverse group of engineering majors. In the past, English departments have attempted to teach similar courses by either using literature as a model for writing or teaching conventional rhetoric. Such approaches have been received unfavorably by engineering faculty or students. If anything, as Robert Connors' synoptic historicization of technical writing instruction made clear, these approaches helped create a "cultural split between English and engineering teachers."[4] That is, engineering students resist curriculum designed around English literature or technical writing scenarios where engineering is not the primary focus.

Although Connors' historical essay places the negative reception of technical writing in the past tense, engineering professors and students alike still refer to technical writing classes "disparagingly."[5] These remarks and the negative attitude towards such courses partly result from a curriculum that does not embrace the needs of a working and researching engineer. If the course is to succeed, the curriculum must be modeled around situations in business and industry where engineers will rely on communication skills to advance their work and careers. However, that criterion does not mean that English departments must compromise their own agendas for writing and communication. Case University's professional and technical writing course (English 398N) requires students and instructors to engage with both rhetorical elements of engineering discourse and the technical and scientific elements of an engineering project. As I will demonstrate, curricular flexibility and additional efforts on the part of the instructor to understand students' research

and engineering interests are essential to integrating engineering topics and interests with professional and technical writing.

PROFESSIONAL AND TECHNICAL WRITING AT CASE: PROMOTING AN "OPEN" CURRICULUM IN ENGLISH 398N

Case Western Reserve University, a private research university located in Cleveland, Ohio, was formed in 1967 by the federation of Case Institute of Technology (founded in 1880 by philanthropist Leonard Case Jr.) and Western Reserve University (founded in 1826 in the area that was once the Connecticut Western Reserve). Ohio's largest independent research university, Case is most highly regarded for its medical school, ranked by *US News* at fifteen and twenty, respectively, in primary care and research, and for its engineering school, particularly the biomedical department, which consistently ranks in the top five among the nation's undergraduate biomedical engineering programs. For these reasons, Case receives the twelfth largest amount of federal research funding among private universities and spends nearly a million dollars *a day* on research.

Given the campus culture and environment, the Case English Department wisely made hands-on research the central concern when designing English 398N: Professional and Technical Communication for Engineers. This advanced writing course is structured around students identifying, proposing, researching, and presenting an engineering feasibility study spanning the entire semester. Research on the subject matter for the project needs to begin immediately. Students work in groups of their choice, preferably of three or four, and begin by completing a project outline form. The form helps break down the problem, the purpose and the audience for their proposed projects. Student conferences are recommended to assist groups in adjusting the proper scope of the project as well as addressing issues of scheduling and time management.

Flexibility and *choice* are central to English 398N. As mentioned, the growth of core requirements for engineering majors has impinged on students' ability to explore other interests. That is why our department invites students to use this PTW course as a chance to investigate a facet of engineering that is either not offered by their school or offered as an elective for which they may not have time. Flexibility is also encouraged regarding the makeup of the student groups. While some in the school of engineering may argue for corralling students into groups comprised of like majors, personal industry experience reveals that practicing engineers spend a large portion of their time collaborating with engineers outside of their own disciplines.[6] Indeed, for new products and solu-

tions to function they often must integrate into other new or existing systems which automatically require cooperation from other engineers.

Pedagogically, students should be asked to identify and select their own research. Granted, instructors do guide and provide counsel for the projects. Nevertheless, instructors should not spoon-feed students prefabricated or "closed" case studies for these long-term projects.[7] Research by such scholars as Barbara Walvoord and Virginia Anderson suggests that allowing students to select their own areas of research can also significantly increase a student's intrinsic involvement in a course.[8] Martin Covington and Sonja Wiedenhaupt define *intrinsic motivation* as the "pursuit of intellectual inquiries which carry no immediate obligation to perform, nor any necessity for tangible payoffs except for the sake of satisfying one's curiosity or for the productive exercise of the mind."[9]

Of course, instructors must continue to attach grades and performance reviews (*extrinsic* motivators) to such assignments. However, giving students an opportunity to pursue areas of interest for which they might not otherwise have time can create a dynamic environment for the course and for class projects. Ken Bain's article in the *Chronicle of Higher Education,* "What Makes Great Teachers Great?" identifies the creation of a "natural critical learning environment" as the foundation for a successful course. Bain explains:

