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**PROJECT SNAPSHOT**

**Engineering and Engineering Technology Pathway Development**

**Type:** Pathway Development

**Project Number:** 2019-12 or P1912

**Project Lead:**Queen’s University

**Collaborators:**Conestoga College Institute of Technology and Advanced Learning, Mohawk College of Applied Arts and Technology, Seneca College of Applied Arts and Technology, Sheridan College Institute of Technology and Advanced Learning, St. Lawrence College is a College of Applied Arts and Technology

**Project Summary**

This project began development of a pathway to bridge Engineering Technology students into Engineering programs in Ontario, starting with five Ontario institutions and expanding to additional institutions. The three-phase transfer pathway model introduced in Project 2018-06, Bi-directional Transfer Pathway for Ontario's Engineering and Technology Programs, will support qualified students in successfully transitioning from diploma to degree program and completing their degree program in a timely manner. The pathway design will be finalized and implemented in the continuing project, Project P2220 Engineering and Engineering Technology Transfer Pathway Development. Significant progress was made in finalizing the gap- analysis, identifying the exact bridging curriculum in collaboration with the participating programs, and attaining approvals and documenting internal processes required for implementation.

Phase 1 (Transfer Preparation) is completed while the student is still enrolled in their Engineering Technology Advanced Diploma program. Qualifying students are supported in incorporating additional courses that have been identified as filling engineering program gaps and being feasible to undertake in addition to the advanced diploma workload. There are three possible delivery mechanisms for such courses: in house, on-line, or at geographically convenient institutions. Students may also decide to take courses during or outside of term, depending on availability.

Phase 2 (Summer Bridge) is completed in-person at Queen's University during a summer semester prior to entering the receiving degree-granting Institution. A block of missing courses is delivered as a cohesive session.

Phase 3 (Program Completion) is completed while attending the receiving degree-granting Institution.

Students are supported in creating a plan to incorporate all remaining missing courses. Courses may be taken in house or on-line. In some instances, courses that might otherwise be designated as electives will be requisite for transfer students in order to ensure that they meet the missing Accreditation Unit (AU) requirements.

A student support program will be integrated into all 3 phases of the transfer process, including upper- year mentorship, tutoring and academic support, cohort-building activities, administrative assistance, and financial assistance.

### Project Rationale

Literature suggests that college pathways disproportionately improve access to engineering degrees for women and visible minorities, with some students relying on transfer as a pathway to a baccalaureate degree. Although several provinces in Canada have established pathways for students wishing to move from an engineering technology diploma to an engineering degree, such as Newfoundland and Labrador, Alberta, and British Columbia, no province-wide pathway in Ontario’s higher education system exists. Where partnerships between specific programs in certain institutions (e.g. Windsor-St. Claire, McMaster-Mohawk, Queen’s-St. Lawrence) exist in Ontario, many of these pathways allow students to complete a Bachelor of Technology degree rather than an accredited engineering degree (e.g. BTech programs at McMaster and Queen’s). The existing St. Lawrence civil engineering technology – Queen's civil engineering partnership attracts multiple students per year, and is accredited. This existing pathway takes 3 years to complete the advanced diploma and typically 3 years to complete the engineering degree, and these students overwhelmingly progress to graduation. The proposed pathway would shorten the time to completion of the engineering degree to 2 years, which is identified as one of the most important reason for interest in a transfer pathway, and involve multiple sending and receiving institutions.

A market research analysis conducted by Academia Group in 2019 (n = 1498) to investigate the current landscape of engineering technology programs in Ontario showed a significant demand from college students for a transfer pathway into an accredited engineering degree, estimating hundreds of applicants. ONCAT project #2018-06 indicated high levels of workplace success and a high demand from the engineering industry for students with the kind of skillset developed through engineering technology/engineering transfer.

### Outcomes

COVID had a significant impact on the timeline of this project, as it was suspended for a year requiring new conversations and reorientation with new collaborators. However, this project has resulted in developing and strengthening relationships with partnering institutions. Previous analysis of potential transfer credits was done by project staff and during this project, significant progress has been made on the official sign-off on transfer credits by professors or engineering Department Heads. The administrative process to admit students and track student data was planned and documented, which can also be used as a template for other receiving institutions setting up the internal processes required to admit students through this pathway. This project funded the development of a key bridging course, Engineering Design. Three additional bridging courses were also completed which were funded through an eCampus Ontario Virtual Learning Strategy grant. This project continues in ONCAT Project P2220, meaning that the outcomes are still in progress.

### Key Steps

Key steps to explore pathway viability included past ONCAT projects as well as a market landscape study commissioned by Queen’s.

The past ONCAT projects analyzed the curriculum of engineering and engineering technology programs in Ontario and did a preliminary assessment of likely transfer credits. These projects also explored the feasibility of multi-institutional engineering transfer in Ontario and determined that a three-phase transfer model would be necessary where students complete a handful of engineering degree courses concurrently with their diploma, complete a summer bridge, and then complete any remaining courses before graduation from their engineering degree.

The market landscape study explored the student interest in engineering transfer in Ontario. This includes the number of potentially interested students, what type of workload they would be willing to complete, and what features would make a pathway most attractive.

