Practice trumps theory for engineers

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Educational practices for engineers need a serious rethink. Besides in-depth technical knowledge, engineers need to develop a broad range of soft skills to deal with clients and suppliers.

The engineering profession is not exactly renowned for its soft skills. Yet social and psychological skills do seem to have an important role in the profession, enabling engineers to successfully manage their relationships with suppliers, clients and other key participants in a major project.

This is one of the findings of research by Julie Gainsburg of California State University, IESE's Carlos Rodríguez-Lluesma and Diane E. Bailey of the University of Texas at Austin. Their paper, "A Knowledge Profile of an Engineering Occupation: Temporal Patterns in the Use of Engineering Knowledge," was first published in *Engineering Studies*.

By identifying the importance of these soft skills, the paper contradicts much accepted wisdom on the engineering skill set.

Take O*NET, a resource center that lists the skills required for the vast majority of trades and professions in the United States. In its ranking of the importance that customer knowledge and personal service play among different occupations, civil engineering - of which structural engineering is one branch is placed 404th.

This puts civil engineers behind tree trimmers, boilermakers and ceiling tile installers - an assumption that perhaps needs to be challenged in light of the research findings.

The primacy of practice

Practice may not make perfect, but it certainly seems to provide most of the knowledge that structural engineers need to do their jobs well.

Knowledge learned in engineering practice seems to be used more often than information from the vast pool of reference materials built up by the structural engineering profession.

In other words, real-world practice results in more usable knowledge than existing professional information sources or that learned in the classroom - a finding that must surely give engineering educators pause for thought.

The authors not only reveal the primacy of practical experience, but also identify the range of different ways structural engineers gain information, how frequently they use these sources and at what point in a construction project.

The use of existing knowledge - from textbooks, manuals and the like - tends to peak in the middle of structural engineering projects, while practically derived knowledge predominates at the beginning and end.

A new approach to training

The dominance of knowledge generated in practice over established learning has deep implications for the education of structural engineers - and the authors make several suggestions as to where changes could be made in university programs.

Emphasizing practical problem solving over theoretical textbook exercises would be an obvious first step. Currently, most textbook exercises give students the idea that there is a standard method for solving any engineering problem.

In reality, a large number of problems require the use of rules of thumb and estimation, as well as innovative uses or syntheses of established methods.

As the real world will be the source of much of a student's knowledge, there is a clear need to expose young students to the profession through experience of real projects and interaction with suppliers and clients.

In short, the sooner the structural engineers of tomorrow are exposed to the realities of their chosen profession, the better prepared they will be. Moreover, talented potential recruits to

the sector are less likely to be put off by excessive emphasis on academic theory.

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