

11 Introducing a Technical Writing Communication Course into a Canadian School of Engineering

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INTRODUCTION

Introducing technical communication into the curriculum of a Canadian engineering school has created its own set of challenges, particularly when some of the engineering professors continue to believe, as Mathes, Stevenson and Klaver suggested in 1979, that the subject is best taught by engineers. Doing so proved to be only modestly successful at my school. Yet, even without the push to use engineering faculty as my assistants, establishing one's authority as an expert in a non-engineering field can create a very real tension between the insider (the engineer) and the outsider (the technical communication instructor). As a female and as a non-engineer, I have occasionally felt like the "outsider." After all, a school of Engineering may well be the epicenter of what McIlwee and Robinson brand the "culture of Engineering," a culture that is both male-dominated and seemingly closed to the outsider.

The false perceptions of the engineering students only complicate the issue. On the one hand, many still perceive the subject as the study of "English," seemingly unaware that analyzing literature and writing essays about it is an activity quite different to writing engineering reports and giving technical presentations about technical problems and engineering designs. On the other hand, some students consider technical communication to be nothing more than grammar and composition, packaged though it may be in technical readings and exercises. Even some engineering professors also adhere to the latter view, and are surprised to discover that the field has grown to be such a rich and varied one (and one, incidentally, that demands the talents of a communication specialist).

Nevertheless, in spite of these misconceptions and challenges, I have found that, if an instructor can focus on the application of the technical communication field to the engineering profession, then many of these erroneous ideas can be dispelled. Indeed, over the years, the technical communication course at our school has met, if not anticipated, current trends within the engineering profession, exemplified most notably by the expectations of the national

accreditation board. And this growing awareness of its relevance to the profession has resulted in the course's becoming more and more integral to the Faculty of Engineering at the same time as I have become less and less the outsider.

For example, in the 1970s, many potential employers simply wanted engineering graduates to be able to write more effectively, and the perceived absence of such a skill prompted complaints to the administrators of our engineering school. To address that need, our school then introduced a technical communication course in 1982, and students' writing skills noticeably improved. Later still, in the 1990s, the workplace had become more team-based, so the accreditation boards of both the U.S. and Canada urged engineering schools to introduce collaborative projects into the curriculum, partly because these projects helped to nurture the skills that were in high demand, such as interpersonal and project management skills. At the University of Manitoba, the technical communication course was already team-based, and thus served as a "prequel" to an emerging and significant trend – the inclusion of collaborative projects and instruction in teaming skills in the engineering curriculum.

Thus, to be successful, a technical communication specialist should be prepared to both adopt and adapt engineering practices. As this essay will discuss, the technical communication course offered in the engineering school at the University of Manitoba can serve as a case study to show how the tension between "insider" and "outsider" can be ameliorated and, more importantly, how the synergy between the practice of engineering and the communication of that practice can be effectively nurtured.

THE SYNERGY OF THE ENGINEERING FACULTY AND THE COMMUNICATION SPECIALIST: MEETING THE CHALLENGES AND ESTABLISHING AUTHORITY

When the technical communication course was first introduced as a compulsory component of the undergraduate program at my institution, we first thought that I would coordinate the delivery of the course as well as teach it. Given that at the time we had close to two hundred students per term, I couldn't do everything on my own, so we initially used engineering faculty as "assistants"; in other words, we did what Mathes, Stevenson and Klaver suggested we do. Such an arrangement was short-lived, to say the least. After one or two terms of teaching and marking the written assignments, most of these colleagues withdrew from the experiment, eager to return to their own courses and their own research. The technical communication course, in their view, was just too "demanding" and "time-consuming." In this sense, then, my colleagues

were quite willing to acknowledge my expertise and “leave me to it.” We then hired a part-time assistant for me, generally a graduate student in English, and, for a time, a graduate student in Civil Engineering. Interestingly enough, this latter arrangement worked surprisingly well, presumably because of his commitment to the course and to the principle of teaching engineering students the basic communication skills. After he graduated, we once again hired a series of assistants who had more of a humanities background.

