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Analysis of historical student performance using engineering accreditation data to evaluate inclusive and equitable teaching practices in chemical engineering

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There has been a global shift in focus in engineering education from inputs (what is taught) to outcomes (what is learned). In engineering, professional skills are now considered equally important for engineers to develop than the scientific and technical content and knowledge of traditional input education models. The nature of engineering work necessitates professional skills, such as communication, teamwork, problem solving, and lifelong learning, in addition to technical proficiency in math, science and design, and this is reflected in expectations regarding engineering curricula.

This outcomes-based education model is currently mandated by the Canadian Engineering Accreditation Board (CEAB), the governing body overseeing the accreditation process of engineering programs in Canada. The CEAB introduced Graduate Attributes (GA), the abilities, knowledge areas, and professional attributes in which students must demonstrate proficiency upon graduation for a program to be accredited, meaning that its graduates are qualified to work as engineers. The monitoring of student performance progression in these GA as part of a continual curriculum improvement model is required for accreditation. This improvement process requires the collection and analysis of performance data to identify and implement meaningful program or curriculum improvements to maintain and improve student outcomes and competencies in each of these GAs.

The evaluation of specific Indicators is allocated to courses and instructors covering relevant material, and each student's performance for that indicator is assessed through relevant coursework (deliverable grades, score on specific assignment or exam questions, etc). This information has been collected each year for decades, for each cohort going through both of CHBE's accredited programs.

A high-resolution analysis of this data, collected by the Department of Chemical and Biological Engineering at the University of British Columbia, was conducted to identify any correlations or causal relationships between students' gender, status (international or domestic), performance in individual GAs, course grades, and/or overall program GPAs. Whether performance in (a) given GA indicator(s) can serve as predictors of student success or difficulty in courses, or highlight any gender or status-based performance differentials was also investigated. The results may allow for early targeted support and "real-time" program monitoring, and inform EDI-enhancing interventions and program improvements. Results of this analysis have the potential to have a significant, long-lasting impact on student equity, learning outcomes and student experience in our department.

This presentation will cover the methodology and results of this analysis, and highlight some possible future avenues of investigation or areas for targeted intervention. Results may also provide interesting insights to other engineering departments in Canada or in the US, where the ABET accreditation process a similar approach.