

Engineering and Technology Labour Market Study



Achieving Diversity: **Strategies that Work**

Engineers Canada
and
Canadian Council of Technicians and Technologists

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About Engineers Canada

Established in 1936, Engineers Canada is the national organization of the 12 provincial and territorial associations and ordre that regulate the practice of engineering in Canada and license the country's more than 160,000 professional engineers. Engineers Canada serves the associations and ordre, which are its constituent and sole members, by delivering national programs that ensure the highest standards of engineering education, professional qualifications and professional practice.

About the Canadian Council of Technicians and Technologists

The Canadian Council of Technicians and Technologists (CCTT) establishes and maintains national competency standards for certifying members with a 'quality seal of approval' in 14 applied science and engineering technology disciplines: bioscience, industrial, building, instrumentation, chemical, mechanical, civil, mining, electrical, petroleum, electronics, geomatics, forestry, and information technology. CCTT's provincial associations are responsible for issuing these highly regarded credentials, which are recognized by provincial statute in many Canadian provinces.





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- Progress in increasing the participation of women in engineering and technology occupations has lagged in comparison with other professions.
- Progress in increasing the female share of undergraduate enrolments in engineering has been set back by recent trends. The female share of undergraduate enrolments is now back to where it was in the early-to-mid 1990s.
- The current gender bias in enrolments in engineering and technology is unsustainable. The age group 15-19 will begin to decline in absolute terms after 2009. If the enrolment base of engineering and technology is not diversified, universities and colleges will be compelled to lower admission standards or increase their reliance on visa students. In the long-run, Canada will face constraints on its ability to meet the need for qualified engineers, technicians, and technologists.
- There is nothing inevitable or fore-ordained about the current levels of diversity in engineering and technology. The evidence from other fields (e.g., medicine and law) is that diversity levels can be changed and that, with the right strategies, change need not be slow.
- This report describes 10 initiatives that broaden career opportunities for targeted groups. *The overriding conclusion that emerges from these case studies is that well focused programs work.*
- Employers can significantly increase diversity in their workforce by partnering with settlement and community organizations that can channel qualified job-seekers to them. Taking deliberate steps to expand recruitment channels entails few, if any financial costs.
- Programs that seek to increase post-secondary enrolments in engineering and technology from groups that are currently under-represented are most successful when they have four elements:
 1. Programs should start in *elementary* school at least by grade 5 or 6.
 2. Programs should *continue through secondary school*.
 3. Support needs to carry through *into post-secondary years in the form of mentorship and support networks*.
 4. Outreach programs at the grade school and high school level need to be *activity focused*. Maths and sciences only become exciting when they are seen as the keys that unlock the door to do things that are truly exciting.
- In the case of some under-represented groups, there are likely to be deficiencies in the secondary school maths and sciences credits required for admission into engineering or technology programs. Bridging will be needed that enables motivated students from under-represented groups to acquire the necessary high school credits.

- A model is now emerging for accelerating the integration of internationally educated professionals. The seven elements that make for success are:

First, programs need to be *directly linked to certification or licensure requirements*.

Second, programs must *strengthen language skills at least to a Canadian Benchmarks Language Level of 6 or 7 for technology jobs and Level 8 for engineering jobs*.

Third, programs need to systematically evaluate technical skills and determine whether there are *deficiencies that require upgrading*. *Courses that address skill upgrade requirements should be reviewed by professional associations for conformity with their standards*.

Fourth, *programs need to deal with the culture of the Canadian workplace*.

Fifth, *programs should include a placement period with industry*.

Sixth, programs should include *one-on-one counselling or mentorship*.

Seventh, the duration of successful programs, including placement, is approximately 12-18 months. Internationally educated professionals should understand the investment that they will need to make to secure employment in Canada that is commensurate with their educational qualifications.

- Implementing successful integration programs requires a complex, *four-cornered partnership involving* professional associations, settlement organizations, a post-secondary institution, and industry. Engineers Canada, the Canadian Council of Technicians and Technologists, and at the provincial level, their respective constituent members should explore strategies for building these partnerships for diversity.



1. Introduction



For some considerable time, engineering and technology professional associations have recognized the challenge of building a more diverse workforce. Most associations actively support diversity initiatives. However, notwithstanding the efforts of professional associations, governments, industry, and the post-secondary system, the diversity challenge remains substantial. Progress has been modest and is vulnerable to reversals. Indeed, since 2002, the share of women enrolled in undergraduate engineering programs has been declining. The actual number of women in enrolled undergraduate programs has been declining since 2003.

This report describes 10 initiatives whose purpose is to broaden career opportunities for targeted groups, and by doing so, to increase diversity in the engineering and technology labour force, or more broadly in science fields. *The overriding conclusion that emerges from these case studies is that well focused programs work.* Each of the programs reviewed in this report has a track record. Many have received awards that recognize their contribution.

The 10 programs that are profiled in this report were selected with a view to three criteria. First, the programs are intrinsically replicable or could be expanded. Second, the programs are especially relevant to engineering and technology and, therefore, to professional associations that are seeking ways to build on their current strategies to promote diversity. And third, the programs reflect a range of diversity challenges.

The 10 case studies are based on documentary research, site visits, and interviews with program administrators, current participants and graduates. No claim is made that these 10 programs are unique, though some are quite distinctive. In compiling a list of programs that might be studied, we identified many other programs that are similar, and often, equally impressive in their accomplishments. Resources limited us to profiling 10 examples of successful programs.

Chapter Two of this report puts these case studies in a broader context.

Chapter Three provides a capsule portrait of each of the 10 programs.

Chapters Four to Thirteen offer more detail on each of the 10 programs:

- Women in Scholarship, Engineering, Science and Technology (WISEST, Alberta)
- Discover Engineering (Ryerson University, Ontario)
- Canadian Association for Girls in Science (CAGIS, national)
- Engineering Access Program (ENGAP, Manitoba)
- Native Access to Engineering Programme (NAEP, Quebec)

- Internationally Educated Engineers Qualification Program (IEEQ, Manitoba)
- Engineers' and Technologists' Integration Program (ETIP, Alberta)
- Corporate Readiness Training Program (CRTP, Alberta)
- Wardrop Engineering's in-house programs (Manitoba)
- Career Trek (Manitoba)

Chapter Fourteen discusses the implications of these case studies for professional associations and other stakeholders in the engineering and technology labour market.

This study is part of the Engineering and Technology Labour Market Study which is a joint undertaking of Engineers Canada and the Canadian Council of Technicians and Technologists (CCTT). The study is supported financially by Human Resources and Skills Development Canada (HRSDC).

The principal components of the Engineering and Technology Labour Market Study are:

- a detailed analysis of *Census and Labour Force Survey* data
- a customized survey of 700 engineering and technology employers
- a customized survey of engineers, technologists and technicians
- construction of a detailed supply and demand model
- executive interviews
- focus groups
- case studies of diversity programs
- case studies of factors affecting educational choice at the high school level

The Engineering and Technology Labour Market Study is supported by a 32-person Steering Committee drawn from professional associations, universities and colleges, industry, and organizations that assist in the integration of internationally educated engineering and technology professionals. The research reports from the Study are published on the Study Website (www.engineerscanada.ca/etlms) as they are approved for release by the Steering Committee.

Research work for the Study is undertaken by Prism Economics and Analysis.



2. Diversity Trends and Why They Matter

Participation by women has increased in all professions. Engineering and technology occupations are not an exception to that trend. However, there are notable differences across the various professions in both the share of women and the change in that share. Figure No. 1 compares the share of women in various professions, based on the 1986 and 2006 *Census*:

Figure No. 1

Share of Women in Selected Professional Occupational Categories
Engineering and Technology compared to Selected Other Professions
Statistics Canada, Census 1986 and 2006

Occupation	1986	2006
All Occupations	42.7%	47.4%
Engineers	6.1%	12.2%
Technicians and Technologists	14.3%	21.5%
Auditors, accountants and investment professionals	40.4%	49.4%
Occupations in Physical Sciences	22.8%	30.7%
Occupations in Life Sciences	29.8%	36.7%
Lawyers and Quebec Notaries	21.8%	38.6%
Physicians	22.8%	36.4%

As can be seen from Figure No. 1, while participation by women in engineering and technology occupations increased between 1986 and 2006, progress lagged in comparison with other occupations.

For engineering occupations, enrolments in undergraduate programs are clearly an important determinant of subsequent diversity trends. Figure No. 2 shows that the share of women in undergraduate enrolments peaked in 2001 and declined thereafter. In absolute numbers, female enrolments peaked in 2002 and then fell off. *The female share of undergraduate enrolments is roughly where it was a decade or more ago. In other words, whatever progress was achieved prior to 2001, proved transitory. In the absence of focused interventions, there is no reason to expect a reversal in the female enrolment trend.*

Figure No. 2

Number and Share of Women in Undergraduate Enrolments in Accredited Engineering Programs, Engineers Canada



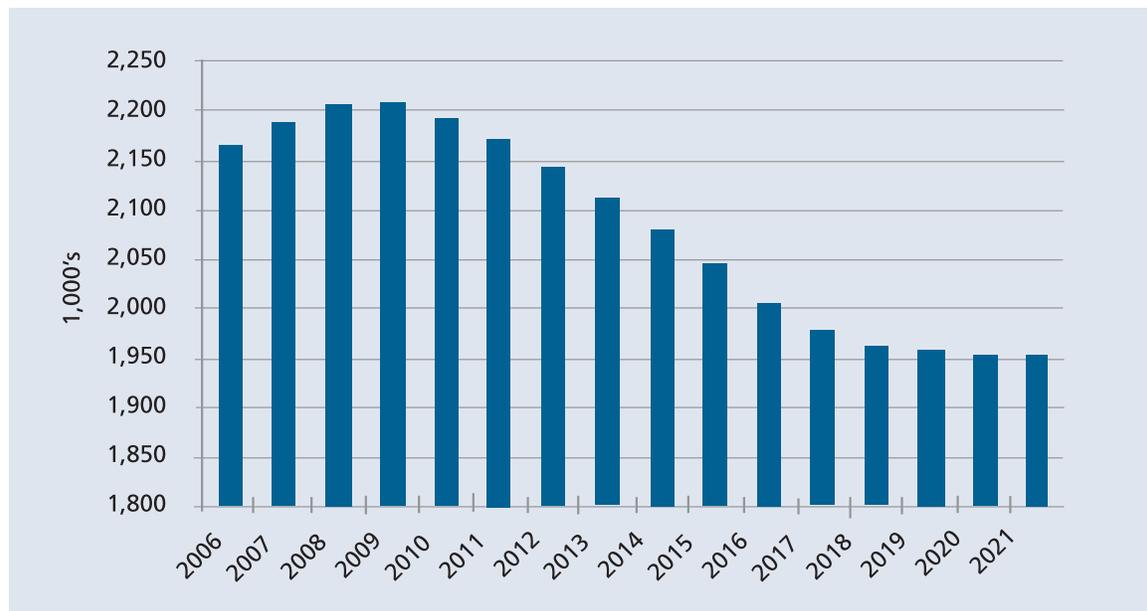
These trends are troubling for a number of reasons. The evident failure to achieve a sustained increase in female undergraduate enrolments is at odds with trends in other professions. *Maclean's Magazine* reported recently that "52% of doctors under the age of 35 are women..."¹ The majority of students at 13 of Canada's 17 medical schools are women, according to the Association of Faculties of Medicine of Canada. This is a radical turn-around from the situation 25 years ago. Law has experienced similar, dramatic changes in its gender balance. The contrast with other professions will lead some to conclude that there are systemic barriers which the profession is not addressing. Regulated professions, in particular, need to be sensitive to issues of access and to real or perceived barriers. A failure to address diversity issues could ultimately weaken support for statutory regulation.

The marked gender bias of admissions into engineering and technology programs also has potentially adverse implications in the context of broader demographic trends. Figure No. 3 shows that the age cohort 15-19 will peak in 2009 and decline thereafter. In some regions of Canada, the peak has already been reached and the decline has set in. This is the age cohort from which the preponderance of first year entrants into engineering and technology programs are recruited. The decline in this cohort means that, if the female share of undergraduate enrolments does not increase, then either enrolments will decline, or, to maintain enrolment levels, universities will have to lower admission standards, or increase the visa student share of enrolments.

¹ *Maclean's Magazine*, "Where have all the men gone?", September 17, 2007.

Figure No. 3

Age Cohort, Age 15-19: Demographic Projection
Statistics Canada – Medium Growth Scenario



There are other aspects of diversity which are equally important. Self-identified Aboriginal Canadians accounted for 3.8% of the total population of Canada. This is up from 3.3% in 2001 and 2.8% in 1996. In 2006, according to the Census, Aboriginal Canadians accounted for 0.7% of engineering employment and 1.9% of technology employment. In Manitoba and Saskatchewan, where the Aboriginal share of the population is over 14%, the share of Aboriginal Canadians is 4.4% in engineering and 7.7% in technology occupations. Neither of these provinces attracts a significant number of internationally educated professionals.² In the long run, ensuring a supply of qualified engineering and technology professionals in Manitoba or Saskatchewan will require addressing the real and perceived barriers to increased participation in these occupations on the part of Aboriginal Canadians.

Income factors are also important in shaping access trends, irrespective of other factors related to diversity. Statistics Canada data show that participation in post-secondary education is strongly influenced by parental income. Participation rates of young people from families with low and moderate incomes are roughly half or less than that of better off families.³

If Canada is to meet its need for qualified engineer, technicians and technologists, the engineering and technology workforce must become more diverse. There is no alternative. The current demographic profile of the engineering and technology labour force is not sustainable. Either the engineering and technology professions will become more diverse or, in the long-run, supply-side constraints will force engineering and technology work to be done outside of Canada.

² Over the past three years (2005-2007), fewer than 1% of persons who immigrated to Canada and who identified their occupation as 'engineer' indicated their intention to settle in Manitoba or Saskatchewan. Virtually all migration of internationally educated engineering professionals into Manitoba or Saskatchewan is inter-regional migration of persons who settled initially in another province and subsequently relocated.

³ Statistics Canada, *The Daily*, February 16, 2005 summarizes the findings, <http://www.statcan.ca/Daily/English/050216/d050216b.htm>. The complete study is available at <http://www.statcan.ca/english/research/11F0019MIE/11F0019MIE2005243.pdf> Cat. No. 11F0019MIE No. 243

3. A Capsule Portrait of Ten Strategies that Work



1. Women in Scholarship, Engineering, Science and Technology (WISEST, Alberta)

WISEST was founded in 1982. The organization's initial impetus was to increase participation of women in engineering, science and technology. The program's goals have since broadened to include other groups that are under-represented in engineering, science and technology, including Aboriginal Canadians. WISEST's programs include, among others:

- an annual province-wide one-day conference (SET) for 100 young women in grades 10-12
- a 6-week Summer Research Program for 60 young women and men who have completed grade 11, welcoming Aboriginal and rural communities
- a one-day conference for grade 6 girls and their teachers
- a student-led support group for women in science and engineering at the University of Alberta

WISEST draws on over 600 volunteers and has had over 15,000 participants in its programs. The organization's operating budget is approximately \$500,000. WISEST has received financial support from foundations, governments, and the private sector.

