

Strategic Plan 2013 - 2020

Vision 2020

**Faculty of Engineering and Applied Science
Progress Report 2017/18**

**Memorial Engineering
November 2018**

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1 Introduction

The Faculty of Engineering and Applied Science (FEAS) had another successful but challenging year in its Strategic Plan entitled “Vision 2020”. The Faculty achieved several historical milestones over the past year. At the 2018 Spring Convocation, the highest ever number of engineering graduates (236) received their BEng degrees. The highest ever enrolment of graduate students (680) was recorded in September 2018. Also, the highest ever number of co-op student placements in a year (over 1,200) occurred in 2018 – even higher than the “double cohort” in 2013 – and at a 99% placement rate of co-op students in the Fall 2018 semester!

The Faculty completed Year 4 (2016/17) of 8 of the Engineering Expansion Strategic Initiative. The provincial government paused the Year 5 growth funding allocation in March 2017 so the growth plan was paused since that time. Over the past year, FEAS has been challenged with expectations of growth by the government funded expansion, while simultaneously absorbing major budget cuts and attrition as a result of lower operating grants from the Province to Memorial University. Therefore this annual progress report on Vision 2020 will reconsider the Faculty’s original growth plan in light of the current budgetary climate.

This progress report provides an overview of the progress and achievements towards Vision 2020 over the past year. It provides a summary of actions completed on each of the four theme areas of the strategic plan – student success; research excellence; external partnerships; and distinguished workplace. The initiatives are well aligned with the University's capstone strategic plan and frameworks. This report will reconsider the growth targets of Vision 2020 in light of the challenging budgetary circumstances at Memorial University. Also, it will reconsider a number of targets and actions from the Vision 2020 plan which have either been completed, or else became repetitive each year without any substantive changes, as they are now firmly established and regularized elements of the Faculty.

2 Alignment with MUN’s Capstone and Strategic Frameworks

MUN's Capstone Plan comprises the university's three strategic frameworks in teaching and learning, research, and public engagement. As outlined in Table 1 below, the FEAS Vision 2020 goals, priorities and action plans are well aligned with the directions outlined by these strategic frameworks of Memorial University.

Memorial’s Capstone Goals	FEAS Vision 2020 Goals
Teaching and Learning Framework	
1. Build relationships – Memorial University establishes connections among educators, students, staff and members of the broader community.	1.2.2, 3.2.2
2. Engage people – Memorial University recognizes that engagement is important in all settings where teaching and learning occur.	1.2.4

3. Create synergies – Memorial University maximizes the benefits that occur when various components of the teaching and learning enterprise come together.	1.2.3
4. Focus on the learner – Memorial University engages its students, educators and staff to develop curricula, programs, support services and spaces that address learner needs and support achievement of clearly identified learning outcomes.	1.1.4, 4.3.1
5. Provide support – Memorial University supports educators, staff and all students it admits by aligning its policies and procedures with the distribution of resources to advance teaching and learning.	1.1.1, 4.2.1, 4.2.2, 4.4.2
6. Commit to quality – Memorial University provides high quality curricula and learning experiences that are current, relevant, creative, innovative and appropriately challenging.	1.1.3, 4.3.3
7. Foster transformation – Memorial University provides a supportive and inclusive environment that fosters individual transformation.	1.2.1, 3.3.5
8. Value contributions – Memorial University recognizes and values the contributions of all individuals who are involved in the teaching and learning enterprise.	1.1.2, 4.1.1
9. Acknowledge responsibility – At Memorial University, educators, students, staff and the institution as a whole share responsibility and accountability for effective teaching and active learning.	1.1.5, 1.2.5, 4.4.1
10. Support lifelong learning – Memorial University models enthusiasm for continuous learning.	3.3.4
Research Framework	
1. Attract, retain, support and celebrate people engaged in and supporting research.	2.1.2, 2.2.3, 2.3.2, 4.3.2
2. Support an environment of research collaboration.	2.1.4, 2.2.2, 2.2.4, 3.1.1
3. Engage with community partners and collaborators locally, nationally and internationally.	2.3.1, 2.3.3, 2.3.4, 3.1.2
4. Support fundamental and applied research excellence in areas of strategic opportunity.	2.1.1, 2.1.3, 2.2.1
Public Engagement Framework	
1. Make a positive difference in our communities, province, country and world.	3.2.3
2. Mobilize Memorial for public engagement.	3.2.1, 3.3.6
3. Cultivate the conditions for the public to engage with us.	3.3.1, 3.3.3
4. Build, strengthen and sustain the bridges for public engagement.	3.3.2

Table 1: Alignment of FEAS Vision 2020 and MUN's Capstone Plan

The action items of Vision 2020 plan have been updated and adjusted over time to align with emerging opportunities / challenges in MUN's Capstone plans. These evolving initiatives will be described in the following sections.

3 Vision 2020 Progress Report

The four primary pillars of the FEAS strategic plan – teaching; research; partnerships; and workplace – will be outlined in this section, including specific outcomes that have been achieved over the past year towards the goals of these priorities. In each of the sub-sections, a selected list of completed action items over the past year will be provided. It is a sample list including some of the main outcomes but not an exhaustive complete list. Most items are new initiatives that have been launched over the past year, while others were continued from a prior year but recently completed this year.

3.1 Creating the Conditions for Student Success

FEAS has achieved a number of significant outcomes and accomplishments over the past year as part of the Vision 2020 goals for enhancing student success and providing an exceptional teaching and learning environment.

Goal 1.1: Support Teaching Excellence

- Faculty members and the Associate Dean, Undergraduate Studies, have actively engaged in national initiatives in engineering education, e.g., CEEA (Canadian Engineering Education Association), Engineering Change Lab.
- Working groups have completed a number of new initiatives to enhance the course delivery of ENGI 1020 (Introduction to Programming) and 1040 (Mechanisms and Electric Circuits).
- Numerous new teaching innovations were introduced in various engineering courses, such as a flipped classroom in ENGI 4892 (Data Structures), wherein a blended format reverses the teaching environment by delivering instructional content outside the classroom and moves other activities into the classroom.
- Electrical and computer engineering laboratory improvements to improve the teaching environment were completed in ENGI 8894 (Embedded and Real-time Operating Systems).
- Civil Engineering expanded its use of problem-based learning approaches in design courses to add more design components, e.g., Hydrotechnical Engineering.