However, in spite of the faculty’s obvious willingness to leave me to teach the course, my place within the faculty hierarchy has been, at times, an ill-defined one, and one that occasionally even baffles my colleagues. For example, when I applied for tenure or promotion, they were at a loss as to how to evaluate me. They found they had to rely on the expertise of others in the technical communication field or in related fields. In Canada, that can at times be problematic because there are so few senior professors of technical communication. Most are instructors in two-year colleges or, if they do have a university appointment, they are usually junior members of the faculty – quite unlike my position at my school where I am now a fully tenured associate professor.

Another area where my position in the faculty has not always been clear is program and curriculum development. Over the years, even though the engineering faculty has frequently discussed the importance of building on what the technical communication course provides, there have been times when decisions about the curriculum have been made that did not include my input. Even today that happens, partly because these are professional engineers who are quite used to making decisions on their own; indeed, they expect to. They also see themselves as problem-solvers, and will therefore take what they consider as appropriate action to solve the problem. Once I remind them that I am the one with the “English” expertise, they will usually willingly accept my input and defer to my judgment in most matters of content and delivery.

In fact, establishing my authority and the place of technical communication within the engineering program has become easier over the years; now, there is much more of a cooperative effort between my engineering colleagues and me than there was at that time, although I have also had to work hard to promote both the field and myself. I have done this by joining engineering-related societies (like IEEE) and becoming an active member in them; by speaking to department meetings; by inviting colleagues into the class to observe what I do; by talking to them as often as I can about technical communication in general and the course in particular. They, in turn, keep me informed as to any developments within engineering that will impact what I do in the course.

So, all in all, the effort to introduce technical communication into the engineering undergraduate curriculum has been a worthwhile one. Furthermore, developing the technical communication course so that it accomplishes what both the profession and the faculty expect of it, while daunting at times and certainly time-consuming, has been an exciting challenge over the years. Now, the effort to integrate communication skills into the more senior level courses, including the graduation project, exemplifies the kind of synergy that is possible between communication specialists and engineering faculty (and, incidentally, the students, the end-users).

THE PROFESSIONAL CONTEXT: TECHNICAL COMMUNICATION AND THE PROBLEM-SOLVING MODEL

We can define engineering as the application of highly specialized, and technical, knowledge to a practical end that either remedies a problem or represents the “best” solution to a problem, usually within a set of defined constraints. We can then argue that engineers are essentially problem solvers. Following the Mathes and Stevenson model, enunciated in their book *Designing Technical Reports*, we can also say that most communication in the professional context of engineering comes about because of an engineering problem, a problem that someone has determined needs to be addressed (31). Thus, learning a problem-solving strategy – particularly one that helps to illustrate the connection between engineering design and the communication that must accompany it – will help students prepare for their professional lives in a way that a less practical approach might not achieve. While providing students with clear-cut steps to follow to accomplish their tasks, such a strategy must nonetheless be flexible enough to allow students to move freely between the steps, to pause and reflect, to test and explore, but without the kind of “lock-step” procedure that may stifle creativity and lead to a less satisfying conclusion (Winkler 119).

Some years ago, I began to develop such a problem-solving strategy after I realized that the processes used to describe both the writing practice, on the one hand, and the scientific and engineering practice, on the other, were remarkably similar, so much so that, in using the old scientific formula of “observe, test and solve,” I could effectively talk to my engineering students about how they could proceed with their writing tasks. Indeed, these basic steps mirror those described by many other scholars who talked about the link between communication and problem solving (such as Barton and Barton; Dunkle and Pahnos; Flower; Maki and Schilling; Moran; Robinson; Souder; Tryzna and Batschelet;

and Winkler); those who discussed engineering design (such as Krick and Beakley et al); and those who studied engineering problem solving (such as Woods et al). These steps include: define the problem; brainstorm possible solutions to the problem; define the criteria to be used to assess any options offered as solutions to the problem; develop the prototype of a possible solution; test the prototype; and, finally, create the final product or document.

