

**AC 2010-1653: COMMUNICATIONS INSTRUCTION IN FIRST YEAR  
ENGINEERING: THE GLUE**

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## COMMUNICATIONS INSTRUCTION IN FIRST YEAR ENGINEERING: THE GLUE

### Abstract

ENGG 251: Design and Communications One and ENGG 253: Design and Communications Two are the flagship courses for the Common Core year at The S\_\_\_\_ School of Engineering, University of C\_\_\_\_. Mandatory courses for all first year (~730) students, ENGG 251/253 are project-based courses on engineering design, taught by an interdisciplinary team drawn from all divisions of engineering, fine arts and communications. This paper serves to examine the role and work of the communications instructor within that interdisciplinary team, and to offer some insight into the ways that communications can be integrated into the engineering curriculum, as well as the benefits that communications brings to the instructor team.

Because of the unique interdisciplinary structure of these courses, the communications instructor holds a tri-partite position as a solo instructor, a team instructor, and as the course technical writer.

As a solo instructor, the communication instructor delivers 6-8 1-hour lectures per semester, on a combination of communication theory and practical writing and oral presentation material.

As a team instructor, the communications instructor works to design, plan and implement at least one major project per academic year, and serves as a resource for other instructors. As well, the communications instructor is responsible for the creation of all assignment and project documents, as well as all grading/evaluation guides for the T.A.s. Finally, the communications instructor acts as supervisor for the 4-6 communications T.A.s assigned to the course.

As the course technical writer, the communications instructor produces all reports, manuals and documentation for the course. In addition, the communications instructor serves as co-marker on all assignment exemplars, to ensure that all T.A.s are marking to the same standard.

This paper redefines the role of the communications instructor to capitalize on this many faceted skill set that, if properly integrated, can greatly enhance the quality, scope and relevance to the engineering educational coursework.

### Introduction

Communication is increasingly an element of engineering education. A brief survey of the curriculum of ten Canadian and American engineering programs<sup>1</sup> reveals that at least one course in communication is mandatory across the board. In the past this course was almost exclusively a university-dictated compulsory communications course, designed

for students in many disciplines. While certainly better than no communications course, a review of student feedback scores, as well as discussion with instructors, reveals student attitudes towards these courses is often dismissive, and the effort displayed in these courses is often lacking. This, in turn, can affect a student's ability to communicate effectively in the workplace, resulting in decreased prospects. In order to combat this, many universities have turned to a dedicated communications course, whether taught by the department of English/Communications or by the Engineering department. These courses, which are more focused on engineering/technical writing, and which engage students using examples and forms relevant to engineering, have led to a greater engagement and dedication to the material by the students, with a corresponding increase in understanding and achievement<sup>2,3</sup>. In most cases, they remain dedicated courses, often fulfilling university communications requirements.

The University of C\_\_\_\_'s S\_\_\_\_ School of Engineering has decided on a slightly different approach, in order to ensure that students are gaining the proper communications skills. While engineering students are still required to take the university-mandated technical communications course, students are also given instruction in communications in their first year of study, as part of an engineering design course. This method ensures not only that students are exposed to proper technical communications skills from the start of their engineering careers, but that communication is seen as an integral part of an engineer's skill set.

Working from the theory that students learn best in an authentic environment<sup>4</sup>, as well as the understanding that students strongly prefer work that is relevant, clear and engaging<sup>3</sup>, the team at S\_\_\_\_ has integrated communications into their first year design course, which is itself a hands-on, real-world engineering course. This has resulted in the hiring of a communications instructor who is dedicated to the first year program, and does not have additional obligations to another department. During the process of integrating this instructor, three distinct roles for this instructor have developed, each of which serves the team and the course in ways that an instructor from another department could not.

