



Engineering Graduates Generic Skills: Issues and Solutions

by Raymond Wong and Albert Tsang, Hong Kong Polytechnic University

Over the last two decades, globalization and modernization have created an increasingly diverse and interconnected world. Technological changes have revolutionized the workplace, patterns of work, job requirements and organizational structures. Such development invites questions about which competencies are most important for meeting the current and emerging needs of industry, and how these competencies can be developed and fostered at schools and universities.

In the context of work, the skills that individuals need to meet organizational and personal goals have become more complex, requiring more than the mastery of certain narrowly defined skills. In 2005, education ministers for the Organization for Economic Co-operation and Development stated: “Sustainable development and social cohesion depend critically on the competencies of all of our population—with competencies understood to cover knowledge, skills, attitudes and values.”¹

Think for yourself

There is a growing consensus that the curriculum in any field of university education should be more than providing the requisite skills for effective work performance. It should also help students think well and think for themselves. It involves identifying questions worth pursuing, pursuing your questions through self-directed search and interrogation of knowledge, and presenting evidence to support your arguments.²

Thinking well or thinking critically involves at least two critical generic components: problem-solving and communication skills. While these generic skills are demanded in many professions and businesses, many studies in the United States, United Kingdom, Hong Kong, Norway and New Zealand indicated that engineering graduates often lack such skills.

A former vice chancellor of the Chinese University of Hong Kong made this statement to stress how important it is for students to develop self-learning abilities and communication skills in a fast-changing knowledge economy:

“In the past, it was possible for a person to stick to one job his entire life. Not anymore ... A graduate may change careers twice or more during his life ... Our future graduates may work in Hong Kong, Shanghai or New York, or three places at the same time. Therefore, it is important to ensure they are bi-literate—the ability to read and write Chinese and English—and trilingual—the ability to speak Putonghua (Mandarin Chinese), Cantonese and English, which will help with their employment prospects.”

One of the authors of this article conducted a study to identify the generic skills required by industry and the adequacy of these skills possessed by current engineering



graduates. In this article, only two generic skills will be discussed: communication and problem-solving skills.

Communication skills

Results of the study indicated that 57% of the engineering graduates (two to three years after graduating from the university) and 71% of the engineering managers regarded communicating effectively in English as being very important; 40% of the engineering graduates and 27% of the engineering managers rated the ability to communicate in Putonghua as very important. When it came time to evaluate the engineering graduates' competence in these skills, however, only 39% of the engineering managers rated that the engineering graduates as "adequate" in English, and 24% rated them as "adequate" in Putonghua. On the other hand, engineering graduates had a different perception of their communication skills—56% said they believed they had adequate skills to communicate in English (17% higher than engineering managers' perception). In terms of communicating in Putonghua, 29% of the engineering graduates rated themselves as having the requisite skills, compared to the 24% of engineering managers' perceptions of the graduates' ability as perceived by the engineering managers polled.

On problem-solving skills, the survey results indicated the engineering graduates generally perceived they had the adequate problem-solving skills to perform reasonably well in handling operations issues in their workplace. Engineering managers, however, had significantly different ratings on the engineering graduates' competence in problem-solving skills.

For example, in one survey question when engineering graduates and engineering managers were asked about the effective analysis of different types of data, 61% of the engineering graduates indicated they had the adequate skills to perform such analysis. Only 49% of the engineering managers, however, agreed with the engineering graduates' self assessment. In another example, when asked to assess engineering graduates' capacity and ability to think creatively and divergent thinking, about 50% of the engineering graduates said they had these skills, and only 41% of the engineering managers indicated engineering graduates had these competencies.

During interviews with engineering managers, some commented that the engineering graduates usually have a narrow focus in looking for solutions to a problem. One manager indicated that engineering graduates are typically good at finding optimal solutions, but they lack the ability to consider other alternatives beyond the quick fix solution and the various implications of a solution.³



Incorporating formal writing, presentation courses

The results of this study about Hong Kong's engineering graduates align—at least in part—with overseas findings related to engineering graduates' communication skills. Given the extent of inadequate communication skills in both English and Putonghua for Hong Kong's engineering graduates, it is desirable to integrate communication skills into courses where there is a context in which these skills can be further developed in engineering education. The other solution that will help engineering students is to enhance formal writing and presentation courses in the engineering curriculum, similar to what McGill University in Montreal offers its students. Writing and presentation skills can only be achieved through frequent practice and timely feedback.

The Hong Kong Polytechnic University offers noncredit-bearing complementary courses to improve students' communication in English. Furthermore, its undergraduates are required to take the university-developed Graduating Students' Language Proficiency Assessment (GSLPA) tests in Chinese and English before graduation. At other universities, such as the State University of New York at Buffalo and McGill University, credit-bearing electives have been developed to address the topics of technical communication for engineers and empowering your technical language.

Some universities in Australia have also taken measures to ensure generic skills are incorporated in the learning outcomes of their engineering programs. For example, Griffith University has developed a toolkit to help its faculties formulate practical strategies for embedding communication, problem-solving, information literacy and teamwork-related generic skills into the design of engineering curricula. The University of Queensland specifies the following learning outcome of its undergraduate engineering programs: communicating ideas clearly and effectively; learning and working independently; and decision making.

The University of South Australia in Adelaide goes one step further and requires the curriculum documentation to indicate the specific components of a student's effort in a course that is designed for the development of specified generic skills. At the University of Technology in Sydney, engineering students might analyze a given problem for an assignment, develop a proposed solution to the problem and present and defend their recommendation in front of a panel comprised of academic staff or industrial representatives, as well as take questions from the panel.

These approaches to embedding development of generic skills in curriculum design will make engineering graduates better prepared to meet the challenges in the workplace.



References

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Raymond Wong is a lecturer for the Department of Industrial and Systems Engineering at Hong Kong Polytechnic University.

Albert Tsang is a principal lecturer and the leader of the BEng (Hons) in Industrial & Systems Engineering Program in the Department of Industrial and Systems Engineering at Hong Kong Polytechnic University. For more information about Hong Kong Polytechnic University, visit www.polyu.edu.hk.