- Numerous site visits were arranged over the past year for Civil Engineering courses, including the Capital Ready Mix Plant, Windsor Lake Water Treatment Plant and the Robin Hood Bay Waste Management Facility.
- New Process Engineering initiatives were completed for the detailed review of labs, including feedback from lab technologists, and tracking of graduate outcomes to map assessments to outcomes.
- Mentors in all departments have supported junior faculty members in their career advancement, teaching effectiveness, and research opportunities.
- Student feedback on teaching has been generally very positive in terms of teaching effectiveness and quality of instruction. The Faculty-wide averages in many or most CEQ questions significantly exceeded the University averages, for example, in categories such as assessments (tests, assignments), technology used to help students learn course content, workloads appropriate to the course, overall organization of the course, and overall effectiveness of the instructor.
- The alternate delivery of co-operative education with community service learning terms was successful and extended for two additional years.
- The Technical Communications Co-ordinator worked closely with students in a number of courses (ENGI 1030, 1040, 3101, 3941, 8152, design projects and co-op work terms) to improve their written communications skills.
- Regular meetings with student representatives from each program were held to seek feedback for program and teaching improvement, after which various actions were taken, and the Department Heads discussed the feedback with instructors.
- Graduate Attribute (GA) and Continual Improvement (CI) processes have been implemented in Departments.
- The Undergraduate Studies Committee of the industrial advisory council, EASAC (Engineering and Applied Science Advisory Council), was consulted to provide input into the Faculty's new GA/CI processes.
- A curriculum development project was launched by Co-op Education for alignment of learning outcomes, indicators, graduate attributes, and electronic feedback on student performance from employers.
- Common course outlines with learning outcomes were collected and organized into a single new database.

- TA performance evaluation was again conducted over the past year for returning TAs. TAs with a poor evaluation were not rehired, new TAs received TA training, and 5 outstanding TA awards were announced.
- Feedback from graduate students on faculty supervision was collected and used based on SGS (School of Graduate Studies) exit surveys.
- Mechanical Engineering created a more effective technical stream format, and after two years, the feedback from students and instructors has been positive.
- ONAE guest speakers were arranged through the Student Section of SNAME (Society of Naval Architects and Marine Engineers) and industry engagement via RINA (Royal Institution of Naval Architects) in Term 8 design projects.
- Process Engineering faculty members served as program reviewers for CEAB accreditation visits, e.g., Dr. Steve Butt (BCIT, University of Toronto, Laurentian University), Dr. Lesley James (University of Calgary).
- Many excellent outcomes were achieved by MCE (Memorial Centre for Entrepreneurship) over the past year to strengthen the student entrepreneurial culture in FEAS and across campus, including a vibrant partnership with Business; active student ambassador team; winning engineering student teams at the Mel Woodward Cup; active entrepreneurship chairs; and closer linkages with Genesis. Some selected highlights of MCE's accomplishments over the past few years is summarized below:
 - New co-working space available 24/7 called FounderSpace in the SJ Carew Engineering Building.
 - 37 newsletters produced and subscribers grew from 200 to 1,200 (of whom the majority are students).
 - MCE's pipeline grew from 21 to 786 student entrepreneurs who are engaged in entrepreneurship activities at various stages of development.
 - 34 workshops, socials and fireside chats.
 - \$1.13M endowment fund, with \$40,000 invested annually, through the Mel Woodward Cup.
 - Two companies from MCE secured over \$600K in external financing (Empowered Homes and Colab Software, which grew to 27 and 8 employees, respectively).
 - In partnership with Futurpreneur, Propel ICT, YMCA Enterprise, Genesis and Common Ground, a visual representation of the entrepreneurial ecosystem in St. John's has been created to guide entrepreneurs and startup companies.
- Site visits were organized for students in Process Engineering courses ENGI 3600, 7640 and 8640 as well as guest lectures in ENGI 7640 / 8640 and 8676.

- Civil Engineering students participated and performed well at national competitions, including 3rd place at the National Capstone Project Competition, Fredericton, and the 44th Annual Great Northern Concrete Toboggan Race, Waterloo (People's Choice and Best New Team awards).
- Dr. Bruce Quinton was selected as the Chair of the ISSC2021 V.1 – Accidental Limit States Committee for harsh ocean environments.

Goal 1.2: Encourage Student Engagement

- A new Supplemental Instruction (SI) program was launched in the Spring 2018 semester to improve retention rates particularly in First Year and develop better study skills and resilience.
- Experiential Learning semesters for research and community service, as well as research and entrepreneurship work term placements, were made available to many co-op students over the past year.
- New surveys on the student learning experience were initiated over the past year in cooperation with Student Life. Also, the Faculty has partnered with Student Life to utilize new student success software that tracks student progress to develop more effective support mechanisms.
- A new data collection initiative was launched to acquire a broader set of data from high school grades through to graduation for multiple cohorts.
- Through a new data-mining project, correlations of student success with “high risk” courses were analyzed.
- High performing undergraduate students were actively encouraged to apply to the fast-track program for graduate studies after graduation.
- A student team placed 1st for their “MatHat” project at a national IDEa design competition of Universities Canada. This national competition invited teams to develop practical solutions for persons with disabilities. Students Katie Gillespie, Jack Chapman, nursing student Grace Clark, and neuroscience student Emma Fornan, developed a MatHat solution for children with Cerebral Palsy. Their project was displayed at the Canadian Innovation Exchange Conference in Toronto.
- Student Brett Vokey and his company BreathSuite won the 1st place award at the Embryo competition of the 2018 Embark Conference in St. John’s.

- A WISE NL female leadership program, called WinSETT, hosted a workshop on "emotional intelligence".
- Based on EASAC's Diversity and Inclusivity Committee recommendations, four new subcommittees were created in support of the "30 by 30" national initiative of Engineers Canada for women in engineering – focusing on 1) changing the Engineering image on campus and the admissions process; 2) adding and modifying the curriculum to attract and retain female undergraduate students; 3) attracting and retaining female graduate students; and 4) increasing the number of female faculty members.
- A new Biomedical stream was successfully piloted in Electrical, Computer, and Mechanical Engineering, for the classes of 2019 and 2020, with about 20 students in each cohort opting for this stream.
- Annual national survey data from engineering schools across Canada for the numbers of students, faculty, ratios, resources, etc. showed that Memorial Engineering compared favorably in several key indicators, for example: FTE UG students / FTE total faculty – MUN 13.0, Canada 18.6; FTE graduate students / FTE faculty – MUN 7.9, Canada 7.3, among others.
- A new entrepreneurship course was introduced in partnership between Engineering and Business.
- Minors in Applied Science in Physics (Electrical Engineering) and Chemistry (Process Engineering) were successfully pursued by students over the past year.
- Electrical and Process Engineering have partnered on an innovative new curricular initiative in Digital Oilfield Education (Drs. Lesley James, Dennis Peters, and Octavia Dobre).
- Through broad consultation, student weaknesses in basic skills were identified, and follow-up actions have been undertaken by CUGS (Committee for Undergraduate Studies) for junior undergraduate courses.
- Student team participation has expanded and these teams continue to prepare for upcoming national and international competitions, e.g., Baja, Paradigm Hyperloop, SAE Aero, Space Cube, Mars Airlock, and SNAME and RINA student groups.
- ONAE course ENGI 3001 (Ocean / Naval Design) featured regular ship visits. SNAME student activities held field / ship visits and networking opportunities with industry.
- The 4th Annual Mechanical Engineering Symposium was successfully held for student engagement on issues of importance in the engineering profession.

