AC 2008-609: IMPLEMENTING INFORMAL WRITING ASSIGNMENTS AND A FEEDBACK AND REVISION LOOP TO ENHANCE LEARNING IN ENGINEERING COURSES

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Implementing Informal Writing Assignments and a Written Feedback and Revision Loop to Enhance Learning in Engineering Courses

Abstract

Several studies have shown that two methods enhance student learning in courses requiring written assignments. The first, informal writing, is an exercise that encourages students to “think on paper” (or perhaps more often, “think on a screen”). Fundamental to this exercise is learning to record observations, interpret data, and document the solutions to problems. The second method requires that students receive feedback on formal assignments they have submitted. The student is then required to revise the assignment using this feedback and then resubmit for grading. While both of these methods are well proven enhancements to the learning process, they have historically been shunned by engineering faculty.

At our university, a campus-wide program for integrating communication requirements into various curricula has had success in overcoming faculty and student resistance to these and other teaching methods not typically found in the engineering disciplines. The Communication Across the Curriculum (CxC) Program uses workshops, Summer Faculty Institutes, discipline-specific communication studios, and an online searchable database to assist faculty in the development and implementation of innovative assignments to build students’ communication skills. Incorporating these two learning techniques for written assignments was found to be most challenging in Capstone and laboratory courses; therefore, examples of successful implementation in each are presented. Workload impact was found to be minimal when the faculty member had obtained tools at a CxC workshop or institute and also took advantage of the Engineering Communication Studio resources. Student acceptance was documented via course-end questionnaires and selected focus groups. Both assessment approaches have yielded consistently positive student responses. Other assessment methods are in development, but early indicators are encouraging.

Introduction. In most composition classrooms, informal writing techniques and revision strategies have long been accepted as effective for improving student writing. Broadly, informal writing is risk-free (not graded and does not follow specific conventions) writing that is designed to aid the student thinking and learning process. Informal writing takes many forms: listing, freewriting, journaling, and even doodling. Ultimately, informal writing is a place where the writing process begins. When informal writing is applied to a larger assignment, it may also be referred to as generative writing or prewriting since its goal is to generate ideas for and approaches to a larger project. Conversely, formal writing is writing that must follow conventional forms and is usually graded for grammar, form, and correctness. It is the product of a writing process.

As the teaching of writing has expanded beyond English departments, settled strategies for the teaching of writing have slowly made their way into classes across the curriculum. Writing across the Curriculum (WAC) programs owe much to James Britton’s The Development of Writing Abilities\(^1\), in which he not only coined the phrase “Writing across the Curriculum” but also discussed the role informal writing should take in the teaching of writing Peter Elbow’s Writing with Power: Techniques for Mastering the Writing Process\(^2\) expanded on Britton’s work, focusing on the need to teach the entire writing process, including revision and editing techniques.
Although informal writing’s importance in the writing process has been well-accepted by English faculty, its adoption has met significant resistance from engineering faculty members, who quite often view this as a burdensome addition to an already demanding academic program. However, the need for implementing such a process gained considerable momentum when it was acknowledged that the teaching of communication skills was crucial to preparing students for professional engineering careers. This need was formalized when the Engineering Accreditation Commission of the Accreditations Board for Engineering and Technology (ABET) put forth criteria in the Engineering Criteria 2000, specifically criterion 3 under “Program Outcomes and Assessments,” which requires students to graduate with both teamwork and communication skills.

At our university, implementation of these writing techniques is a multi-layered process involving a campus-wide communication initiative, a certification process for communication intensive courses, and an engineering-specific communication studio. As these new techniques are integrated into the engineering curriculum, we are concurrently developing an assessment program to critically review the impacts on the curriculum and the increase in writing skills gained by the students. This assessment utilizes an outside advisory body, digital portfolios, and student feedback via questionnaires.

**The Campus-Wide Communication Program.** Writing across the curriculum has been updated to include visual, oral, and technological communication in addition to writing in an initiative called Communication across the Curriculum (CxC). CxC offers students the opportunity to earn Distinguished Communicator (DC) certification by completing 12 hours of Communication-Intensive (C-I) courses with exemplary grades, demonstrating evidence of leadership on campus and in the community, and assembling a digital portfolio showcasing their communication skills. In addition to the DC program, the initiatives described below are key elements of the CxC program that have been successfully implemented in the College of Engineering in order to integrate communication skills into the existing engineering curricula.

