Collaborative Teaching: Reflections on a Cross-Disciplinary Experience in Engineering Education

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Introduction

Most of us know a lot more about cooperative learning than about collaborative teaching. We are also far more sympathetic to the former than the latter. The principled virtues and practical benefits of having our students work together in teams seem altogether less attractive when we envision ourselves joined in (chained to?) a common teaching enterprise. While collaborative learning seems to offer an ethically compelling alternative to the competitive model of individualized achievement and assessment, the notion of collaborative teaching unnerves many of us because it implies a loss of professional autonomy–and, indeed, may suggest (to our colleagues, at least) that we're not up to the task of doing our own pedagogical thing.

Likewise, while we may regard cooperative learning as good preparation for the real world of working in teams, collaborative teaching may well seem naively oblivious of the real-world academic promotion-and-tenure system that judges us on our individual teaching (and scholarly) merits. Finally, if cooperative learning offers practical benefits to us as teachers in reducing the number (and improving the quality) of assignments we have to read and grade, the coordination of teaching effort that collaborative teaching entails may actually increase the amount of time we spend teaching. All of this is complicated by a lack of research and shared practices for knowing how to do collaborative teaching–again, in utter contrast to a burgeoning database of experience and research in cooperative learning.

Is collaborative teaching, then, really worth the risk and trouble? Yes. . . but only when it promises both to enrich student learning and–equally important–provide a fulfilling collegial experience. For several years now–at Georgia Tech and the University of Virginia–I have experimented with cooperative learning approaches and pursued collaborative teaching efforts. At Georgia Tech, I had my students in a few courses undertake at least one cooperative learning project each quarter. This usually involved a team paper project, lasting for two or three weeks. I also taught a graduate course in Social Theory for historians of technology with another sociologist. Since coming to UVA's engineering school in 1994, however, I have gone c-crazy–cooperative learning projects in every course as well as two consecutive years of collaborative teaching with engineering colleagues outside my own discipline of sociology. This paper briefly describes one of my UVa collaborations–why we did it, what we did, and how it turned out. It draws extensively on other publications where the collaboration is discussed in much greater detail. [1, 2, 3, 4]

I should say at the outset that collaborative teaching can take many forms and degrees of collaboration–I have no model to sell, just my own story and reflections on it. My story happens to be quite positive and upbeat, but I'm well aware that collaborative teaching may not be good

for everyone. Reflecting on my own CT experiences and those of a few colleagues (some of whom would never teach collaboratively again), there are at least two cardinal principles for effective collaborative teaching: Be sure that you and your collaborator articulate a genuinely shared pedagogical rationale, and then implement that rationale systematically in the micro-structure of your courses. In short, choose your partner carefully and then plan, plan, plan.

A Case Study in Collaborative Teaching

During the fall semester 1996, John P. O'Connell (a chemical engineer) and I (a sociologist of technology) collaboratively taught two courses in an attempt to put a professional development model to work in first-semester undergraduate studies at UVa. One was a required core technical communications course (TCC 101) typically taught in sections of 25-30 students by faculty of the multidisciplinary Division of Technology, Culture and Communications, using a common syllabus but with specific assignments tailored to each instructor's disciplinary interests and strengths. (Approximately 25% of entering students are given advanced placement credit for this course.) The course introduces students to the uses of oral and written language communication, stressing their relevance to professionalism in engineering and applied science. Students learn how to search and retrieve technical information, write abstracts, essays, and reports, and give oral presentations for a variety of audiences. One key project assignment introduced students to fields of engineering and helped them choose a major. Other assignments addressed technical and humanistic aspects of engineering, technology, society, and ethics. A leitmotif of the TCC 101 course (and the Division's other courses) is that technical and communicative competence are complementary skills. Accordingly, engineers must learn to adapt the content and form of a technical communication (written or oral) to the intended audience. Solving engineering design problems, as students did in ENGR 164, calls for a similar integration of technical and communication skills.

The other course was a required cross-disciplinary engineering design class (ENGR 164) also taught in multiple sections of 35 students by engineering faculty from several different disciplines working from a common set of goals but not the same syllabus. These goals involved lectures, workshops, and five assigned projects to cover: open-ended design case studies via individual and team designs; methodologies for computation, problem solving and conceptual design; consideration of engineering economics, environmental aspects, quality and safety; professional responsibilities and ethics; and career opportunities for engineers.Both courses were coordinated in a similar way in fall, 1995 with four instructors. Student enrollments in TCC 101 and ENGR 164 sections are not normally coordinated. Both years we received assistance from the Engineering Dean's Office to assign incoming students at random to the paired sections.

In the 1996 collaboration there were two groups of 28 students (totaling 12% of the entering class), each group taking a section of TCC 101 with me, paired with a section of ENGR 164 taught by John O'Connell. The section classes were of the same length on mostly the same days of the week, while the individual syllabi for the sections of each course were identical. As in the regular sections of each course, the assignments ranged from short assignments in resource utilization and generic communication skills to multiple-week projects analyzing information and designing alternative products and processes. Compared to the regular sections of each course, the paired sections were distinguished by generally more intensive student teamwork;

assignments and in-class activities of broader sociotechnological concern; joint formulation of project goals, statements and activities of the courses; coordinated due dates; generally more extensive use of university library and electronic information resources; joint grading of team oral presentations; and more extensively coupled, systematic course and teacher evaluations. All of these activities were couched within an explicit model of Professional Development in undergraduate engineering education.

Conclusions

The main purpose of pairing our sections–to provide our students with a rich, multidimensional professional development experience–was fulfilled, according to our students. Asked, in a final course evaluation (December 1996), if they would recommend a collaborative 101/164 section pairing to future students, 72% of our students said they would. In a one-year follow-up survey (November-December 1997), administered anonymously via the Web, students were even more positive about the value of the paired courses for their professional development. Thus, pairing technical design and technical communication seems to have provided a genuine synergy to reinforce and complement a shared set of professional development goals. That it worked with first-semester engineering students is all the more gratifying.

As instructors and colleagues, our collaboration succeeded because we shared a vision of professional development and its importance and because we sustained that vision through frequent course-related interactions during the semester. Shared vision is undeniably crucial, but there's also no substitute for careful planning and implementation, assignment by assignment (for shared or coordinated assignments). John O'Connell and I were fortunate, of course, to have jointly participated in developing the PD vision for several months before our collaborative teaching started. Thus, we were in a better position to implement a systematic model in our paired sections than instructors who had less common ground to start with. Despite these advantages, the demands of CT are palpable: it takes time and students will (properly so) hold you accountable for your joint efforts. Yet the synergism of CT can also add real value to teaching and learning.

Finally, although the PD framework guided our thinking about the goals of undergraduate engineering education, we had no comparable model for collaborative teaching–let alone CT along cross-disciplinary lines. (Perhaps indeed the very notion of collaborative teaching "models" is chimerical.) Our experience was thus unusually fortunate, which points to the importance of our working relationship itself as one of interpersonal confidence, mutual regard, and co-support in making our CT experience so satisfying. Moreover, in addition to its direct pedagogical benefits for teaching and learning, CT also proved "good to think with." By this I mean that our continuing conversations about teaching (they continue to this day) have taught us much about each other as well–not only about our teaching philosophies and styles but also about our respective cross-disciplinary approaches to technology, society, and the role of engineering. These conversations, in turn, led to several co-authored papers, some summer funding for course development, and our plan to repeat the collaboration in the future. Not bad for a rare and risky academic venture.

References

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