- Female enrollment in Mechanical Engineering has increased to 25% in 2018 (Class of 2022) – a significant increase above its prior historical average of about 16.5%.
- The Globe and Mail reported that, for the fourth year in a row, Newfoundland and Labrador had the highest percentage of female undergraduate engineering students in Canada (26.9%).
- The ICEOP funding program for international work term placements was successful over the past year with numerous international opportunities and placements for co-op students.

3.2 Increasing Research Capacity

Very good progress was also made over the past year on the strategic plan goals of increasing research capacity and intensiveness, as described in the following selected examples.

Goal 2.1: Attract, Retain and Support Research Activities

- Several workshops were held to discuss research proposal success, including 5 NSERC sessions to discuss NSERC Discovery Grants and program updates, as well as NSERC Strategic Partnership Grant applications.
- ERO (Engineering Research Office) has regularly updated its database to keep an up-to-date record of grants and contracts, which are communicated monthly through Faculty Council updates and newsletters.
- Several faculty members participated on major NSERC Strategic Network and CREATE proposals, e.g., Drs. Bing Chen, Heather Peng and Dr. Octavia Dobre.
- A CubeSat research project led by Dr. Weimin Huang and Des Powers (C-CORE), funded by the Canadian Space Agency, was featured in a CBC News article as the first satellite in Newfoundland and Labrador to be built and launched from the International Space Station for the purpose of measuring the thickness of ice sheets in the North Atlantic.
- A team of faculty and staff members including Dr. Faisal Khan, Dr. Adedoyin Odukoya, and Jinghua Nie, visited Nigeria and Ghana to develop new collaborative partnerships with Universities in Nigeria and Ghana (3 MOUs signed and 2 others expected), e.g., University of Lagos, Covenant University, University of Mines and Technology Tarkwa, and Royal Maritime University Accra.
- Dr. Mohammad Al Janaideh was awarded a France Mobility Fund by the French Embassy, which allowed for student exchange programs with universities in France.

- Growth of research grant applications has occurred in the other two major federal funding agencies (CIHR, SSHRC), for example, with Dr. Stephen Czarnuch and Dr. Sarah Power pursuing new collaborations with the Faculties of Medicine, and Humanities and Social Sciences.
- Major new grants were secured by an engineering team (Drs. Bing Chen, Helen Zhang, Neil Bose and Tahir Husain) in a partnership with DFO (Fisheries and Oceans Canada), valued at nearly \$5M in funding. Under the Multi-Partner Research Initiative (MPRI) program, FEAS has secured the highest amount of funding among all 6 projects at Canadian Universities.
- Several researchers in FEAS were awarded funds through the Ocean Frontier Institute.
- As a part of Research Week, joint workshops were held with several faculties / schools and the Marine Institute to foster collaboration between researchers and interdisciplinary research. Researchers were invited to give brief presentations on their research activities and discuss areas where they are seeking collaboration.
- Over the past year, PRNL issued two calls for proposals, and over 10 LOIs were submitted by FEAS researchers to each call for proposals.
- Natural Resources Canada issued two calls on Clean Energy applications and 5 LOIs were submitted, including 1 by an industry partner, and 3 proposals valued at \$4.491M which were selected to submit a full application.
- Continued rapid growth has occurred in graduate student enrolments, including the highest ever total enrolment of 684 graduate students as of October 2018 (239 MASc; 200 MEng; 245 PhD). This represents a graduate student to faculty ratio of nearly 8 – the highest at Memorial and among the highest of all engineering schools in Canada.
- Research projects have expanded a number of industry and international partnerships, e.g., Dr. Brian Veitch (LRET program with Sweden); Dr. Claude Daley (GEM program with industry partners and other departments); and PhD student exchanges with the University of Stavanger, Norway; Chalmers University, Sweden; and NTNU, Norway.

Goal 2.2: Support Research Excellence and Focus on Areas of Strategic Importance

- An internal review process for NSERC Discovery Grants, which encourages applicants to share their proposal with at least 2 peers holding a Discovery Grant (one expert and one non-expert within the evaluation group), has yielded good outcomes over the past year with a DG success rate of 66% – well above the national average.

- ERO has created a Scopus list of faculty members in FEAS, for tracking the Faculty's scholarly output, and encouraging faculty members to consider Google Scholar or other similar accounts to observe the impacts and citations of their research articles.
- A 3rd Annual Research Poster Day was held successfully, including broad advertisement across campus, externally (radio), and exposure through a Telegram article, positively describing the success of graduate student and research projects.
- Ten additional scholarships per year were awarded for undergraduate students to carry out a research semester during co-op work terms.
- Faculty researchers were featured prominently in news stories, newspaper articles, and the Gazette, including but not limited to: Drs. Bruce Quinton, Yan Zhang, Kelly Hawboldt, Helen Zhang, Brian Veitch, Faisal Khan, Rocky Taylor, Octavia Dobre, Yuri Muzychka, Ralf Bachmayer, Weimin Huang, Eric Gill, Carlos Bazan, Dennis Peters, Glyn George, Geoff Rideout, and activities at MCE (Memorial Centre for Entrepreneurship) and MEO (Memorial Engineering Outreach).
- FEAS recently moved several administrative processes to a new MUN Researcher Portal, so as to better manage research grants and contracts, although further improvements are needed and currently underway to address feedback from faculty members.
- ERO has developed a new mentorship program, to be introduced soon, to form collaborative teams of established researchers and early career researchers. This will support joint applications to large research projects and link researchers with industry partners who have an established partnerships with Memorial.
- Mechanical Engineering had a 100% success rate with all NSERC Discovery Grant applications awarded from 2015 to 2018. From 2012 to 2018, the success rate in the department has grown from 29% (4 of 14) to 71% (12 of 17).
- ERO joined a working group of all research and contract administrators across Memorial to review current practices, streamline processes, and reduce duplication of efforts.
- Research grants were funded through the Harris Centre, e.g., two from the MMSB Fund (Dr. Kamal Hussein and Dr. Tahir Husain) and one from the Thriving Regions Fund (Dr. Carlos Bazan).