**Communication-Intensive Courses.** One way of accomplishing the goal of improving communication is through the support of C-I courses within the CoE curriculum. C-I designated courses meet specific criteria concerning communication, such as focusing on at least two of four communication modes (spoken, visual, technological, and written), multiple iterations of written and/or oral projects, and concentrating at least 40% of the course grade on communication. Currently in the CoE, there are 31 C-I designated courses throughout the curriculum, ranging from introductory to capstone courses. All Engineering disciplines have at least one C-I designated course in their core curriculum. CxC provides several resources for faculty who are interested in designing a C-I course.

**Faculty Summer Institutes.** Since 2005, CxC has held three Summer Faculty Institutes for faculty interested in improving communication skills in their classes and curricula. The participants are introduced to strategies and techniques by both internal faculty leaders and outside consultants. Previous faculty participants set the tone for each subsequent Summer Institute by discussing successes and setbacks experienced in their classrooms when implementing communication strategies. Consultants from other universities are invited to lead workshops on how to design and assess oral, written, and visual communication projects. So far,
27 engineering faculty members have participated in the CxC Summer Faculty Institutes. In order to teach a C-I course in the CoE, Engineering faculty must attend a Summer Institute. In turn, the faculty are invited back to Summer Institutes to provide a feedback loop as they discuss their experiences teaching C-I courses.

Summer Institute participants learn about assessment strategies and rubric design, and they also learn ways to effectively integrate assessment into the iterative process throughout the course of a project and a semester. Lively debate between the consultants and the faculty is encouraged. The faculty participants are divided into inter-disciplinary teams (except for the Engineering faculty, who need to concentrate on ways to fill the void left by the removal of Technical Writing from the English Department), which design presentations that highlight what they have learned at the institute, as well as how they plan to implement the various techniques in their classes.

**Workshops.** Schedules for various workshops offered by CxC and workshop materials can be found on the CxC website by any interested faculty member. Since its inception in 2005, CxC has presented 13 faculty-focused workshops on topics ranging from designing a website to using video in a classroom. The majority of the workshops (7) have focused on incorporating communication into the classroom and developing C-I syllabi, and two have been specifically focused on grading informal and formal writing and incorporating them into a syllabus. The workshops are led by faculty members who have experienced success in their classrooms or who feel that their experiences may be valuable to other faculty members. Engineering faculty have served as leaders for three workshops.

**Searchable Database.** CxC also offers an online searchable database for faculty interested in looking at syllabi, rubrics, and assignment ideas. The resources in the database are produced by faculty at this institution and are also gathered from other universities, providing a wide scope of ideas, discussion, and viewpoints on issues regarding communication.

**The Engineering Communication Studio (ECS).** The ECS assists Engineering faculty through consultation on syllabus and assignment generation, help with meeting C-I course requirements, and sharing lecture responsibilities and class preparation. Because ECS staff members work with such a wide array of faculty in a variety of disciplines within the CoE, they are familiar with a range of pedagogical approaches to the many communication requirements of C-I courses.

While Engineering faculty have long been comfortable with teaching and grading technical reports and other assignments found in traditional Engineering courses, they may be less familiar with other ideas for meeting communication requirements, including informal assignments like freewriting, storyboarding, and conferencing, as well as formal assignments like building digital portfolios. Often, the ECS staff is able to suggest strategies for incorporating formal and informal assignments into traditional Engineering courses in a way that the class will meet C-I course requirements without taking class time away from technical pursuits and without significantly increasing the instructor’s workload.

Instructors often worry about adding communication assignments to their syllabi because they fear encroachment on their time. The biggest misconception among Engineering faculty about certifying their courses as C-I is that they will have a greater number of written assignments to grade, and thus increase their workload. However, ECS staff regularly point out that engineering
faculty already employ a number of communication-based assignments, ranging from technical reports to posters to oral presentations. For this reason, another aspect of support the ECS provides is in the area of time management when grading assignments. All of the ECS staff have backgrounds in teaching communication-based assignments and are therefore familiar with grading strategies such as the development and use of rubrics. The ECS staff is also familiar with current writing pedagogies so that it is able to help faculty teach writing as a process, addressing higher order issues like organization and focus with small assignments that can be graded quickly early in the semester, and then addressing details through revision and editing as the process is completed. The result is often that final projects are better developed, and therefore require less intensive feedback from the instructor.

