Engineering Accreditation

Canadian Federation of Engineering Students – Official Stance

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"The Canadian Federation of Engineering Students believes that the accreditation system for Canadian engineering programs should protect the interests of engineering students by ensuring a high and consistent standard for the quality of their education and by involving student voices in the process of accreditation visits and the development of accreditation criteria."

The Students' Position

- Students are a key stakeholder in engineering education, and should be actively consulted in discussions and decisions related to engineering accreditation.
- The accreditation visit process should be reformed to better evaluate and incorporate student perspectives.
- An effective accreditation system should be primarily focused on learning outcomes, and any measure of student inputs should be representative of total learning time, and not favour lecture-based learning over other learning methods.

The Issue

The accreditation of Canadian engineering programs is overseen by the Canadian Engineering Accreditation Board, a committee of the Engineers Canada Board. The Accreditation Board is currently composed of 19 members ("the total number of members is subject to the current and anticipated number of accreditation visits") with a diverse range of engineering backgrounds in academia as well as industry (Engineers Canada 2016). The Accreditation Board grants accreditation to undergraduate engineering programs which meet or exceed acceptable standards for the practice of professional engineering in Canada on the basis of regular accreditation visits. The accreditation of any program is reviewed at least every 6 years (CEAB 2017). Accredited Canadian engineering degrees are also recognized for their substantial equivalence in quality internationally by the 19 signatories of the Washington Accord (IEA 2017).

The two foundational components of accreditation criteria are Accreditation Units (AU) and Graduate Attributes (GA). Accreditation Units are an inputs-based metric which measures in-class learning time (1 lecture hour = 1 AU, 1 laboratory/tutorial hour = 0.5AU) (CEAB 2017). An accredited engineering program must consist of at least 1950 AUs distributed across a broadly defined range of subjects including mathematics, engineering design, and complementary studies (CEAB 2017). Graduate attributes are an outcomes-based metric which identifies 12 attributes that graduates of Canadian engineering programs are expected to possess, including problem solving, design, communication skills, and professionalism. Accredited programs must demonstrate that the learning outcomes of their courses establish student competencies in these 12 areas. Other requirements for accreditation include the qualifications of faculty and leadership, the financial resources of a program, and the quality of the educational experience (CEAB 2017).

Engineers Canada has acknowledged that students are a key stakeholder in engineering accreditation, along with regulators, educators, industry, and the members of Engineers Canada and the Accreditation Board (Engineers Canada 2016). Currently, the direct involvement of students in accreditation is limited to "interviews with individuals and groups of students" at the level of accreditation visits (CEAB 2017). At the regulatory level,

a representative from the CFES (the Vice President Academic) also attends meetings of the Accreditation Board as an official observer to speak on behalf of student interests. The Quebec Confederation for Engineering Student Outreach (QCESO) also periodically sends representation to these meetings. Representatives from both student organizations were invited to the 2016 Forum on Accreditation to share input as stakeholders.

At the level of accreditation visits, a better effort can be made to effectively engage students. The students in engineering programs have a valuable perspective on the structure and function of their programs, and wider consultation of student bodies would likely yield more useful results for accreditation visiting teams. Accreditation visits for medical programs conducted by the Committee on Accreditation of Canadian Medical Schools (CACMS) incorporate significantly more student engagement. During a CACMS accreditation, a committee of students at each school are required to perform an intensive Independent Student Analysis (ISA) which includes a thorough, independent, self-study of their educational program and student services; the results of the ISA then play an important role in the accreditation decision for each school (CACMS 2016). While this intense level of student responsibility is not necessarily an ideal direction for engineering accreditation, some minor adjustments could substantially improve the student engagement aspect of accreditation visits. For example, interviewing a larger number of students on a randomized basis, or distributing program surveys to the entire undergraduate population of a program would help to gain a more comprehensive picture of student perspectives, without the slanted perspective of interviewing a small number of engaged students, or students that may have been hand-picked by their faculty. These updated processes of gathering student feedback could be facilitated by the engineering student society at each school, with the CFES offering resources and supports for effectively managing the processes at all schools visited in a given year.

In recent years, the process and criteria of engineering accreditation have been the subject of considerable controversy and debate. The primary conflicts have been over 1) the high burden placed on school resources by the accreditation process, and 2) the allegedly restrictive nature of the joint AU-GA system. In response to the first concern, Engineers Canada has established a four-stage Accreditation Improvement Program (AIP), which is focused on improving the efficiency, reliability and level of consultation in the accreditation process (Engineers Canada 2017). The CFES has been impressed by the initial work of the AIP, and is pleased to have been included as a stakeholder in the process. In response to the second concern, an AU Task Force was created to examine how AU can be adapted to allow more flexibility in the delivery of engineering education (Engineers Canada 2017). The AU Task Force contains representation from the Accreditation Board, the National Council of Deans of Engineering and Applied Sciences (NCDEAS), and engineering regulators; regrettably, no effort was made to engage student representation in this group (Engineers Canada 2017). The task force will be presenting a final report on their findings at the February meeting of Engineers Canada (Cassidy 2017).