2. Discover Engineering (Ryerson University, Ontario)

Discover Engineering was established in 1991 as an outgrowth of Ryerson University's Women in Engineering Program. Discover Engineering is focused on increasing the participation of young women in engineering by providing hands-on exposure to science and engineering, and career information. Programs target girls from grades 7 to 12. The programs have included:

- summer camps
- six-weeks paid work in a lab research setting
- high school workshops
- a career conference for women in grades 10-12, their parents, teachers and guidance counsellors
- a province-wide conference for female students in grades 7-10

Discover Engineering has an operating budget of approximately \$100,000. Ryerson's Women in Engineering Program, which sponsors Discover Engineering, receives both public and private sector support.

3. Canadian Association for Girls in Science (CAGIS, national)

The Canadian Association for Girls in Science was established in 1992 by Larissa Vingilis-Jaremko when she was 9 years old. There are 12 CAGIS chapters with over 3,000 members. Membership is open to girls between the ages of 7 and 16.

- CAGIS chapters hold 1-2 hour events on weekends and after school at the workplaces of the presenters.
- Each event involves a presentation and hands-on activities. All activities are organized by volunteers.
- In collaboration with a private publisher, CAGIS has published two mystery/science adventure novels, aimed at girls in the age 8-12 group.

CAGIS is incorporated and administered by a volunteer board. Membership fees are \$30 per year, which includes a subscription to *YES MAG* – a science magazine for grade school and early high school students. CAGIS also receives public and private sector support. Web space is provided by the University of Western Ontario.

4. Engineering Access Program (ENGAP, Manitoba)

The Engineering Access Program was established in 1985 to increase the number of Aboriginal persons studying engineering at the University of Manitoba. ENGAP was a joint initiative of the University of Manitoba's Faculty of Engineering, the provincial Department of Education, and the Manitoba Energy Authority. The Province of Manitoba provided the initial financial support. ENGAP recruits high school students of Aboriginal ancestry who are prepared to commit to a minimum of five years of full-time study.

- The program begins with a mandatory two-week summer orientation. During the orientation, academic staff assess the students' needs and develop individual academic plans to prepare them for engineering studies.
- Following the two-week orientation, most students proceed to a full term of make-up studies in maths, physics and chemistry to prepare them for first year engineering courses.
- Participants then enter full-time engineering studies in the second term (January).
- Throughout their studies, participants are supported by tutors and academic counsellors.
- Financial support is also available.

Currently, there are about 55 participants in the ENGAP program. Sixty-eight student have graduated from ENGAP since 1985-86, and today, children of ENGAP graduates are enrolling in the program.

5. Native Access to Engineering Programme (NAEP, Quebec)

The Native Access to Engineering Programme was a joint initiative of the Faculty of Engineering and Computer Science at Concordia University and the l'Ordre des ingénieurs du Québec (OIQ), the licensing body for engineers in Quebec. The program was launched in 1994. NAEP is currently run by Mount Pleasant Educational Services Inc. (MPES), located in Kahanawake, Quebec.

- The program's initial focus was summer camps with Aboriginal students.
- Subsequently, NAEP undertook the development of curriculum materials and related teacher support materials in maths and sciences for use with Aboriginal students.
- Since 1998, these curriculum materials have been distributed over the Internet through a partnership with IBM Canada.
- NAEP also created career awareness materials for Aboriginal students.

- As part of providing support and resources for teachers, NAEP produced the *DreamCatching* conference, a series of hands-on interactive workshops for math and science teachers. MPES is still currently producing the DreamCatching conference.

In 2005-2006, NAEP reached approximately 2,000 individuals through various national and international events and activities.

6. Internationally Educated Engineers Qualification Program (IEEQ, Manitoba)

The Internationally Educated Engineers Qualification Program was established in 2003 by the University of Manitoba's Faculty of Engineering in conjunction with the Association of Professional Engineers and Geoscientists of Manitoba (APEGM). The purpose of IEEQ is to provide a pathway to licensure for persons who obtained their university qualifications in engineering outside Canada.

- Participants in IEEQ first apply to APEGM for licensure. APEGM approves for admission to IEEQ those applicants that need to pass 5 or fewer confirmatory examinations for licensure.
- Applicants must have a minimum Canadian Benchmarks Language Level of 8.
- Participants in IEEQ take the IEEQ course, *Practising Professional Engineering in Manitoba* that is oriented to the needs of internationally educated professionals.
- IEEQ participants study in the engineering department that covers their field (civil, mechanical, and electrical) and they are integrated in class with Canadian undergraduate students. Most participants complete the program in 12 months.
- Following completion of the IEEQ courses, participants proceed to a 4-month placement. IEEQ graduates may then proceed to APEGM's Engineer-in-Training program and, with the requisite experience, to licensure. The Engineer-in-Training program is the same for IEEQ graduates as for graduates of any accredited university engineering program.
- Intake was 18 participants in 2008. This is scheduled to increase to 30 participants in 2009 and 40 participants in 2010. In the first four cohorts (2003/2004 through 2006/2007), 39 participants entered IEEQ of which 31 successfully completed the program.

The program is managed by the University of Manitoba. APEGM's Academic Review Committee oversees admissions. Students pay tuition fees of \$2,400 to \$3,200, plus text book fees of \$600-\$1,000, and up to \$400 of incidental costs.

7. Engineers' and Technologists' Integration Program (ETIP, Alberta)

The Engineers' and Technologists' Integration Program is focused on accelerating the integration of internationally trained technology and engineering graduates into employment as technicians and technologists. The program was established in 1996. The program is run by the Edmonton Mennonite Centre for Newcomers in partnership with the Association of Science and Engineering Technology Professionals of Alberta (ASET), the Northern Alberta Institute of Technology (NAIT), and the Government of Alberta.

- Applicants to the program rate themselves on 40 competencies in the Prior Learning Assessment and Recognition (PLAR) assessment that was developed by ASET.



- Applicants with satisfactory PLAR scores are interviewed by ASET prior to being approved for admission into ETIP.
- Applicants must have a minimum Canadian Language Benchmarks (CLB) Level of 5.
- The ETIP program consists of three-semesters.
 - o The first focuses on computer labs, business writing, occupation-specific language training, technical reading and writing, and understanding the Canadian workplace.
 - o The second semester consists of technical studies in standards and codes.
 - o The third semester is focused on job search preparation, including practice in 'cold calling'.

Only 46 applicants are admitted into the program each year. Program graduates are accepted into ASET as Technologists-in-Training. Graduates are also eligible to apply for APEGGA's provisional licence. Six months after graduation, 96% of ETIP graduates are employed as technicians or technologists.

8. Corporate Readiness Training Program (CRTP, Alberta)

The Corporate Readiness Training Program is a bridging program for internationally trained engineering and technology graduates. CRTP was started by Bow Valley College in 1999. Participants must have a Canadian Benchmarks Language (CLB) Level of 6.

- CRTP offers a 10-week training program in communications skills, job search, and Canadian workplace culture. During the training session, CRTP invites speakers from industry and APEGGA to make presentations.
- The 10-week course is followed by a 6-week placement.

There are approximately 100 students registered in CRTP per year. Roughly 70% of participants are hired by the employer with whom they do their placement.

9. Wardrop Engineering Inc. (Manitoba)

Wardrop Engineering Inc. is a multi-disciplinary engineering consulting firm with 1,200 employees supporting operations in over 30 countries. In 2005, the company established an Employment Equity Committee with a view to increasing the representation of designated employment equity groups in their managerial and professional ranks. The four designated employment equity groups under federal legislation are: women, Aboriginal Canadians, members of visible minorities, and persons with disabilities.

- Wardrop's strategies focus primarily on recruiting channels, and also include policies and practices to accommodate members of equity groups.
- The company works with the Maytree Foundation and the Toronto Regional Immigrant Employment Council to source new Canadian staff.

Members of visible minorities now account for around one-third of core engineering and design staff and are represented at all levels, including the Board of Directors. Women account for 21% of the company's 84 managers. Wardrop has received numerous awards and recognition for its contribution to diversity. These include designation by *Maclean's Magazine* as one of the 'Top 100 Employers' to work for in Canada for eight years.

10. Career Trek (Manitoba)

Career Trek was launched in 1996 to “fight poverty through career development.” The program does this by offering career awareness and experiential learning to elementary and high school students whom teachers believe have the potential for post-secondary training, but who fall into the category of being at high risk of not proceeding to post-secondary training. Participants are nominated by teachers.

- In Phase 1, approximately 240 participants from elementary schools attend 20 Saturday sessions from October to April in which they are exposed to 80 different careers in 17 different fields. These sessions include on-site visits and hands-on learning. Phase 1 includes “Family Days” which involve parents.
- Phase II participants are graduates of Phase I who are now in the first years of secondary school. They attend weekly 2-hour sessions offering in-depth exposure to a particular career and the skills it requires.
- Career Trek also has a program with the Skownan First Nation.

Since 1996, Career Trek has had over 2,750 participants. Approximately 49% of graduates proceed directly from high school to post-secondary training. This is above the provincial average (35%) and around two-and-half times the post-secondary participation rate for young people from low income backgrounds. Career Trek receives financial support from the Manitoba government, various public and private organizations, and the Natural Sciences and Engineering Research Council of Canada.





Founded in 1982, the Women in Scholarship, Engineering, Science and Technology (WISEST) is an organization with a mandate to develop programs to attract, retain and help advance under-represented populations in Scholarship, Engineering, Science, and Technology – Strengthening Science and Society through the Power of Diversity. Based at the University of Alberta, WISEST was initially focused on the under representation of women, but in 1984, it extended its support to Aboriginal people in science and engineering programs. WISEST is one of 27 member groups of CCWESTT - the Canadian Coalition of Women in Engineering, Science, Trades and Technology.

Origins

In early 1982, Dr. Gordin Kaplan, the University of Alberta's Vice-President of Research at the time, had noticed that there was only one woman in attendance among 150 seminar participants at a seminar on microprocessors. This led to the creation of a new group at the University of Alberta to promote the participation of women in non-traditional careers – Women in Scholarship, Engineering, Science and Technology (WISEST). Dr. Kaplan was keen on having the group discover why women were under-represented in the hard sciences and engineering fields, and then to do something about it. Accordingly, the first task of WISEST was to collect data on the number of women in decision-making roles in those fields. The research revealed that, in December 1981, only 19% of academic staff at the University of Alberta was female. In the Faculty of Science, the proportion of women was only 5%, and in the Faculty of Engineering, even lower at 2%. With the support of the University of Alberta's Vice-President of Research and a volunteer committee, the group set about developing programs that encourage women to enter these fields. WISEST programs were so successful that they are now models for other Canadian universities aiming to increase the recruitment of young women.

The Programs

WISEST has developed several programs aimed at increasing women's awareness of opportunities in engineering, science and technology, through information, role models, and hands-on experience. The programs are:

SET Conference

This is a one-day conference for young women in Grades 10 to 12. Started in 1983, the conference provides students an opportunity to take part in hands-on lab sessions and meet women working and studying in science, engineering and technology (SET) fields. There is a component for parents so that they can learn about scholarships and what life at university will be like for their daughters.

Summer Research Program

This is a six-week summer program (210 hours) for young women and men who have completed Grade 11, welcoming participation from Aboriginal and rural communities. Started in 1984, the program provides students an opportunity to become part of a research team and work on a SET research project.

Choices

This is a one-day workshop for Grade 6 girls and their teachers. Started in 1991, this event provides the girls the opportunity to experience the fun of science and hands-on laboratory activities. The event is held during Reading Week so that the labs at the University of Alberta can be used.

UA-WiSE

Supported by WISEST, this is a student-led learning and support group for young women in science and engineering at the University of Alberta. UA-Wise holds monthly meetings during the school-term, which include panel discussions where women faculty and professionals in science and technology discuss career and school opportunities. More information about UA-WiSE is available at <http://www.ualberta.ca/~uawse/>

Celebration of Research

This Gala event at the end of the summer turns the knowledge gained at the Summer Research Program into a form of outreach to the whole community. Knowledge is shared with family members, teachers, academia, government, and sponsors. All are invited for the research posters event which boosts the students' confidence by building valuable presentation skills.

Screening

There are at least twice as many applicants as there are spots available for the Summer Research Program. Applicants are selected for their interest and aptitude in science. The Summer Research Program selects mainly honour students with an interest in science, and who can show that they can work responsibly in labs. Applicants have to submit reference letters from several people including their teachers. They are also required to submit essays as to why they selected WISEST programs. There were 100 applicants for the 60 paid Summer Research Program positions.

Professional association affiliations

The Association of Professional Engineers, Geologists, and Geophysicists of Alberta (APEGGA) has been developing a strategic relationship with WISEST for over a year. The association has provided the following:

- Volunteers from its membership to supervise science/engineering experiments and to be role models, e.g. for small discussions, and at the Summer Research Program
- Speakers for WISEST career panel sessions
- Support for the new annual WISEST golf tournament

There has not been any past affiliation with the Association of Science and Technology Professionals of Alberta (ASET).



Outreach

The programs are promoted only by word-of-mouth. Outreach to teachers happens in the Summer Research Program and the Choices program. The Choices program demonstrates to teachers that science can be fun and a representative team (a teacher and students) take this message back to their schools and they share the benefits of the programs with their classes.

Size

There are 600 WISEST volunteers and 15,000 alumnae. Approximately 600 girls in Grade 6 attend the Choices conference over two days.

Geographic Reach

In 2008, as a way of extending students' networks, students from other provinces and the United States participated in the Summer Research Program.

Funding

WISEST programs are fully funded by a variety of donors. The University of Alberta funds the long-term position of the WISEST Coordinator, as well as the WISEST office space. The programs have received the Natural Sciences and Engineering Research Council of Canada (NSERC) PromoScience grant funding for many years. Donations from corporations, foundations, individuals, and the public sector, sustain WISEST and its programs. Donations are accepted in the following forms:

- Becoming a Partner of the WISEST Summer Research Program and sponsoring a student's attendance
- Making a contribution, or becoming a Founder of the Future, to launch WISEST's new programs:
 - ▶ WISER Mentor Network – supporting early career researchers and professionals
 - ▶ Science and Engineering Entrepreneurship Initiatives – at student and professional levels
 - ▶ Scientist/Engineer/Technologist-in-Residence Program – with industry at schools
 - ▶ WISEST Innovative Community Program – taking WISEST programs to rural colleges
 - ▶ Professional Retention and Development Series – inspirational speakers and networks
- Margaret-Ann Armour Endowment Fund for Rural Students

The University of Alberta has been a sponsor of the Summer Research Program for the past six years. In addition to other sponsors, the following government organizations sponsored the 2006 Summer Research Program:

- Alberta Heritage Foundation for Medical Research
- Alberta Human Resources and Employment (Summer Temporary Employment Program)
- Alberta Ingenuity Fund
- Alberta Ministry of Education
- Alberta Ministry of Environment
- Alberta Ministry of Innovation and Science
- Alberta Women's Science Network

Budget

The WISEST annual budget is approximately \$500,000.

Governance

Staff consists of Gail Powley, P.Eng., WISEST Vice-Chair, and Grace Ennis, Coordinator. The volunteer WISEST Board consists of scientists, engineers, educators, scholars, the school boards, the private sector, and student representatives from the University of Alberta. Gail Powley, who reports to the Vice-President (Research) Office, provides staff support to the Board. Some of the Advisory Board members are also volunteer Chairs of various WISEST committees: the Program Committee, the Public and Professional Awareness Committee, the Research Committee, and the Student Liaison Committee, all of which meet regularly.

New Initiative

WISEST is working with teachers in schools to develop a Scientist-in-Residence Program, similar to the Artist-in-Residence Programs that many schools have. It will involve collaboration with industry and the school system to show that science can be fun and can offer dynamic local careers.