Eventually, I developed this connection into a more formal model that my students abbreviated to “C.A.T.S.,” the acronym for Classify, Analyze, Test and Solve, as illustrated below (“Two Hats”; “Problem Solving”; “Implementing Collaborative Projects”; *Handbook*). This problem-solving model, stressing as it does both the methodology and the process, as Plants et al suggest, guides students as they work so that they are able to proceed fairly quickly and effectively. At the same time, the model is flexible, giving students the option to go back and forth between the steps or skip steps altogether. All in all, this model highlights the importance of problem solving to the *entire* engineering activity, and it is in this professional context that the model is so useful (Parker “Case Study Workshop” 40, Halstead & Martin 245).

Procedure/Activity	Engineering Design	Communication Design
C – Classify	<ul style="list-style-type: none"> • Problem Definition • Gathering Data • Brainstorming 	<ul style="list-style-type: none"> Audience Analysis Purpose Formulation
A - Analyze	<ul style="list-style-type: none"> • Developing Ideas/Possible Solutions • Examining Technical Alternatives • Developing Working Solutions 	<ul style="list-style-type: none"> Communication Alternatives (patterns, outlines)

(more)

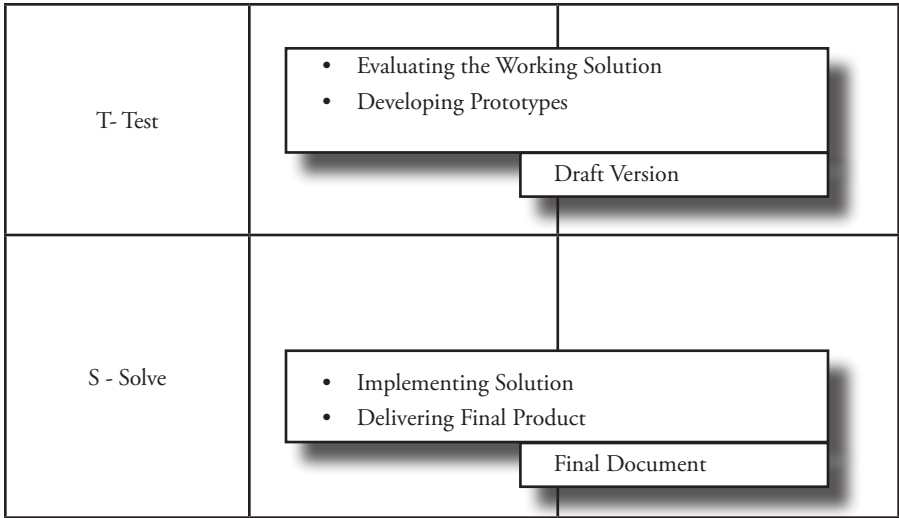


FIGURE 1: PROBLEM SOLVING IN ENGINEERING AND COMMUNICATION DESIGN

THE ACADEMIC CONTEXT: A TEAM-BASED COURSE AND THE COLLABORATIVE MODEL

Of course, the problem-solving model also has a place within the academic context, since it highlights at least one of the skills a prospective engineer must have. So, too, with a team-based course, such as the one offered at my school, which helps students develop the skills they will need as practicing engineers in an increasingly team-based workplace (Reimer 94, 99; Sageev and Romanowski 688; Vest et al 14-15). Indeed, both the Canadian Engineering Accreditation Board and its American counterpart, the Accreditation Board of Engineering and Technology, have come to recognize the need for such skills and have recently argued that collaborative projects should be integrated into the undergraduate engineering curriculum because such projects develop the requisite skills, the so-called “soft skills,” such as project management, and interpersonal and teamwork skills.

