Post-graduate training for geotechnical engineers – is it time for a professional masters?

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ABSTRACT
Recent strategic planning within the Department of Civil and Geological Engineering at the University of Saskatchewan has highlighted the need and the opportunity to revamp our approach to post-graduate training. We are currently working on a redesign of our MEng program into a professional Master's program, which will involve modular, workshop-format course offerings using innovative and web-based distant learning technologies. It is envisaged that this program will offer greater flexibility to engineers wishing to obtain post-graduate qualifications and will enhance our interactions with industry. It will also result in the development of teaching tools which would provide more flexibility to faculty.

RÉSUMÉ
La récente planification stratégique au sein du Département de Génie Civil et Géologique à l'Université de la Saskatchewan a souligné le besoin et l'opportunité d'améliorer notre approche à la formation universitaire supérieure. Nous sommes actuellement en train de reconcevoir notre programme de maitrise MEng en un programme de maîtrise professionnelle, qui impliquera l'offre de cours modulaires sous forme d'atelier de travail en utilisant les technologies innovatrices d'enseignement à distance basées sur le web. Il est envisagé que ce programme offrira une plus grande flexibilité aux ingénieurs souhaitant obtenir des qualifications universitaires supérieures tout en augmentant nos interactions avec l'industrie. Il pourrait également conduire au développement d'outils d'enseignement qui fourniraient plus de flexibilité au corps enseignant.

1 INTRODUCTION

One of the components of a recently developed strategic plan for the Department of Civil and Geological Engineering at the University of Saskatchewan was to develop 'professional' graduate programs in various civil and geological engineering specializations. This planning element highlighted the need to revisit post-graduate programs currently offered by the department and has given us the impetus to fundamentally alter our approach to post-graduate training.

The current economic boom in Saskatchewan has created unprecedented competition amongst employers for the recruitment of new engineering graduates. Industry is keen to have their new employees undergo Master's-level training; however, in many cases, they cannot afford to let the employees take significant time off work to complete this training. Employers are looking for flexibility that is difficult to provide using either our current MEng program, which is course-based and takes approximately 12 to 18 months to complete, or our MSc program, which is research-based and takes approximately 18 to 27 months to complete.

In the past, the need for engineers with post-graduate qualifications was fulfilled by a steady output of students graduating with MSc or MEng degrees. With the current high demand for new engineering graduates not only in Saskatchewan but in other rapidly growing economies such as India and China, it has become more difficult to recruit graduate students for our MSc and MEng programs.

2 RECENT DEVELOPMENTS AT THE UNIVERSITY OF SASKATCHEWAN

We have recently created a new Saskatchewan Centre of Excellence in Transportation and Infrastructure (SCETI) funded by the provincial government. We are actively pursuing initiatives to establish similar centres in the areas of mining and mineral processing. The one clear message from industry in the development of these initiatives has been the urgent need for advanced training of professionals. In response to this demand and opportunity we are currently working on a redesign of our MEng program into a professional Master's program that will include some of following features:

- Smaller number of courses (6 plus project)
- Flexible course delivery methods (including flexible course time schedules, web-based options, short-duration workshop-type courses, etc.)
- Projects developed in concert with employers
- Short-term research 'internships' at the university

The central idea is to offer core post-graduate training in shorter, more focused workshop formats (3 days to 1 week). These course offerings would be created as modules out of existing core programs in areas such as geotechnical engineering, and could be linked, along with extra-course assignments and labs, to create accredited courses. For example, a 1-week course in Geotechnical Practice can easily be created by combining modules taken from several core geotechnical courses, namely, Soil Mechanics, Foundation Engineering, Geosynthetics, Earth Structures, and Geotechnical Modelling.

Each module would include lecture notes and video recordings of in-class lectures (described later) and supplementary self-study materials and have a self-

assessment component involving quizzes and assignments. Such modules can also be made available to industry to 'train' their engineers in one or more aspects of their core business. For example, a newly hired engineer could be asked to 'study' and 'pass' a module on shear strength of soils or on design of flexible earth retaining systems.

It is anticipated that a modular offering of post-graduate courses would provide the much-needed flexibility to practicing engineers wishing to acquire post-graduate qualifications. An engineer who wants to pursue a masters degree could be provided time off work for short durations (one week at a time). This intermittent leave should be quite acceptable to most employers, and would allow the young engineer to complete the required number of courses over a period of several years. The engineer would then embark on an industry-related research project under the joint supervision of a professional mentor selected from his employer and a professor at the Department of Civil & Geological Engineering. This arrangement would essentially eliminate the need for the engineer to take 18 to 27 months of 'study leave' to complete an MSc.

2.1 Use of Web-based Technologies

One simple web-based approach to course delivery is currently being experimented with by the geotechnical group at the University of Saskatchewan, and is loosely based on previous experience in the use of web-based technologies at the University of Manitoba (Alfaro et al. 2008). The authors have been awarded a grant from the Technology-enhanced Learning (TEL) program of the Government of Saskatchewan to develop a series of web-based distant learning modules in geotechnical engineering. Currently, the first author is involved in the development of these modules for Advanced Soil Mechanics, which is one of the five core post-graduate courses in geotechnical engineering at the University of Saskatchewan. Trials to identify suitable tools for the development and the web-based delivery of the modules are on-going. These trials will help in the selection of the most suitable format for video streaming and in the design of templates for overall program and individual course websites. These trials are also aimed at helping the instructors become familiar with the techniques used in the preparation and the delivery of course materials.

This TEL-funded program, when fully implemented, will provide a unique opportunity to enhance recruitment of graduate students and enhanced accessibility to graduate-level training both for the local industry and for international collaborations. Specifically, it will provide new resources for training of practicing engineers in the province, expanding the provinces workforce, providing increased access to these engineers off campus and across the province. It will also contribute to inter-institutional graduate student training in areas of high-need and create courses that can be utilized by students as part of their graduate training in high-demand areas. It will also result in the development of teaching tools that provide more flexibility to faculty in terms of course delivery.

3 CONCLUSIONS

It is expected that a professional masters program developed along the conceptual model described in this article should result in a 'win-win' for faculty by producing additional revenues for research, creating industrial contacts and funding collaborations, and encouraging engineers to return for graduate training/research. Even at this conceptual stage the proposed professional masters program has been attracting significant interest from industry and government provincially as well as from other universities internationally. It is our hope that that linkages to other universities in Canada so that resources and course preparation loads can be shared.

REFERENCES

Alfaro, M., Blatz, J. and Graham, J. 2008. Refining geotechnical education to reflect modern engineering practice. Specialty Session on Geotechnical Education. Proceedings of the 61st Canadian Geotechnical Conference, (this conference), Edmonton, AB.