Awards and Recognition

WISEST has been recognized as follows:

- Received Natural Sciences and Engineering Research Council of Canada (NSERC) PromoScience grant funding over many years
- Margaret-Ann Armour, founding member and former WISEST Vice-Chair, was awarded the Order of Canada in 2006. Dr. Armour's contributions to science and technology have been recognized with numerous national and international awards such as the Montreal Medal from the Canadian Chemical Institute, the American Chemical Society Award for Encouraging Women into the Chemical Sciences, a 3M Teaching Fellowship, the Macleans Honour Roll of 10 Canadians Who Are Making A Difference, and as one of 100 Edmontonians of the Century.
- NSERC Michael Smith Award for Science Promotion, 1994

Success Factors

WISEST's success is attributed to the following factors:

- *Four Pillars.* The following pillars form the foundation of WISEST programs: mentoring, role models, hands-on experience, and the formation of networks. The last is especially important as interaction with people in the field creates a very personal experience, and helps the girls gain confidence.

"Participating in the Summer Research Program made me change my career path. Originally, I thought I was going into genetics. After attending the Program, I changed to computer science. The Program exposed me to an array of careers. Experiencing the Summer Research Program provided me with a learning experience. It made me realize that genetics was not the career for me..."

Valerie Dacyk, participant in the Summer Research Program (biological sciences) in 2003.

- *Variety of Programs.* WISEST has developed various programs founded on the above pillars: SET, the Summer Research Program, Choices, and UA-WiSE. In SET, some of the students were successful in getting their papers published even while they were still in Grade 11.

"My passionate Grade 10 teacher encouraged me to apply for the Summer Research Program. My friend, Sara, and I went together. My school is a rather small school. I participated in an engineering project where you extract iron out of iron ore. I was supervised by a PhD student. I did this long project for six weeks. Following that experience, I wrote an extended essay for the high school IB program and co-authored a paper. I would not have been able to decide to get into engineering if I did not attend the Summer Research Program..."

Alyssa Shinbine, Grade 12 student enrolled in engineering at the University of Alberta, participated in the Summer Research Program in 2007

- *Parental Involvement.* In the SET program, there is a component for parents where they can learn about scholarships and what life at university will be like for their daughters.
- *Outreach to Teachers.* The Choices program demonstrates to teachers that science can be fun. One team (teacher and students) per school take this message back to their schools and share the benefits with the class.
- *Evaluation and Newsletter.* An evaluation of the Summer Research Program is conducted

"I participated in the Summer Research Program back in 2001, by participating in a research lab at the University of Alberta, Hospital Labs. The project I worked on was a side interest of the doctor who was supervising the project. The project involved working with ancient DNA. By the end of six weeks, I felt that I accomplished something and helped move the project along. The doctor was a very good mentor. Now that I have graduated, I am working for the doctor. I continued with genetics and graduated from university with a general science degree with a focus on genetics... The program gave me a very realistic idea of what scientific research was..."

Shaina Archer, participated in Summer Research Program in 2001

and a newsletter compiled and published on the WISEST website at the end of each Summer Research Program. The evaluation report documents lessons learned and the newsletter is a means of enhancing the personal networks that develop in the Program.

- *Community Outreach.* The Summer Research Program is a form of outreach to the whole community. Knowledge gained in this program is shared with family members, teachers, academia, government representatives, and sponsors at a Gala event at the end of the summer. All are invited for the research posters. This event builds valuable presentation skills and boosts the students' confidence.

Challenges

WISEST has experienced the following challenges:

- Shortage of staff to manage alumnae volunteers. The ratio of staff to volunteers is 1:10.
- Tracking WISEST alumnae and measuring the success of the program due to low resources.
- Coordinating the various initiatives of such size using mostly volunteer labour.

Replicability

Since 1982, there have been a few acknowledged instances of WISEST program replication. Both the organization model and programs have successfully been replicated. For example, WISE Newfoundland and Labrador is, in effect, a replication of WISEST. The Alberta Heritage Foundation for Medical Research saw the impact WISEST was having and requested their assistance in creating a similar program for students to learn about biomedical research; in 2000, WISEST helped set-up the Heritage Youth Research Summer Program. The University of Alberta's Computer Department also modelled a similar program on WISEST programs. Initiated in 2007, Discover Engineering's ROPES program was modelled after the WISEST program showcased at the 2006 CCWESTT (Canadian Coalition of Women in Engineering, Science, Trades & Technology) Conference.





Origins

The origins of Discover Engineering lie in a meeting in 1991 of a group called Women in Engineering (WIE). WIE had started in 1989 at Ryerson University, Toronto, to offer engineering career information to high school and university women. WIE was modelled on programs such as Women in Engineering Programs and Advocates Network (WEPAN) in schools in the United States and included committee members representing staff, faculty, and students from Ryerson's Faculty of Engineering and other departments. The meeting in 1991, led by Electrical Engineering professor Peter Hiscocks and Rosemarie Volpe of Ryerson's Centre for Student Development and Council, was to discuss ways of addressing the problem of low enrolment of women in engineering at Ryerson and in schools across Canada. WIE decided to create a high-school-oriented Discover Engineering Summer Camp. Once established, and with the support of industry partners, the program has expanded its range to include events for girls and women from primary school to university. The events, most at no cost to participants, have included visits to high schools, a career conference at Ryerson University, and a program for Girl Guides. The Discover Engineering two-week camp evolved into a five-week camp in 1992 then a weekend mini-camp in 2004.

Programs

The evolution of Discover Engineering's programs is described below:

Discover Engineering camps

The Discover Engineering camps showed high school girls something about the science of engineering. WIE hired female undergraduate engineering students as camp counsellors and they guided participants in sessions led by Ryerson faculty, staff, and alumni. The camps featured hands-on learning, challenging experiments, and engineering career information. There was no screening for participating in the camps; any girl who applied was admitted.

Launched by the WIE Committee to celebrate Discover Engineering's 15th Anniversary in 2006, the Discover Engineering Mini-Camp was a weekend version of the week-long camp. The Mini-Camp made participation possible for students who were unable to commit to attending for a longer period because of work or other commitments.

Each camp accommodated 30 students. The fee was approximately \$100 for attending the week-long camp and approximately \$40 for attending the weekend Mini-Camp. The camp fee covered

only one quarter of the cost of the camp per student, and the balance was subsidized by the organizations and individuals supporting the program. Students in need were able to seek funding assistance.

The camp activities included:

- o Building a Geodesic Dome out of everyday materials.
- o Designing and guiding a battery-powered light-emitting diode (LED) ornament which participants took home.
- o Building a wind turbine that generated electricity.
- o Designing and building robots using LEGO ROBOLAB kits, which came complete with motors, sensors, a mini LEGO microcomputer, and ROBOLAB software.
- o Creating personalized websites using HTML programming code, Java and JavaScript.
- o Making a jelly-like substance similar to “slime” of different colours and odours and was like lip balm.
- o Constructing a rocket from plastic pop/water bottles then competing for the farthest distance travelled as the rockets were shot across an open field.
- o Visiting various centres for engineering and technology such as the Toronto Aerospace Museum.
- o Listening to female engineers from industry describe their academic history, career paths and their current jobs, and hearing them answer questions about the engineering profession.
- o Playing an enjoyable and educational floor game called “WAMMO” (Women Aware, Motivated, and Moving On) that was based on women’s issues related to the labour force, family, stereotypes, education, science, and engineering.

Every February, applications were sent to guidance, math, and science departments in more than 150 high schools across the Greater Toronto Area. Young women in high school who had completed Grade 9 and were interested in engineering, were invited to apply.

Research Opportunity Program in Engineering and Science (ROPES)

In 2007, after attendance at the Mini-Camps had begun to decline, a new program, Research Opportunity Program in Engineering and Science (ROPES), was initiated. The ROPES program consists of six weeks of paid work in a research lab from July to August. Although the program welcomes both male and female participants, it requires that more than half the participants be female.

Applications for the program are reviewed by a selection committee comprising the Associate Dean of Engineering, Architecture and Science, the Women in Engineering (WIE) Chair, and an undergraduate student hired for the WIE office. In 2008, 21 students out of 56 applicants were selected.

Discover Engineering High School Workshops

Beginning in 2006, 70-minute Discover Engineering high school workshops were offered to co-ed classes. These workshops were led by female faculty, staff, and engineering students, and consisted of hands-on activities followed by question-and-answer sessions, discussions about how engineering applied to daily life, and what opportunities there might be in the field. From 2003 to 2006, the Ontario Women’s Directorate funded Discover Engineering for the READY-SET-GO! high school workshops. The workshops were given by senior engineering undergraduate women who provided an example of female achievement in engineering to the girls.



Discover Engineering Career Conference

The Discover Engineering Career Conference was a one-day conference held for young women in Grades 10, 11, and 12, along with their parents, teachers, and guidance counsellors. The conference program featured panel discussions and workshops about careers in engineering. Those attending also had the opportunity to meet women who worked in engineering-related careers.

Discover Engineering Girl Guides Conference

The Discover Engineering Girls Guides Conference was a half-day event for Girl Guides aged nine to 12. The Guides tried hands-on activities, and learned about different types of engineering and how engineered devices have improved the way we live. They earned engineering badges for taking part in the event.

A survey of the subsequent careers of 74 past campers from 1991/1992 revealed that 57% of the women had enrolled in engineering after attending the camp, and that 75% of those said that the camp had influenced their decision.

GoEngGirl

In 2005, representatives from Ontario's 15 engineering schools met to discuss the drop in female enrolment in post-secondary engineering programs in Ontario and the result was the start of GoEngGirl. Discover Engineering has participated in this province-wide conference, which replaced the conferences described above. It is an annual one-day 'celebration of engineering' for female students in Grades 7-10. In 2008, the conference was co-hosted by Ryerson, the University of Toronto, and the University Of Ontario Institute Of Technology at 11 locations across Ontario. During the conference, the girls participated in hands-on activities such as building a prosthetic limb or a wind turbine, while their parents heard about possible careers and the courses their young daughters could consider. All of the participants had an opportunity to listen to presentations from current female engineering students and alumnae, and had an opportunity to ask questions and network.

Support Program

Since female students are a minority in undergraduate engineering programs, a support program has been created to provide mentoring, on-line dialogue, and tips on how to write a resume or have an outstanding job interview. Female engineering undergraduates can drop by the Women in Engineering office at set times during the week to discuss issues.

Geographical and Student Reach

Discover Engineering programs extend throughout the Greater Toronto Area. The following summarizes the age groups for the various programs:

Initiative	Grades
Camps and Mini-Camps	10-11
Research Opportunity Program in Engineering and Science (ROPES)	11
High school visits	10
GoEngGirl	7-10

Governance

Women in Engineering (WIE) runs the Discover Engineering programs from Ryerson's Faculty of Engineering, Architecture and Science, and is supported by the Dean of Engineering who provides the WIE office space. Frankie Stewart is the current WIE Chair and Ryerson University engineering faculty member. As WIE Chair, Frankie is granted time release from teaching. The WIE committee meets regularly throughout the year.

In the late 1990s to the beginning of 2000, Lisa Anderson co-ordinated Discover Engineering activities in the Dean's Office; today, there is no permanent staff support for the WIE Chair. Ms. Anderson was paid to run female recruitment and retention programs at Ryerson University's Faculty of Engineering, Architecture and Science. She also compiled Discover Engineering's annual reports and prepared sponsorship packages.

Funding

Workshops

Discover Engineering has received funding for various initiatives over the years. For example, high school workshops were added in 2006 with funding from the Youth in Science Technology Opportunity program. Today, the workshop supplies are funded by Actua, a national not-for-profit organization and a registered charity that represents a network of 28 member organizations across Canada with the mandate of increasing the scientific and technical literacy of young Canadians. The young women who run the workshops are volunteers.

Research Opportunity Program in Engineering and Science (ROPES)

The Natural Sciences and Engineering Research Council of Canada (NSERC) PromoScience provided \$30,000 for three years for the ROPES program with the Dean's Office, from Ryerson, making-up the difference. For example, in 2008, the Dean's Office provided \$40,000. ROPES funding covers the student salaries. The professors and graduates are already part of the University's expenses. ROPES funding also covers high school outreach and promotional materials (total \$20,000-\$25,000 a year).

GoEngGirl

Each Dean of Engineering supports GoEngGirl financially. Provincial corporations sponsor the giveaway bags for the participants. Discover Engineering, as a non-profit organization, hired a full-time co-ordinator to direct fundraising to subsidize camp fees and activities and about \$27,000 a year was raised. The list of "industry partners" has included companies such as Celestica, Ontario Hydro Services, Ontario Power Generation, and Ryerson University itself. Today, the Faculty fundraising office fundraises for Discover Engineering.

Annual Costs

Annual costs are approximately \$100,000. The annual revenues vary depending on the NSERC PromoScience funding secured and the success of fundraising.



Outreach

As noted above, Discover Engineering sends promotional literature to guidance, math, and science departments in more than 150 high schools across the Greater Toronto Area, for young women who have completed Grade 9. The package contains posters, informational material and application forms. The teachers with a good track record of sending female students to Discover Engineering programs have formed a network with the program staff and volunteers.

Awards and Recognition

Discover Engineering has been recognized over the years as follows:

- In 2004, the Women in Engineering (WIE) program, and in particular, the Discover Engineering High School Workshop program, received funding from numerous industrial partners and the following organizations:
 - The Natural Sciences and Engineering Research Council of Canada (NSERC) awarded \$30,000 in PromoScience funding to provide Discover Engineering High School Workshops in Toronto-area high schools.
 - The Ontario Women's Directorate provided \$50,000 in Partners for Change funding to present additional workshops in rural and remote areas of the province.
 - General Electric, through the GE Foundation, committed \$90,000 (US) to Discover Engineering, in order to continue the expansion of this program across the province.
- Peter Hiscocks, the founder of Discover Engineering, received the Canadian Council of Professional Engineers Award for the Support of Women in the Engineering Profession, 2003.
- Discover Engineering received the Natural Sciences and Engineering Research Council of Canada (NSERC) Michael Smith Award for Science Promotion, 2002.
- Discover Engineering received the Canadian Engineering Memorial Foundation (CEMF) Award for outreach programs deemed most effective at attracting senior high-school students, particularly women, to engineering, 2002.
- Discover Engineering received the Women in Engineering Programs and Advocates Network (WEPAN), Women in Engineering Program Award in 2001. Ryerson University is the first Canadian university to receive this award.

Success Factors

The following factors have contributed to the success of Discover Engineering:

- *A trailblazing Example.* Women in Engineering Programs and Advocates Network (WEPAN) exposed Women in Engineering (WIE), to successful female recruitment and retention programs in schools in the United States.
- *Variety of Initiatives and Programs.* Discover Engineering has offered a variety of initiatives for girls and young women aimed at providing exposure to the challenges and rewards of engineering. Factors such as fluctuating recruitment levels and changes in the student

environment (students working in the summer and higher tuition fees), have motivated initiatives, such as the summer week-long camp, to the mini-camp, and the Research Opportunity Program in Engineering and Science (ROPES) program.

- *Outreach to high schools.* Every February, program attendance packages are sent to guidance, math, and science departments in more than 150 high schools across the Greater Toronto Area aimed at all young women who have completed their Grade 9. The package contains posters, informational material and application forms.
- *Fundraising.* Discover Engineering, as a non-profit organization, hired a full-time co-ordinator to direct fundraising to subsidize camp fees and activities.
- *Support Program for female engineering students.* As female students are a minority in the undergraduate engineering programs, a support program was created that included mentoring, on-line dialogue, and tips on how to write a resume or have an outstanding job interview. Female engineering graduates can drop by the Women in Engineering office at set times during the week to discuss any issues.