Goal 2.3: Expand Engagement with Partners

- Several Lunch and Learn sessions were held over the past year for research dissemination by Drs. David Molyneux, Yahui Zhang, Steve Bruneau, and Mohammad Al Janaideh (advertised across campus and MI).

- Interdisciplinary collaborations among different units has expanded, e.g., cross-appointed faculty members from C-CORE (Mitacs grants); Drs. Faisal Khan's and Kelly Hawboldt's collaborations with researchers at MI; Dr. Stephen Czarnuch with researchers in Science, HSS, and the Canadian Institute for Public Safety Research and Treatment; and Dr. Weimin Huang's partnership with C-CORE (CubeSat; Canadian Space Agency), among numerous others.
- Several international research partnerships have grown, for example, with Dr. Tahir Hussain expanding the partnerships with the Saudi Electricity Company and Global Environmental Management Services in Saudi Arabia.
- The Norwegian INTPART program has an increased presence of FEAS, for example, Dr. Rocky Taylor and Dr. Brian Veitch as part of a team from UNIS (University of Stavanger, Norway) that secured funding from the Norwegian Research Council.
- Dr. Bing Chen has led a PEOPLE (Persistent, Emerging, and Organic Pollution in the Environment) network to over 50 researchers and industry partners to tackle environmental concerns and response to accidental oil spills in cold and harsh climates.
- Dr. Wei Qiu led and expanded the CiSMART (Canadian Network for Innovative Shipbuilding and Marine Research and Training) network to address new technological and human resource challenges facing the Canadian shipbuilding and marine industry with the renewal of the Canadian Navy and Coast Guard fleets. A national workshop was held to facilitate the collaborations. Another workshop, in partnership with Transport Canada, will be held in Halifax on November 2018, to address ship noise issues.
- Numerous visiting graduate students and scholars were supported over the past year, including from Vietnam (VIED), China (CSC), Iraq (Iraqi MOHE), Mexico (CONACYT), Brazil (SWB), Indonesia, Norway, Finland, Malaysia, Germany, Nigeria and Ghana.
- Joint initiatives were successfully carried out with other institutions from countries abroad, e.g., UPC (China), CUPB (China), IIT (India), Amity (India), HIT (China), UNIBEN (Nigeria), ZJUT (China), PKU (China), as well as initiatives with MI.
- Undergraduate and graduate student exchange programs were successfully held with UArctic, CUP-B (China), UPC (China), UNIS (Svalbard, Norway), WHU (China), UPES (India), and Amity (India).
- A new Canada-China Joint Center for Water and Environmental Sustainability (C3WEST) between Memorial, UBC and Peking University (China) has been developed and led by Dr. Bing Chen.

- The Centre for Risk, Integrity and Safety Engineering (C-RISE), led by Dr. Faisal Khan, successfully held numerous events and workshops over the past year.

3.3 Expanding Partnerships

Numerous activities of external engagement, outreach and partnerships with industry, high schools and other organizations, have been pursued over the past year.

Goal 3.1: Expand Partnerships that Contribute to Research

- The Graduate Studies Office has worked closely in partnership with SGS on several strategic initiatives, including graduate student recruitment events in China, Vietnam, India, Nigeria and Ghana, and market expansion strategies in Bangladesh, India, Indonesia, Brazil, Bangladesh, Turkey, Mexico, Iran, Nigeria, Pakistan, and China.
- New partnerships were established with the Provincial Government in the area of transport, pavement materials for highways, and asphalt (Dr. Kamal Hossain).
- Dr. Bipul Hawlader served on the Geotechnical Review Panel for the North Spur Stabilization on the Muskrat Falls project.
- Dr. Bing Chen was appointed by the Honourable Dominic LeBlanc, Minister of Fisheries, Oceans and the Coastal Guard, as a Member of National Advisory Committee of Canada's Oceans Protection Plan (OPP) Multi-Partner Research Initiative (MPRI), 2017 – 2019.
- Civil Engineering faculty members contributed in significant leadership roles, nationally and internationally, in professional societies, e.g., Dr. Bing Chen (elected as Vice-President, International, of the Canadian Society for Civil Engineering, CSCE); Dr. Assem Hassan (Member, CSA S474 Code Committee); Dr. Leonard Lye (Associate Editor of Canadian Journal of Civil Engineering, and Canadian Water Resources Journal); and Dr. Bipul Hawlader (Associate Editor, Canadian Geotechnical Journal).
- Several new and ongoing major grants in Process Engineering were launched over the past year – Dr. Steve Butt (ACOA AIF project on thin seam drilling); Drs. Faisal Khan and Kelly Hawboldt (Genome Canada, MIC Grant on microbial corrosion in offshore facilities); and Drs. Lesley James, Dennis Peters and Octavia Dobre (Digital Oilfield Education), among others.
- Faculty members in Process Engineering led or served on numerous workshop and conference organizing committees, e.g., Drs. Steve Butt and Lesley James (SPE Well Integrity Workshop); Dr. Faisal Khan (Safety and Risk Workshop; also MIC national workshop); Dr. Syed Imtiaz (CSCHE Conference);

- Dr. Lesley James served as the 2017/18 President of the Society of Core Analysts.
- New collaborative research projects have been established with NRC-OCRE on ship noise (Dr. Lorenzo Moro).
- Several ONAE faculty members served on technical committees of professional societies: Dr. Lorenzo Moro (ISSC Dynamics Committee), Dr. Bruce Quinton (ISSC Specialist Committee - Accidental Limit States), and Dr. Wei Qiu (Joint ISSC-ITTC Committee).
- Process Engineering faculty members served on national committees for funding agencies and professional societies, e.g., Dr. Kelly Hawboldt (NSERC IRC Committee, Strategic Network Review Committee, Chemical Engineering RTI Committee); Dr. Faisal Khan (Chemical Engineering Discovery Grant Committee); and Dr. Kelly Hawboldt (Registration Committee, PEGNL).