The key steps taken to develop the pathway included:

* Ongoing collaboration with project partners.
* Establishing institutional commitment to run pathway and attaining necessary Quality Assurance approvals.
* Official faculty sign-off on transfer credits.
* Determine necessary pathway curriculum to fill gaps and meet accreditation requirements.
* Bridging course development.
* Planning the administrative process to admit students, track student data, etc.
* Development of marketing materials and website.

### Pathways Created

Pathways into engineering at Queen's University were developed to the point of being able to create formal quality assurance modifications for institutional approval. The pathways will be finalized, go through quality assurance requirements, and be implemented in the continuing project, Project P2220 Engineering and Engineering Technology Transfer Pathway Development.

### Incompleted Pathways

The pathways discussed in this project are in the process of quality assurance review for institutional approval, along with additional pathways from new partnering institutions in the continuing project, Project P2220.

### Challenges

This largest challenge this project faced was that it was put on hold when the COVID-19 pandemic forced institutions to move to remote delivery. There was a loss of momentum when the project resumed after more than a year, and it took some time to reengage and reorient all of the project partners and new staff. The project pause also allowed time for curriculums to naturally evolve. As a result, some of the curriculum gap analysis work had to be revisited to ensure it was still accurate.

### Student Outcomes

The proposed pathway will benefit transfer students by improving the existing engineering transfer process and reducing time to completion. The existing college to university engineering transfer process will be improved by removing any requirements to provide secondary school transcripts so university admission decisions are made only on college marks, pre-determining transfer credits for students so they know what they are getting before they apply, reducing application fees by avoiding the OUAC application process, and providing administrative and academic support during the transfer process to make it simpler and easier for them.

Time to completion of an engineering degree will be reduced to as little as 2 years (plus a summer bridge) which has the additional benefits of reducing tuition cost and the opportunity cost of additional time at university. The market research completed as part of this project indicated that time to completion is one of the important key students use when choosing between a transfer opportunities. The benefit of completing a transfer pathway, such as the one proposed, into an accredited engineering degree program is that it allows students to work toward licensure as a professional engineer.

### Student Credential

Engineering Technology students entering this pathway will complete their Engineering Technology diploma as normal. This pathway will allow them to attain an Accredited Engineering degree in less time.

### Student Time Savings

The proposed pathway will save students up to two full years of study.

### Student Financial Savings

The proposed pathway will take as few as five semesters to complete over a two year period: a summer bridging semester plus 2 years in their degree program. This would save students up to three semesters of tuition costs. Importantly, it would save students the opportunity cost of spending additional calendar years in education instead of starting a job.

### Student Flexibility

This pathway makes things easier for students by making the transfer process into engineering programs a more welcoming experience. This includes: pre-determined transfer credits which means students know the credit they will receive before they begin the transfer process; a clear, welcoming, and well-explained application and admission process; an opportunity to complete some asynchronous online engineering courses before graduating from their diploma to better understand the workload of an engineering program before committing to moving cities or paying a full semester of tuition. This allows them to make informed decisions and sets them up to feel welcomed and included in their new institution.

### Student Work Alignment

This pathway provides a time-efficient pathway towards an accredited engineering degree which means graduates are eligible to pursue licensure as a Professional Engineer. A Professional Engineering license leads into a higher-paying career trajectory.

### Institutional Outcomes

The proposed pathway is changing the institutional culture around attracting transfer students to engineering programs. It is highlighting the value the different experiences that engineering technology transfer students bring to the engineering classroom. It has prompted Queen's University to specifically allocated a number of program seats for college transfer students, and allocate money to attract transfer students.

### Sector or System Implications

Areas of focus that could contribute to seamless transfer in the engineering sector could include more collaboration between institutions on things like standardizing some key curriculum elements. This could be accomplished through meeting with the Council of Ontario Deans of Engineering to gather together the university engineering stakeholders for a conversation. Something similar could be done with the college engineering technology stakeholders. Then, a meeting with interested parties from both sectors could be planned.

British Columbia has a well-defined “standard” first-year engineering curriculum. This allows colleges to offer the standard first-year curriculum as a standalone 1-year certificate which give students the ability to transfer into a participating engineering degree program. Whether or not colleges in Ontario did something similar as in British Columbia or not, it would be useful to define a common core curriculum to help Ontario Engineering Technology programs offer courses that would meet that threshold. This could include some key second-year courses as well. For example, many Engineering Technology programs have a calculus course, but each course is slightly different, and some do not quite match the university-level engineering calculus curriculum. If there was a well-defined and agreed-upon “standard” for a university-level calculus course, programs could ensure that their calculus course aligns with this, which would make transfer more seamless by making transfer credits very easy to determine.

### Tips/Advice

Advice to other institutions looking to develop transfer pathways in the engineering sector include:

1. Budget plenty of time for the layers of approvals that modifications to programs require.
2. Regular communication and collaboration with all project partners are important to develop strong relationships.
3. Work with project partners on areas of each institutions’ curriculum that require only small tweaks to be made eligible for a transfer credit.
4. Consider areas where you can make the transfer process easier for students. This was identified as a barrier by student support staff and staff who support student transfer. This includes things like reducing small hidden fees, making the application process administratively simple or at least clearly explained, or reducing the number of tasks required as part of the application process. Another important thing to consider is keeping contact with students between then they apply and when they enter the program, so they are not left “in limbo” between two institutions.
5. Consider the Canadian Engineering Education Board (CEAB) Accreditation Criteria at all steps of pathway development.

