INSTILLING A NEW ETHICAL STANDARD

Today's engineering graduates learn that an ability to make ethical decisions is important for more than as a requirement for the P.Eng. But maintaining an ethical perspective isn't simply a matter of memorizing rules and concepts. How can the profession ensure that commitments to professionalism endure in an increasingly competitive marketplace?

Efforts to put engineering in the most positive light–whether to forestall challenges to self-regulation, or to encourage a greater number of students to pursue careers in the profession–depend in some measure on the degree of personal integrity and professionalism that individual practitioners exercise in the working world.

Any occupation dedicated to upholding public safety and protection faces an inherent challenge when its practitioners, however well meaning, encounter and respond to circumstances in the real world for which no textbook can prepare them.

Engineering is no exception; changing conditions in the engineering marketplace are requiring engineers to make moral judgments in response to any number of predicaments that would test one's professional mettle. Among these changes are the increasing use of multi-disciplinary teams by engineering firms, increased competition for contracts due to globalization and outsourcing, and the greater participation of internationally trained engineers–who may have unaccustomed sets of values and priorities, and ways of doing things–in their professional lives.

Such issues put additional pressure on engineering educators and regulators, alike, to draw attention to the professional codes of ethics that are expected to inform the conduct and practice of licensees.

PEO's *Code of Ethics*, section 77 of Regulation 941/90 under the *Professional Engineers Act*, is a central plank in the ethics education of engineering students in Ontario, and an ability to apply it to engineering practice situations is needed to successfully complete the PEO Professional Practice Exam, which is one requirement for licensure. Typically, it is at the tail-end of the undergraduate experience that the ethical considerations of practice are raised, in the hope graduates will enter the workforce with a healthy balance of idealism and practicality.

Student perception

PEO Councillor Seimer Tsang, P.Eng., has more than a passing interest in engineering ethics, based on his 28 years of teaching mechanical engineering at Lakehead University in Thunder Bay. He says there is continual pressure on engineering educators to instill in engineering students a proper level of appreciation for ethics.

"The students' interest is to get their [engineering] degree and they wonder why they need to bother with an extra course on laws and ethics," Tsang said. "They don't always see the need [for an ethics course] or the relationship [to their engineering studies], and that sometimes makes it harder for the engineering school to demonstrate the relevance of ethics to a professional engineer."

Tsang says drawing on the experience of guest lecturers who are practising professional engineers is one way to help students make the connection between ethics and professional practice. And while most junior engineers won't be faced with an ethical dilemma early in their careers, the experience of a veteran engineer is useful in raising their awareness of the kinds of decisions they may be called on to make in the future.

By Michael Mastromatteo

Several years ago, PEO collaborated with engineering regulators in Alberta and Manitoba to produce an educational kit to support the teaching of professionalism and ethics to engineering students. Entitled *Professionalism and Ethics: The Foundation*, the kit was provided to the deans of engineering across Ontario with the primary aim of assisting them to engage students in a contemporary discussion of professionalism issues; the tool's secondary emphasis is on professional licensing and the role of regulatory bodies.

Through three video vignettes drawn from real-life experiences, the kit is aimed at ensuring that the teaching of engineering ethics is not overly theoretical or idealistic, with only passing relevance to the hard realities of contemporary practice.

Dr. Carolyn MacGregor, director of the Professional Development for Engineering Students (PDEng) program at the University of Waterloo, says teaching students about ethical conduct does not in itself guarantee that graduates will apply what they've learned down the road. An ability to impose "ethical decision making" on situations the students might encounter in industry or practice, she says, will be more effective than a singular emphasis on rules, regulations and concepts.

"Teaching young adults to behave in an ethical manner is unlikely to sink in if instruction is limited to text books and tests on the rules," MacGregor told *Engineering Dimensions*. "One of our findings…has been that some of the gaps in behaviour are related to gaps in instruction from parents. I suspect that the same may hold true with a strictly academic approach to the teaching of engineering ethics."

MacGregor's observations suggest that an individual's upbringing, experience, character and integrity will likely influence how an ethics education plays out in the working world. "I purposely use the term 'ethical decision making,'" she said, "as I think we can assess a student's ability to use critical analysis to assist in weighing a wide range of criteria as part of ethical decision making. However a

score on any test does not guarantee behaviour. Think of how many people have passed their driver's test and still break the law every time they drive over the speed limit. The driver's test does not guarantee that the driver will drive responsibly. It only acknowledges that the driver can operate a vehicle responsibly. Put a police car on the side of the highway, and drivers will reduce their speed–even if the car is empty. Perhaps one of the ethical issues faced by business is the lack of 'cop cars' in the workplace."