Goal 3.2: Expand Partnerships that Contribute and Strengthen our Programs

- Over the past year, there have been continued partnerships with CITL in the development of several courses in a “blended learning” format.
- A new joint PhD degree between MUN and NTNU (Norway) was launched in the Fall 2018.
- Partnerships with employers outside the province have grown as part of the Co-op Education work term retention and development plan. This has led to good success over the past year, for example, with the highest ever number of co-op student placements in a year (1,200; higher than the double cohort class of 2013) and a 99% placement rate in the Fall 2018 semester.
- The recently introduced Co-op continuous job match process has worked smoothly over the past year and therefore was extended indefinitely.
- Flexibility of co-op work term duration is being investigated within departments to enable the flexibility of an 8-month work term in the final year by potentially allowing courses / electives to be interchanged between Terms 7 and 8.
- Recent new co-op initiatives of curriculum enhancement, annual Director’s Awards event through external grant funding, and promotional marketing (brochures, newsletter Synergies, and Co-op Newsletter) were all successfully adopted over the past year.

- A number of seminars and training opportunities were made available to graduate students including the Thesis Boot Camp; TSEP and ETP programs by EDGE; and other career / professional development opportunities.
- Opportunities were provided to prepare and support the development of teaching skills for TAs, including TA training sessions, seminars offered by EDGE, EGSS and ADGS, and CITL support services.
- Co-op Education has expanded to many new employers outside of province, including over 150 new employers in the past two years.
- Memorial University received \$7 million from Emera Inc. for student innovation and entrepreneurship of which a significant portion will be directed towards aspiring student entrepreneurs in MCE.
- Four adjunct professors were appointed in Ocean and Naval Architectural Engineering to expand collaborations with external organizations, including three from NRC to enhance the NRC-MUN collaborations.
- A new ONAE Advisory Board was established and met twice over the past year to guide and provide input into ONAE's programs and research.
- Engineering Co-op Education became a global institution partner of WACE (World Association of Cooperative Education).

Goal 3.3: Improve Engineering and FEAS Profiles in the Community

- Promoscience and Actua funding proposals were successful for engineering outreach to elementary and high school students.
- Labrador outreach activities were expanded including 3 camp sessions in parallel and a co-op work term placement for travel and outreach across a number of indigenous communities throughout Labrador.
- The Faculty hosted numerous outreach events, including the annual Open House, continued participation in high school fairs, participation in "Science Rendezvous", hosting for various groups (GirlGuides), support for CodeNL initiatives, and many other outreach events in schools.
- Dr. Steve Bruneau was called as a Witness for the Commission of Inquiry on the Muskrat Falls Project.

- Reunion 2018 (organized by Coreen Bennett) was very successful, including over 100 alumni from the Classes of 1983, 1988, 1993, 1998, 2003 and 2008.
- The Memorial Engineering 50th Anniversary Celebration planning is underway for a major event in August 2019. An organizing committee has been formed (Chair: Coreen Bennett).
- Dr. Leonard Lye was appointed as the Vice-Chair of the PEGNL Registration Committee, Experience Review Committee, and examiner of confirmatory exams for APEO and APEBC.
- Several prominent workshops and conferences were hosted by Civil Engineering, e.g., Building Sustainably in the Age of Climate Change (with the Cement Association of Canada), Building Climate Resilience Workshop (75 participants, funded by NRCan); PEOPLE Network workshop; and the Canadian Geotechnical Conference, to be held in St. John's in 2019.
- Faculty members in Process Engineering gave a number of invited lectures at universities worldwide, e.g., University of Technology Petronas, Malaysia; University of Tasmania; among several others.
- SHAD2018 Director Dr. Lye led another successful SHAD program in 2018. Dr. Lye has been involved with SHAD Memorial since 2003 as the engineering faculty advisor and since 2007 as the program director, representing the SHAD board since 2008.
- Many faculty members were actively engaged in international professional societies, e.g., SNAME, RINA, AIAA, CSME, IEEE, etc.

3.4 Fostering a Distinguished Workplace

Continued solid progress was achieved over the past year towards the Vision 2020 goals and action items for a distinguished workplace.

Goal 4.1: Promote a Culture in which All Work is Valued

- Several ECE faculty members received honours and awards: Dr. Glyn George (PEGNL Honorary Membership); Dr. Weimin Huang (PEGNL Teaching Award); Dr. Dennis Peters (PEGNL Award for Service); and Dr. Eric Gill (Professor Emeritus).
- Dr. Bing Chen was the recipient of the 2017/18 Bedell Award by the Water Environment Federation for outstanding contributions to water resources.

- Mechanical Engineering faculty and student achievements were actively promoted through the media and news stories, for example, in CSME Bulletin articles featuring Dr. Rocky Taylor, and soon Dr. Ali Nasiri and Dr. Xili Duan.
- A CFI video with Dr. Claude Daley, Dr. Rocky Taylor and a graduate student (Marjan Taghi Boroojerdi) was featured nationally and highlighted Memorial's innovative research in ice mechanics and ice-structure interactions.
- Dr. Geoff Rideout received the prestigious 2018 Teaching Excellence Award from the Association of Atlantic Universities.
- A successful Engineering Reunion 2018 event included new inaugural Distinguished Alumni Awards to Kim Keating and Earl Ludlow.
- The Faculty of Engineering and Applied Science received Memorial's award for leadership in institutional change for the "persistent determination in the pursuit of equity and student accessibility as a natural part of student learning and engagement". The Faculty renovated the Fortis Angus Bruneau Lecture Theatre to include students with disabilities, and led initiatives to enable students with disabilities to take tests and exams alongside other students in the SJ Carew Engineering Building.
- Prof. Darlene Spracklin-Reid began her term in 2018 as the Chair of the PEGNL Board of Directors.
- Dr. Claude Daley was the recipient of a prestigious international award (2018 SNAME K.S. Davidson Medal) for outstanding achievements in ship research.
- An Electrical Engineering student, Courtney Harnum, received the international JW Estey Outstanding Scholar Award from IEEE.
- The EASAC industry advisory council chair, Fred Cahill, received the JD Eaton Award for outstanding volunteer contributions to Memorial University.
- Dr. Faisal Khan received an Excellence in Review Award from I&EC Research (industrial and engineering chemistry research) in recognition of outstanding service to the technical community.