In working on a team-based project, for example, students will work collaboratively through a “series of stages ranging from initial brainstorming to final report writing”; as they do so, “they become acquainted with such processes as participating in meetings, demonstrating leadership, and providing useful feedback to their colleagues” (Ingram and Parker “Influence of Gender” 7). Indeed, fairly recent work on the subject of collaboration, including Mary Lay’s

and my own, has supported the view that such projects help students to learn the values and protocols and language of their chosen profession. They do so by engaging in a process (collaboration) that ultimately leads to a product (a final report). If the process of communication instills the social element so critical to the success of the team's interactions, then the product of that communication represents the intellectual or learning outcome of that process. In this way, students become more familiar with their profession's discourse community, since they are researching an engineering topic and writing about it from an engineering point of view. Just as importantly, by writing and working as a team and by generating a product, students also become more "communicatively competent," more ready to assume their professional status (Bogdanowicz 1).

For these reasons, and also partly because I felt that such projects would encourage intelligent, but generally quieter, students to become more actively engaged in both the class and their own learning, I had already introduced collaborative projects some years earlier in the technical communication course offered at our school. Unlike their other engineering courses, the technical communication course enabled them to engage in a project where social processes (such as interpersonal and teaming skills) were as important as the intellectual ones. Along the way, at the same time as they learned more about an engineering topic, students would also be developing their oral and written communication skills.

However, most definitions (such as those of Allen, Blyler, Duin, and Flynn) tend to focus primarily on the social nature of collaboration – as I also did in some of my earlier work, defining collaboration as “a series of interactive activities that [are] social in nature” (“Influence of Gender” 9). The team's interactions help to provide the necessary “social knowledge” (Ingram and Parker “Gender and Modes” 34), gained as it is by “socially constructed” tasks (“Influence of Gender” 8). But to focus solely on the team and its individual members is to minimize the importance of what they produce, so this emphasis on its social nature should not ignore other important elements that will help to define and describe collaboration. While such factors as decision-making, responsibility and interaction are critical to an understanding of collaboration, so, too, is the purpose or the goal of collaborating; namely, to produce a document that, as a finished product, must “speak” for itself. Thus, the collaborative model that I will present here will include three essential elements - the project, the team and the collaborative process – all intertwined as illustrated below:

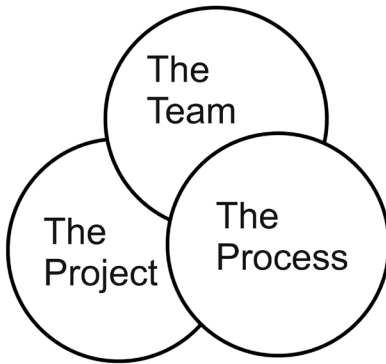


FIGURE 2: THE COLLABORATIVE ELEMENTS

The “project” will be a document or report; in other words, a finished product. It is also a product that someone else has requested and needs. Since, in technical communication, it is always reader-centered (and it is often a client who is the reader), this product will be the goal, a necessary outcome, of the collaboration. The students who interact so they can reach that goal are clearly the “team,” and the “collaborative process” is the way they will reach that goal. Leadership theory likewise speaks of a variety of needs that relate to these elements. The project, for example, entails task needs or the jobs to be done; the social and emotional needs concern the team; and the procedural needs, such as how to accomplish the tasks, relate to the process of collaboration (Morgan 205-206). Together, these elements will describe what collaboration is within the academic context of an engineering classroom.

Nevertheless, introducing these collaborative projects into the technical communication course (and gradually changing the course into a team-based one) was not an easy task, and certainly not as straightforward as I had at first envisioned. For one thing, a classroom does not, and cannot, replicate the workplace, where things like group maintenance and team unity, the process, are less critical than producing what needs to be done, the product (Dannels 152 Freedman and Adam 402-418, Freedman and Artemeva 5). As well, the classroom imposes its own set of restrictions, from the physical space available for team meetings to the constant presence of an authority figure, namely, the professor. In the final analysis, perhaps all we can try to do, as Artemeva et al have suggested, is help our students transfer the skills we teach to the workplace (“From Page to Stage” 313).

