ENGINEERING A SMARTER APPROACH TO LICENSURE

By Bob Dony, PhD, P.Eng., FIEE, FEC

In my previous President's Message, I wrote about the need to address concerns raised about the evolution of our engineering accreditation system. Having just returned from the Engineers Canada annual general meeting, I noted that accreditation was a topic of concern across the country as well. This is a timely opportunity for us to examine the fundamentals of our accreditation system and how it serves the regulatory obligations of PEO.

For most of our sister "right to practise" regulators, the gold standard for entry into the profession includes not only graduating from an accredited degree program, but passing a set of standardized technical exams. For example, the law societies have their bar exams and the colleges of physicians have their board exams. Even for the professional engineer (PE) licence in the United States, the requirements include obtaining a degree that is accredited by the Accreditation Board for Engineering and Technology, and then passing both the National Council of Examiners for Engineering and Surveying fundamentals of engineering exam and the principles and practice of engineering exam.

In Ontario, the academic (technical) requirements for licensure is "a bachelor's degree in an engineering program from a Canadian university that is accredited to the Council's satisfaction" or "equivalent" (R.R.O. 1990, Reg. 941 33.(1)1). No further technical exams are required. This is true across the country for our sister engineering regulators. So why is engineering different from other professions in not requiring additional technical exams after graduation? I think we've simply engineered a smarter approach.

THE MODERN ACCREDITATION PROCESS

For over 50 years now, the Canadian Engineering Accreditation Board (CEAB) has been accrediting programs nationally to "Council's satisfaction." The CEAB is a board committee of Engineers Canada, the national organization of the provincial and territorial engineering regulators, including PEO, who are its owners. The CEAB has produced a set of criteria that engineering programs must meet to be granted accreditation. The accreditation process includes a detailed questionnaire for the educational institution, a two-and-a-half-day site visit by a team of senior engineers, with a final decision by the entire CEAB board. The maximum period for accreditation is six years, after which the institution must re-apply for a full accreditation visit. The accreditation decision applies to programs, not departments or universities. Over the years, over 100 different programs have been accredited, from aeronautical engineering at the Royal Military College of Canada to water resources engineering at the University of Guelph, and have included a variety of instructional methods, from classical lecture-based delivery to fully problem-based learning at Université de Sherbrooke.

The CEAB criteria includes aspects found in most other modern accreditation systems: curriculum analysis, student environment, academic and support staff, and facilities and resources. They were also updated recently and now require institutions to define and evaluate a program's learning outcomes and a continual improvement process for curriculum renewal based on their learning outcomes assessment. Most of these criteria apply to the program in general. For example, the degree to which students meet the learning outcomes is determined by statistical sampling of student performance.

While these program-based criteria are common to other accreditation systems, the CEAB criteria also include rigorous student-based criteria. These criteria follow the "minimum path" principle: every student must meet the criterion for the criterion to be met. As part of the curriculum analysis, an overall minimum number of instructional hours (or equivalent problem-based learning) is defined. In addition, minimum numbers of hours are defined for specific curriculum components: mathematics, natural sciences, engineering sciences, engineering design, and complementary studies. The institution must show that every graduate of the program meets these minimum standards. During the visit, the institution must also provide for every course that may be part of the program course notes, textbooks, examinations, tests, labs, projects, etc., complete with graded student examples.

It is the review of this course material, coupled with the detailed curriculum analysis, that gives us as regulators the confidence in the technical rigour of a program. If we, through the visiting team, are satisfied with the rigour of the thermodynamics exam an applicant has taken in their accredited program, why would

we as a regulator assign an additional thermodynamics exam as part of the licensing process? Besides, who do we have set technical exams for applicants not from CEAB-accredited programs? Engineering professors who teach such courses in CEAB-accredited programs! In effect, our system combines the accredited education and technical board exams into one unified process.

However, such thorough student-based, minimum-path curriculum analysis is not part of most other accreditation systems. Therefore, it makes sense that other regulators would need additional board exams to ensure each applicant meets the requisite minimum level of technical expertise.

EVOLVING APPROACHES

Our unique approach to accreditation that so closely integrates the education into the licencing process is, I believe, a major contributor to the strength of our engineering profession in this country. Without the use of standardized board exams, educational institutions are free to develop innovative programs that are truly world-class. And the evidence bears this out. Canada is one of the top exporters of engineering services in the world, punching well above our weight. Further, the recent announcements of Ford and General Motors to establish autonomous vehicle research programs in Ontario is further evidence of the excellence of our engineering profession.

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However, as much as we can rightly celebrate our successes, we cannot remain complacent. The deans of engineering, both provincially and nationally, have raised concerns that the current accreditation criteria may not be allowing yet further innovation in educational methods and curriculum. As a professor of engineering myself, I know first-hand that the classroom of today is not the same as it was even a few years ago. Through research into new teaching and learning methods, we are developing more effective educational approaches to replace the traditional “chalk and talk” of old. The “sage on the stage” is evolving into the “guide on the side.” The use of technology is ubiquitous. Students’ expectations and backgrounds are changing. The profession itself has evolved.

WORKING TOGETHER

On May 29, PEO jointly hosted a workshop, “The Academic Requirements for Licensure: Beyond 2022,” at McMaster University between the Ontario deans of engineering and representatives from PEO that included senior staff, Council and members of the Academic Requirements Committee (see ”Workshop discusses academic preparation of future practitioners,” p. 25). It was an opportunity for the two sides involved with the academic requirements to licensure to talk with each other about our perspectives and concerns. Some of the topics of discussion included internationalization of the profession and education, teaching and learning methods, and curriculum content measurements, amongst others. By the end of the workshop, all agreed that we must continue to work together to evolve our licensing process, adapting to the innovations in engineering education already in the classrooms across the province. There has been much interest nationally in this workshop so it is an opportunity for Ontario to take a leadership role. As PEO is soon to move forward into its second century of regulating the profession, we all understand that we as a regulator must not just adapt to the changing profession, but become a leader of that change. **e**