Goal 4.2: Promote Excellence through Personal Growth

- Lifelong learning and professional development of staff members have been encouraged to further their education and enroll in training programs. Training and short courses by staff members over the past year included:

- Supply Chain Management;
 - Public Procurement Act and Regulations;
 - Procurement Card Training;
 - Research Portal – Romeo;
 - Onbase training for admissions;
 - Workflow training for graduate student payroll;
 - Banner – Stores Inventory, Finance and HR;
 - FAST Training – Budgets;
 - Project Management;
 - Digital and Social Media;
 - Google My Business Information Session;
 - SI Supervisor Training Workshop;
 - Microsoft Work for Technical Communications;
 - Technical Writing and Editing;
 - Research, Analysis and Information Design;
 - Concepts and Practices of Technical Communication;
 - Unconscious Bias Training.
- Staff members attended conferences for professional development opportunities:
 - Research on the Rock Conference;
 - Canadian Higher Education Information Technology Conference;
 - IT Security / Hacking Conference;
 - Memorial’s IT Conference;
 - Municipalities NL Workshop;
 - Atlantic Petroleum Workshop;
 - Canadian Association of University Business Officers.
 - Junior faculty members in all departments were mentored by senior colleagues through co-supervision of graduate students and participation in larger established research groups. Best practices in teaching were regularly shared and discussed at Department meetings.

Goal 4.3: Provide Adequate Physical Work Space for Employees and FEAS Activities

- EN 2006 was renovated last year, renamed as the “Fortis Angus Bruneau Lecture Theatre”, and modernized to support students with disabilities, and an increased seating capacity of 236 students.
- The Paradigm Hyperloop team was assigned additional new space in room EN 1005.
- Additional space was provided on the mezzanine in the fluids laboratory for student groups as well as EN 1035D for student teams.

- Additional space in Coughlan College has provided more desk space for graduate students.
- Civil Engineering spaces have been renovated and upgraded, including new furniture in the Civil Engineering Senior Design Lab; and upgrades to the Environment Lab.
- The ONAE fluid labs will be upgraded by a new initiative in partnership with ExxonMobil to develop and build a depressurized wave tank.

Goal 4.4: Promote a Safe, Healthy and Respectful Work Environment

- The Faculty actively promoted safety in the workplace and employees participated in the following training sessions:
 - First Aid / CPR;
 - Mental Health First Aid;
 - OH&S Committee;
 - OH&S Committee Re-certification Training.
- The Building OH&S Committee was active and met quarterly to discuss and resolve various safety issues within the engineering buildings.
- Seminars and workshops were held on wellness and diversity:
 - 11th Annual Retreat, Dominion Memorial Stadium, October 2017;
 - Topics presented – Teamwork, Time Management, Harassment – Bullying in the Workplace, Emergency Evacuation Session;
 - 12th Annual Retreat – in planning stages – topics include Email Security, Diversity and Privacy; among others.
- Several social events were held to increase engagement and build a strong sense of community, e.g., annual Faculty and Staff kick-off meeting and social in September, year in review meeting in December 2017 including award presentations, etc.
- Numerous Faculty / Staff Social Club activities were held over the past year – 28 functions compared to 17 in the previous year, and membership increased from 88 to 91: staff (36), faculty (37) and Co-op (18).
- The Social Club recognized milestone events of a member and made monetary contributions towards collections for non-membership milestones.

4 Updates to Vision 2020

4.1 Budget Reductions and Attrition

Starting in 2012, and reiterated by the NL Government in the 2016-17 budget, the Province has supported an engineering expansion strategic initiative. Over a period of 8 years, this growth plan originally called for an increase of undergraduates from 155 to 250 graduates per year (+12 per year); graduate students from 360 (+36 per year) to 650; faculty complement from 61 to approximately 100 (+5 per year); and 24 new staff positions (+3 per year). The NL Government has funded up to Year 4 (i.e., 4 of 8 years) but then “paused” since the 2016–17 provincial budget in March 2017.

The engineering expansion is funded separately from Memorial’s regular operating grant from the Province. The original 8–year funding commitment for engineering expansion from the NL Government was an annual base increase of \$1.718M in Year 1 (2012–13), followed by 7 years of incrementally stepped annual increases of \$1.138M each year, totaling \$9.684M of a base budget increase. The actual base budget increase has been \$4.326M since 2012. So less than half of the originally envisioned budget increase was allocated. This has enabled about half of the projected increase in faculty complement from growth funds.

But over the past several years, Memorial University has absorbed large budget reductions and imposed attrition from the provincial government. These reductions and attrition have been passed down to all faculties / schools. Since 2016–17, and up to the next fiscal year, there have been base budget reductions to FEAS which exceed \$1.3M, excluding additional faculty / staff attrition, and continued anticipated reductions in the next few years. A number of faculty and staff positions have been lost, as well as ongoing reductions to operating budgets including all areas of general operating funds, teaching assistantships, and per course instructors. The faculty attrition is apportioned by department based on the relative faculty complement of each department.

Year 4 is half–way between Years 1 and 8 in the original Vision 2020 growth plan. The Year 4 target commitment was 203 graduates per year; 504 graduate students; and 80 faculty members, including permanent and contractual. As of September 2018, the number of BEng graduates was 236 (Spring 2018 convocation); 684 graduate students; and 79 faculty members, including lecturers hired through MASc premium fee course–based graduate program revenues. So FEAS has met and exceeded its enrolment commitment to the government funded expansion, despite the reductions in faculty / staff complement and operating funds as a result of Memorial’s budget cuts and attrition over the past several years.

Overall, FEAS has been challenged with expectations of growth by the government funded expansion, while simultaneously absorbing major budget cuts and attrition as a result of lower operating grants from the Province to Memorial University. Therefore a reconsideration of the original Vision 2020 growth plan is needed.

Assuming the Province’s intention is a pause of the engineering expansion rather than a cancellation, the Faculty’s growth targets are paused rather than cancelled. Table 2 summarizes the original Vision 2020 enrolment targets. Higher enrolments of students were admitted years ago beyond the Year 4 level, and new initiatives were launched, on the premise of the Government’s commitment to the 8–year expansion. However, going forward, until such time that the provincial government resumes its support of the expansion for Year 5 and beyond, the Faculty’s growth plan is temporarily paused at the Year 4 enrolment levels.