"We had to choose an area of engineering for the program. I chose civil engineering. I liked meeting every week to talk about our experiences. We bonded and went out for lunch. We didn't finish our project... We had to recreate a building using AutoCAD and find out how it reacted to natural disasters..."

Akanksha Ganguly, participated in ROPES 2007. Her team was composed of her and a young man. She has finished Grade 12. She has chosen to pursue medicine as she likes 'helping people'. She heard about Discover Engineering from her school teacher.

"There were three graduate students supervising three students, so the ratio was 1:1. There was always someone available to help... I worked with two students. One is going into computer science at Waterloo and the other wants to go into biotechnology. We had to introduce our product and do a presentation at the end. We won third place and received a \$50 gift certificate. It was encouraging..."

Nika Zolfaghari, participated in ROPES 2007. Her team was composed of two other young women. She has finished Grade 12 and started first year engineering at Ryerson University in September 2008.

Challenges

Discover Engineering has encountered the following challenges:

- *Lack of full-time and permanent staff.* Although the current Women in Engineering (WIE) Chair is dedicated full-time to the program, she is given only time release from teaching. The Chair's responsibilities include co-ordination with the faculty fundraising office. In the past, a contracted staff person has worked on the programs in the Dean's Office. This is currently under review.
- *Necessity of having to train new personnel continually.* Because there is no permanent staff, the Chair has had to continually train new, temporary personnel.
- *The effect of external factors on the kind of program offered.* When the number of participants in the Discover Engineering camps fell, WIE had to reconsider the structure of the programs offered. Five-week long camps were successful for six to seven years before attendance numbers fell, attributed to students having to work in the summer due to rising tuition fees. Mini-camps were introduced in 2004 that were successful for two years before attendance numbers fell again. The ROPES program was started in 2007, modelled after the University of Alberta's Women in Scholarship, Engineering, Science and

Technology (WISEST) program showcased at the 2006 Canadian Coalition of Women in Engineering, Science, Trades and Technology (CCWESTT) Conference.

- *Miscellaneous funding sources.* Each Discover Engineering initiative has its own funding sources. As a result, the Chair is required to exercise diligence in keeping track of the funds and how they are spent, bearing in mind the unique conditions under which they were provided.

Replicability

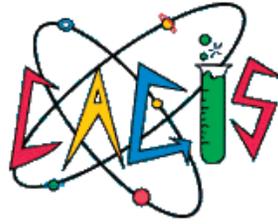
Modeled after Women in Engineering (WIE), the Ontario Network of Women in Engineering (ONWiE) was formed in February 2005. The objectives of the network are to:

- Identify desirable changes in the participation rate of female engineering students in Ontario.
- Collaborate to effect positive change in the participation rate of females as students and professionals in engineering.
- Provide opportunities for participants to network and to share information and available resources related to women in engineering.

The Deans of the Schools or Faculties of Engineering, as well as the NSERC/HP Chair for Women in Science and Engineering, provide ONWiE with financial support.

After 2006, Discover Engineering's programs were modelled after the University of Alberta's WISEST programs that were profiled at the 2006 Canadian Coalition of Women in Engineering, Science, Trades and Technology (CCWESTT) Conference. Other universities have been observed to ramp up their summer programs for junior and high school children. For example, the University of Toronto's Jr. DEEP summer day-camp for students in grades 7 and 8 was offered at 15 locations across the Greater Toronto, including all three University of Toronto campuses and 12 non-campus Greater Toronto Area locations. Jr. DEEP is celebrating its 18th anniversary at the University of Toronto in 2008. Jr. DEEP is modelled on the University of Toronto's DEEP Summer Academy for high school students. DEEP runs for four weeks during the month of July at the St. George Campus of the University of Toronto.

The Canadian Council of Technicians & Technologists (CCTT) launched its new national GoTECHGirl initiative at the 2008 CCWESTT Conference. Modelled on the GoENGGirl program, GoTECHGirl raises awareness among young women in Grades 7-11 across Canada. It is made possible through cooperation between CCTT, colleges and technical institutes.



Aims

The Canadian Association for Girls in Science (CAGIS) is a non-for-profit organization dedicated to promoting science, technology, engineering, and mathematics (STEM) interests in girls aged 7-16. In a supportive girls-only environment, CAGIS members explore topics with women and men who work in STEM-related fields. The aim is to make girls comfortable with science, technology, engineering, and mathematics, by overcoming gender stereotypes and resolving any qualms the girls may have. CAGIS has been consistently “for girls, by girls”, as Larissa Vingilis-Jaremko founded it in 1992, when she was only nine years old.

History

Larissa had observed that the girls in her class thought that science was difficult and boring and that scientists were “geeky old men with crazy hair and glasses”. Supported by a scientist mother and an engineer father, she began inviting science, technology, engineering, and mathematics speakers to her class. Larissa soon realized that girls in other schools had similar perceptions of science and engineering. Her mother was President of the Canadian Association of Women in Science and Larissa used to accompany her to the organization’s Board meetings. At one of these meetings Larissa announced that she was going to start CAGIS, and the Board encouraged her to do so with \$40.00 seed money on the condition that she did the work herself. The family had recently moved to London, Ontario, so Larissa decided to start by contacting girls who had attended science and engineering camps in that city. She obtained their contact information from guidance counsellors and sent the girls an application form to attend a range of monthly events. The first event was a presentation on microbiology held at the University of Western Ontario and attended by 20 girls.

Soon CAGIS evolved into chapters in various areas of Ontario and today it has grown to 12 chapters from New Brunswick to British Columbia. The current objective is to spread this chapter network within Canada and possibly the United States.

Program Activities

CAGIS Chapters hold events on weekends or after school. They are 1-2 hours long and typically held at the workplaces of the presenters, who are women and men with careers in science and technology. An event begins with a short presentation that introduces a science, technology, engineering, and mathematics concept, followed by hands-on activities to make the science ‘fun’ and help the girls grasp the subject. As well as experiencing “fun science”, the girls can discuss school, careers, and other issues of concern about their future.

Program Management

In the early days when CAGIS was beginning to grow, Larissa had her friends from school volunteer to help co-ordinate events. Now this work is done for each event by a volunteer two-person co-ordination team comprised of past participants, high school students, or professors. The co-ordination team meets regularly to plan events for a few months ahead. There are now over 3,000 CAGIS members and two new chapters are planned for fall 2008.

CAGIS is now incorporated and has a Board of Directors comprised of the 12 chapter co-ordinators. Larissa Vingilis-Jaremko is the founder and President, and her mother, Dr. Evelyn Vingilis, is the Chief Operating Officer. CAGIS is operated by mostly volunteers, but the webmaster and database person are contracted from Fletcher Wright Associates, association management consultants. Fletcher Wright Associates administers the member list, provides members access to the members-only site, and sends member contact information to the chapter co-ordinators.

Financing

The membership fee of \$30 a year covers administration costs, a regular national newsletter for CAGIS members, website maintenance, chapter supplies, and room bookings for some meetings. For the past eight years CAGIS has received funding from Natural Sciences and Engineering Research Council's (NSERC) PromoScience program - \$10,000 a year for three years – through a direct application process. CAGIS has also received funding from the Ontario Ministry of Energy, Science and Technology, as well as corporate donations from Shell Canada and Canada Trust. The University of Western Ontario provides CAGIS web space independent of the university and meeting rooms for the London chapter.

Honours and Awards



Source: <http://www.science.mcmaster.ca/psychology/images/stories/larissa.jpg>

In 2004, CAGIS was awarded the Natural Sciences and Engineering Research Council's (NSERC) Michael Smith Award for Science Promotion.

Over the years, Larissa has been recognized for her work in CAGIS:

- Received a four-year TD Canada Trust Scholarship for Outstanding Community Leadership, 2001
- Named as one of Canada's Top 100 Most Powerful Women (in the Globe and Mail by the Women's Executive Network), 2006
- Named YWCA Young Woman of Distinction, 2006
- Named in Chatelaine Magazine as one of their 80 Amazing Canadian Women to Watch, April 2008

Success Factors

The success of CAGIS is attributed to the following:

- **Scheduling**

There are two kinds of chapters: city-based (where the events are held on weekends) and school-based (where the events are either held during school lunch periods, or after school). This aims to make events available at times when girls will be able to come.

- **Event Organization**

As noted above, the events or meetings last 1-2 hours, explore science, technology, engineering, and mathematics (STEM) and are typically held at the workplace of the presenters, who work in science and engineering. The meetings consist of a short presentation introducing a STEM concept followed by hands-on activities to make the science ‘fun’ and help the girls grasp the subject.

- **Membership**

As CAGIS is “for girls by girls”, members are encouraged to take an active role in voicing their opinions, exploring their interests, writing for the newsletter, writing for New Moon magazine, and helping to organize the regular chapter events. This helps girls build their confidence and encourages membership growth.

- **Role Models**

Her mother, Dr. Evelyn Vingilis, was a role model for Larissa. Larissa followed in her mother’s footsteps to attend university. She has completed her honours degree at the University of Toronto with a major in psychology and two minors in biology and French. She is currently pursuing graduate studies in the Department of Neuroscience and Behaviour at McMaster University.

“I really liked to volunteer for CAGIS. You get to meet great people and do really fun stuff. Kind of help you get interested in science.”

Beth Harper, entering third year engineering at McMaster University

Larissa’s mother is Chief Operating Officer for CAGIS. In addition to her role as past President of the Canadian Association of Women in Science, Dr. Vingilis was instrumental in the founding of the Canadian Coalition of Women in Engineering, Science and Technology.

“When I volunteered in Grades 10 and 11, I really enjoyed it. Other volunteers were university students in math and sciences. I was able to explore my options and got to know what things were out there.”

Nyree Grimes, entering first year engineering at Queen’s University

The younger girls gain from being with such role models as Larissa and her mother, and with the older girls who are volunteers. The older girls gain confidence and benefit from their volunteer experience (high school students need a total of 40 volunteer hours) – all in a fun environment. The use of volunteers makes the program very sustainable.



- **Range of Event Topics**

The event topics cover a diverse range to give the girls the opportunity to view science, technology, engineering, and math with a very broad scope. One event was focused on paper-making at the Ontario College of Art and Design. Participants had an opportunity to experience paper-making, see how paper fibres are spun and mixed, and learn how to make paper that is best for writing. Here is a list of some of the topics of other past events:

- o Building and testing bridges in a wind tunnel
- o Sampling plant communities in forests and fields
- o The physics of figure skating
- o Performing orthopaedic surgery on rubber knees
- o CSI and forensic science
- o The physics of art restoration
- o Computer science and website development
- o Dentistry and searching for cavities
- o Mechanics and the internal combustion engine
- o The chemistry of cosmetics

- **Event location**

Because the events usually occur in the workplaces of presenters, girls become familiar with the places where science and engineering happen. This insight into science and engineering workplaces helps girls make informed decisions about their future careers.

- **Magazine Readership**

A membership in CAGIS includes an annual subscription to *YES MAG*, Canada's science and engineering magazine for kids: www.yesmag.ca. CAGIS receives a volume discount rate for the magazine.

- **Magazine Contributors**

CAGIS members have the opportunity to write science sections in *New Moon* magazine. The partnership between CAGIS and *New Moon* provides a unique opportunity for the girls to be published and become paid authors by writing in the "Science Side Effects" section.

- **Joint Publications**

CAGIS has published two mystery-adventure novels in partnership with Whitecap Publishing: *Summer of Suspense*, by Kristin Butcher, and *Crystal Connection*, by Tanya Lloyd Kyi. These are the first two books of *The Science Squad Adventure Series* and Dr. Evelyn Vingilis wrote the science content for them. The stories feature hip fictional CAGIS members who use STEM to get themselves to get out of challenging situations. Science sidebars and experiments, included in each chapter, relate to what the characters are doing. Written for girls, ages 8 – 12, these books are available for under \$10 at Chapters.Indigo.ca – the online book store. The books complement and reinforce what CAGIS stands for.

- **Daughters Program**

CAGIS organized the Daughters Program at the 2008 Canadian Coalition of Women in Engineering, Science, Trades and Technology (CCWESTT) Conference held at the University of Guelph. The Daughters Program provided fun science activities for young daughters of Conference participants. This was the first time that the event was formally organized although it had been informally arranged in the past. This event must have helped recruit future CAGIS members.

- **University Partnership**

The University of Western Ontario provides CAGIS web space independent of the University. With this partnership comes an awareness of the need to use the space wisely.

- **Low Membership Fee**

The membership fee of \$30 a year is kept low to encourage membership and not exclude girls from low income families.

- **Inclusive Membership**

Applicants are not screened as CAGIS is inclusive and encourages participation. It seems that recruitment efforts are unnecessary as CAGIS has grown by word of mouth only.

Challenges

CAGIS faces the following challenges:

- **Tracking current CAGIS members and past members**

A national newsletter keeps members informed, but it is difficult to stay in touch with all 3,000 members, or keep track of their later career paths to determine the impact of CAGIS. The only way Ms. Vingilis-Jaremko is made aware of CAGIS past member accomplishments, is through e-mails or letters she receives. Conferences are a way of maintaining links, but they are very expensive to organize.

- **Expanding across Canada**

Limited resources make it difficult to start a new chapter unless there is an engaged CAGIS volunteer living in the area. The CAGIS website www.cagis.ca encourages such involvement under the heading *Is Your City Missing?*

- **Replicability**

Larissa Vingilis-Jaremko is not aware of programs that replicate CAGIS. However, there are other similar programs for girls such as the Quest 4 Girls Club, a club aimed at girls in grades 3 through 5 and supported by the Association of Professional Engineers and Geoscientists of New Brunswick, the



University of New Brunswick, and Actua's National Girls Program. Actua is a national charitable organization dedicated to providing young Canadians with positive, hands-on learning experiences in science, technology, and engineering. Worlds UNBound/l'Univers sans limites is a member of Actua and has close to 15,000 young people from New Brunswick participating in camps, school workshops, Quest 4 Girls Club, and other programs. It is also interesting to note that *YES MAG*, the popular award-winning magazine for 9-14 year-old boys and girls, has been in print since 1996.

Quest 4 Girls Club offers club meetings and 'Adventure Days', at which young girls are exposed to various fields of engineering, science, and technology through visits and interactive presentations from female mentors, hands-on-projects, and fun activities. The club meetings are held at participating schools and Adventure Days at the University of New Brunswick. In 2008, fifteen schools from four different school districts in seven municipalities across New Brunswick had school club groups. These school clubs met six times throughout the year at school for a lunch hour project. The hands-on projects are supervised by volunteers comprising current and past Worlds UNBound instructors, along with engineering and science students.

CAGIS seeks to increase the number of chapters and has the potential to do so. Each chapter is a replicable entity, but expansion is limited by lack of manpower. Although the involvement of volunteers is an asset to CAGIS, their lack of numbers and the nature of their involvement limits the speed at which CAGIS can expand and replicate. More resources, perhaps full-time, paid employees, are required to accelerate growth.





The Engineering Access Program (ENGAP) provides Aboriginal people with access to university studies in engineering through the timely application of an academic, personal, and financial support network.