> "Natural" because what matters most is for students to tackle questions and tasks that they *naturally* find of interest, make decisions, defend their choices, sometimes come up short, receive feedback on their efforts, and try again. "Critical" because by thinking critically, students learn to reason from evidence and to examine the quality of their reasoning, to make improvements while thinking, and to ask probing and insightful questions.[10]

The challenge for English 398N instructors is that engineers view different project tasks as intrinsically or naturally more interesting than others. As Dorothy Winsor documents in her landmark ethnography, *Writing like an Engineer: A Rhetorical Education,* young engineers tend to devalue documentation, reporting, and presenting, the very communication tasks which technical writing instructors believe are essential to invention, knowledge production, and productive engineering. Instead, the *invention and creation of material artifacts*—glorified by engineering since the days of Vitruvius—captures our students' attention. Even so, successful invention, discovery, and problem solving require communication skills in the engineering workplace, to say nothing of the public realm. Vitruvius, after all, never would have become the father of Western engineering if he could not write a courtly cover letter to Augustus, the father of all

clients. When students grasp this political and rhetorical lesson, English 398N becomes central to their education and future careers.

A well-designed PTW curriculum, therefore, not only will encourage students to respect all components of an engineering project but demonstrate to students that persuasive communications are not external and extraneous to the engineering process, but rather internal and inherent to their field. To accomplish this crucial goal, instructors must use course assignments to orient students towards their prospective readers. Accordingly, the next section details all of the assignments in the course's semester-long sequence: such print texts as the *project topic form, client letter, proposal, progress report, feasibility study,* and *feasibility study presentation* and such electronic texts as a *web site* and a *web site presentation.*

COURSE ASSIGNMENT SEQUENCE: BRINGING AUDIENCE AND ENGINEERING TOGETHER

By creating a series of persuasive documents throughout the semester, English 398N students learn to develop solutions to the unique challenges and circumstances they encounter as their research progresses. The student research and the semester-long project strive to answer one question: *Is this engineering project feasible?* At the beginning of the semester, the answer to this question is indeterminate. By the end of the assignment sequence, students must present their results, their discoveries, their recommendations, or in other words their answer, to the rest of the class. Each student group must convince the class that their solution and recommendation on how to respond to a particular engineering problem are not only viable but optimal.

The groups' first assignment requires them to begin completing *a project topic form.* The form contains five short categories designed to help students identify: 1) the engineering problem, 2) the purpose of the research, 3) the specific audience, 4) the desired change within that audience, 5) available resources for their proposed projects. As students begin to detail their problem, they must discuss how their engineering studies relate to their proposed project. This cornerstone assignment ensures students witness the centrality of engineering to writing and of writing to engineering. For the best results, instructors should schedule student conferences in order to assist groups in adjusting the proper scope of the project as well as addressing issues of scheduling and time management. While the project topic form asks students to begin analyzing their audience, the actual engineering project retains prominence.

However, as student groups begin completing their project topic forms, instructors need to reinforce the importance of not just investigating a particular engineering problem but also identifying the audience receiving the communications. Focusing on both audience and engineering addresses what I consider a critical concern: Too many textbooks tend to conceive of audience and audience interaction as external to the engineering enterprise. Thus, audience in all its specificity is never adequately treated, or is treated only impressionistically. To compensate for this deficiency, student groups refer to their primary audience as the "client," a common practice in business and engineering.

Since the group projects run the duration of the semester, students are required to nurture relationships with their determined client from the start. Appropriately, before actually drafting their *research proposals,* student groups must introduce themselves to their clients. The group collaborates on a letter in which the students introduce themselves, give an overview of the identified problem, let the client know about the coming proposal, and begin to establish credibility. Although students are given the option of researching and responding to a formal request for proposal or RFP, the student projects are largely unsolicited proposals. In this course, the *client introduction letter* simulates the real-world scenario of drafting an unsolicited proposal. Rife with uncertainty, unsolicited proposals are often much harder to construct than proposals tailored to a specific RFP.

The *project topic form,* the *client letter,* and the actual *proposal* are the first three assignments in the course's interlocking assignment sequence. At the beginning of the course, the instructor must explain each assignment's individual purpose and how the assignments dovetail into each other. The client letter, for example, prepares the audience for the reception of the proposal, while the goal of the proposal itself is to gain the client's permission to proceed with the proposed *engineering feasibility study.* While this sequence does not mirror industry one-hundred percent of the time, it is common for companies to propose studies that report on the feasibility of an engineering project before investing more of their resources.

