

# **A Framework to Support the Communication Needs of CS Undergraduates**

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## **Abstract**

Professional organizations such as the ACM and the IEEE have recognized that the communication skills students develop in the classroom do not match workplace expectations. For many programs, the preferred solution of simply adding a dedicated technical communication course to their curriculum has not been particularly effective. This work presents our efforts over the past two years to explore a communication-across-the-CS-curriculum model where many “traditional CS” courses have added communication components, in addition to revamping our technical communication course to expose students to authentic disciplinary practices. The results, so far anecdotal, point to improved student performance and attitudes across several communication dimensions, in particular writing and presentation.

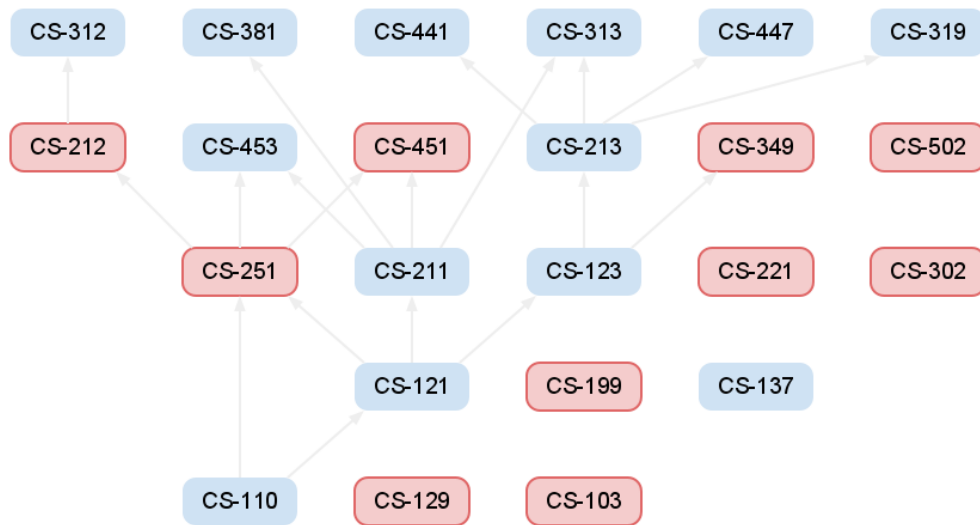
## **Significance**

Recently, Computer Science programs in the US have made the call for a renewed attention to language and technical writing skills, as General Education requirements do not seem to be sufficient in introducing students to professional communication practices. To bridge that gap, a sophomore or junior level course on Professional Communication is often introduced, operating under the assumption that dedicated instruction for one semester will help students understand the basic principles of communication so that they can apply them in later courses or their careers. However, these courses are often driven by lower-level concerns, mostly pertaining to correctness, concision, coherence or document design, falling short of giving students the skills to carry out communication “performances” in a professional setting. This work presents a framework which can support the communication needs of CS undergraduates for advanced coursework and professional practice.

## **Content**

The joint ACM IEEE/CS Computing Curriculum from 2001 (and repeated in the 2008 interim report) states that “mastery of the discipline includes not only an understanding of basic subject matter, but also an understanding of the applicability of the concepts to real-world problems”. For the purposes of developing effective communication skills, such a statement points directly to the need of engaging students with real audiences in real contexts through professional genres, a direction congruent with theories of situated learning according to which a learning curriculum consists of situated opportunities for the development of new practice and evolves precisely out of participation in communities of practice.

Using this broad theoretical orientation, we can think of a tripartite framework where one has to learn the technique (or acquire technical skills) first, then participate in simulated instances of the practice, and finally participate in real performances or real use. Such a comprehensive approach can guide the curriculum and make the connection between the academic context and professional practice, since the first step (practicing technique) can be a solitary activity, the second part (simulation) can be based on imitation of practice by others and the third part (performance) can be supported by guided participation in use by more knowledgeable others.



**Figure 1: Affected courses in our CS program**

For the last two years, a number of instructors at Carnegie Mellon Qatar have been independently experimenting with writing, speaking and visual communication assignments in several CS courses. This effort affected about half of the courses in the curriculum, as illustrated in Figure 1: the courses with a border and a red background were modified to incorporate some form of communication activities, the others (in blue) did not. At the heart of this effort was the revamping of a required sophomore-level applied communication course (CS-221) to incorporate elements of situated learning theory, and specifically the tripartite framework: practicing technical skills, simulating practice and performing in real contexts. Following are brief descriptions of the three steps in the framework.

### ***Practicing Technique***

The development of expertise in most fields requires a certain degree of technical skill which can only come through sustained practice. In music or in sports, it takes months or years of practicing technical skills before one can perform in a concert or a game. Similarly, we decided that practicing technical writing and speaking skills was a critical step in enacting this framework. Most technical communication courses make this the focal point of the work that students do, but in our case we decided that recitation sessions or online modules would allow students practice without taking up classroom time. These practice sessions were directly related to the patterns they were encountering in classroom discussions of different genres.

### ***Engaging in Simulation***

The second step towards developing expertise with communication skills is to begin simulating the practice. Students work on projects where they have to simulate practice: for example, they have to develop job application materials in response to a job or internship advertisement, or they have to write a proposal on a technical project in response to a request for proposals the instructors create for a real organization. Students, therefore, have to understand the affordances and constraints of real genres and produce responses for real audiences, with the exception that these audiences do not receive the materials or act upon them.

### ***Performing***

The last step of the model requires students to engage with real audiences (“clients”) and perform in communication events which are evaluated both by the instructors for the purposes of the course, but also by the clients. Students are introduced to real communicative performance through a user guide

assignment. As user manuals are rarely targeting specific audiences, it is critical for some clients to find people who can help them rewrite or develop from scratch user guides for their constituents. For example, in the Fall 2010 semester students developed user guides for tools and technologies intended to assist people with disabilities. Their client is MADA, the newly formed center for assistive technologies in Qatar, but their audience (who they will have to interact with for feedback and requirements specifications) is disabled people. This interaction makes students accountable for the quality of documentation they are producing. At the same time, the clients (MADA in this case), expect artifacts they could utilize with little or no revision.

The accompanying presentation elaborates on the ways this framework has been enacted in many of our CS courses and address future steps, which include a more sustainable communication-across-the-curriculum model. So far, as a result of these modifications, we have observed changes in student attitude towards communication and in their performance. These observations are purely anecdotal and will need to be followed up by a more formal study based on rigorous longitudinal measurements, both within the university as well as by following our students after they graduate.