### **Course Organization**

ENGG 251/253 are paired first year courses offered at the S\_\_\_\_ School of Engineering at the University of C\_\_\_\_. S\_\_\_\_ has a common core first year program, which ensures that all students have the same background, and allows students a full year to adjust to the University and to gather some information about the various areas of engineering offered at the school before they have to specialize. ENGG 251 and 253 are key components of this first year program, offering students education in Engineering Design and problem solving, as well as instruction in drawing, sketching, technical writing and presentation skills.

Because of the broad and varied curriculum of ENGG 251/253, a traditional lecture/lab structure is not truly practical. Instead, 251/253 rely on long and intensive lab periods (4.5 hours a week, divided into two blocks, one of 1.5 hrs and one of 3 hrs) with short

lectures (1 hr. per week). In addition, the course work is divided into projects, with students working on three projects in the fall semester (251) and two projects in the winter semester (253). Students work in groups for all projects, with less than 50% of their term mark coming from individual assignments (43%).

The broad nature of the course, and its inclusive nature, extends to the teaching team as well. The course currently has a 'Head Instructor' who oversees the entire program; six engineering instructors, representing all five major branches of engineering offered at Schulich (Mechanical, Chemical and Petroleum, Civil, Electrical and Computer, and Geomatics), who supervise the individual lab sections; a fine arts instructor and a communications instructor; in addition, the course also has a full time technician, 20-24 engineering teaching assistants, 4-8 fine arts/industrial design teaching assistants and 4-6 communications teaching assistants.

### **Communications instructor as Solo Instructor**

The primary role of the communications instructor in ENGG 251/253 is that of solo lecture instructor. As one of the two lecture instructors, the communications instructor is responsible for half the lectures each semester, as well as at least two laboratory periods of instruction.

The primary challenge for the communication instructor is to ensure that the material the students are exposed to is both relevant and engaging<sup>6</sup>. The common core first-year curriculum is heavily weighted towards technical and mathematic – based material; while this is both practical and necessary, it is also time-consuming and challenging for the students. Thus, work that is viewed as 'less important' consequently receives less attention. When students in three sections were informally polled about their courses during high school, less than 10% listed English, History or Social Sciences in their favourite courses and not a single student would admit to a non-science, non-math course being in their top 5 grades<sup>7</sup>. Clearly, students in the University of C\_\_\_\_\_ engineering program do not prioritize 'arts' classes, and the skill set they grant.

This internal prejudice makes the communications instructor's role as professor all the more relevant. Overcoming these prejudices and making the work interesting without downgrading the academic weight is a challenge that requires a fair amount of preparation and research. Often, the most difficult part of the job is in designing lectures and workshops that engage and entertain students. In ENGG 251/253 this is accomplished in three ways.

#### *Theory*

Communication theory is a broad and diverse field. Clearly first year engineering students do not require an in-depth instruction in semiotics or language patterns, however basic communication theory, such as the Shannon-Weaver theory, are both useful and approachable. More importantly, giving first year engineering students a structural framework for communications, something many students see as 'artsy' (non-structured

or open to interpretation), makes communication seem more ‘scientific’ and thus more approachable. Nevertheless, of the three areas of instruction, theory is the most challenging for the instructor. If theory is to be used to impose structure, it must be delivered at the start of ENGG 251. This presents a strong challenge for the instructor, as theory must be made interesting and engaging, in order to ensure student attention.

### *Practical Writing*

For most students, the majority of writing they have done is related to literature or social studies, two fields that most students feel are ‘irrelevant’ to their future. As such, the major challenge for the communications instructor is to make the writing relevant to the students. Primarily this is done in the lectures. While the writing instruction is designed to be general, that is, instruction is given on a format, like status reports, or oral presentations, specific instructions unique to a project are also given. This serves two purposes, to give students a strong base they can modify, while ensuring that students cover all the information required by a project.

This area is perhaps the easiest for the instructor, as students are often most eager for information that they feel is directly applicable to their work/lives. Assisting students to see the forms behind the individual assignments is more difficult, but a course commitment to repetition of forms (status reports are introduced in project one and repeated in all following project, for instance), allows students to build their skills over an extended period, and allows the communication instructor to return to certain forms multiple times, elaborating on the form each time, rather than delivering a single lecture where much of the information is not absorbed.