Relevance to real world

Her views are supported in part by Marc Rosen, P.Eng., dean of the faculty of engineering and applied science at the University of Ontario Institute of Technology (UOIT) in Oshawa. Dr. Rosen says that despite the need to instill an appreciation of ethics as a regulatory and licensing requirement, educators still must take pains to relate it to marketplace realities.

"I admit that a difference often exists in how academics view engineering ethics, compared to how practitioners in industry view engineering ethics," Rosen said. "Academics often discuss hypothetical situations or realistic cases, but do not necessarily need to make the difficult decisions that a practitioner would, if the ethical dilemma were to arise in industry. In the world outside academe, the actual types of ethical behaviour observed can vary–sometimes markedly. Students from time to time tell me of ethical dilemmas they face on summer jobs or during internships,

and ask for advice. The situations often are very challenging, complex and likely to lead to serious problems if not managed correctly, making it difficult to provide simple answers. By using numerous and extensive realistic cases from industry in engineering ethics courses, I hope to narrow the gap between what engineering students are taught at university and how ethical situations unfold in industry."

Idealism in the workplace

Although engineers in the early stages of their careers aren't as likely to find themselves in difficult ethical situations as veteran engineers, ensuring a strong sense of professional behaviour from the outset is still important.

This was the prevailing view of the consulting engineers contacted by *Engineering Dimensions*.

Carolyn Adams, P.Eng., an environmental project manager with multi-disciplinary firm Marshall Macklin Monaghan (MMM) said that in her experience, it might take up to five years before a beginning engineer would face any serious ethical dilemmas.

She said her firm prefers to link new hires with a senior engineer who will guide their development and help the newcomer to understand the firm's expectations in terms of personal conduct and the assumption of new responsibilities.

"The mission statement and the message from the president both emphasize that MMM is a company that places high importance on ethical behaviour and we strive to adhere to the PEO *Code of Ethics*," Adams said.

She added that some young engineers tend to take a highly idealistic view of ethics when they join larger firms. "Our recently hired staff in other disciplines seem somewhat idealistic about work conditions, if not ethics," Adams said. "They see things in black and white—if another consultant's report is not perfect, that consultant must have been doing a less than perfect job. With more experience, I tend to think that there may have been extenuating circumstances. And, although errors may have been made, I am not likely to assume that someone hasn't done what they were sup-

posed to. I would think that there needs to be a similar approach to ethical questions."

Nick Carter, P.Eng., a principal with HH Angus and Associates Consulting Engineers, agreed that including an ethics or professionalism component in a firm's orientation program helps new hires to focus on their professional obligations, particularly those outlined in PEO's *Code of Ethics*. HH Angus issues a quality assurance manual to all staff, which details what is expected of its people, including requirements on how to behave vis-à-vis suppliers, contractors and other consultants.

Carter added, however, that ethical behaviour is ultimately linked to the individual's upbringing as well as their experience, culture and values.

"An individual's social and cultural background can influence how someone behaves in a professional setting, so that makes an emphasis on standards of corporate conduct even more of an issue at times," he said.

Often, internationally trained engineers come from different social backgrounds and their ethical value systems may be different from Canadian-born or -trained P.Engs. This can present a problem in the working world, if a company fails to provide appropriate instruction.

Ethical danger zones in industry today include accepting gifts from suppliers, where these gifts might influence an engineer's design decisions. Some companies have extremely strict policies in this regard and their employees may not accept even a cup of coffee. While this is a failsafe policy, given that engineers willingly accept potentially career-ending professional liability for their professional practice, accepting such

gifts as a promotional pen, the occasional business lunch, or a local educational seminar or promotional event open to the industry should not prevent them from making decisions in the best interests of the public and their clients.

However, engineers working for multi-function firms, such as a design/build outfit, might more easily be put in situations where they find themselves in a conflict between their loyalty to their employers and their loyalty to the public good. Similarly, an engineer at a consulting engineering firm might someday have to choose between protecting the interests of a valued client, in a situation of environmental contamination, for example, and those of the public.