But the greatest challenge confronting a professor who wants to introduce team projects into the classroom is evaluation. Initially, I believed that marking team reports would be less work than marking individual ones. In real-

ity, though, what needs to be graded is not just the product itself, but also each individual team member who helped to create it. In fact, evaluation is perhaps the single most challenging aspect of collaborative projects, as I discuss at greater length in an earlier paper (“Evaluating Collaborative Projects”). And group projects certainly do not reduce your workload; rather, they increase it.

But a collaborative model and a team-based course do provide flexibility within the academic context. Unlike the more prescriptive lecture format, a team-based course demands that students have enough in-class time for group work. Once the professor has provided both the overview of the tasks at hand, such as reviewing each other’s documents, as well as the framework needed to complete the work, students then have the chance to be actively involved in their own learning. Just as the workplace demands that teams be self-contained units, so, too, does the technical communication class. Students are expected to work on their own, resolve problems on their own, produce on their own. In other words, to be effective and to make that transfer of skills to the workplace possible, student teams should have roughly the same degree of autonomy as a workplace team would have.

Having said that, however, it is nonetheless important that the professor, unlike an employer, be available to intervene as needed. After all, these are still students who, unlike their professional counterparts, have no salary to compensate them for a poor group experience. Their grades depend on the smooth functioning of the team within the context of the classroom. Therefore, they shouldn’t ever feel that they must “sink or swim”; rather, the professor is there to help them achieve their goals.

THE SYNERGY OF THE PROFESSIONAL AND THE ACADEMIC CONTEXTS IN THE TECHNICAL COMMUNICATION CLASS

The technical communication course that is offered at our school has certainly evolved over the years, but it has faced many challenges along the way, not the least of which is helping students to develop the “soft skills” they will need when they graduate. While I would argue that the problem-solving model described here provides students with a way of approaching their communication and design problems whether they are in the classroom or the workplace, the collaborative model reflects, rather than duplicates, the realities of the workplace. It nonetheless provides students with the kinds of skills they will need to succeed as professional engineers, such as project management, interpersonal skills and teamwork skills. Together, these models help to create a synergy be-

tween the professional and the academic contexts, a synergy that is as important as it is unique.

A representative series of tutorials that I have developed will illustrate this process. Organized according to the technical elements of the project, the communication elements and the team elements, the tutorials guide the students as they produce a document that both reflects the practice of the workplace and incorporates the attributes expected of the engineering graduate. For example, once students have either been assigned to a team according to their majors or have chosen their own team according to their common interests – and these team assignments occur early in the term, usually within the first two weeks of classes – we begin by detailing the two models and offering examples of how they work.

The early technical communication tutorials then focus on the team element and offer strategies to help students plan how they will proceed and how they will manage the team itself; for example, who will assume which leadership roles and how will they organize their meetings and their time. A subsequent tutorial encourages the teams to consider the collaborative process as a whole and, specifically, to discuss and begin to define such things as what their goals as a team will be and what standards of behavior they expect from each other. We build on this initial introduction to the process of collaboration later in the term, of course, but we try in these early tutorials to get students thinking about the whole “teaming” process and the kinds of skills they will need to develop if the group is to be a functional, productive team (and not merely a loose collection of individuals). Later in the course, other tutorials emphasize the various steps in the process of writing, revising and producing a document, including writing and revising strategies, document design, visual aids, and so on.

Other tutorials, meanwhile, have teams begin the work on their projects. Because the project must deal with an engineering topic, teams need to consider what technical issues they will have to consider. If, for example, they want to study traffic congestion on campus, they will have to decide how they will approach the issue; they might want to look at it from the perspective of traffic jams and line-ups or from the perspective of parking shortages. They will also need to determine how many cars do in fact create a problem and how you determine that number in the first place. From the discussion of the technical problem, these tutorials then talk about the need to evaluate any possible solutions, so teams must also develop criteria (such as cost or size or speed) by which to judge any options they are considering. As well, they need to define these as specifically as they can. About this time, too, another tutorial has the team looking at defining both audience and the document’s purpose.