Origins

On Nov. 14, 1984, the University of Manitoba's Faculty of Engineering, the Manitoba Energy Authority, and the Department of Education began discussions that would lead to the establishment of ENGAP. The subject was the feasibility of a program that would make it easier for northern native people to study at the Faculty of Engineering. A working group was established to develop a proposal for presentation to the Manitoba Hydro Board, and it eventually tabled a report that highlighted the need for such a program, its objectives, target group, delivery agent and structure. The report also provided a budget estimate for the first eight years of the program. In early 1985, the Engineering Access Program (ENGAP) was officially launched with the appointment of John Glanville, in the role of Director.

Partners

The University of Manitoba made an agreement with the Province of Manitoba for a period of eight years. The Province would provide full funding for the program, and the University of Manitoba, through its Faculty of Engineering, would operate and administer the program.

Screening

The original student screening system was similar to that employed by the University of Manitoba Access Programs (UMAP). A screening committee reviewed every application and chose to interview the applicants who best met the selection guidelines. The original screening committee comprised representatives from ENGAP, ACE, UMAP, Manitoba Métis Federation (MMF), and Manitoba Indian Education Authority (MIEA). The applicants chosen for interview were brought to the University of Manitoba and interviewed by a selection committee which consisted of representatives from ENGAP, MMF, ACE, Community College Access Programs (CCAP), UMAP, Native Student Advisor (NSA), Native Education Branch (NEB), Northern Association of Community Councils (NACC), Manitoba Association for Native Languages (MANL), and Keewatin Tribal Council (KTC).

The program prerequisites are:

- Aboriginal ancestry (Status Indian, Non-Status Indian, Métis, or Inuit)
- Manitoba residency
- Applicants must be prepared to study full-time for a minimum of five years
- Applicants should have a minimum of Grade 9 education

Applicants who meet the regular engineering requirements are able to accelerate their ENGAP program if they demonstrate the ability to do so. The screening process is now less rigorous and most applicants to the program are accepted.

The Program

The program begins with a mandatory two-week summer orientation, which the students admitted to the program must attend full-time. The objective of this orientation is to help students obtain the necessary information and skills that will ease their entry into university life. Academic staff assess the students' needs and plan individual academic courses of study for them. The students also get a better idea of the workload they would be expected to take on and can make final decisions about their program of studies or even whether they want to go into engineering. Some students may be required to take additional upgrading courses in maths, physics, and chemistry to prepare them for first year engineering courses. These upgrading courses begin in September and run through December. Orientation activities include: attending lectures in maths, computers, and writing and study skills, familiarizing students with campus services, registering for September classes, touring the University campus, along with touring the ENGAP offices and the Faculty of Engineering building.

In addition to ENGAP courses, while in the program, students are required to take all other courses in the regular engineering program of their choice. These courses begin in the second term (January). Group study is available and the Undergraduate Coordinator and tutors assist with any academic difficulty the students may encounter. Counselling services also help the students balance the heavy workload with other aspects of their life. Although ENGAP students typically take the engineering degree in five to six years, it is possible for them to complete it in four. ENGAP students choose their engineering discipline at the same time as the other engineering students - on completion of the first year of study. Most ENGAP students choose Civil Engineering.

Program Supports

ENGAP provides academic, personal, and financial support.

Academic

Academic support is provided in both preparatory and university courses. ENGAP offers upgrading courses in Physics (Physics 1 and 2), Pre-calculus math, and Computer Programming. Also ENGAP offers a section of first year calculus to primarily ENGAP students. In all ENGAP courses, class size is limited and contact hours between the students and the Instructor are roughly double that of a regular semester course. Other academic supports are assistance with academic program planning, course selection, revisions and registration. There are also tutorial and remedial supports, study skills training, and a continual evaluation of the student's progress. Every student is entitled to a number

of tutorials free of charge that can be taken individually or with another student one-to-one or two-to-one with tutors who are paid for their work. Informal mentoring is encouraged by having ENGAP students tutor other ENGAP students.

Personal

A counsellor assists students and their families with the personal and social adjustments of taking the program. The counsellor can also provide assistance in any of the following issues:

- Relocation of student and family if required
- Finding suitable accommodation
- Day-care arrangements as needed

Financial

A limited amount of financial assistance in the form of bursaries is available to students who have no other means of funding or who demonstrate the greatest need. Before 1993, the program would accept up to 15 students per year (to a maximum of 45) and these students were fully funded. Today, students are not funded but financial aid is available to them through the various bursaries and through the Canada Student Loan (CSL). ACCESS Bursaries are available to ENGAP students who are eligible for a Canada Student Loan.

Class Size

The first 15 students entered ENGAP in September 1985. The agreement between the University of Manitoba and the Province of Manitoba capped the number of students admitted to ENGAP at 15 full-time students in any given program year, or 45 total, over the original eight years of the program. Today, there are about 55 students in the program. Sixty-eight students have graduated from ENGAP since 1985-86 and today, children of ENGAP graduates are enrolling in the program. Fifteen students started the program in the summer 2008.

Geographic Reach

The program originally accepted only students who were residents of Manitoba, but, since the program has been under capacity, students have recently been accepted from British Columbia, Alberta, Saskatchewan, and Ontario.

Funding

The original agreement between the University of Manitoba and the Province of Manitoba signed in August, 1985, meant that ENGAP received funding from the Manitoba Jobs Fund, Limestone Training Initiative, and the Manitoba Adult and Continuing Education Branch and \$406,000 was paid to the University of Manitoba to fund the program for the fiscal year 1985/1986. Today, the Manitoba Government's only funding to the program is through bursaries granted to the students with the highest need.



Budget

The program's budget increased from \$406,000 to \$830,000 from 1985/86 to 1989/90. After 1990, the future looked uncertain for ENGAP and budget cutbacks became the norm. Today, the program is financed through the Faculty of Engineering where funds are earmarked from the Council of Post-Secondary Education. Some fundraising is also involved.

Staff

The program currently has four staff members. Randy Hermann is the Director and Diana Klassen Laurie is the Undergraduate Coordinator. There is a Counsellor and an Administrative Assistant. The Director reports to the Dean of Engineering, Dr. Doug Ruth, who chaired the hiring committee that hired Randy Hermann at the time he was Associate Dean. The role of the Undergraduate Coordinator is to assist the students in their studies. The Undergraduate Coordinator also teaches Pre-Calculus and the first year Calculus courses, as well as the maths portion of the summer orientation.

Graduation

ENGAP graduates and their families are invited to attend a graduation ceremony in the spring. Corporate sponsors are also invited and the ceremony takes place in a relaxed and inspiring atmosphere. Students still in the program, are invited to volunteer to help run the event.

Post-Graduation

ENGAP provides services and advice following graduation. For example, the program assists students in finding their first job.

Awards and Recognition

Over the years, ENGAP has been recognized as follows:

- The Ivan Ahenakew Award, by the Interprovincial Association on Native Employment Inc., 2007
- National Award for Fostering Aboriginal Learning and Achievement, by the Conference Board of Canada, 2001

ENGAP students have won the following national awards:

- National Aboriginal Foundation Achievement Award, 2004
- National Métis Youth Role Model Program, 2003

Success Factors

The following factors contributed to ENGAP's success:

- *Dedicated ENGAP staff and office.* Dedicated ENGAP staff focus on the program's students

"Students have access to the ENGAP student room. They help each other along. This is so important, especially for those who are struggling. You get mentoring..."

Rachel Elders, graduated in 2008 from Engineering from the University of Manitoba

and ensure that the office /student room provides a safe haven for students, in which a spirit of camaraderie is fostered and informal mentoring encouraged.

- *Academic, personal, and financial support.* To provide academic support, the Undergraduate Coordinator helps students choose and register for courses, and provides tutoring for courses, free of charge. The Counsellor provides assistance with personal and family counselling, resume and job search advice, daycares and accommodation. The Administrative Assistant and Aboriginal Student Advisor provide assistance with navigating through the various bursaries and scholarships. Students also benefit from social activities that create a sense of community within the University of Manitoba's Faculty of Engineering.
- *Summer orientation.* The summer orientation consists of two weeks of pre-University courses. Students benefit from an introduction to the University of Manitoba and to engineering which builds on their backgrounds. Students take courses in maths, computer usage, and study and writing skills. They have an opportunity to think about whether engineering is right for them, and staff have an opportunity to decide whether the student is ready for the heavy workload demands in engineering.
- *ENGAP students must complete the same engineering degree, as all the other engineering students.* However, they may take longer to complete their engineering degree to allow them to take upgrading courses such as Preparatory Physics 1 and 2, Preparatory Chemistry, Computer Programming, and Pre-Calculus Mathematics. This ensures that the engineering degrees achieved by ENGAP students are equivalent to those achieved by other students.
- *ENGAP provides services and advice following graduation.* For example, the program assists students with finding job placements, as well as keeping an informal group of past graduates up-to-date on ENGAP.
- *Sometimes ENGAP graduates persuade their employers to recruit more ENGAP graduates.* The list of organizations that employ ENGAP graduates includes Manitoba Hydro, Golder Associates, Syncrude, Acres, the Association of Professional Engineers and Geoscientists of the Province of Manitoba, and the Aerospace industry in general.

"There's a place to drop-off books, get oriented, see how the university classes are set-up, and know where the classes are held. It helps to organize you..."

Kirsty Tremblay, going into second year of ENGAP and, working part-time with Manitoba Hydro where she has been since Grade 12.

"I think the upgrading and the tutors are very helpful. There is always either a current or past student in the ENGAP office available to help..."

Jim Massey, ENGAP second year mechanical student who commutes 60 km every day to attend ENGAP

"Once you graduate, you receive information, e.g. a newsletter. There is no formal mentorship. They let us know when other ENGAP graduates change jobs. A number of ENGAP graduates keep in touch..."

Rachel Elders, 2008 ENGAP graduate now employed with Manitoba Hydro

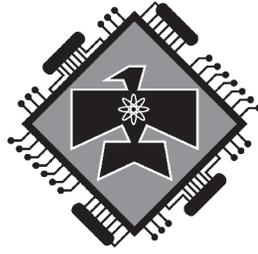
Challenges

ENGAP has the following challenges:

- *Outreach.* It is a challenge to get information to the Aboriginal people as to what engineering is, how engineering can assist their community, and about good-paying jobs in engineering.
- *Loneliness.* This is a challenge for the Aboriginal people who have to leave their communities and families to study with ENGAP.
- *Lack of initial support.* When the ENGAP students arrive from a remote area, they have few academic, social and financial supports. ENGAP tries to meet this challenge by providing and maintaining these supports after the students have commenced the program.
- *Funding.* It was a major challenge to set-up the program initially without funding for the students. Funding flowed while the agreement between the Province of Manitoba and the University of Manitoba was in effect. Instead of being fully funded to attend ENGAP as they were at the beginning, students now only have access to bursaries and scholarships.
- *High schools in remote communities generally lack in maths and science subjects.* Some schools in remote communities do not have the capacity to offer maths and sciences classes. Even when schools do offer maths and sciences, their students do not attain the same levels in comparison to students in cities.

Replicability

As far as Randy Hermann knows, ENGAP is unique at this point in time. There were similar programs at Concordia and Lakehead University which modelled ENGAP, but they are no longer offered. The University of Manitoba's, Faculty of Management Aboriginal Business Education Program, used ENGAP's upgrading pre-calculus math course for its students, and is in the process of setting up its own course. Randy Hermann has been working with the University College of the North to set up programs similar to ENGAP, but they are not developed yet. He concedes that it is very difficult to set-up a similar program like ENGAP with no funding.



**Mount
Pleasant
Educational
Services Inc.**

There are very few Aboriginals working in the applied sciences in Canada. The Native Access to Engineering Programme (NAEP) seeks to change that by encouraging Aboriginal students to stay in school and study math and science. Formerly associated with Concordia University, NAEP operates today under Mount Pleasant Educational Services Inc. located in Kahnawake, Quebec.

Origins

NAEP was established by the Faculty of Engineering and Computer Science at Concordia and l'Ordre des ingénieurs du Québec (OIQ), the licensing body for engineers in Quebec, in 1993. It had come about because Corinne Mount Pleasant-Jetté, an assistant professor at Concordia's Faculty of Engineering and Computer Sciences in Montreal at the time, had approached the OIQ, about the need for Aboriginal children to know what engineers do. A status Indian from the Tuscarora Nation, Ms. Mount Pleasant-Jetté taught Technical Writing and Communications in Engineering to undergraduate students in engineering and computer science. Dawn Wiseman, the Faculty's Communications Officer and former President of Concordia's Engineering and Computer Science Student Association, became interested in the need. She was one of the co-founders of REACH, a member of the Actua network of science camps, and had the background and connections to help a program come about.

With the University and OIQ's moral support and Dawn's driving force, Ms. Mount Pleasant-Jetté approached Indian & Northern Affairs Canada with the idea of a pilot summer science camp for 20 Aboriginal youth in Quebec in 1994. Using Ms. Mount Pleasant-Jetté's networks within the Native community, a five-day experimental, hands-on event was organized. The later Engineering Explorations camps used the REACH camps concept, but added explicitly Aboriginal content. The summer camp counsellors were all Aboriginal students. The Engineering Explorations camps confirmed what had been suspected, that young Aboriginals were not receiving easy-to-understand information about science, technology, engineering and mathematics (STEM) careers. In 1997, the development and distribution of culturally-relevant curriculum was initiated to support STEM – related teaching, learning, and career guidance. Then it became apparent that teachers in Aboriginal communities needed curriculum support, so NAEP created a model curriculum. A focus group of ten teachers recommended what grade level the materials would work for, and what to include in the curriculum. An analysis of the right time to introduce the curriculum to the school children was also done since Cree schools began their term at various times. Sample materials were then developed and sent to teachers for feedback. The materials consisted of a newsletter called "Harmonics", a worksheet and teacher's guide.

NAEP began providing professional development and training to teachers in Aboriginal communities such as a series of in-house professional development workshops called *DreamCatching*.

The growth of the Internet made it feasible for NAEP to post its materials online and this was first done in 1998. Most of the effort of the next four years was focused on the development of the Distributed E-Learning Community for First Nations Science Education. A partnership with IBM Canada made the development of this online system possible and it is still being used to disseminate educational materials to Aboriginal communities.

Now retired from Concordia University, Corinne Mount Pleasant-Jetté directs the NAEP program as President of Mount Pleasant Educational Services (MPES) Inc. which has applied for charitable status.

Programs and Services

The NAEP ran summer camps, participated in career days, and developed materials for use in schools. Contacts with Status Indian, Non-Status Indian, Inuit, and Métis groups yielded information about the types of issues that were particular to each group and that information was integrated into the curriculum. Some of the materials developed include a series of K-4 activity books entitled: “What Engineers Do”, “What Scientists Do”, “What Health Scientists Do”, and “What Mathematicians Do”. The booklets are intended not only for the students but also for teachers, older siblings, and parents.

Other projects included:

Engineering Education: A Guide for Aboriginal Students

This is a resource for teachers and students who want to know what engineering is all about, where it can be studied, and what undergraduate programs are available in Canada. It also contains information about programs that provide support to Aboriginal students.

Curriculum Materials

NAEP curriculum sets (newsletter, worksheet, and teacher’s guide) were produced four times per academic year. The curriculum sets incorporate information that is portrayed using Aboriginal examples and role models. There were at least 25 curriculum sets developed for a wide range of topics relevant to the Aboriginal community such as ocean engineering, nutrition, building engineering, water, and geology. The curriculum sets are based on the required math and science curricula for Grade 9.