Growth Year	Total Faculty Complement	Term 3 Enrolment Target	Steady-State Graduates
0	61.5	200	155
1	66	214	167
2	71	229	179
3	76	243	191
4	80	258	203
5	85	272	215
6	90	286	226
7	95	301	238
8	100	315	250

Table 2: Original Vision 2020 growth plan with enrolment targets

One of the most pronounced changes over the past few years in FEAS has been the remarkable increase of graduate student enrolments. The total enrolment has more than doubled since 2011. Note that the current graduate student enrolment as of September 2018 (684) has significantly exceeded the original Vision 2020 Year 4 target of 504 graduate students. Unlike undergraduate enrolments which can be capped, the growth of graduate student enrolments is mostly determined by the needs and decisions of faculty members in support of their growing research programs. Also, a significant portion of the graduate student growth has been funded through MSc premium fee revenues returned back to FEAS and therefore separately from the government funded engineering expansion.

4.2 Creating to Conditions for Student Success

In addition to temporarily pausing the engineering expansion of Vision 2020, a number of targets and actions from the Vision 2020 plan [1] have either been completed, or else became repetitive each year without any substantive changes since they are now firmly established and regularized elements of the programs. Therefore they will be removed from the strategic planning tables of the Vision 2020 document. In addition, some new strategic priorities have arisen in the past few years and were presented at Faculty Council meetings, such as the Women in Engineering Action Plan. These should now be reflected in the targets and actions of the strategic plan. These revised tables are summarized below for the four strategic pillars of the FEAS strategic plan – teaching, research, partnerships, and workplace distinction.

GOAL	TARGET
1.1 Support teaching excellence	1.1.1 Reward and foster teaching excellence for faculty and graduate students
	1.1.2 Support curricular development and innovation
1.2 Encourage student engagement	1.2.1 Improve the teaching and learning environment
	1.2.2 Regularize a continual improvement process (REVISED)
	1.2.3 Strengthen co-op education and external engagement
	1.2.4 Change the engineering image on campus and admissions process to attract and retain female students (NEW)
	1.2.5 Update the curriculum to attract and retain female students (NEW)

Table 3: Goals and targets of thematic Pillar 1 (student success)

4.3 Increasing Research Capacity

GOAL	TARGET
2.1 Attract, retain and support research activities	2.1.1 Increase our research capacity
	2.1.2 Recruit / retain top graduate students and increase funding for graduate students
	2.1.3 Increase number of faculty holding NSERC grants and diversify funding sources
2.2 Support research excellence and focus on areas of strategic importance	2.2.1 Align FEAS's research capacity with areas of strategic importance
	2.2.2 Provide adequate space for research programs and ensure labs are well maintained and equipped
	2.2.3 Improve administrative support and effectiveness of researchers' time
2.3 Expand engagement with partners	2.3.1 Increase collaborative research with industry, government and other partners
	2.3.2 Foster and support student innovators, entrepreneurs and spin-off companies
	2.3.3 Increase faculty involvement in policy, regulatory and professional activities

Table 4: Goals and targets of thematic Pillar 2 (research excellence)

4.4 Expanding Partnerships

GOAL	TARGET
3.1 Expand research partnerships	3.1.1 Expand partnerships within FEAS, across Memorial, and other universities
	3.1.2 Increase collaboration with industry and government agencies
3.2 Expand partnerships that strengthen our programs	3.2.1 Encourage multi-disciplinary collaboration on curriculum and new initiatives
	3.2.2 Engage in collaborative degrees and student exchange with institutions
	3.2.3 Expand co-op education and internship opportunities
3.3 Improve engineering and FEAS profiles in the community	3.3.1 Participate and increase community outreach activities including public policy
	3.3.2 Continuing Engineering Education
	3.3.3 Promote diversity in engineering
	3.3.4 Enhance alumni and industry connections

Table 5: Goals and targets of thematic Pillar 3 (external partnerships)

4.5 Fostering a Distinguished Workplace

GOAL	TARGET
4.1 Promote workplace excellence	4.1.1 Recognition of excellence in the workplace
	4.1.2 Regularize an informal mentorship system
	4.2.3 Provide opportunities for professional and personal development
4.2 Promote diversity, equity and inclusion (NEW)	4.2.1 Raise the percentage of female students in engineering (40% by 2030 for undergraduates; 30% by 2030 for graduate students) (NEW)
	4.2.2 Increase the number of female faculty members (30% by 2030) (NEW)
	4.2.3 Support Memorial's indigenization strategy and TRC calls to action (NEW)
4.3 Provide adequate physical work space	4.3.1 Provide adequate space for faculty, staff, students and researchers (REVISED)
	4.3.3 Provide state-of-the-art teaching and research laboratory facilities (REVISED)
4.4 Promote a safe, healthy, respectful work environment	4.4.1 Promote a safety culture and safe environment
	4.4.2 Promote work / life balance, diversity and respectful work environment

Table 6: Goals and targets of thematic Pillar 4 (distinguished workplace)

4.6 Short-term Priorities

In the short-term, over the next year, the priorities for undergraduate programs will focus on the following areas.

- Due to declining demographics, there will be a challenge to maintain undergraduate enrolments, particularly domestic students from the province, and therefore a priority to expand recruitment and retention initiatives.
- An accreditation follow-up report on graduate outcomes will be required for submission in May 2019, and hence this will be a continuing priority. This includes further work on mapping of indicators, their assessments, indicator reviews, and continual improvement processes within departments.
- Work term assessment data will be used in the accreditation report, based on the co-op curriculum development project and transition to a data-driven approach based on co-op employer feedback data in electronic form.

In terms of graduate programs, significant efforts over the next year will be focused on:

- New course-based graduate programs to be launched in energy systems engineering (MESE; Fall 2019), and safety and risk engineering (MASSRE has started; 10 students currently enrolled).

- The Department of Mechanical Engineering is currently developing a new course-based graduate program proposal in Mechatronics.
- Identify new opportunities and expand international partnerships and collaborations especially those attracting government sponsored students.