Thus, in preparing their document, students must first write a proposal suggesting they look at a particular engineering topic; then give periodic up-

dates on their progress, including formal oral reports as well as informal briefings to the class; eventually deliver the completed written report; and, finally, orally present their findings to the class at the end of term. At the same time, as the Canadian Council of Engineers suggests, they have gained “a knowledge of the basic principles of project, human resource and time management” (3) through the series of tutorials, each of which emphasizes the different phases of the task while focusing on the technical, communication and team elements of the project.

CONCLUSION

In 1982, when the Faculty of Engineering at the University of Manitoba first introduced the technical communication course into its first-year program, few engineering schools in Canada had taken this bold step, although many schools in the U.S. had already developed technical communication courses for engineering students. But there was a distinct difference between the American precedent and what we were doing. Rather than being a member of another department altogether, like English, I was a member of the Faculty of Engineering. As well, rather than being offered as a service course, technical communication was a compulsory – and an integral - component in each student’s program of study. In contrast, many technical communication courses in Canada, even now, are offered either by English departments or by writing centers that offer a variety of communication-related courses to a variety of disciplines.

Only recently, with the growth of academic programs dedicated to the study of technical and professional communication, do specialized departments with specialized instructors teach technical communication to future practitioners. But, again, this trend seems to be more pronounced in the U.S. than in Canada. One reason is the earlier development of such programs in the U.S. Conversely, in Canada, there are fewer programs offering only technical and professional communication, and most of these tend to be offered in the two-year colleges, although this may be slowly changing. So, all in all, there do seem to be some very real differences between the U.S. and Canada in terms of developing these professional writing programs.

Lilita Rodman, a leading Canadian scholar in the field of technical communication, addresses some of these differences when she suggests that what Canadian scholars focus on and what American scholars tend to emphasize in their research are not always the same. As Rodman notes, many of our scholars – scholars like C. Schryer, to name just one - have contributed greatly over the last while to current topics like the study of genre in technical communication. Besides these kinds of contributions, though, because Canada is a bilingual coun-

try, many of our Canadian scholars have also become increasingly interested in linguistics, a subject that seemingly has less interest for our U.S. counterparts (Rodman 13). Canadian scholars, then, do seem to have found their own particular niche in the field over the years.

Similarly, my position in the Faculty of Engineering at our school also seems to represent quite a unique niche – in Canada, at least – and the technical communication course that I have developed likewise holds a unique place in the development of technical and professional communication at our school since it is connected so closely to the undergraduate engineering curriculum. In essence, because I am so tied to the Faculty of Engineering itself, the course has come to be viewed as integral to engineering by students and staff alike. Additionally, over its twenty-year lifespan, this course has evolved into a smaller version of a technical communication program, one that is linked to both the Faculty of Engineering and the engineering profession. Indeed, as I have suggested here, it serves as a case study to illustrate the synergy that is possible between engineering and technical communication.

Initially offering instruction only in writing (and only to undergraduate students), now the course encompasses collaborative projects, project management, peer review, oral presentations, document design, textual illustrations and, recently, research methods. In the future, we hope to be able to offer a course in technical communication to our engineering graduate students; as an elective in a student's graduate engineering program, such a course will include topics related only to the academic side of engineering, such as thesis writing, preparing academic articles and oral defenses. Currently, we are also looking at ways to integrate technical communication into the graduation thesis and design project in a more formal way. These developments reflect trends in both technical communication and engineering (Ford & Riley 325-326).

Therefore, this paper has explored the academic and professional contexts for the study of technical communication in our school by looking at two primary topics: first, how a problem-solving model, as a way of approaching the communication task, adapts what is a common engineering practice to the teaching of technical communication and, secondly, how introducing collaborative projects into the technical communication classroom can be an effective way to prepare students for the demands of the workplace and the profession. Thus, within the professional context of engineering, the technical communication course can reflect the changing communication needs of the workplace and the engineering profession where team-based projects are increasingly the norm. Just as importantly, within the academic context, the course can reflect many of the developments in two seemingly disparate disciplines, technical communication and engineering.

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