The “Harmonics” newsletter features role model Aboriginals working in the applied sciences field. There is a “Community Profile” on the topic’s historic relevance to the community, and a “Fun Facts and Things to Think About” section that provide some reflection on the topic. Teachers used the newsletters as literacy tools too. The lessons are aimed at Grade 9, but the teachers use their discretion in introducing the material to the children depending on whether they think the children will be interested. The worksheets include an “Elders’ Concerns” section; this recognizes the role of the older Aboriginal generation in passing knowledge to the younger generation.

DreamCatching: Professional Development Opportunities

NAEP also provided support and resources for teachers. Professional development opportunities included the *DreamCatching* conference, a series of hands-on interactive workshops for math and science teachers. Mount Pleasant Educational Services Inc. (MPES) is still producing the *DreamCatching* conference.

Outreach

When research funding was available, outreach efforts were extensive. Today, outreach efforts are limited.

In 2005-2006, NAEP reached approximately 2,000 individuals through various national and international events and activities. The NAEP website continued to receive comments and requests for information, materials, and support. For example, there were 150 postings to the NAEP listserv in 2005-2006.

Always seeking innovative ways to inform parents about the program and its initiatives, NAEP sponsored the printing of 1,500 reflective Halloween bags with the NAEP logo and website address in 2005-2006. The bags were sent to some community elementary schools in Quebec, Ontario, New Brunswick, and Saskatchewan in time for distribution to students for Halloween.

Geographic Reach

The availability of NAEP materials and resources on the World Wide Web extends NAEP's reach far and wide: across Canadian provinces and territories, ten US states, the UK, and Australia.

Funding

NAEP received \$2.3 million in funding over 13 years from 1993-2006. The funding varied every year but the program grew consistently. The program began with \$2,000 from Indian and Northern Affairs Canada, and \$2,000 from Concordia's, Faculty of Engineering and Computer Science. Concordia has also given in-kind support in the form of facilities, payroll and accounting administration, along with funding registration.

According to Ms. Mount Pleasant-Jetté, federal and provincial funding for the program accounted for approximately 80% of the total funding with the balance being private and corporate donations. For example, Indian and Northern Affairs Canada and the Quebec Ministry of Education (now the Quebec Ministry of Education, Recreation and Sports) provided year-after-year funding. Professional associations have also made small donations, while IBM Canada provided the NAEP website - the equivalent of \$50,000. The Association of Professional Engineers and Geoscientists of Manitoba (APEGM) funded the printing of 10,000 copies of "What Engineers Do". The publication has been translated into French and parts of the book are also translated into Cree.



Budget

The NAEP annual operating budget used to be \$200,000, including special projects. Today, the budget is approximately half of that due to the financing being project and cost-delivery based. The funding used to cover salaries, benefits, travel, program development, and postage mailings. The camps were successful but expensive: the cost was \$36,000 for 10 Inuit children, and this did not include the cost of chaperones and housing.

Governance

As mentioned above, Corinne Mount Pleasant - Jetté is both NAEP's founder, and President of Mount Pleasant Educational Services Inc. She is credited with initiating the key contacts with the right organizations and following through to cement the deals. Dawn Wiseman, the Program Coordinator, is responsible, not only for the daily management, but also for curriculum materials and program initiatives. She hired and directed a number of part-time, casual, and contracted staff in various positions. A Circle of Advisors guided NAEP in its work. The Circle met two to four times a year and was led by an Elder and included seven or eight representatives from Concordia, the engineering profession, and native communities, and a representative from the Aboriginal Science and Engineering Association (CASEA).

New Initiatives

The following are a few new initiatives:

- *DreamCatching 2009* conference, being produced in conjunction with Randy Hermann of Engineering Access Program (ENGAP) and Dr. Doug Ruth, the University of Winnipeg's Dean of Engineering.
- *Circles of Science*, a computer-based science exploration and discovery initiative;
- "What IT Professionals Do" commissioned by IBM in an attempt to recruit Native American and Aboriginals to work for the company.
- "Aksud", a new publication consisting of images aimed at five to six-year-olds, which encourages children to learn with their grandparents.

Awards and Recognition

The NAEP has been recognized as follows:

- The NAEP website which provides abundant information about science and, particularly, engineering careers. The website has been recognized for its content and has been included in the following online science education resources:
 - ◆ The Gateway to Educational Materials (GEM), sponsored by the US Department of Education, <http://geminfo.org/index.html>
 - ◆ The National Digital Science Library (NSDL), a digital library of high quality resource collections and services, organized in support of science education at all levels, <http://www.nsdl.org/>

- ◆ Eisenhower National Clearing House (ENC), located at Ohio State University. Funded by the US Department of Education, ENC focuses on identifying effective curriculum resources, creating high-quality professional development materials, and disseminating useful information and products to improve K-12 math and science teaching and learning. The NAEP website was selected as one of 12 sites, the Digital Dozen, to feature on ENC Online. <http://www.enc.org/>
- “A Day in the Life of an Engineer” is a NAEP publication that is unique in terms of its content and broadband delivery. This project has been recognized as follows:
 - ◆ Received an Award of Excellence in the Multimedia category, as well as the festival’s top honour - the Canadian Education Association Achievement Award, 2005.
 - ◆ Invited to enter the Montreal International Festival of New Cinema and New Media (FCMM) and included as part of a showcase held in two installation galleries in Mexico City in December 2003.
 - ◆ Won Silver at the 2004 Horizon Interactive Awards, <http://www.horizoninteractiveawards.com/>
- The NAEP programs were awarded the Natural Sciences and Engineering Research Council of Canada (NSERC) Michael Smith Award for Science Promotion, 2003.

Success Factors

NAEP’s success is attributed to the following factors:

- *Aboriginal experiences were integrated into the summer camps, materials, and curriculum distributed to teachers.* Aboriginal people working as engineers were brought to speak to the students in the camps about, e.g. community planning. Through contacts with Status Indian, Non-Status Indian, Inuit, and Métis groups, knowledge was amassed on the types of issues that were particular to each Aboriginal group and that knowledge was integrated into the curriculum.
- *Part of the materials developed includes a series of activity books aimed at K-4 grades entitled: “What Health Scientists Do”, “What Engineers Do”, “What Scientists Do”, and “What Mathematicians Do”.* The booklets were intended not only for the students but also teachers, older siblings, and parents.
- *A focus group session and analysis preceded the development of curriculum sets delivered to teachers in Aboriginal communities.*

“I loved the fact that the themes of DreamCatching and Connecting the Dots were ever present. I feel supported and reaffirmed as an educator.”
Anonymous DreamCatching 2003 evaluation comment

Source: NAEP Programme Review 2000-2004

“The DreamCatching conferences are a great place to pick up some native-contextual activities and to network with teachers from across the country (and the USA). The booklets and activities that they have put out over the years provide some good ideas for teachers as well. The listserv hasn’t been very active of late, but it could become a powerful resource for people that have some questions that could be answered quickly by other subscribers. The listserv also provides some interesting and timely links to websites that could be interesting to the students and teachers alike.”

Barry Hannah, Educational Consultant, DreamCatching conference attendee and presenter, on NAEP listserv

In addition, research was conducted on curriculum specifics associated with math and science for Grade 9 students.

- *Curriculum and professional development and training opportunities for teachers were developed to provide much-needed support in the Aboriginal communities.* Professional development opportunities include the DreamCatching conference, a series of hands-on interactive workshops for math and science teachers. The workshops are hands-on so that the teachers can apply the information when they return to the classroom.
- *At least 25 sets of materials were created for a wide range of topics relevant to the Aboriginal community such as ocean engineering, nutrition, building engineering, water, and geology.* Each set consists of newsletters, a worksheet and teacher's guide.
- *Teachers use the newsletters as literacy tools too.* The lessons target Grade 9 students but the teachers use their discretion in introducing the material to the children depending on whether they think the children will be interested.
- *Each newsletter has a "Community Profile" section on the topic's historic relevance in the community, and a "Fun Facts and Things to Think About" section that provides some reflection on the topic.*
- *In the worksheets, there is an "Elders' Concerns" section, reinforcing the cultural role of knowledge transmission from one generation to another.*
- *The Distributed E-Learning Community for First Nations Science Education in partnership with IBM Canada, is used to disseminate educational materials to Aboriginal communities.* There is abundant information about science and, particularly, engineering careers, posted on the award-winning NAEP website. There is also a listserv source available to teachers on the website.
- *Garnering an award on its own, "A Day in the Life of an Engineer" is an interactive, multimedia section of the NAEP website.*
- *NAEP is always seeking innovative ways to inform parents about the program and its initiatives.* In 2005-2006, NAEP sponsored the printing of 1,500 reflective Halloween bags personalized with the NAEP logo and website address. The bags were sent to a number of community elementary schools in Quebec, Ontario, New Brunswick, and Saskatchewan in time for distribution to students for Halloween.

"I appreciate the listserv very much. I keep the sites in a folder, and when I need ideas or more info about a specific topic, I look through your sites, as they are always more useful than when I try a search myself."

*Barbara Muller, Secondary School Teacher, Kativik School Board
Source: NAEP Programme Review 2000-2004*

Challenges

NAEP has experienced the following challenges:

- *Funding Formula.* NAEP requires substantial funds for outreach efforts, curriculum/program development and program delivery. When NAEP was associated with Concordia University, research funding was easily secured. Now that the program operates under Mount Pleasant Educational Services Inc. (MPES), project-based funding can only be secured. This substantially limits program delivery and outreach efforts, and makes event planning challenging.

- *Lack of permanent human resources.* Because the funding is project-based, the program lacks permanent staff to implement outreach efforts.

Replicability

The ease of use encourages people to go to the NAEP website. Because web browsing is usually anonymous, it is difficult to know if anyone is replicating the features of NAEP. After the initial camps had been held, Corinne Mount Pleasant-Jetté met with the University of Quebec at Chicoutimi in 1996 to discuss the sharing of resources to support the education of some native reserves within the University's catchment area. She supplied the University with binders of Engineering Explorations camp information on how to run summer camps, as well as logistics and coordination information, and staff training manuals. Today, the University of Quebec at Chicoutimi is still running a summer experience for students.

The Engineering Explorations camp information binders were also delivered to the Saskatchewan Tribal Council's education division. The Council ran 'Super Saturday' camps on Saturdays, four times per year modelled on NAEP's camps and curriculum.

Ms. Mount Pleasant-Jetté also volunteered to advise the Natural Sciences and Engineering Research Council of Canada (NSERC)'s President on how NSERC serves Aboriginal students.





Origins

The Internationally Educated Engineers Qualification (IEEQ) program is a program that aims to enable engineers with non-Canadian qualifications to make a successful transition into their profession in Manitoba and make progress toward gaining a P.Eng. licence. IEEQ is a combination of university engineering courses, co-op work experience, cultural orientation, language and communication support, along with professional networking. Participants spend eight months in classes at the University of Manitoba and four months at a paid work placement. The core courses are engineering economics and another called *Practising Professional Engineering in Manitoba* and, with recent changes, up to eight technical courses. The number of courses required depends on an academic assessment by the Association of Professional Engineers and Geoscientists of Manitoba (APEGM). The program was setup as a pilot program in 2003 to provide a means for international engineering graduates (IEGs) to gain academic recognition with APEGM, as part of the process toward a P.Eng. licence in Manitoba.

The number of immigrants in high-demand professions settling in Manitoba doubled between 1999 and 2006. Engineering was one of these professions. A summit in 2002 sponsored by the Manitoba Government, urged the professions to review their licensing models and find ways to better integrate internationally-educated professionals into their fields. After the summit, Dave Ennis, Executive Director of APEGM, and Ron Britton, Associate Dean of Engineering at the University of Manitoba, created a university-based one year program that would lead to licensure. Marcia Friesen was hired as IEEQ Coordinator at the time to implement the details. IEEQ had three goals: licensing pathway, labour market entry, and cultural orientation. The intent was to move to a time-efficient licensing pathway that would result in significantly less attrition for the international engineering graduates. Although APEGM's database had not maintained statistics, it was thought that the attrition rate in the traditional licensing pathway of writing confirmatory exams was as high as 50%.

The program broke ground since this was the first time an engineering university program doubled-up as a licensing pathway. It was also the first time that a licensing program recognized by a provincial professional association was delivered by an organization other than the provincial association itself. IEEQ was influenced by the ENGAP program and other programs for international engineering graduates such as the one sponsored by Ecole Polytechnique in Montreal. The provincial licensing organization, the Order of Engineers of Quebec (Ordre des ingénieurs du Québec, OIQ), does not recognize it formally, but the program that is similar to IEEQ, offers preparatory courses for the exams administered by OIQ.

Screening

APEGM is the gateway to IEEQ as that organization is first to assess the participants for technical competency. Applicants proceed with their application to IEEQ only if APEGM determines that they need to pass five or fewer than five confirmatory exams. Depending on the year, between two-thirds to three-quarters of the applicant international engineering graduates are assigned the number of confirmatory exams that make them eligible for IEEQ. It is up to the participants whether to proceed or not. They are not eligible to proceed if they are assigned engineering proficiency exams or more than five confirmatory exams. Applicants have entered the program with at least a bachelor's degree in engineering from their homelands, but some have Master's degrees.

Applicants are also required to have a minimum Canadian Benchmarks Language Level (CLB) of 8. When IEEQ was developed, the level of English required for engineering classes was determined to be at a Canadian Language Benchmarks Level 8-9. Nevertheless, IEEQ staff have found that some English competency issues existed in participants who had been accepted into the program. Another minimum requirement is that participants be either permanent residents or citizens of Canada, with a preference for residents of Manitoba.

Curriculum

Marcia Friesen teaches the course that was specially developed for IEEQ, *Practising Professional Engineering in Manitoba*. It helps international engineering graduates transition to the culture of professional engineering in Manitoba. It formed the basis for the *Working in Canada* seminar and has been included in the Engineering Qualification Recognition Model (eQRm). The *Working in Canada* seminar curriculum was written for an audience of instructors interested in developing and delivering a seminar for international engineering graduates. It was expected that such a seminar may be delivered by regulatory bodies, universities and colleges, and/or community agencies serving immigrants in settlement issues. The IEEQ participants study in the engineering department that covers their field (civil, mechanical, and electrical) and they are integrated in class with Canadian undergraduate students. Most participants are able to complete the program in 12 months, although there is the option of completing the program over 24 months.

Development

The number of participants in the program increased from 7 participants in 2003 to 9 participants in 2007. The participants are scheduled to increase to 18 in 2008, 30 in 2009, and 40 in 2010. In the first four cohorts (2003/2004 through 2006/2007), 39 entered IEEQ, of which 31 successfully completed the program.

Work Placements

The work placement period is four months but the work involved is year-round. There is no obligation on the part of employers to continue work placements beyond four months but many do. Work begins in late October for May placements. An assignment in one of the program's courses has the program participants writing a one-sentence profile on themselves. By late October, marketing is developed with professional profiles on the program participants. The participant profiles are

distributed to an e-mail list. Supporting industry include Manitoba Aerospace, the Manitoba division of Canadian Manufacturers and Exporters, and Consulting Engineers of Manitoba.

Approximately 80% of the participants complete the IEEQ in 12 months and continue with their co-op employers beyond four months of work placement. When they complete the IEEQ, they receive a letter from the Dean of Engineering at the University that indicates that they have completed the required academic qualifications. Following completion of the program, the participants can apply for registration for Engineer-in-Training (EIT) with APEGM. Once they have demonstrated at least four years' engineering experience (of which at least one year must be Canadian experience; up to three years can be engineering experience acquired in the home country), they can apply for registration as a Professional Engineer (P.eng.) with APEGM.