Generally, the proposal begins with background information and components of the current situation the student group proposes to investigate. The groups elucidate the engineering problem and state their objectives surrounding that problem. The degrees to which all of the components of a standard proposal, such as criteria, method, solution, schedule, cost, conclusions, and recommendations, come into play vary from project to project. Instructors should note that the use of forms, like a standard proposal which may seem "natural" as a basis for instruction in the classroom, are only effective if they have a relevant engineering purpose and situation attached to them.[11] That is, leading instruc-

tion with forms without exigency will not persuade students of the importance of communications in engineering.

Charles Bazerman states the issue succinctly, if sternly: "As teachers, if we provide our students with only the formal trappings of the genres they need to work in, we offer them nothing more than unreflecting slavery to current practice and no means to ride the change that inevitably will come in the forty to fifty years they will practice their professions."[12] To overcome these "trappings," researched engineering projects must teach students how to apply genres to an authentic engineering research project. Again, student conferences are recommended so instructors may manage the projects as they grow. For the purposes of this class and this structure, all proposals end with the request that the audience authorize the group to move forward with a feasibility report. That is, with successful proposals the groups have effectively persuaded their audiences that the identified issue is serious enough or potentially beneficial enough to justify the cost of doing the research for the feasibility study.

After students receive permission to move on to the feasibility report the interlocking assignment sequence contains additional work for the students.[13] Just as in industry, clients want updates on the engineers' work. Student groups are responsible for a formal progress report written for their defined audience. Clients who have invested resources in a project desire ready access to reporting. To that end, student groups are asked to develop a web site that supports their studies. In terms of communicative goals, the site is an efficient means of providing up to date progress information. In industry, many engineering firms use web sites to manage tasks and schedules for their projects. Students prepare and deliver short presentations on the design of their web sites in order to prepare for their upcoming final presentations.

The last stage of the assignment sequence is for each group to deliver a *formal presentation* to the rest of the class reporting on the results found in their feasibility report. Each group must make a recommendation and defend their findings in a question and answer session. Each of these stages presents instructors with the opportunity to teach systematically all of the standard forms for a professional and technical writing course including proposals, progress reports, feasibility studies, and formal presentations. The curriculum for this course avoids promoting the mere "trappings" mentioned by Bazerman by allowing student groups to begin and end with an engineering project containing goals and objectives that are their own.

The assignment sequence for professional and technical writing provides evidence for the "open" versus "closed" approach to the course. In this open model, students identify and investigate a real engineering project and audience. In a closed model with a fabricated audience, however, "if students want

to know more about these fictional readers' motives, values, or attitudes, they find that these important issues are not available. Or, worse yet, they discover that the teacher is making up answers to these important audience-analysis issues off the cuff."[14] Instead of the instructor fabricating audience characteristics the students are charged with researching their real audience just as they would in a professional engineering situation. The open model thus reduces the chance of "pseudotransactional" writing or "writing that is patently designed by a student to meet teacher expectations rather than perform the 'real' function the teacher has suggested."[15] In the professional and technical writing course the "real function" is to investigate the feasibility of an engineering project.

SAMPLE STUDENT PROJECT: A FEASIBILITY STUDY ON LINUX

The above section provided an outline of English 398N's major assignment structure; but to better demonstrate the curriculum for the professional and technical writing course, I have included a sample project and traced its steps. This example is an original student project and is detailed here with permission of the student group.

The Linux Project

In this project, a work group begins with premise of proposing a study to overhaul the university's server platforms because as young software and computer engineers they are dissatisfied with Windows NT. According to these students, other equally robust Linux-based applications could meet the university's needs. Ambitiously, the group wants to explore the possibility of developing their own brand of Linux for the campus. They cite security issues and potential cost benefits as primary arguments for their case and indicate their audience would be the chief information officer and his or her staff. The project form is brief but engages student groups with their engineering ideas.

Project Topic Form

The engineering "problem" you intend to investigate:

The feasibility of replacing the Windows NT servers that support the university's network infrastructure with a student developed system based on the Linux operating system.

Purpose of and need for this project:

Conservative estimates in regards to money lost due to security issues with Windows software are calculated to be in hundreds of millions of dollars. Instead of relying on and waiting for Microsoft to develop and release patches for their software the university could actively develop its own repairs when problems arise. Code for Linux is distributed under the terms of a General Public License (GPL) that states the code is free as long as any improvements or alterations that are made to the code are not hidden from others. Linux is part of a unique on-line phenomenon known as "open source" development where programmers from around the world share their work to improve applications such as Linux. Microsoft, on the other hand, intentionally obfuscates its code from users and developers.

