

STRATEGIES FOR COMMUNICATION SKILLS DEVELOPMENT

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ABSTRACT

As the scope of computer science continues to expand and move further into inter-disciplinary research, we see communication skills development (CSD) gain prominence in tertiary courses. Employer groups, professional bodies and universities increasingly demand that our graduates emerge being able to think critically, write, and work effectively in teams. But how do we go about creating a sustainable framework for CSD? This paper outlines several strategies departments can use to integrate CSD in a curriculum. Using a case study approach, we report on interviews with employers, students and staff. We identify common themes from these stakeholders, and set out a series of strategies that can be used to address urgent and serious need to integrate CSD into our courses.

Keywords: *Communication Skills Development, Curriculum Change, Communication across the Curriculum*

I. INTRODUCTION

There is little discussion about communication skills development (CSD) within computer science courses. Perhaps this can be forgiven. In the past, we made only sporadic efforts to encourage CSD and put a great emphasis on the technical proficiency of our students. Recently, however, the joint IEEE/ ACM Task Force on Computer Science Curriculum 2001 (IEEE/ ACM 2001) has sought to redress our historical imbalances. Partially in recognition that effective communication skills are rated as one of the top three factors that employers seek in graduates, the Task Force set out a series of guidelines:

- CS (Computer Science) graduates should be able to write effectively, make informal and formal oral presentations and be able to give and respond to constructive criticism (Ch 9, section 9.1.4, p. 42).
- At minimum, a CS curriculum should offer coursework that emphasizes the mechanics and process of writing, at least one formal presentation to a group and the opportunity to critique at least one oral presentation (Ch 9, section 9.1.4, p. 42).
- CSD should be fully integrated into degree requirements, not separate (Ch 9, section 9.1.4, p. 42).
- Opportunities to work in teams should begin early in the curriculum; a team should undertake a significant capstone project in latter years (Ch 9, section 9.1.5, pp. 42-43).
- Learning to work in teams is “extremely important” and should be tied to client-driven projects (Ch. 10, section 10.3.2, p. 59).

Closer to home, the Australian Computer Society (ACS) has published a 'core body of knowledge'. Found amongst the requisite Group 1 topics, the ACS guidelines for professional level course accreditation specifically focus on technical writing and documentation proposals, an ability to conduct technical reviews and manage conflict resolution; an understanding of ethics, social implications and professional practice; and mature project management and quality assurance skills. Optional Group 2 topics promote the technical aspects of IT education and include, for example, data structures and algorithms, program implementation and design and conceptual modeling. Further, some key employability competency requirements across Australia, the UK, Canada and North America (ACER 2001, p. 38 cited in DEST 2002, p. 28) all emphasized the importance of communication skills, teamwork, problem-solving skills, self-management planning and organizational skills. In the DEST (March 2002) report 'Employability Skills for the Future', employers were seeking highly skilled *and generically skilled* graduates. In a recent study by the OECD (2001, p.99), employees viewed communication and capacity to work in teams as highly sought after abilities. The DEST report also highlighted the expectation that post compulsory training institutions are seen as playing a key role in "employability and generic skills development", emphasizing Kirby's (2000, p. 37 cited in DEST 2002, p. 18) recommendation of post-compulsory education needing to balance general academic development with "portable skills and occupational orientated training". How have Australian universities been responding to this expectation?

II. CSD POLICIES AND TRENDS IN AUSTRALIAN TERTIARY INSTITUTIONS

If you did an extensive search across university websites, you would conclude that the development of 'graduate attribute' statements is a prominent feature of many Australian universities. And if a major university does not have a statement up yet, you would see they are working on one. After our searches, we saw that the message was clear: there is a national effort to define graduate attributes, and communication skills abilities are threaded throughout them.

Using the University of Melbourne as an example of this trend, published undergraduate attributes include "ability and self-confidence to comprehend complex concepts, to express them lucidly, whether orally or in writing, and to confront unfamiliar problems" (James & Baldwin, 2002).