Four months of IEEQ work experience is equivalent to four months work experience by APEGM in order to avoid the perception that the pathway to licensure for international engineering graduates is easier than that for Canadian undergraduates.

Mentorship

An informal type of mentorship often develops during the co-op placement, between a senior engineer in the company and the international engineering graduate, in order to help the international engineering graduate “learn the ropes.” IEEQ makes a deliberate attempt to maintain contact with program graduates in the hope that such people may provide mentorship to future program participants once they are established in industry.

Supports

Various supports are provided to program participants motivated by feedback from past cohorts. For example, academic supports are provided to ease the transition back to university and to enhance perseverance and success in courses; financial supports are provided, such as industry-sponsored bursaries, to make the program a realistic option for the international engineering graduates and their families; and social supports are provided such as social events with IEEQ families and staff, to provide opportunities to build relationships within the group and wider networking opportunities within the engineering industry. There is also ongoing development and enhancement of program materials such as a resource guide that provides information on English as a Second Language, counselling, and childcare services.

Governance

The University of Manitoba managed the program and Ron Britton provided oversight, while APEGM's Academic Review Committee focused on who was admitted into the program, its concern being that the path to licensure was sufficiently rigorous. During its first 18 months, there was a lot of accounting and reporting to the Academic Review Committee. Today, the program is officially offered as a licensing option for a select group of international engineering graduates through APEGM. It is governed by a partnership between the University of Manitoba program and APEGM; it has full freedom within the engineering faculty's rules and regulations. Whereas there is no formal contract between the two organizations, the partnership is based on a formal letter from the

University of Manitoba to APEGM's Academic Review Committee. John Woods, coordinator of the Engineering Qualification Recognition Model (eQRm) project, is a past President of Consulting Engineers of Manitoba, and he is also a representative on the APEGM Council.

Although there is no formal contract linking them, segments of the economy that regularly employ engineers (industry) and advanced settlement and immigrant support networks, also form part of that partnership. IEEQ draws on the input from local industry in the design of the program format and content, and by industry's participation in the paid work term component of the program. Settlement agencies in the community act as entry points for international engineering graduates to become aware of the program and, if necessary, to upgrade their English language skills to the minimum benchmarks set for program entry.

Funding

IEEQ had an extended pilot stage with funding by the Manitoba Government being renewed one year at a time. The provincial government later provided two years of funding at a time so that program participants who failed it in the first year could be accommodated. The pilot phase lasted five years. Today, IEEQ is a permanent program funded by the University of Manitoba's baseline funding as a post-secondary program. Students pay tuition fees on a per-credit-hour basis, as any other undergraduate student. Students pay nominal tuition fees of \$2,400 - \$3,200 to register in the program. Textbook costs are an extra \$600 - \$1000 and incidental fees up to \$400.

Annual Costs

The program's administration costs for staff and overhead are approximately \$350k. Since the University of Manitoba was at full capacity for undergraduate faculty, additional six faculty members were hired at cost of \$650k. The University allocates tuition revenues to offset one-time IEEQ costs.

Outreach

In the beginning, outreach was 'low key' as the funding was year-to-year and the number of students admitted into the program was limited to 12. Today, outreach to candidates is done through articles in the APEGM newsletter and attending networking events in the engineering community. Applicants to APEGM receive a package that includes a brochure on IEEQ; the program is not highlighted for them to take. Low key marketing geared to the agencies servicing immigrants was also developed; Marcia does information sessions for them by request only. There are 100-150 international engineering graduate applications to APEGM per year.

IEEQ's outreach to industry consists of articles in industry newsletters and industry networking events which IEEQ staff attend to encourage work placements.

The Engineering Qualification Recognition Model (eQRm) was developed primarily based on the IEEQ model, for adoption, in whole or in part, by other provincial and territorial jurisdictions as an outcome of Phase III, the implementation phase of Engineers Canada's From Consideration to Integration (FC2I) project.

Bursaries and Scholarships

In addition to offering work placements, bursaries and scholarships are another way for industry to assist. Bursaries are needs-based while scholarships are performance-based. For example, if an industry needs electrical engineers, they can contribute towards bursaries and scholarships. Manitoba Hydro is considered a flagship employer; it contributes towards bursaries for the program's participants in addition to offering a limited number of placements after successful completion of the program.

Although there is no distance learning component yet in the IEEQ program, it is being considered by the Engineering Qualification Recognition Model (eQRm).

Awards and Recognition

IEEQ has been recognized over the years as follows:

- For best practices by Engineers Canada's *From Consideration to Integration (FC2I)* that led to the development of the eQRm – for adoption, in whole or in part, by other provincial and territorial jurisdictions. The eQRm is an outcome of Phase III, the implementation phase, of FC2I. The Internationally-Educated Engineers Qualification Bridging Program (IEEQB) program, launched in 2007 in Ontario, is very similar to the IEEQ program.
- Received the Recognizing Learning Award in the Programs category from the Canadian Association for Prior Learning and Assessment (CAPLA), 2006
- Received the Pearl Award (Pursuit of Excellence in the Assessment and Recognition of Learning) from the Manitoba Prior Learning and Assessment Network (MPLAN), 2006

Success Factors

The following factors have contributed to the success of IEEQ:

- *Partnership.* IEEQ is the product of a successful partnership between a university, a provincial licensing body (the regulator), industry, and settlement agencies. Proper lines of communications were set-up and have been maintained between all the partners.
- *APEGM assessment of applicants.* Applicants proceed only if they are assigned no more than five confirmatory exams by APEGM.
- *Schedule Revision.* Additional meetings of APEGM's Academic Review Committee, and a revised schedule, were required to meet the greater workload created by the introduction of the IEEQ program.
- *English language benchmarking.* As part of the original IEEQ development,

"I was offered a full-time position by ND LEA Engineering and Planners who sponsored my work placement. I was with them for 1.5 years. It was easy to apply for other jobs after that; I would not be able to get an interview otherwise..."

Yuriem Nodarse Soler, 2005 IEEQ graduate

"I attended classes also attended by Canadian undergraduate students. You are one of them! It was scary at the beginning. I was scared if I was going to understand the professors..."

*Nini Murgas, 2007 IEEQ participant currently in co-op work placement.
Originally a civil engineer from Columbia*

engineering classes were benchmarked and found to be at a Canadian Language Benchmarks Level 8-9. In From Consideration to Integration (FC2I), Phase I, employer interviews, it was found that 'by far the most important factor for determining the level of employment was the individual's ability to communicate in English (or in Quebec, French)'. IEEQ Candidates need a minimum Canadian Language Benchmarks Level of 8.

- *Participants study in the engineering department of their field.*
- *Integration of participants.* The international engineering graduates attend class with the established Canadian undergraduate students. This integration is a test of the rigour of the program.
- *Custom-designed course.* One course specially developed for IEEQ is called Practising Professional Engineering in Manitoba. The course helps international engineering graduates in the process of transitioning to the culture of professional engineering in Manitoba.
- *Flexibility in completion time.* Most participants are able to complete the program in 12 months, although the option to complete the program in over 24 months also exists.
- *Intensive work-placement process.* Work begins in late October for May placements.
- *Mentoring.* A senior engineer in the placement company often mentors the international engineering graduate, in order to help the international engineering graduate "learn the ropes". IEEQ attempts to maintain contact with program graduates in the hope that such people may provide mentorship to future program participants once they are established in industry.
- *Support to participants.* Academic, financial and social supports are provided to program participants.
- *Industry Outreach.* Outreach is done through articles in the APEGM newsletter and attending networking events in the engineering community. Articles are also provided in industry newsletters to encourage work placements.
- *Equivalence of work experience.* Four months of IEEQ work experience is equivalent to four months work experience by APEGM in order to avoid the perception that the pathway to licensure for international engineering graduates is easier than that for Canadian undergraduates.

"What we learned to do in our own country does not necessarily work here. What is normal in my country is not normal here. The program prepares you for the workplace in Canada. For example, you need to have space between yourself and the person you talk to..."

Yuriem Nodarse Soler, 2005 IEEQ graduate who was a civil engineer in Cuba and is now employed with Manitoba Highway in a full-time position.

"I heard about the program before at the International Centre..."

Nini Murgas, 2007 IEEQ participant currently in co-op work placement.

Challenges

The following are some of the challenges encountered by IEEQ:

- *Initially, the provincial government provided funding one year at a time.* Although the provincial government had to be satisfied that its funding was being spent on a worthwhile program, it created an environment of uncertainty for the University and APEGM hesitation about committing to the program.

- *Rigorous and necessary due diligence exercised by APEGM over who was admitted into the program.*
- *Attempt to secure consistency in the assessment of the candidates' English language skills.* Although the minimum level for acceptance into the program is English Canadian Language Benchmarks Level 8, IEEQ staff have found that some English competency issues existed after the candidates were accepted into the program.
- *Marketing the international engineering graduates for work experience placement.* Marketing the international engineering graduates requires perseverance by both participants and the University. It is a delicate balance between persevering and being too aggressive, as well as being aware that employers evaluate candidates in different ways.

Replicability

IEEQ has been replicated in Canada. IEEQ's course *Practising Engineering in Manitoba* formed the basis for the *Working in Canada* seminar and has been included in the Engineering Qualification Recognition Model (eQRm) mentioned above. In Ontario, large components of the IEEQ program have been replicated through the development of the Internationally-Educated Engineers Qualification Bridging Program, offered by Ryerson University's Faculty of Engineering Architecture and Science, in collaboration with Professional Engineers Ontario (PEO). The program is funded by the Ontario Government and the Government of Canada.



Origins

In the mid 1990s, staff at the Edmonton Mennonite Centre for Newcomers (EMCN) noticed that among internationally-educated graduates landing in Edmonton, engineers outnumbered all the others. The Engineers' and Technologists' Integration Program (ETIP) was launched in 1996, as Luella Gaultier, Manager of Bridging Programs for Immigrant Professionals at EMCN puts it, to help internationally-educated engineering and technology graduates integrate rapidly into Canadian engineering and find employment.

Partners

The Centre had approached the Northern Alberta Institute of Technology (NAIT), the Association of Science and Engineering Technology Professionals of Alberta (ASET), and the Government of Alberta. All agreed that the process for integrating internationally-educated engineering graduates needed streamlining, so the Edmonton Mennonite Centre for Newcomers developed a proposal with the Association of Science and Engineering Technology Professionals of Alberta, which used its good relationship with the Northern Alberta Institute of Technology. The Government of Alberta provided funding through Student Finance. ETIP broke new ground when it began; no other program was used as a model.

Development

In 1997, the first intake was a group of 12 participants from several engineering disciplines. The program focused on improving communication skills and the Northern Alberta Institute of Technology instructors came to teach general vocabulary at the Edmonton Mennonite Centre for Newcomers. Eventually, it appeared that a multi-disciplinary group in a long course was difficult to manage and class composition was changed so that participants were streamed according to their discipline. A third semester was introduced and by 1999, the program had developed into the way it is today: separate semesters and participants streamed by engineering discipline. The ETIP program is considered as three separate bridging programs that match the disciplines of the three Northern Alberta Institute of Technology departments that work on the program: mechanical, civil, and electrical engineering. At times, chemical and electronics engineering have been offered.

The Program Today

Today, ETIP is a 10-month (three-semester) customized practical training program for mechanical, civil, and electrical engineering and technology graduates delivered in partnership with ASET and Northern Alberta Institute of Technology. It is designed to serve the needs of professionals who trained as engineers overseas but do not have credentials that meet Alberta standards. The program is delivered on site at the Edmonton Mennonite Centre for Newcomers' Path to Employment



location and at the Northern Alberta Institute of Technology. Program graduates become ASET members as Technologists-in-Training, and are eligible for full membership as Certified Engineering Technologists after one year of employment in the engineering field. There is no formal internship with employers. ETIP participants are in high demand by the booming Alberta oil industry.

Class Size

As many as 150 people apply to ETIP every year, but the capacity limit at the Northern Alberta Institute of Technology means that only 46 can be admitted. In 2006, a summer program for 20 internationally-educated mechanical engineering graduates was added as an evening course. Each year, there are two intakes for the program and a part-time evening option is offered during the summer intake.

Application Process

The application process has several stages:

- (a) Interested professionals attend an information session and complete an ETIP application registration.
- (b) The ETIP employment counsellor interviews applicants to assess their readiness for the program. Applicants who are still in the process are given one week to complete a self-assessment of their experience and industry/academic training in their discipline, e.g. Civil Engineering Technology. Applicants rate themselves on 40 competencies in the Prior Learning Assessment and Recognition (PLAR) assessment (http://www.emcn.ab.ca/etip_plar), developed by ASET. Applicants are required to submit their PLAR assessment with copies of their resumes, diplomas, transcripts and course descriptions for any training they have completed along with their International Qualification Assessment Service (IQAS) assessment (as required by the provisions of the program funding, the applicants' non-Canadian credentials qualifications are assessed by the International Qualification Assessment Service <http://employment.alberta.ca/cps/rde/xchg/hre/hs.xsl/4512.html>), and the Canadian Language Benchmarks for Academics (CLBA). The latter is an English test that is more intensive than the general Canadian Language Benchmark version. A minimum score of Canadian Language Benchmark Level 5 is required for admission to the program. Any applicant scoring less than that is advised to take one to two years of English training before reapplying to ETIP.
- (c) ASET evaluates and scores the Prior Learning Assessment and Recognition scores and the process then moves to the next step - the interview. (Applicants whose Prior Learning Assessment and Recognition scores show that they are not at the required technical level are referred to the Northern Alberta Institute of Technology).
- (d) The interview is conducted by a panel of ASET, Northern Alberta Institute of Technology, and Edmonton Mennonite Centre for Newcomers representatives.
- (e) Applicants who have passed the interview can, with the help of advisers, apply for financial aid through the Student Finance Agreement administered by Alberta Employment and Immigration. The funding application process takes three to four weeks, and eligibility is geared to the student's

income. Employment Insurance-eligible participants are funded by Employment Insurance. Some students are awarded the cost of tuition only, some the cost of tuition and books, and others tuition, books, and a living allowance. Most receive funding for the cost of tuition, but a student who is denied can apply for a loan to the provincial government through the Immigrant Access Fund.

Some applicants are not admitted to the program for a variety of reasons: inadequate English skills, low PLAR scores, poor interview performance, or unsubstantiated credentials.

First Semester

The first semester of the ETIP program covers computer labs (including AutoCAD), business writing, occupation-specific language training, technical writing, reading, making presentations, understanding Canadian workplace culture, group and team work. The goal is to raise the Canadian Language Benchmark level by one level, but levels tend to rise by 1.5 on average. To help the participants understand easily, Edmonton Mennonite Centre for Newcomers' instructors are careful to speak slowly. Peer tutoring is encouraged, especially in the computer labs.

Second Semester

The second semester is spent at the Northern Alberta Institute of Technology in the participants' fields of study where they learn the practical aspects of their engineering discipline, for example, standards and codes. The technical training received by ETIP participants is hands-on, and complements the knowledge they already possess.

Third Semester

In the third semester, participants focus on job preparation and learn how to put together their resumes, cover letters, and how to approach engineering companies that they wish to work for. No participant profiles are prepared ahead of time; instead, the participants learn how to make 'cold calls'. Most ETIP participants are hired before the end of the third semester.