Description of target audience(s):

University CIO, department of computer science and engineering, engineering students, and non-engineering students.

Desired changes in target audience(s):

That the audience will recognize the opportunities to not only save money and reduce network "down time" but also provide students with a unique learning opportunity. The audience will attain a clear understanding of the technical and economic feasibility of this plan.

Available resources to support this project (internet, library, personal, etc.):

Library, university network administrators, software engineering professors, Linux development web sites.

Student Conferences

The course instructor and the student group meet to confer on their project. During the meeting, the group specifies that they want to replace the server platform with Linux not only to make it more secure but to integrate it into the global open source software movement. The group will need to define this movement to all members of their audience and explain why it would benefit the school to become a part of it. The instructor suggests that the option of developing their own brand of Linux could be difficult to maintain long term. The team therefore decides to explore existing Linux packages, such as Red Hat and SuSE, as an option. They also expand their identified audience beyond members of the IT department to include high-level administrators who would also be involved in the decision-making process.

Client Letter

The letter introduces group members as computer and software engineering students, who have recognized a potential security problem in the current system. The group believes that a Linux implementation may save the school money as well as bring the engineering school recognition for the innovative project. They inform their audience members about the forthcoming proposal, when to expect it, and that they hope to gain authorization to complete a feasibility report.

Proposal

The group proposal discusses the background information on the university's use of NT and some of the known security issues surrounding that technology. Its objectives include eliminating security breaches, cutting down on maintenance and down-time, and increasing network compatibility. For their proposed feasibility study to succeed, the students will have to examine statistics on Linux security, investigate other institutions or businesses that have implemented it, determine initial costs, long-term maintenance costs, training needs, and time to implement to name a few. The work done towards developing the proposal helps groups identify their criteria and objectives for success with the final projects. In short, the group begins to get a clear sense of what they will have to uncover for their study to succeed.

Progress Report

After the students turn in their proposal and the instructor authorizes them to proceed with their feasibility report, communication with the client becomes even more critical. The progress report is assigned in an effort to demonstrate that business and engineering groups are held accountable for their work. In this particular case, the audience for the report is understood to be the university CIO but students must bear in mind that anyone on staff could potentially be a reader. Again, since student groups are preparing engineering planning documents for each assignment they should be discovering all of these potential audience members. Instructors warn that a manager can ask for a "progress report" at any time and while people are generally pleased to hear about past success they are more interested in whether or not the group will meet upcoming deadlines and if the project will finish on schedule.

Website

A great deal of communication occurs online, and many engineering projects are managed via the internet or corporate intranets. While the web portion of the course is in place for this reason, it also requires students to conceptualize how to organize and structure their data in a digital environment. The group members will need to ask themselves questions unique to a digital environment such as, "What is the first thing the audience for this project will want to see if they come to the site for a quick update?", "Where is all of the empirical data going to be placed?", "How does the audience contact the group and who is in charge of what parts?" At this stage, it may benefit the student groups to dissect other web sites, particularly those related to similar engineering issues. Students will want to discuss what makes some sites succeed and others fail in terms of navigation, organization, and information availability. Engineers are often managing large data-sets and this assignment helps introduce that task.

Website Presentation

The web assignment is an excellent opportunity to discuss the power of communication as it relates to the specific group projects as well as to give student groups the opportunity to keep abreast of their peers' research. Instructors may find it advantageous to ask the groups to give informal presentations on their web sites so they may explain their communication and hierarchy decisions to the rest of the class. This is an effective way to generate dialogue between the student groups. This presentation exercise introduces the student groups to presenting as a team, which many of them have not had to do. In the engineering workplace, teams often present as a group and not individually. Also, instructors should note that with the web presentation coming first, the final presentations on the feasibility study recommendations generally excel due to the additional practice.

Feasibility Study

Finally, the feasibility report is due. In the Linux case, instructors can expect to see a detailed cost breakdown in terms of servers, initial installation fees, software fees, maintenance, additional personnel, training, and total cost of ownership models. There also should be a convincing amount of data on security benefits realized by other institutions or corporations, unbiased testing centers and user testimony. There should be a concise timeline for installation

and implementation. Naturally, there will be a recommendation on whether or not to develop a brand of Linux, buy and implement an existing Linux package, or leave the NT system unchanged. Instructors advise the students that in business feasibility studies are researched and written by engineers so companies do not make costly investment mistakes. That is, despite all of their hard work and fondness for Linux, student groups may conclude that the best solution is to stay with the present system.