Student feedback on the course gathered from USRI surveys indicates that this layering of knowledge, rather than just delivering it once, is considered a positive feature of the course.

This area constitutes the majority of communications instruction, and this has been reflected in student success in other courses. Since the inception of the course, rewrite and redos for poor writing in second year courses have decreased by over 70%, based on academic records. In addition, student success in the university mandated technical writing course (often taken in third or fourth year) has increased, with an average grade increase of 6%.

### *Real-Life Examples*

Perhaps the most important form of instruction the students receive, and the one that takes the most effort for the communications instructor is that on how the assignments that are being done in class relate to the types of written work professional engineers do in the workforce. This requires the instructor to give real-world examples from all branches of engineering, which, in turn, mandates constant contact with professional

engineers in all fields. Through contact with other professors, and their contacts in the workforce<sup>8</sup>, at least one real-life example is introduced for each format, with these examples changing every year. The final challenge (project) of each year is a collaboration with industry or a non-profit organization; this allows students to see how the work they have done all year is applied in a non-academic environment. While student feedback is often neutral on the final challenge in the end of year USRI surveys, feedback gathered after the internship year (between third and fourth year) indicates that students feel that the first year real-world challenge was the most thorough preparation for the working world that they have received. In addition, informal feedback from graduating students indicates that the 'real-world' examples in first year are routinely cited as experience in job interviews, and is looked upon well by employers.

### **Communications Instructor as Team Instructor**

The second major role that the communications instructor plays within the course is that of a member of the instructional team. While each instructor has an area of specialty, there are a number of duties that are divided between them, and the communications instructor, as a team member with no other course assignments, covers a large number of roles.

These roles can be divided into two major sections, administrative responsibilities and academic responsibilities.

To a great extent, the administrative responsibilities could be covered by any instructor, but are necessary in courses the size of ENGG 251/253. The devolution of these responsibilities onto the communications instructor is based primarily on availability, but also on practicality. As the communications instructor is a dedicated instructor (has no other courses), he/she has more time to dedicate to the details of organization and administration. In addition, the communications instructor is more available to other instructors and T.A.s as the communications office is directly opposite the course labs. The communications instructor is responsible for the scheduling of all course T.A.s (Coaches), whether from engineering, arts or communications. Because of the sheer number of T.A.s, and the status of all but a few of them as graduate students, this scheduling requires extensive preparation at the beginning of every semester. Each T.A. is asked to file their top three lab preferences, among the six lab slots, and a schedule is constructed based on preferences. Approximately 80% of T.A.s receive their first choice of time slots, and all others receive their second choice. In addition to the time this job requires, there had been, in the past, some complaints from T.A.s that when engineering instructors from a particular discipline did the scheduling, T.A.s from that discipline received preferential scheduling. Assigning the scheduling to the communications instructor eliminated the complaints, as the communications instructor is perceived as neutral. This is re-enforced by the fact that the communications T.A.s are not part of the regular schedule, but are attached to a group of labs, and thus there is no preference for those T.A.s.

The second major administrative responsibility of the communications instructor is that of timetabling for all projects. Because of the number of projects that are run every year, and the number of deliverables, or marked elements, per project, scheduling to ensure that students are not overwhelmed, and that the course is not end-loaded, is essential. Because the communications instructor is the only instructor who participates in the development of all projects, this is a logical assignment.

The academic roles, as a team member, are more directed towards communications. Because of the way the course is designed, each engineering instructor plans, or assists in planning, at least one of the projects<sup>9-14</sup>. Given that there are between two and nine instructors contributing to each project, it is essential to ensure that the material is delivered consistently. Because of this, the primary academic responsibility of the communications instructor to the team is to develop and produce all project documents, regardless of who is planning the projects.

