Embedding Matters in Engineering: Learner and Instructor Views

Peggie P.K. CHAN\textsuperscript{a*} and Hari K. GARG\textsuperscript{b}

\textsuperscript{a} Center for English Language Communication, 10 Architecture Drive, National University of Singapore, Singapore 117511

\textsuperscript{b} Department of Electrical and Computer Engineering, Block E4, Level 5, Room 45 4 Engineering Drive 3; National University of Singapore, Singapore 117583

*Corresponding Author’s E-mail: elccpk@nus.edu.sg

\textbf{Keywords:} Curriculum Development; Embedding; Engineering Education; Training in Communication Skills.

Extended Abstract

\textbf{Introduction}

\textbf{Rationale}

The curriculum of the engineering faculty in many universities is usually a packed one, often with new modules being added to equip engineers for the globalised world of work and technology. As such, the teaching of communication skills often has to take a back seat. The Faculty of Engineering (FoE) at the National University of Singapore (NUS) is no exception. Existing and new engineering modules jostle for curriculum space, yet the faculty has to devote space to the teaching of peripheral yet important skills such as communication and critical thinking. This is critical not only for purposes of accreditation but to continue to meet what industry requires of our graduates. The faculty is currently supported by separate study courses but research suggests that these support structures are counterproductive (Wingate, 2006). Essentially, these skills cannot be learnt apart from the subject content and learning process associated with the content. Research also found that the development of writing skills is fundamental to the understanding and construction of subject-based knowledge within an engineering course (Berkenkotter & Huckin, 1995). Additionally, NUS’ Able Communicator Initiative is targeted at equipping its students communication skills that are an essential part of workplace competence.

The objective of this paper is twofold: a) it describes the teaching of communication skills within an embedded setting, where embedding involves communication skills that “...are developed as an integral part of the study programme, and are assessed” (Gibbs, 1994) b) it reports on a study undertaken to review the response of students and content instructors who teach on the programme towards the approach.
**Models**

The communication skills that FoE content subjects often require embedding are both written and oral. FoE departments describe the support they require to the Centre for English Language Communication (CELC), the university’s provider of English language and communication teaching and support. CELC then proposes options of instructional modes, the most common being lectures, consultations on the report, and assessment of the assignments the department in collaboration with CELC, opts for (example, reports and the oral presentation), and in some cases, co-conducted tutorials. The differences in the models thus lay in the instructional modes, amount and frequency of exposure learners have to language and communication instruction, the level of CELC involvement, and the collaboration between the content and communication specialists.

This paper studies the model adopted in one module—EE303: Innovation and Enterprise 1. This module covers topics such as design thinking methodology, opportunity identifications and evaluations, customers’ needs generation, product specifications, concepts design and product architecture, testing, manufacturing and commercialisation, intellectual property (IP), project management and other pertinent facets of new technology product design. The assessments are three project presentations during which students present on New Product idea, Product Specifications and Intellectual Property and Product Development Plan, a product brochure, a storyboard, an insights paper and class participation. Instructional modes include lectures on persuasive rhetoric and skills in oral and written communications, product brochure design and strategies of proposal presentations, and online materials that provide support in team presentations, questionnaire and storyboard design, and writing.

**The Study**

The research questions are:

1. What are students’ perceptions of the embedded components in the content courses? What value do they see in these programs compared to other language and communication courses they have taken?

2. What are academic staff’s perceptions of the value of the embedded components in the content courses? What do they value in embedding? How does the embedding of language and communication add value to the content courses?

Surveys, insights papers and online student feedback on the content subjects in which the embedding occurred, were studied to examine the extent to which the embedded elements were valued by students. Surveys and interviews were conducted amongst the content instructors to examine their views on the approach.

**Findings**

Preliminary findings suggest that students are positive towards the approach. On one of the content subjects (EE1001: Emerging Technologies in Electrical Engineering), the online feedback on the module suggests that students are increasingly aware of the embedding of communication, as evidenced by the increase in mentions of communication/language and related topics in the feedback. In AY 2010/2011, there were 6 mentions (total=109 comments), in AY 2011/2012, 12 mentions (total=103 comments), and in AY 2012/2013, 32 mentions (total=125 comments).
On EE3031, the insights papers (a graded assignment where students record their reflections of the module from topics learnt to learning points and aspects of the module that made an impression on them) were also studied. In Semester 2 of AY 2013/2014, on this module offered to part-time students, of a total of 98 such papers, 80 mentioned language and communication skills. “Mention” here refers to the reference students make of these embedded elements. On the full time course, 77% of the papers mentioned the embedded elements. Typically, students comment positively on the usefulness of say, embedding language and communication into a content module, or negatively on say, the difference in expectations between the content and language instructors. Whether briefly or extensively, positively or negatively, it is clear that students value highly the embedding of language and communication elements in their learning on this module. There was ample mention made of the positive contribution of the teaching materials—the supplementary materials, videos of student presentations uploaded to IVLE and the instructor feedback offered for improvement.

**Conclusion**

Overall, the content instructors find the embedding of language and communication useful as an engineer’s job requires communication of information in a concise way, often in a short span of time and invariably, engineers-to-be do not get adequate training in this. One content instructor put it this way:

> Engineers tend to focus on the technical aspect of a problem and its solution, … Embedding lang/comm … has helped students to gain an understanding of the importance of defining the problem first before rushing to find/provide solutions. Hybrid modules like EE1000 provide students the opportunity to articulate their views and thoughts in group discussion, presentation and report writing, which is important for preparing students with life-long learning and critical thinking skills.

**References**