Feasibility Study Presentation

All of the group's findings are reported to the class in the final presentation. Instructors may wish to create a setting that is more formal than casual and place a good deal of importance on the groups persuading their peers that their data and their recommendations are sound. Peer groups have the opportunity to challenge the presenting groups and their recommendations in a question and answer session.

INTEGRATION WITHIN THE RHETORIC CONCENTRATION AND THE TRAINING OF PTW INSTRUCTORS

Despite its careful calibration, the curriculum design for English 398N would have proven ineffective, if the Case English department had not implemented an effective instructor training and credentialing system. The question we faced is how can we train fledgling rhetoric scholars, well-versed in Aristotelian concepts and the uses of *logos, ethos,* and *pathos,* to teach engineering students communication skills? The problem is complicated by considering who is most likely to teach such a professional and technical writing course. With even smaller-sized engineering programs placing heavy teaching demands on English departments, that demand is often met by graduate students (at Case the number of students enrolled in engineering necessitate offering eighteen sections of the course a year with approximately twenty students per section). An advanced professional and technical writing course presents young instructors, most of whom have only limited experience teaching composition courses, with many new challenges, including a diverse engineering audience as well as advanced software and technology.

According to Connors, as technical writing "grew up" in the second half of the twentieth century, the "age-old battle raged on between those who wished to teach technical students to write and those who wished to teach them to read and appreciate great literature."[16] Despite the growth and acceptance

of professional and technical writing programs coexisting with English departments, a divide can be felt between those who teach writing and those who teach literature. This national trend is evinced primarily by the low number of senior faculty involved with or interested in teaching professional and technical writing in traditional English departments. For scholars pursuing careers in professional and technical writing, the struggle for acceptance and legitimacy within an English department remains challenging. But, as members of PTW programs are discovering, there are opportunities to effectively integrate with and contribute to English departments without being dismissed as "second rate."[17]

For example, Case's graduate technical writing pedagogy seminar is not a freestanding anomaly without ties to our department's other research foci. In fact, for a PTW pedagogy seminar and a PTW curriculum to secure reception as legitimate scholarly activities worthy of *any* English department, both must be understood in terms of that department's larger offerings. To illustrate, the Case English department offers a concentration in "Writing History and Theory," referred to as the WHiT program. This program resembles other rhetoric programs which have been gaining momentum in academia; but because it also examines the practice if writing as *historically, culturally,* and *technologically* situated, it can more easily accommodate a professional and technical writing pedagogy course.

PhD students in the WHiT program study rhetorical theory and history, the history of writing and publishing practices, authorship, linguistics and semiotics, and digital communication theory. The program examines relationships between textual elements such as word-image interface, lexical and grammatical choices, document design, and global and rhetorical issues, such as text production and circulation, copyright, audience, ethics, and rhetorical effect.[18] Equally important, especially for PTW purposes, the program allows graduate students to develop an in-depth understanding of the way that writing functions not only in cultures and society but in individual disciplines, organizations, and institutions.

Graduate students interested in WHiT, must enroll in a course on rhetorical theory, which serves as an overview and a backbone for the program. Beyond this core requirement, the program itself is comprised of three general areas designed to provide students with the necessary theoretical and historical foundation on the study of writing: history of writing, digital writing, and linguistics and semiotics. As I will demonstrate, the WHiT program is an excellent opportunity not only to prepare graduate students for the specialized classroom of professional and technical writing but also to promote the examination of engineering as a rhetorical practice and analyze the unique discourse of the engineering discipline.

Most English departments, however, offer "standard" pedagogy courses, designed to prepare graduate students to teach freshman composition. This practice can raise concerns from faculty invested strictly in literature or composition studies about the need for a second, separate seminar for professional and technical writing. Indeed, whether in the WHiT program or the literature-based concentration, all graduate students at Case are required to enroll in the pedagogy course titled "Rhetoric and the Teaching of Writing," designed to ready graduate students for the composition classroom. Most standard pedagogy classes focus on graduate students gaining an understanding of major themes in composition theory in order to develop a set of coherent, historicized pedagogical practices. Typically, the primary goals will include developing an understanding of the major trends in composition scholarship and pedagogy, and to explore a variety of pedagogical strategies for writing classes, including assignment sequencing, assessment techniques, and student conferencing.