In order to do this, once the planning instructors have decided on a general plan for the project, including an outline of each deliverable, the communications instructor creates the first draft of the project documents. These consist of a project overview, which includes a discussion of each of the project steps, a summary of each of the deliverables and the grading breakdown; detailed document for each of the project deliverables; and grading guides for each deliverable. These are returned to the planning team for edits, altered accordingly, and then distributed to the entire instructional team for discussion. The communications instructor then does a final edit and posts the documents to Blackboard for student consumption<sup>15</sup>.

This is often the most challenging role the communications instructor fills. Acting as team author often involves mediating between other instructors, as well as acting as the 'dissenting voice' in discussions. Without a team committed to interdisciplinary education, the communications instructor could find themselves in a very uncomfortable position.

The second major academic role the communications instructor performs as part of the team duties has to do with ensuring consistent grading. Because of the fact that there are six lab sections and 24 T.A.s, each of whom marks papers from approximately 26-30 students, consistent grading is essential, but also a challenge. Although there are grading guides for each deliverable, and each T.A. has a lab instructor to consult with, the team has determined that more guidance is required. Accordingly, after each written deliverable is handed in, the communications instructor gathers assignments from one of the six lab sections (papers from four T.A.s) and marks the papers as exemplars. In consultation with the planning instructors, a selection of papers representing a span of grades are anonymized, scanned and posted as grading exemplars for T.A.s. This not only gives T.A.s strong models to follow, it encourages best practice in academic feedback<sup>16, 17, 18</sup>.

This consistent grading policy has only been implemented in the past two years; in that time, grade appeals to instructors have decreased by 50%, and, as those appeals are

handled in a consistent manner, with exemplars accessible to all students, appeals to the Associate Deans have decreased over 90%. In addition, the clear exemplars have ensured that all T.A.s return work within two weeks; previously, the scheduling of 'marking meetings' and the unavailability of many T.A.s meant that documents were often held for 21-25 days. The current turn-around time is ~9 days.

In addition to these communications-based team roles, the communications instructor shares equally in T.A. supervision, as there are 4-6 communications T.A.s assigned to the course; co-plans at least one project; and chairs and acts as recording secretary for at least one team meeting.

### **Communications Instructor as Technical Writer**

The official title of the communications instructor for ENGG 251/253 is "Communications Instructor and Writer-in-Residence". While the communications instructor does not work full-time on technical writing, producing specific documents for the department or the course is part of the communications instructor's role.

Most of the documents the instructor produces are related to the course: project documents and grading guides. In addition to these, however, other documents are produced.

The communications instructor is responsible for the production of the course manual, which is distributed to all instructors, T.A.s and all administration. This document lays out all roles, responsibilities, and requirements of the instructors and T.A.s, as well as the course goals, objectives and theories. In addition, the document must be revised every year with overviews of all prospective projects for the following academic year, and with any revisions to the instructor/T.A. roles, based on the experience of the previous year.

In addition, the communications instructor is responsible for course outlines and any other required documentation for the course. Typically, it is the communications professor who writes up the results of any appeals, and who documents all cases of academic misconduct for the Associate Dean of Students to rule on.

Outside of the course structure, the communications instructor produces all documentation related to certification, curriculum development and/or course revision for the department administration. In the past this has taken the form of one to four reports per year, depending on the needs of the Associate Dean Academic.

Finally, the communications instructor serves as the technical editor in residence for all members of the instructor team, as well as many of the T.A.s and other members of the teaching staff. Typically this involves acting as proofreader and editor on grant applications and academic papers, as well as conference presentations.



## Conclusion

Although communications instruction is considered necessary in most engineering programs, this role is usually filled by instructors from other faculties who do not contribute to the engineering program. By integrating a communications instructor into a first year program, and specifying three distinct but complementary roles for said instructor, S\_\_\_\_\_ School of Engineering has created an atypical, but beneficial position, one that ensures a high quality of instruction for students and a stronger, more focused educational team.

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