Similarly, in early 2017 the NCDEAS announced an accreditation pilot project dedicated to researching and potentially testing out alternative accreditation criteria (Cassidy 2017). Based on updates and correspondence from the NCDEAS, the pilot project appears to have changed scope several times; by September of 2017, it had become a research project on applications of the European Credit Transfer System (ECTS) conducted by a staff member at the University of Victoria, and as of December 2017 it is not clear when the pilot project will be producing final results, or exactly what those will entail (Cassidy 2017).

The CFES acknowledges the importance of reducing the administrative burden on schools during the accreditation process, and commends Engineers Canada for their work in improving this process. However, the CFES also acknowledges that this issue is likely best addressed by the Accreditation Board and faculty

leadership, as they are most knowledgeable on the topic, and the direct impact of these changes to students are minimal.

The nature of the current accreditation criteria represents a far greater interest for Canadian engineering students. As discussed in the CFES official stance on Student Mental Health & Workload, unnecessary and excessive workload requirements have a series of negative impacts on student wellness (CFES 2018). While part of the burden for easing workload-related stress falls at the level of universities, the reform of the AU-component of the accreditation criteria also presents an opportunity to better quantify and manage student workload.

As mentioned previously, an AU is equivalent to a 1-hour lecture, or 2 hours of formal tutorials or labs. This makes it an input-based measure of time spent performing traditional learning activities, which can be a valuable metric when determining the completeness of an engineering program's structure. However, the CFES National Student Survey suggests that an average Canadian engineering student spends 19.2 hours performing course work outside of school hours each week, which is nearly as much time as the 23.6 hours they spend in labs, tutorials and lectures (CFES 2018). The current AU system fails to capture this significant portion of student workload (45% of a student's work hours in a given week). Assuming that assigned course work is an important component of student learning, the system also does not adequately capture the total student inputs required to build a successful program. The AU system also privileges traditional lecture-based learning methods over experiential learning methods by assigning twice as many AU to lecture hours, and by providing a limited K-Factor rationale for assigning AU to internship programs (CEAB 2017). It is not clear that this is because lecture-based learning is any more effective, but seems based on the rationale that lectures are inherently more consistent and thus easier to quantify. The NCDEAS has suggested that this system also inhibits the flexibility of programs to incorporate new and effective learning methods (NCDEAS 2016). An ideal accreditation system should track the total learning hours invested by students, and only privilege different kinds of learning methods over others on the basis of their effectiveness at achieving course outcomes.

The European Credit Transfer System (ECTS), which has been a focus of the NCDEAS during their pilot project, is a system of tracking academic credits among institutions in the 48 countries of the European Higher Education Area (EHEA 2015). The system first emerged as a means to fairly compare and transfer student's credits between European institutions, and is primarily focused on measuring course value by identifying learning outcomes and total student workload for a course. For example, a program profile in the ECTS system would describe the range of learning outcomes that the program imparts to students, and then include a measure of "total student effort" in terms of the number of hours invested by a student, split between "lectures and colloquia" and "student centred learning" (EHEA 2015). The CFES sees the ECTS as a positive model for the evolution of the current AU system, and encourages a general shift towards a system predicated on course outcomes and total learning time. An initial step in this program is better understanding how total learning hours are distributed across engineering courses, which is an outcome of the workload-tracking pilot program discussed in the CFES official stance on Student Mental Health & Workload (CFES 2018).

The CFES acknowledges that the Canadian system of engineering accreditation is an effective and world-class institution. The ability to begin the journey of professional practice immediately after graduation, without the requirement of a technical exam, is a unique advantage given to our students over the engineering students of other nations or students of other professions in Canada. However, there are improvements to be made to the current system to better evaluate the outcomes of workload and better involve student feedback. The CFES is prepared to offer an active student voice on these issues, and expects to be engaged as a primary stakeholder in all discussions and decisions related to engineering program accreditation.

What the CFES is Doing

- The CFES has provided student representation as an observer of the Canadian Engineering Accreditation Board for several years, and in 2015 formalized the responsibility to advocate to the Accreditation Board under the newly created Vice President Academic position
- In 2016, the CFES provided student representation to the Forum on Accreditation, to give student input on the future of accreditation.
- The CFES identified student workload and experiential learning methods (in the context of accreditation) as major research areas in 2017.
- The CFES has become engaged as a stakeholder in the Engineers Canada Accreditation Improvement Project.
- In 2017, the CFES sent representation to a meeting of the NCDEAS for the first time, and has discussed future collaboration on issues related to accreditation.

What the CFES Plans to Do

- The CFES will give Canadian engineering students a stronger and more consistent voice at the Canadian Engineering Accreditation Board.
- The CFES will push for inclusion in all relevant projects and committees related to the Canadian Engineering Accreditation Board.

Recommendations to Partners, Stakeholders, and Other Entities

- The CFES calls on the Canadian Engineering Accreditation Board to update its accreditation visit practices in order to incorporate more valuable and active student feedback.
- The CFES calls on the Canadian Engineering Accreditation Board to pursue a change to the Accreditation Unit system that better reflects learning outcomes and total learning time.
- The CFES calls on the Canadian Engineering Accreditation Board to include CFES student representatives as equal stakeholders in all relevant projects, committees, and task forces related to accreditation.
- The CFES calls on the National Council of Deans of Engineering and Applied Sciences to collaborate on joint recommendations to the current accreditation system based on the shared interests of faculty and students.

Sources

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