5 Progress Indicators

5.1 Faculty Data

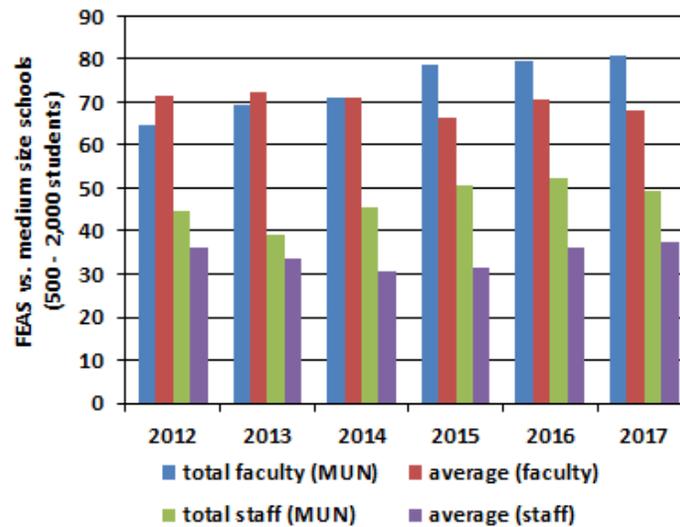


Figure 1: Number of faculty / staff members relative to other Canadian engineering schools [2]

5.2 Student Data

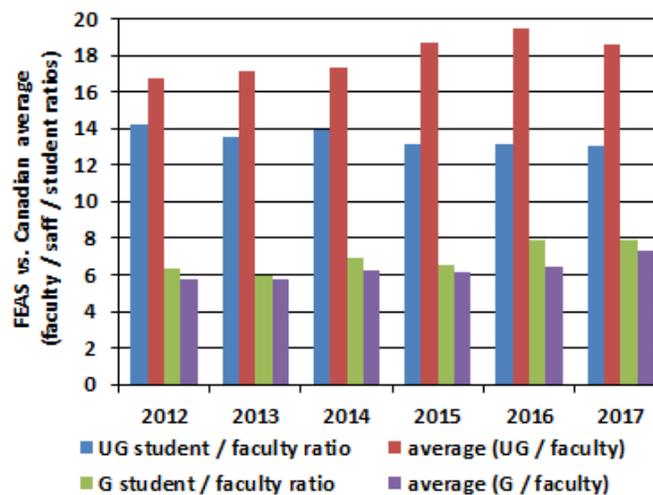


Figure 2: Undergraduate and graduate student to faculty ratios relative to other schools [2]

5.3 Student Diversity of Women in Engineering

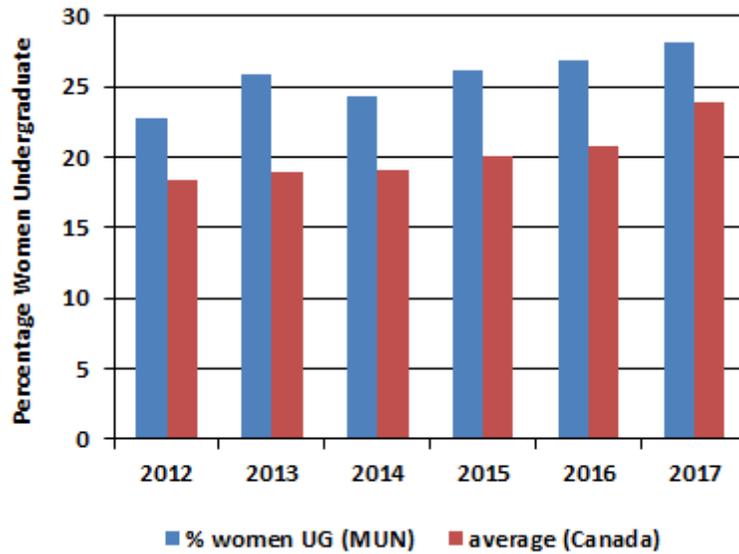


Figure 2: Percentage of female undergraduate students in engineering [2]

5.4 Operating Funds

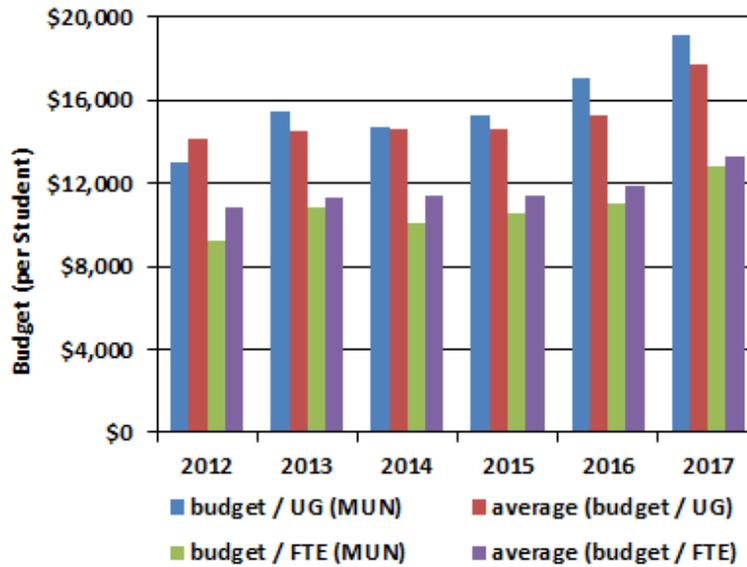


Figure 3: Operating budgets and resource allocations for students [2]

5.5 Research Impacts

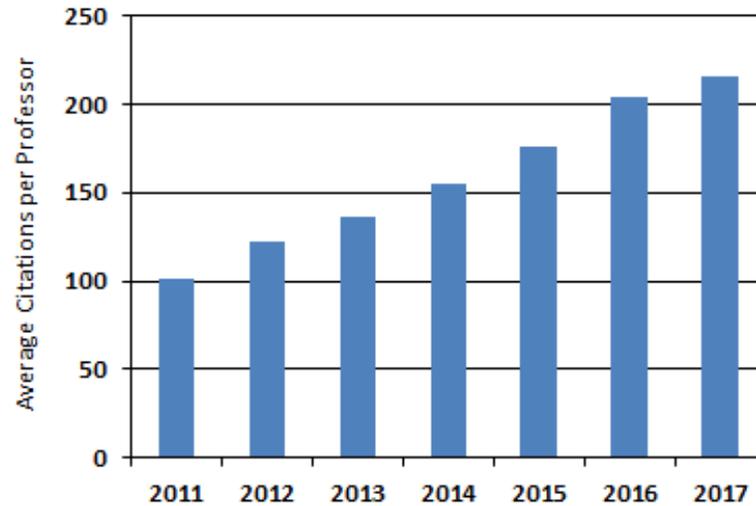


Figure 4: Average number of citations to research articles per engineering professor per year

6 Acknowledgements

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7 References

- 1) Vision 2020, Strategic Plan of the Faculty of Engineering and Applied Science, Memorial University, St. John's NL, July 3, 2013.
- 2) Resources Survey of Engineers Canada, National Council of Deans of Engineering and Applied Science, 2017.
- 3) Fact Books, Centre for Institutional Analysis and Planning, Memorial University, St. John's NL, 2009 – 2018.