Perhaps the most obvious way the ECS staff aids CoE instructors is through in-class participation. When class time is needed to discuss communication-based aspects of assignments, such as the writing process or informal generative writing strategies, the ECS staff is available to give presentations to the class as a whole. In addition to in-class presentations, the ECS offers a number of focused workshops, which can be tailored to meet specific class needs or can be left general enough to help a larger number of students. Students may also request one-on-one help from Studio staff.

**Examples of Informal Writing Techniques.** In one Engineering Capstone course, students are required to keep an informal design notebook. Students are encouraged to use the notebooks as a means of documenting their progress through the design process. This notebook is collected, and a portion of the notebook is graded. The professor reads 35 entries marked by the student as “quality entries.” These entries are graded on the perceived usefulness to the individual student and the design group rather than a strict set of formal requirements. The graded portion of these notebooks is a relatively minor part of the notebook as a whole. Non-graded entries are risk-free informal writing in which the student reflects on aspects of the design process as well as the composition of oral presentations and bi-weekly reports. The notebook’s value is intended to be as a form of prewriting. Students beginning the process of writing a formal report find that they have already written extensively on every aspect of their project.

A different example of informal writing is evident in another Engineering department’s Capstone course in the form of periodic project updates in PowerPoint presentations. Student groups are required to show how their planned or completed tasks will meet the objectives of their senior projects. Laying out multiple tasks, complete with Gantt Charts, creates a storyboard environment in which the students informally write and revise their design projects.

One way the ECS supports all Engineering classes is by facilitating informal writing in a group setting with the use of portable and wall-mounted dry-erase boards. Studio staff observed impromptu student groups working in the Studio, and found that the students usually gathered between the computer workstations or they moved chairs into small circles in the informal lounge. The ECS purchased wall-mounted dry-erase cabinets and mounted them between computer workstations. The ECS also purchased portable dry-erase easels, which can be gathered along with moveable chairs into impromptu work spaces. These have been some of the most regularly utilized resources in the ECS.
**Revision Techniques.** One of the requirements of C-I courses is that students receive feedback from the instructor on formal graded assignments. Several strategies have been adopted by faculty to accomplish this requirement. Some classes require that the formal papers be broken into smaller assignments. In some cases, these are separated into several components. For example, in one senior lab, preliminary lab reports are collected and graded as stand-alone assignments, but the instructor’s comments are designed to aid in the composition of the final lab report.

Another approach is to break a large assignment into smaller components following a typical composition process. Students might turn in a topic proposal, followed by a preliminary outline, then an annotated bibliography, and then a series of drafts which are revised and edited into their final form. One instructor uses PowerPoint presentations as a storyboarding method, which leads students into their preliminary outlines, and finally into the drafting process. In other classes, the revision process is determined by the student rather than the instructor. For example, in one senior lab, students turn in a variety of lab reports for grading. However, they are required to choose one of these graded reports for revision and resubmission for a higher grade.

Because ECS staff members have often worked with the classroom instructors in designing these assignments, and because ECS staff members consult with C-I course instructors, the ECS staff is familiar with the methods being employed in each class. For this reason, they are well-equipped to help students through the composition process regardless of which of the above methods is employed.

**Assessment Methodology.** As exploratory writing initiatives such as those described in this paper have evolved, so have our tools to assess their effectiveness. The assessment tools discussed below and the preliminary results are still under development as we collaboratively seek better approaches for integrating communication skills into the engineering curricula.

**Industry Advisory Council.** An Engineering Communication Advisory Council was formed to provide an independent review of ongoing initiatives designed to improve graduating engineers’ communications skills. The Council is a non-compensated group of senior-level engineers in government and private industry, appointed to rotating three-year terms by the Dean of the CoE. The Council convenes formally as a group on a semi-annual basis to review progress on the communication initiatives and to observe examples of the communication-intensive projects produced by sophomore and senior design classes. Between scheduled meetings, additional interactions occur between Council members and the CoE. Members review examples of students’ written reports, and compare results to those previously reviewed.

