Teaching Engineering Career Literacy and Teamwork Communication Skills in the First-Year Writing Course

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One of the challenges that has long faced engineering education is to adapt communications instruction to the needs of engineering students. English composition courses, while appropriate for liberal arts students, do not focus on the communication skills prized by the organizations that hire engineering students. Such skills include the capacity for clear technical exposition (including process analysis and technical description) and the ability to adapt technical material to a variety of audiences.

Changing patterns of work in contemporary engineering organizations call for further innovation. In a revealing interview with 20 UVa engineering graduates in the summer of 1995, the Professional Development Committee - an ad-hoc faculty committee concerned to increase the professional development emphasis in the UVa engineering curriculum - found that our graduates cited the following shortcomings in their UVa engineering education:

- **Insufficient emphasis on teamwork**. Students need more experience working with people who have varying intellectual styles and abilities.

- **Insufficient background for working effectively in cross-functional settings**. Students need to understand the differences among the various functional units of a contemporary organization and learn to communicate across intellectual and cultural boundaries. Here, our interview subjects stressed the

- **Insufficient career awareness**. Students need to get to know themselves better and make major (and subsequent career) choices that suit their interests, temperament, and talents. They need to know how to find mentors who can help them work through important career decisions.

Summing up the responses we received, one of the interviewees commented, "This is really about appreciating diversity. When people say 'diversity,' they usually think we're talking about racial and sexual diversity. That's an important part of diversity training, but equally important is learning how to appreciate different thinking styles. When you graduate and get out there, you have to work with people who look at things differently. They have

different skills. You have to learn to appreciate these and take advantage of them. And you can't even do that unless you've been through some self-discovery, in which you figure out what your thinking style is."

The Division of Technology, Culture, and Communication (TCC) at the University of Virginia's School of Engineering and Applied Science has been a leader, for more than a half century, in adapting communication instruction to the needs of engineering students. TCC 101, Language Communication in the Technological Society, reflects the Division's lengthy experience in this area; for example, the course stresses speaking as well as writing skills, and teaches students how to adapt their messages to the specific audiences that they will encounter in engineering organizations (including technical peers, technical managers, non-technical executives, and the general public). We chose this course to serve as the foundation for an experiment in adapting the communications curriculum to the new needs of engineering organizations.

The Engineering Career Orientation Project (ECOP), required of all students in our experimental sections, is based on the Research Interview Project (RIP), in which TCC 101 students interview research professors concerning their engineering research and report back to the class, individually. In transforming this project into a group project that focuses on major choice, we hoped to achieve the following objectives:

- **Teach students the fundamentals of how to work effectively and communicate in a team setting**. Each group was expected to elect a leader, who developed an agenda and minutes for each meeting of the group.

- **Place students in an independent team setting, in which they would be expected to discover each other's skills and strengths, and divide the work accordingly**. Students are expected to discovery variations in intellectual style within the group and take advantage of them. They were asked to select the best person to be the group's leader, researcher, interviewer, and master of ceremonies for the group's oral presentation.

- **Use the project as a foundation for increasing literacy about engineering career choices**. The project culminates in the group's presentation to the entire class. This presentation describes the focus, history, and mission of a specific engineering discipline; an example of research or design that exemplifies this discipline's possibilities; a description of a practicing professional's day-to-day work conditions and career experience after graduation; and a "how-to" guide for majoring in this discipline at UVa. For materials, students were required to find and form relationships with third- or fourth-year mentors as well as practicing professionals in the discipline.

To introduce the ECOP project, students learned about the structural changes in the U.S. economy (such as reengineering, downsizing, outsourcing, and the demand for faster time to market) that have brought teamwork and teamwork communication skills to the fore. They were asked to develop these skills in a context that mattered greatly to them, since most students would have to choose a major by the end of the first semester at SEAS.

At the end of the semester, questionnaires were distributed in both sections. The ECOP project was singled out by students almost uniformly as the single most valuable experience of TCC 101. In a course evaluation questionnaire, students ranked the ECOP project highly (see Table 1); in fact, they ranked it higher than all other course experiences (see Table 2).

Table 1. Selected Responses to Student Course Evaluation

Question	Section 1	Section 2	Section 3
Please indicate the relative contribution of ECOP to what you've learned in the course so far (1 = Very Important, 2= Important, 3 = Somewhat Important, 4= Not Important)	1.50	1.64	1.62
Do you feel that you've had something valuable, useful, and important to contribute to your ECOP team project? (1 = Almost Always), 2 = Most of the Time, 3 = Sometimes, 4 = Seldom, 5 = Never)	1.60	1.57	1.42
Do you feel that other students in your ECOP team have had something valuable, useful, and important to contribute to your ECOP team project? (1 = Almost Always), 2 = Most of the Time, 3 = Sometimes, 4 = Seldom, 5 = Never)	1.65	1.57	1.67

Table 2. Importance of TCC 101 Components to Learning
(1 = Very important, 5 = Not important)

Question	Section 1	Section 2	Section 3
Class discussion	2.25	2.05	2.04
ECOP project	1.50	1.64	1.62
In-class workshops	2.45	2.48	2.31
Lectures	1.60	1.57	1.42
Library orientation	2.50	2.30	2.98
Oral presentations	1.80	1.96	1.58
Peer critiques	2.50	2.50	2.58

Reading	1.65	1.57	1.67
Use of electronic information sources	2.60	1.82	1.74
Writing	1.50	1.64	1.62

In conclusion, this project demonstrates the importance of talking to recent graduates about their communications needs and bringing this knowledge back to the curriculum. In today's engineering organizations, effective communication includes not only knowing how to write and speak clearly in an technical setting; it is equally important to discover one's own distinctive intellectual and analytical style, and learn how to build on one's own strengths and those of others in cross-functional teamwork settings.

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