At Case, this course challenges graduate students to develop a research project proposal of their own that demonstrates engagement with current issues in composition and rhetoric as well as constructing a syllabus and assignment sequence to be used in a future writing course. Unquestionably, these goals are so broad that an English department may raise legitimate concerns regarding redundant curriculum in a second pedagogy course, especially when graduate students are calling for a larger selection of course offerings. Consequently, a professional and technical writing pedagogy course should be distinctive and separate from standard pedagogy offerings as well as advance the WHiT agenda.

English 506, Teaching Technical and Professional Communication, sets itself up first as a WHiT seminar with a strong scholarly agenda and second as a practical guide to instructing professional and technical writing. This graduate course strives to align itself with the general mission of the WHiT program, promoting topics that include studies in rhetoric of science and technology; history of professional and technical writing; critical approaches to technology; ethics and law (e.g. copyright and intellectual property); collaboration and management of writing projects; document design theory (print and electronic); theories on digital reading and writing; engineering and science concentrations; and, finally, practical matters of curriculum design, assignments, writing evaluation and course management.

In addition, a portion of each seminar is set aside to address practical pedagogical issues. Among the requirements for the course, graduate students must observe at least two professional and technical writing classes. Afterwards, students reflect on those observations in the seminar and ask questions of the instructor for clarification on class proceedings. Graduate students are responsible

for reviewing a portfolio of engineering writing and evaluating the work with their peers from the pedagogy course.

General pedagogy courses such as Case's challenge graduate students with scholarly activities such as researching and proposing new approaches to composition theory or historicizing the growth of composition and rhetoric courses. Similarly, the professional and technical writing pedagogy course must demonstrate a unique scholarly agenda. The course taps into the rich field of the rhetoric of science by expanding the term more broadly to the rhetoric of science, technology, and engineering. In his introduction to *Landmark Essays on the Rhetoric of Science,* Randy Allen Harris defines the rhetoric of science as "the study of how scientists persuade and dissuade each other and the rest of us about nature, – the study of how scientists argue in the making of knowledge."[19]

As an established field, therefore, the rhetoric of science provides a starting point for analyzing and discussing technical writing. Graduate students will be given the opportunity to explore the similarities and differences between scientific and engineering rhetoric and discourse. Discoveries and inventions, Harris maintains, need to be analyzed and argued not only among the scientific (and engineering) community but amongst the "rest of us" too.

Besides such notables as Harris describes, numerous other works augment the exploration and development of the curriculum for Case's PTW pedagogy course. Prominent figures include Alan Gross, Jeanne Fahnestock, Dilip Gaonkar, Carolyn Miller, and many others whose research provide avenues into the study of what degree persuasion plays a part in science. Charles Bazerman's *The Languages of Edison's Light* is an excellent means of examining the role rhetoric plays in engineering and invention. Bazerman artfully excerpts pages from Thomas Edison's journals, patent applications, and personal letters which all "reveal the rhetorical activity of the discourse" surrounding Edison's discoveries.[20]

Such texts are necessary. Our graduate students, who have the opportunity to teach engineers, report struggling with convincing the class of the value of this "rhetorical activity." English composition instructors as well as the students in their classrooms are generally more comfortable with the notion that a "right" answer is the answer which is best argued. The transition to a professional and technical writing classroom comprised of engineering students can challenge this belief. Engineers are more likely to search for a concrete and proven "right" answer or the equivalent of some "transcendent absolute truth" in the spirit of Plato.[21] In short, the "brute facts" are valued.[22] In contrast, Edison's patent applications took advantage of the patent review system in that Edison argued "based on the novelty of a conception rather than on its proven viability, usefulness, or market value."[23]

Regardless of these industry realities, engineering students often have less patience for rhetorical practices that debate what is possible, probable, or even most likely to be true. Consequently, while the study of rhetoric forms an effective foundation for preparing graduate students to teach the course, overtly promoting rhetoric to a classroom of engineering students can meet with a cold reception. Graduate students learn that their studies of rhetorical theory, especially as it relates to scientific activity, provides valuable insight to a new community of engineering students but that explicit rhetorical terminology cannot serve as the structure for the course. Indeed, most of their rhetorical strategies focus on establishing *ethos* for themselves as authoritative instructors. My past experience as a senior software engineer at Marconi Medical Systems, a medical imaging company and a subsidiary of Philips Electronics, probably carries more weight with my students than my PhD in English.