For postgraduates, guidelines highlight "the capacity to communicate effectively the results of research and scholarship by oral and written communication" (James & Baldwin, 2002). Across websites, we noted that the term 'communication skills' is often tied to concerns of employers but in and of itself is not a focal concern of university or faculty policies. At one site (anonymised here), for example, undergraduate Bachelor of Engineering (BE) students were promised to eventually "possess a broad knowledge base of their chosen discipline and of other disciplines so as to facilitate effective communication with those other professionals with whom engineers routinely communicate"; and "have verbal and written communication skills that enable them to contribute substantially to society".

Another way CSD is positioned is within a framework of good teaching practice. At some universities, for example, academic staff are asked to "assist in the development of students' communication skills through

providing opportunities for practice of and feedback on presentations in a range of media (e.g. oral, graphic, written)"¹. Interestingly, the same institute lists key graduate attributes within the staff index.

Despite the recognition of the need for CSD both within our own curriculum bodies and from our various institutions, there is sadly little guidance for doing so. We know that we are creatures of habit, and we understand that curriculum changes are difficult to make. So, what are some of the strategies for integrating CSD into our own courses? To answer this question, we set out our own experiences in developing such strategies. In the remaining paper, we first explain how we interviewed stakeholders; second, how we analyzed the data and third, our framing of key strategies and persistent questions.

III. STAKEHOLDER INTERVIEWS

Getting stakeholder views on CSD from all sections of the department, we knew, was a logical place to start. Those likely affected by the change will feel they had a voice in the decision; those who make decisions will feel they have listened. Accordingly, our participants consisted of a cross-section of undergraduate students, postgraduate students and casual tutors, academic staff and, finally, industry representatives. (See Appendix Academic staff, for example, were asked to provide responses to open-ended questions in a focus group session that was held in-lieu of a departmental research seminar. A casual lunch was provided to encourage participation. Twelve full-time staff attended the two hour discussion session.

Three forms of data were gathered and analyzed:

- Open-ended written responses from postgraduate students and casual staff;
- Notes from semi-structured interviews and focus groups with both academic staff and industry representatives; and

Written responses to a set of questions posed to a cross-section of students. Data was analyzed cyclically in two main stages. In the first round of analysis, the debriefing provided a basic set of initial categorizations. Using this, a *case-oriented* analysis (Miles & Huberman 1994, pp. 172-193) was pursued with data from the three (industry, staff and student) cohort groups. In the second cycle of analysis, a stronger *thematic-orientation* was undertaken. Working from the existing case-oriented categories, we sought patterns in the data set and sought to develop an understanding of recurrent themes. Notably, we made no attempt to determine relative frequencies of particular ideas: that is, if a single idea was found in a transcript, it was reported with equal weight as concepts which occurred several times. In the absence of previous empirical work on CSD within the department, the reason for emphasizing unique ideas over recurrence of ideas was to build up a overall view of the present situation. Future research that integrates quantitative measures, of course, will be required to test the strength of each theme.

IV. ESTABLISHING THEMES

Five themes emerged from the analysis: communication skills definition, CSD fitting into a crowded curriculum, CSD in course work, employer views and staff concerns.

4.1 Defining Communication Skills

What do we talk about when we talk about communication? Students and staff had a well-defined concept of communication skills that included a keen sense of audience awareness, the presence of personal attributes such as confidence, an appreciation of the differences in modes of presentation and an identifiable set of desired outcomes such as concise report writing.

Specifically, they saw effective communication skills as the ability to:

1. Convey ideas to people who don't necessarily understand a particular concept.
2. be concise, confident and adaptable in presenting yourself and your ideas.
3. Take criticism and listen to conflicting views/ideas.
4. Conduct a productive meeting; be diplomatic in small group situations.
5. Effectively utilize a variety of modes of Presentation, such as face-to-face/remote, written/spoken, public/private, group/individual
6. Construct reasonable, rational, logical arguments and to arrange evidence appropriately to support an argument.
7. Ascertain what information needs to be conveyed and thus provide what is requested.
8. Listen or read others' communications and comprehend and understand.
9. Have a keen sense of audience awareness, including giving technical presentations to both fellow students and non-technical friends and family.
10. Write clearly and concisely.
11. Use language that is appropriate for both the topic and the audience at hand.

When asked to identify the three most important skills needed to communicate effectively, respondents singled out audience awareness, critical thinking and presentation skills. .