But whatever the situation, an ethical mindset and a commitment to professionalism should help steer practitioners through these dangerous waters. As Konstantin Kreyman, P.Eng., of McMaster University's engineering faculty suggests, striving for a commonly understood way of doing the right thing can be more than a sentimental notion. "In a few years, today's students will play on a global, web-enabled marketplace that will be open to more people in more places. To be successful in this environment means being ready not only to share the knowledge and work without regard to distance and language, but also to make and sell leading-edge engineering products that satisfy the requirements and strict principles of engineering ethics. Engineering ethics should be the necessary basis to enable them in such a borderless, multi-cultural environment to implement engineering solutions that regard the practitioner's duty to public welfare as paramount."

–Michael Mastromatteo

Rosen says one problem educators face in linking ethics education with real-world situations is the reluctance of some employers to admit that ethical dilemmas actually crop up in day-to-day operations. "It's extremely useful to get case studies from industry, where this is possible," he said. "This is a challenge though, as companies often do not want to publicly discuss ethical problems with which they have had to deal. If possible, I try to find a guest engineer who is available to speak to the class about an ethically problematic situation in a company. The reason for focusing on realistic cases is that I find teaching engineering ethics by considering cases to have distinct advantages over focusing mainly on theory."

In fact, engineering faculties across Canada are moving to balance the ideal with the practical, to develop in graduates an anticipatory mindset that will better enable them to respond to the dilemmas encountered in industry or private practice.

Konstantin Kreyman, P.Eng., a professor at McMaster University's engineering faculty, discusses ethics at length in his Introduction to Professional Engineering course. He agrees there may be a gap between the teaching of ethics and how it influences engineering practitioners in industry, but believes that a theoretical grounding in ethics is a necessary part of a student's learning environment.

"It seems to me the existence of this gap is not an unexpected thing," he said. "Instructors are, after all, able to present to students just a model of the real engineering environment and problems. To me, this is the essence of engineering education—acquiring new knowledge by using adopted and, very often, simplified real-world examples. The question is, however, how big or reasonable is the gap? Will fresh graduates be able to use their university knowledge and skills to overcome it and to solve real-world problems?"

Some educators stress that increased collaboration among educators, industry and regulatory bodies is the key to a stepped-up sense of ethics and professionalism. As well, it is argued, a legalistic following of rules is simply not enough

to bring a higher sense of professionalism to one's practice. Instead, a basic appreciation of ethical values and moral principles must be used, in combination with professional judgment, to help graduates steer clear of ethical pitfalls.

Ability to discern

Students are also taught that it's not always easy to recognize ethical situations, so that graduates will need to have developed their own ethical criteria and decision making tools, as well as the confidence to make difficult decisions.

In addition, they learn that an engineer's duty to public safety and welfare must take precedence over an engineer's duty to an employer. But maintaining such a hierarchy of professional obligations once in the workforce may be challenging, when one's relationships with contractors, suppliers and other stakeholders can bring into question the appropriate balance between one's loyalty to an employer versus one's duty to the public, the profession, and oneself.

Although large employers of engineers often imbue their ethics expectations in new hires by way of mission statements, company policy manuals and even mentoring programs, those just starting out in the profession should develop their own skills and judgment to help keep ethics and professionalism prominent in all their interactions. Such was the recurring theme at both a recent industry forum, sponsored by the Ontario Society of Professional Engineers, and an engineering education forum organized by the University of Ontario Institute of Technology.

Meanwhile, those setting the academic qualifications for professional licensing, such as the Canadian Engineering Accreditation Board (CEAB), are seeking to boost the requirement for ethics learning. The CEAB recently established a new accreditation criterion requiring accredited programs to include a component dedicated to making students more aware of the role and responsibilities of the professional engineer in society. The CEAB also mandates "appropriate exposure to ethics, equity, public and worker safety and health considera-

tions, and concepts of sustainable development and environmental stewardship" as "an integral component of the engineering curriculum."

Whatever efforts are made to make ethics education more relevant to a changing marketplace, insiders believe regulators, educators and employers will benefit from greater collaboration. Carolyn MacGregor, for one, suggests that each stakeholder can bring about a better delivery of ethical learning by considering in common some of the following basic questions:
- What are the main ethical issues as they are perceived by industry?
- Are these issues being tackled as part of the core curriculum in engineering programs?
- What issues are educators seeing in the classroom that may translate into ethical problems in the workplace?
- How do we make a better connection between the classroom and the workplace?
- How do we instill in students a responsibility to monitor and regulate ethical behaviour for themselves as a step towards a career in a self-regulating profession?

For any profession, keeping the public's trust is vital to maintaining the privilege of self-governance. And despite the constant reminders of the engineer's seal, code of ethics and well-established regime for complaints and discipline, much depends on each practitioner's sense of doing the right thing to further the profession's good name.

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