**Digital portfolios.** The digital portfolio is often seen by students as a best-works showcase allowing them to present their most successful communication projects to potential employers or graduate school admissions committees. However, students seeking our Distinguished Communicator designation must build digital portfolios that present examples of written, oral, visual, and technological communication. This more comprehensive digital portfolio provides a forum to assess students’ progress on specific written assignments and growth over the entire college learning experience. Ideally, students will build a digital portfolio early in their university experience and then work on their portfolios throughout their undergraduate programs.
so that the result is a cumulative four- or five-year record that serves as a means for ongoing assessment of their writing skills.

**Student surveys.** Questionnaires have been utilized to assess student perceptions and attitudes regarding each of the communication initiatives. These have been presented to students as end-of-course queries for all engineering C-I courses, randomly generated sampling of Studio users, and questionnaires for students who have developed digital portfolios in freshman and sophomore courses.

**Findings to Date.** Our informal writing and review/revise communication initiative are integral to the teaching of C-I courses in each of the engineering disciplines. To help faculty meet these requirements, 27 faculty members have participated in the Summer Institutes and have become the cadre leading the COE in communication integration into the engineering curricula. Although the feasibility of meeting some of these writing requirements was met with some initial faculty skepticism in the COE, all Capstone Courses in each engineering discipline are now C-I certified, and we are rapidly approaching our goal of having at least three C-I courses in each of the engineering disciplines. Probably one of our most successful tools in overcoming faculty resistance has been the use of the initial cadre to lead sessions in subsequent Summer Faculty Institutes. This permits skeptics to raise their concerns with engineering faculty who have successfully implemented the initiatives and have a frank discussion leading to more receptive participants.

Students attitudes regarding the value of C-I courses were assessed by course-end questionnaires. The compiled results reflected a high regard for the skills learned and an understanding of the value of communications for their future careers. See Figures 1 and 2 below for student responses.

![Figure 1. Student Responses in C-I Course Questionaire](chart.png)
Figure 2. Student Responses to C-I Course Questionaire

Given our Advisory Council members’ senior positions in their organizations, they bring a unique assessment of the communications skills needed by their new hires for future success. They candidly let us know whether LSU graduates meet their perceived criteria and where they see deficiencies in communications skills. As the members have become familiar with the directions of our communication initiatives, they have offered highly valued suggestions to improve our overall program goals.

The digital portfolio is evolving as our most comprehensive assessment tool for writing improvements; however, its effectiveness is dependent upon students developing the portfolio early in their academic program and then consistently updating it throughout with writing assignments. In the Fall of 2007, digital portfolio development became a requirement in several freshman level engineering courses. Students in these courses were surveyed to assess their perception of the value of the digital portfolio and their attitudes about keeping the portfolios current in coming years. Although most students saw value in the digital portfolio, there was a less than enthusiastic attitude about keeping the portfolios up-to-date in the future.

The most promising incentive for students to update digital portfolios is its requirement for achieving the Distinguished Communicator award upon graduation. We are encouraged by the fact the seven of the first eight students to receive the DC certification at the 2007 Spring Commencement were engineering graduates. Although this initial group managed to assemble their digital portfolios using archived materials, the effort was challenging for the students because of its retrospective nature. Had this been an ongoing process over several years, we believe it would have less onerous and more meaningful to the students and for our assessment purposes.

Conclusion. Using a multi-layered approach, this university has had success implementing informal and formal writing in the engineering curriculum. Faculty has access to a number of resources provided by CxC for developing C-I course syllabi and assignments. Working in
conjunction with CxC, the ECS consults with CoE faculty on specific syllabi and assignment generation issues. Implementation of informal and formal writing and the writing process as a whole has been successful through C-I courses, which are designed to avoid creating unnecessary extra work for the classroom instructor while enhancing the student communication experience. The number of C-I courses at this university has increased as more engineering faculty are introduced to the ideas of a complete writing process, including informal writing and revision in their courses. Initial student feedback has been generally positive, and CxC and the ECS hope to see this trend continue. Other assessment methods are still in preliminary stages, but early indicators have been encouraging.

**Future Work.** Sixty-five (65) engineering students are now in line to receive their DC certification in the future. We are exploring incentives to have these students keep their digital portfolios current throughout their undergraduate years. A second goal for the future is to develop a college-wide faculty feedback mechanism to quickly identify barriers to implementing writing initiatives such as those described here, and also to assess faculty perceptions of the value of our communication initiatives.

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