4.2 Fitting CSD into a 'Crowded Curriculum'

From experience, we suspect that one reason for the lack of CSD in the department is the perception that the existing curriculum is 'too crowded'. Already hit by significant reductions in contact time, some academic staff argued for example that there was simply insufficient room for additional material. Students were concerned that they were ill-prepared to meet the demands of writing tasks in later years since they had not written, argued or presented orally since their school days. Nonetheless, they were aware that employers sought more than just coding skills. Comments from a fifth year combined degree student response were particularly illustrative:

Unfortunately due to the nature of Computer Science subjects, and perhaps computer scientists, students spend excessive number of hours coding for assignments and minutes on commenting. This attitude would probably follow onto curriculum content directed at communication skills. I can imagine an attitude of, 'this won't give me a job, what's it got to do with computer science' towards such assessment and a desire by some to just get to the coding. This is a problem as many of us will go on to design systems for other people, or with other people, and for this we NEED effective communication skills. (5th Year Eng/Arts student) Some students saw staff abilities as a key impediment to CSD and, closely related to this, effective content learning. Students highlighted that the best place for CSD was in the tutorials where there was a notable emphasis on being "forced" to

communicate through small group work, present tutorial questions and to write comments when coding in small “open friendly tutorials”.

Essentially, students thought that a change in the teaching style of tutorials was the best way to enhance CSD opportunities. Importantly, as one respondent wrote, existing tasks should be revised to better teach fundamental communication skills as opposed to the further development of “gimmicky activities like student councils or conferences”. Other students highlighted the need for team work activities right from their first year. One innovative suggestion focused on making greater use of digital media. By recording the lecture material, one respondent wrote, the tutorial groups could discuss the problems at hand and thus pave the way for a ‘problem based learning’ (PBL) approach to instruction. PBL tutorials would thus be more student-centered, and the role of tutors would be to facilitate group work and provide occasional help. This student’s comment is telling of the need for effective communication skills:

I am not a lecturer or tutor, but I feel I can be of use here, personally I feel that most tutors/lecturers are poor communicators (hence poor lecturers and tutors!), the reason I say this is because if they communicate poorly, you just give up on understanding and tune out. The best lecturers and tutors that I have had were excellent communicators, and in my opinion perhaps helped others learn by their example. (2nd year CS student)

4.3 Placing CSD in Coursework

Respondents were asked if they thought they would graduate from the university with strong communication skills. Although students generally believed they entered the university with a reasonable ability to communicate effectively, they reported that their skills were not being challenged or developed through their departmental courses. Excerpts from transcripts provide relevant examples:

At the rate I'm going without much help in improving my communications skills, it is difficult.

Apart from writing essays for submission, I will never know my standard in written communication. Learning from mistakes in essays are costly [sic]. There is also not much emphasis placed on effective oral communication, at least not in 1st year [sic]. Such factors lead to my conclusion that I'll be alright, but no more. (1st year CS student, ESL)

Because I am an ESL student, and my communications skills are not improving very well because I am only focusing on university curriculum. [There is] No pressure on me at the moment to develop my communication skills in any way. (2nd year CS student, ESL)

I think that my 3rd year experiences have definitely reinforced and further developed my communication skills. That being said however, I still believe that the concepts can and should be introduced earlier. We are going to have to interact with people eventually, so the sooner the better. (3rd year SE (Software Engineering) student)

Many participants cited sport and social activities as the primary way they had developed communication skills. Peer interaction was the key, they wrote, and formal lectures were simply not the place for CSD. Tutorials were cited as the best venue for interaction but that group work must be well-managed. Essentially, students recognized that CSD was important both for later year subjects and to potential employers and they saw tutorials as the best place to develop CSD through well-managed peer interactions and group work.

4.4 Views from Industry

Two senior representatives of the Human Resources (HR) department of a leading employer of IT graduates were asked a series of questions about communication skills, work placement practices and desired attributes of graduates. As far as the industry representatives were concerned, an ideal student candidate for a responsible position would have the following attributes:

- Achieve high academic results;
- Demonstrate a positive attitude;
- Involvement in extra-curricular activities;
- A willingness to be flexible and pro-active;
- Show maturity and focused work style;
- Be social and able to be part of social activities;
- Think for self and have initiative; and
- Consistent ability to work in a team.