PTW instructors can overcome student resistance and skepticism, however, by keeping their classes "user-friendly." English 398N's combination of the project topic form and assignment sequence is a tested method for maintaining a "project-centered" focus, one which increases intrinsic motivation for the course. Indeed, it is the "open" curriculum of the course that assists PhD students specializing in rhetoric with succeeding in their teaching.

Despite significant progress over the last several decades, arguments are still being made that "the technical communication course should be taken out of the hands of English teachers."[24] Given the persistence of this attitude, instructors must be equipped to engage with engineering and their engineering students' projects. Consequently, pedagogy courses that specifically address the needs of individuals preparing to teach professional and technical writing courses are essential to graduate students.

Such courses are also a welcome addition to rhetoric programs such as WHiT so that the programs may succeed in their missions to prepare graduate students for the academic job market, which increasingly favors candidates possessing the ability to teach in different areas including composition, linguistics, and technical writing. Case University's two-part strategy of redesigning the professional and technical writing course's curriculum (foreground engineering situations, research, and interests in PTW courses and initiate a new pedagogy course for English graduate students) is the best method for enhancing and sustaining the complex relationship between English departments and schools of engineering.

This improved collaboration would benefit not only the academy but the nation. As Hurricane Katrina graphically showed, our country's infrastructure has become disgracefully derelict. More than ever, we need civic-minded engineers who can make their case to government and industry, voters and con-

sumers. Effective professional and technical writing instruction, therefore, has become a necessity, not a luxury. As Samuel C. Florman observed a decade ago:

> By creating the engineers of the future, educators can transform the world in meaningful ways. Yet engineering education cannot flourish in the absence of popular regard and government support. We have something like a Catch-22 here. Appropriate education is needed to further a renaissance in engineering, but a renaissance in engineering is needed to inspire steps toward appropriate education. Someone must break this paralyzing cycle.[25]

Public works require public words. As the ancient Romans realized, the orator and the engineer are alike. Both deal with *res publica*—the orator by constructing arguments, the engineer by arguing for construction. To prevent our own republic from crumbling, English departments must build bridges between rhetoric and engineering. The best way, as outlined here, is to offer an open and flexible professional and technical writing curriculum.

NOTES

[1] English for Engineers. (1915, June 19). *Engineering Record* p. 763. quoted in Connors, Robert J. "Landmark Essay: The Rise of Technical Writing Instruction in America." *Three Keys to the Past*. Eds. Teresa C. Kynell and Michael G. Moran. Samford, CT: Ablex Publishing, 1999. 175.

[2] Here I am referring to the three best-selling textbooks frequently used for the professional and technical writing classroom by Paul Anderson, John Lannon, and Mike Markel. See:

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[3] Computer science is an excellent example of an engineering field struggling to keep pace with growing technology. Traditionally, C++ serves as the core computer language taught in introductory courses and it is used or referenced throughout the remainder of a student's education. Over the last five years, schools have been abandoning C++ in favor of Java. However, even more recently schools are experimenting with Microsoft's newer language C# (pronounced C sharp). All of these languages are object-oriented in nature but each possesses

unique attributes. Regardless of which language a school selects, companies will continue developing applications with all three and engineering schools will feel the pressure to keep pace. Consequently, these demands cause reevaluations of a school's course offerings and often force courses out of a system.

[4] Connors, Robert J. "Landmark Essay: The Rise of Technical Writing Instruction in America." *Three Keys to the Past.* Eds. Teresa C. Kynell and Michael G. Moran. Samford, CT: Ablex Publishing, 1999. 176-7.

[5] Ibid. 178.

[6] I can testify to this fact personally. For three years I worked as a senior software engineer for a major medical company. Companies such as my employer hired engineers from most of the major engineering disciplines. In order for our software applications and other company initiatives to integrate with the rest of our products and services, our software engineering team needed to collaborate and communicate with other engineering disciplines including electrical and biomedical engineering. Also, it should be noted that guideline "d" on page two from The Accreditation Board of Engineering and Technology criteria states students must attain: "an ability to function on multi-disciplinary teams."