Throughout the interview, the representatives placed a strong emphasis on teamwork. “All work is teamwork”, they said. More importantly, the firm does not consider applicants who do not have team skills (Last year, competition for positions was very competitive and over 900 students applied for work at the firm with only 6 recruits in Victoria across all divisions.) For them, a three-month teamwork project was considered an absolute minimum requirement. The industry representatives asked university lecturers to reconsider “old fashioned” methods of giving out information and having students work alone. In their minds, an ideal dynamic curriculum should:

- Prepare students to work in teams;
- Develop an ability to think critically and independently;
- Absolutely develop client focused skills; and
- Encourage students to be flexible.

In a similar vein, the representatives specifically recommended that students learn to write in a number of genres. These forms included bids, expressions of interest, formal letters to clients, and both inter-company and inter-team communications that could effectively communicate with sales personnel, technical staff and sub-contractors. Audience awareness was deemed crucial, specifically in cases where a topic is presented to both technical and non-technical personnel. They also suggested a need for reports to be written in an engaging and enthusiastic style. Further, they added that extensive experience in the collaborative writing of long documents was a necessary skill.

4.5 Academic Staff Discussions

Academic staff interviews brought out several points:

- Staff were generally supportive of efforts to increase CSD activities, and understood the need for more attention to this area of the curriculum;
- The curriculum was very crowded, and thus any additional material would be overwhelming;

- Some staff felt they would not be personally able to contribute to CSD without additional professional training;
- The best way forward would be to designate selected subjects at each year level for CSD focused activities;
- Tutorials were seen as the best place for CSD exercises; and
- Casual tutor and demonstrator training should be strengthened and more closely monitored.

One of the primary concerns of the staff was the possibility that any CSD activities would increase an already heavy workload. Many staff did not feel that they could accommodate any further demands on their time. In particular, the time needed to mark written material from students and provide comprehensive feedback was seen in a negative manner. To further solicit ideas regarding CSD, draft copies of preliminary recommendations were sent to all members of the departmental teaching committee for comment. Responses by committee members focused on enhancing the quality and frequency of student feedback. One member suggested the possibility that a non-credit 'Scientific Communications' subject be offered as a way to improve CSD opportunities at the honours and postgraduate level. Another committee member stressed the need to bolster efforts to develop the students' critical thinking skills – whether tied to communication skills or not – throughout the whole of the course. Clearly, even though staff supported CSD in principle, they saw it as an additional time commitment in an overcrowded curriculum. Their view was that tutorials were the best place to implement CSD and consequently tutor training, development and progress would be even more critical.

V. STRATEGIES AND QUESTIONS

In summary, we found there was overall agreement that CSD was perceived to be very important. Stakeholders could define and priorities communication skills. Student and industry respondents stressed the need for teamwork. For their part, academic staff were concerned about putting more into an already overcrowded curriculum. They noted the lack of appropriate staff development, and saw tutorials as the best place for CSD. With these points in mind, the challenge is to develop sustainable practices for integrating CSD in a busy department. In-lieu of comprehensive policy directives at a university, faculty or departmental level, and given that the immediate actors for implementation often come from cohorts of enthusiastic individuals within a department, often with an influential staff member providing momentum, it would seem that the most immediate response to CSD could be to encourage a 'bottom-up' approach. This may indeed provide the drive for realistic and sustainable policies on CSD. This could be undertaken immediately by academics through awareness raising, being transparent and explicit about integrating CSD, role-modeling and mentoring, reflection and responding individually to highlight that computer science and engineering academics can *do* CSD competently. These points are exemplified below with some further considerations.

5.1 Make CSD Practices Transparent

Academics can make their own communication processes more transparent and embed these qualities in their own subjects more explicitly. This can be done, for example, by taking the lead in innovative assessment. This

is also likely to enhance the profile of a department within a university. Generally, staff have under-utilised the potential of assessment practices to be the “key to improving teaching and learning” (James, McInness & Devlin 2001, p. 4). We should think about how and why we assess throughout our courses and, where appropriate, create integrated tasks that have the dual purpose of enhancing both content learning and CSD. However, some key questions to consider are:

Is an assessment-driven approach really the best way to enact a CSD agenda? Which specific subjects should be targeted?

What relative weightings should be assigned to CSD tasks?

How much assessment training would be required?

To what extent could peer assessment be harnessed to increase student involvement and lessen the burden of marking for staff?