[7] In their article, "Genre, Rhetorical Interpretation, and the Open Case: Teaching the Analytical Report," Sheehan and Flood assert that, "To situate their students, technical writing teachers have typically turned to closed case assignments" (21). Their research instead advocates "the use of open cases in which students use the analytical report genre to interpret and study technical issues in a workplace where they are already situated – the university campus." In, *IEEE Transactions on Professional Communication,* Vol. 42, No. 1, 1999, 21.

[8] Anderson, Virginia and Barbara Walvoord. *Effective Grading: A Tool for Learning and Assessment*. San Francisco: Jossey-Bass, 1998.

[9] Covington, M. V., and Wiedenhaupt, S. "Turning Work into Play: The Nature and Nurturing of Intrinsic Task Engagement." R. Perry & J. C. Smart (Eds.), *Effective Teaching in Higher Education: Research and Practices*. New York: Agathon Press, 1997.

[10] Bain, Ken. "What Makes Great Teachers Great?" *The Chronicle of Higher Education*. April 9, 2004. vol. 50, issue 31 pp. B7.

[11] Connors, Robert J. "Landmark Essay: The Rise of Technical Writing Instruction in America." *Three Keys to the Past*. Eds. Teresa C. Kynell and Michael G. Moran. Samford, CT: Ablex Publishing, 1999. 180.

[12] Bazerman, Charles. *Shaping Written Knowledge: The Genre and Activity of the Experimental Article in Science*. University of Wisconsin Press: Madison, Wisconsin, 1988. 320.

[13] All assignments are graded by the instructor and passing grades indicate to students they are to proceed to the next assignment. Although student groups

are not required to formally submit their research to their identified audience, some groups have decided to share their findings.

[14] Sheehan, Richard J. and Andrew Flood. "Genre, Rhetorical Interpretation, and the Open Case: Teaching the Analytical Report." *IEEE Transactions on Professional Communication,* Vol. 42, No. 1, 1999, 23.

[15] Spinuzzi, Clay. "Psuedotransactionality, Activity Theory, and Professional Writing Instruction." *Technical Communication Quarterly* 5, no. 3 (1996): 295.

The term "psuedotransactionality" was originally coined by Joseph Petraglia. See: Petraglia, Joseph. "Spinning Like a Kite: A Closer Look at the Pseudotransactional Function of Writing." *Journal of Advanced Composition* 15 (1995): 19-33.

[16] Connors, Robert J. "Landmark Essay: The Rise of Technical Writing Instruction in America." *Three Keys to the Past*. Eds. Teresa C. Kynell and Michael G. Moran. Samford, CT: Ablex Publishing, 1999. 189.

[17] Connors explains that prior to the formation of a technical writing discipline, "there was no glory and no real chance for professional advancement" if an English professor decided to pursue teaching communication to engineers. It was, therefore, assumed that if a professor was teaching technical writing, he or she was forced into the position and perceived as "second rate." Connors, Robert J. "Landmark Essay: The Rise of Technical Writing Instruction in America." *Three Keys to the Past*. Eds. Teresa C. Kynell and Michael G. Moran. Samford, CT: Ablex Publishing, 1999. 178.

[18] Case Western Reserve University English Department "English Graduate Concentration in Writing History and Theory" <http://www.case.edu/artsci/engl/html/whit.html>

[19] Harris, Randy Allen. *Landmark Essays on the Rhetoric of Science*. Mahwah, N.J: Hermagoras Press. 1997. xii.

[20] Bazerman, Charles. *The Languages of Edison's Light*. Cambridge: The MIT Press, 1999. 4.

[21] P. Bizzell & B. Herzberg (Eds.) *The Rhetorical Tradition: Reading from Classical Times to the Present*. Boston: Bedford/St. Martin's, 2001. 81.

[22] Alan Gross bluntly remarks, "the 'brute facts' themselves mean nothing; only statements have meaning, and of the truth of those statements we must be persuaded." Gross, Alan G. *The Rhetoric of Science*. Cambridge: Harvard University Press, 1996. 4.

[23] Bazerman, Charles. *The Languages of Edison's Light*. Cambridge: The MIT Press, 1999. 85.

[24] Connors, Robert J. "Landmark Essay: The Rise of Technical Writing Instruction in America." *Three Keys to the Past*. Eds. Teresa C. Kynell and Michael G. Moran. Samford, CT: Ablex Publishing, 1999. 192.

[25] Florman, Samel C. *The Introspective Engineer*. New York: St. Martin's Press, 1996. 183.

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