5.2 Role-Model and Mentor CSD

Another potentially untapped resource is that many academic staff can provide excellent role-models and mentors for students, new tutors and demonstrators. One important way for staff to position themselves as a valuable CSD resource is to acknowledge the significance of role-modeling, whether directly or indirectly. Although departments have long recognized the importance of casual tutors and demonstrators as a pivotal factor in both the quality of teaching and CSD, such staff receive little formal training in these areas. Guidebook for tutors and demonstrators exist (see, for example, James & Baldwin 1997). However, evaluation and ongoing training of casual tutors and demonstrators teaching efforts’ is likely to be sporadic. Focused tutor and demonstrator training, support and evaluation would likely have four effects: a) overall better quality of teaching results across the department;

b) improved selection criteria and casual staff retention;

c) a better understanding of tutor and demonstrator needs and

d) the stronger integration of CSD tasks and activities. For their own professional development, other full-time staff may take an active role in training, mentoring and ongoing evaluation. However, some further questions arise:

What funding arrangements can be used to conduct such efforts?

To what extent should Senior Tutors and other academic staff be asked to participate in casual staff training and evaluation?

To what extent should the criteria *and* selection processes of tutors and demonstrators be made transparent and dependant on teaching performance?

To what extent are subject coordinators responsible for the supervision, mentoring and professional development of casual tutors and demonstrators?

5.3 Raise Awareness of and Collaborate on CSD

There are many ways in which academic staff at an individual level can raise awareness of CSD, for example one way that this is done at CSSE (Computer Science and Software Engineering) at the University of Melbourne is through explicitly linking subjects with key CSD attributes on the department’s web site². Another innovative

way to harness the advantages of the Internet is to develop credible purpose-built CSD resources³. The creation and provision of a single departmental site could act as a catalyst for the sharing of CSD tasks, materials and annotated references across the year levels. One example of a creative collaborative approach is the ‘Skills for Sustainable Engineering at RMIT’ website⁴. Ideally, however, a site could consist of academic staff input about CSD. For example, staff could write a brief 500 word description about how they write a paper or prepare for a conference. This could parallel a ‘research processes’ series for postgraduate research students. Some key questions for discussion might be: How would staff be encouraged to recommend such a site for a number of subjects? How could a range of staff in the department be motivated to contribute? How would students be motivated to make use of such sites? Another creative way to foster further collaborations between academics, professional institutions and industry sponsors is to award and encourage communication excellence. One such strategy is that used by IPENZ (Institute of Professional Engineers New Zealand) ‘Annual Communications Award’ for the best practice communication of the work of an engineer or group of engineers to the public or media⁵. Promoting and highlighting the value of such activities by academics to their students could act to increase the importance of CSD.

VI. CONCLUSION

As educators we are aware that we need to further develop innovative ways to integrate CSD. Employers locally and internationally view effective communication skills (highlighting interpersonal skills, teamwork and effective writing amongst many others) as a key attribute and consistently rank these as prime considerations of new graduates. They argue that one of the key places for developing CSD should essentially reside with tertiary institutions to foster and develop these skills in their graduates. And, too, we know that this means that our universities will develop stronger policies that promote responsibilities of CSD across the university from faculty to department and subject levels which are sustainable. This will lead, we hope, to a greater and more transparent commitment to implementing, reviewing and documenting CSD efforts across universities. Despite staff recognition of the importance of CSD and their welcome support for developmental activities, particularly in the areas of writing, teamwork, and critical thinking, we have found that the reality of time and training constraints are significant barriers to adoption. To increase the possibility of greater CSD integration, careful consideration needs to be given to professional development requirements, additional workload and how best to integrate CSD effectively and resourcefully. In the immediate short-term, CSD can be emphasized through innovative assessment, role-modeling and mentoring for tutors and demonstrators, and collaboration and consciousness raising by the cohort of departmental enthusiasts to drive CSD innovations. Our students provide the strongest motivation for our

efforts. Indeed, they recognize the gaps in their communication skill levels as they progress through their degree, and clearly see the need to highlight CSD much more. As one student wrote: “Well, it is hard to fit a totally comprehensive course into four years that is an unfortunate reality which must be accepted. But communication is such a critical skill it just can’t be left on the backburner.”

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