Qualifications

Upon satisfactory completion of the ETIP program, graduates leave with a Technologist-in-Training designation from ASET (T.T.). To help participants earn provisional APEGGA licences, in 2009 ETIP will cover the cost of the APEGGA application fee.

Edmonton Mennonite Centre for Newcomers (EMCN)

EMCN has a Board of Directors, an Executive Director, an Associate Director to whom Luella Gaultier, as Manager of Bridging Programs reports to, a full-time recruiter, and a full-time employer liaison person. EMCN offers seven bridging programs, of which three are ETIP, and 40 other programs. The agency also offers employment and career services, including individual counselling and employment workshops, to help immigrants settling in the Edmonton area search for employment.



Costs and Funding

ETIP's annual operating costs are approximately \$600,000, the greater part of which is consumed by the cost of technical training at the Northern Alberta Institute of Technology, including , instructors, staff, and rental space. The Edmonton Mennonite Centre for Newcomers applies for the funding renewal of the ETIP program to Alberta Employment and Immigration (www.employment.alberta.ca) which also gives funding support to program participants. Universities, colleges, and industry do not fund the program. The cost of tuition is \$11,000/person and \$2,000 for books.

Outreach

When it comes to advertising ETIP, the Edmonton Mennonite Centre for Newcomers has found that the most effective outreach is by word of mouth, so the full-time recruiter makes presentations at ethnic associations and other settlement agencies. The program is also advertised with posters and brochures, as well as on the Edmonton Mennonite Centre for Newcomers' website <http://www.emcn.ab.ca/>. The employer liaison person contacts engineering employers about the possibility of referring program participants. For example, professionals in China could come to Canada, take the ETIP program and in return, the program would produce employable ETIP graduates who have at least a Technology-in-Training designation. The employers do not sponsor ETIP candidates; they merely refer them to ETIP and benefit from getting more employable job candidates. The liaison person organizes fairs, guest speakers, and networking on behalf of ETIP participants.

Post-course follow-up

There is a 90-day and a 180-day follow-up with ETIP graduates after they complete the program. The follow-up determines their current employment status and level of satisfaction with the program. The 90-day follow-up shows that more than 80% of graduates are employed as technologists, technicians, draftspersons, engineers, or designers. Approximately 96% of the program's graduates have found employment in their field at the 180-day (6-month) follow-up. ETIP staff encourages unemployed graduates to return to Edmonton Mennonite Centre for Newcomers for individual coaching or job skill strategy sessions.

Current Initiatives

An Edmonton Mennonite Centre for Newcomers-funded research team is conducting a feasibility study pilot program using an 'adjunct' model (for a Banking and Certified Management Accounting Program). Another proposal to develop e-learning supports for ongoing programs such as ETIP, is being funded by Alberta – Enhanced Language Training (ELT). Alberta-ELT is also funding an Edmonton Mennonite Centre for Newcomers -led program to benchmark the language demands of the engineering profession.

The Bridging Program for Engineer Graduates is a program that responds to the needs of engineers in disciplines not offered through ETIP. The program augments the three bridging programs of ETIP.

Awards and Recognition

Over the years, ETIP and Luella Gaultier have been recognized as follows:

- Luella Gaultier has spoken about ETIP at various venues, for example, the Central Alberta Workforce Symposium in Rocky Mountain House, the National Career Development and Workforce Learning Event (NATCON) organized by the Conference Board of Canada, and at a conference organized by the Public Policy Forum in Ottawa
- Ms. Gaultier was one of 20 recipients of the 2005 Citation for Citizenship, a Government of Canada award recognizing people and organizations that help newcomers integrate into Canadian life
- Edmonton Mennonite Centre for Newcomers was selected by the Citizens Bank of Canada as one of eight agencies to receive donations from the Bank's innovative Shared Interest Program, 2005
- Edmonton Mennonite Centre for Newcomers was selected from over 60 nominees to receive the prestigious Duncan & Craig Gold Laurel Award for innovation in the non-for-profit sector for the third time in the past four years, 2005

Success Factors

The following factors contribute to the success of ETIP:

- *The first semester is geared to helping participants learn computer and relevant communication skills.* The first semester includes computer use and AutoCAD, business writing, pronunciation of words and terms specific to relevant technical fields, technical writing, reading, making presentations, Canadian workplace culture, group and team work.
- *The second semester enables the participants to update their skills in the Canadian context.* The semester is spent at the Northern Alberta Institute of Technology in the participant's field of study where they learn, for example, standards and codes.
- *The third semester prepares participants for work.*

"Both my parents graduated from this program. I got help writing my own resume. I got help building it right... The best part of the first semester is the insight you get on what is good work ethic. The best part of the second semester is the technical knowledge I gained and working with other people. In the third semester, the best part was the tips for job preparation..."

Aaron Tristan Pena, 2007 ETIP mechanical engineering bridging program graduate now employed with Layfield Geosynthetic and Industrial Fabrics Ltd.

"In the workplace, we are outnumbered. They don't have the time (to speak slowly). We have to be well-prepared...The (ETIP) program is managed by people with experience who are very people-oriented..."

Doina Varzaru, 2006 ETIP graduate now working for Colt Engineering. Doina received more than one job offer and was hired before the end of the third semester

"It's a bit of a challenge being away from school for too long...I recommend that people not be away from school for more than 10 years..."

Manikayi Rukande, ETIP participant in second semester of ETIP mechanical engineering bridging program.

- *Participants focus on job preparation and learn to put together their resumes, cover letters, and speak to prospective engineering companies. Most ETIP participants are hired before the end of the third semester.*
- *Classes are formed according to engineering discipline: mechanical, civil or electrical.*
- *ETIP chooses participants carefully to increase their chances of success.*
- *The program seeks to enrol as many participants as resources will allow. Each year, there are two intakes for the program, as well as a part-time evening option during the summer intake.*
- *ETIP applicants assess their skill with Prior Learning Assessment and Recognition (PLAR) developed by ASET.*
- *Applicants who lack the required technical expertise are referred to the Northern Alberta Institute of Technology for other courses of study.*
- *The employer liaison person contacts engineering employers about the possibility of referring candidates. For example, professionals in China could come to Canada, take the ETIP program and in return, the program would produce employable ETIP graduates with at least a Technology-in-Training designation.*
- *To help participants earn provisional APEGGA licences, ETIP will cover the cost of the APEGGA application fee in 2009.*
- *There is a 90-day and a 180-day follow-up with ETIP graduates upon their completion of the program. The follow-up determines employment status and their satisfaction with the program.*
- *If ETIP graduates are not employed, the Edmonton Mennonite Centre for Newcomers' staff encourage them to return to the Edmonton Mennonite Centre for Newcomers for individual coaching or job skill strategy sessions.*

"It was very easy to digest. I used different muscles in my mouth to try and minimize my accent..."

Ali Kazmi, participant in second semester of ETIP electrical engineering bridging program

Challenges

The following are some of the challenges encountered by ETIP:

- *Resource allocation.* ETIP staff do not know the extent to which participants will receive funding. Sometimes ETIP applicants drop out when their funding application is rejected. By the time this is known, the Edmonton Mennonite Centre for Newcomers may have already committed to paying instructors.
- *Long Application Process.* The ETIP screening process needs to begin in June for an intake in January of the following year. This lead time is necessary to ensure that only qualified candidates are accepted into the program.
- *Cost-driven limits on intake.* The cost of Northern Alberta Institute of Technology's technical training comprises the largest portion of ETIP's operating costs.
- *High staff turnover and new staff training.* With three semesters, it is a challenging task to schedule instructors and maintain staff in a not-for-profit environment.

Replicability

As far as Luella Gaultier is aware, ETIP has not been replicated. Based on its success for internationally-educated engineers and technologists, the ETIP program has been used as a model for other occupations and the Edmonton Mennonite Centre for Newcomers now has similar bridging programs for accountants, payroll, banking, and chartered management accountants.

ETIP has the potential to be replicable as it has replicable components such as the content of its three distinct semesters. However, it is open to question whether the program is sustainable without external funding.





About CRTP

Team Lead, Laurel Madro, describes the Corporate Readiness Training Program (CRTP) as a specialized bridging program that assists internationally-educated professionals to gain Canadian work experience in their fields of expertise. The program consists of 10 weeks of intensive business language skills training and cultural awareness training followed by a six-week work placement that matches the participants' skills. Originally the program was called Work Experience for Immigrants Program (WEIP) but in 2007 it changed its name to Corporate Readiness Training Program. Under contract to Alberta Employment and Immigration, and administered by Alberta's Bow Valley College since 1999, the program is proud of the number of its participants eventually hired by their host company. The idea is not to just help internationally-educated professionals 'get in the door'; the goal is to have them 'get in the door and excel'.

The program is advertised in three ways. For student outreach, program brochures are dropped off at settlement agencies. Next the program is promoted on the Bow Valley College website. There is also bus and radio advertising to reach the general public. Outreach to the approximately 800 employers in the database is mostly by phone.

Before a CRTP program begins, interested people are invited to attend an information session. There is one information session per month. An orientation session is arranged for the successful applicants just before the first program session.

Applicants for the CRTP program are interviewed for about an hour to determine if they have the requisite good attitude and are ready and able to undertake the program. They must also have at least Canadian Language Benchmark (CLB) Level 6. Approximately 15-20% of CRTP candidates are not admitted to the program because their computer skills are not adequate or because they have been out of their field for a long time; they are referred instead to the Southern Alberta Institute of Technology (SAIT) for skill upgrading.

CRTP came to teach essential skills training because of the findings of a Human Resources and Skills Development (HRSDC) literacy study. The study identified nine essential skills in which one needs to be competent to be successful in all jobs:

1. Reading Text
2. Document Use
3. Numeracy
4. Writing
5. Oral Communication
6. Working with Others
7. Thinking Skills
8. Computer Use
9. Continuous Learning

CRTP's classroom training covers these skills in ten weeks with a variety of topics: communication skills, job-hunting skills, presentation skills, portfolio and business card preparation, and team work. Also included are: leadership styles, workplace expectations and simulated work loads. For example, participants are taught how to schedule their time and are given the skills to 'scan and skim' (instead of reading a document line by line) so that they can navigate through e-mails and documents such as standards and codes. Participants learn how to become more efficient in performing work tasks. They are also taught how to focus on strategies for navigating through the 'system'. Classroom activities are designed to reflect the workplace as much as possible. The course work includes a heavy homework load, plenty of group work, research, presentations, and personal responsibility and accountability – all with feedback from instructors and peers. Classroom activities reflect the nature of the workplace as much as possible.

Laurel's background in social studies enables her to see how the participants are progressing in the group. Business skills best practices used from other programs are incorporated into CRTP. For example, a course on organizational behaviour was incorporated in this way as were some case studies from Harvard School of Business.

Laurel Madro manages CRTP as Team Lead. Conrad Murphy is the Director of Workplace Learning Services, and oversees CRTP, the Centre for Career Advancement, and Test of Workplace Essential Skills (TOWES) administration. Also involved in the program's implementation are two instructors, three employment facilitators, and 1.6 administrative staff. Bow Valley College has a Board of Governors comprising public and Bow Valley College members.

One confidence-building activity in class, develops the skills of document use and oral communication. Participants are asked to gather information from periodicals in their field and develop a presentation that they will give to the class. This activity benefits the participants by developing their research and presentation skills, as well as helping them with their English vocabulary.

The same skills are developed when the participants give constructive feedback about their resumes and cover letters to one another. The feedback helps them rebuild their resumes as well as develop their communication skills. They also practise speaking on the phone and work in teams to prepare and deliver presentations.

CRTP participants are assigned a large project as part of the program. In teams of four, the participants are asked to conduct an S (trengths) W (eaknesses) O (pportunities) T (hreats) analysis on a company of their choice, and present their conclusions in a talk to the class. The analysis is a cultural quantum leap for many of them as they may not be used to scrutinizing companies in their home countries. The exercise opens their eyes to potential opportunities. CRTP participants are encouraged to make an appointment with the company of interest as part of the research. Each team is deliberately not profession-focused, includes at least one female, and at least two non-English language mother tongues in the group. The project is assigned in Week 5-6, and the project presentation is delivered in Week 9. The group presentation is made not only to the participants' own class but to another class as well. Very important is the project wrap-up after the presentations. The participants discuss team involvement and how the team members were assigned to do various tasks with reference to Tuckman's Theory on how teams go about a task. Staff intervene if they



observe that the group is behaving more like a work group than a team. The course also explores cultural values e.g. “power distance” - how much distance should exist between the employee and the boss. Participants are asked for their feedback on how different this would be in their home countries. This helps them better understand the value of team work in Canadian culture so that they can integrate better into the workplace.

Participants can further develop their research skills in another assignment in which they research 30 companies and their connection to their own professions.

The program uses external standards to help learners evaluate their strengths and weaknesses so that they can build on their strengths and try to work on their weaknesses through a variety of in-class tasks. A full range of classroom material developed by CRTP, assist participants to develop better workplace skills. Participants can use Essential Skills On-line (ESO), the Test of Spoken English and the Computer-Based Skills Assessment (CBSA), to practise on their own.

The most important external standard is the proprietary Test of Workplace Essential Skills (TOWES). TOWES is used to help employers focus on skill gaps and provide focused training. It was developed in 1998 as a partnership between the British Columbia Construction Industry Skills Improvement Council (SkillPlan) and Bow Valley College with funding from the National Literacy Secretariat. TOWES involves pre and post-testing. It is a tool that uses workplace documents to test and train the following three skills that are essential for safe and productive employment: reading text, document use, and numeracy. These are the first three skills in the list of nine essential skills that the HRSDC study identified.

The Test of Workplace Essential Skills (TOWES) is administered during the first week of the program (pre-training), and again in Week 9 (post-training). It helps the instructor to evaluate the participants’ work essential skills and makes the participants aware of the areas that need development. The use of TOWES is based on the premise that the lack of essential skills can lead to higher accident rates and lower productivity.

In the classroom part of the program, participants learn to:

1. Improve their English language skills in reading, writing, listening and speaking
2. Evaluate their computer skills through Computer-Based Skills Assessment (CBSA) testing
3. Evaluate and improve their Workplace Essential Skills using The Test of Workplace Essential Skills (TOWES)
4. Understand and use a variety of Canadian expressions and idioms
5. Write an effective professional cover letter and resume
6. Successfully interview for a job
7. Work as a member of a team to complete various projects
8. Network to find job leads, meet people and further their career
9. Better understand Calgary’s corporate culture
10. Present to colleagues and clients effectively
11. Understand the importance of volunteerism
12. Communicate with colleagues and clients formally and informally
13. Set short and long-term career goals

14. Conduct and participate in business meetings
15. Multi-task in a stressful environment, meet deadlines, and manage time effectively
16. Research the labour market for future opportunities

Members of the corporate community are invited to participate in the delivery of the program as guest speakers and volunteers. They are also invited to attend networking events. Many of those who volunteer their time and energy are previous students who have found employment and wish to share their experience with the current intake. Participants are encouraged to participate in organized events or conferences to practise their volunteering and networking skills.

During the ten weeks of classroom training, representatives of the Association of Professional Engineers, Geologists, and Geophysicists of Alberta (APEGGA) make presentations on, for example, the role of the engineering profession and how to get an accreditation. They have also given seminars on ethics. Alberta Employment and Immigration is funding study groups for engineers at the College's drop-in Centre. The study groups help CRTP participants work towards passing APEGGA's ethics exam. Since technicians and technologists are usually more easily integrated into the engineering technology workforce, there has been no concerted effort by Bow Valley College to partner with the Association of Science and Engineering Technology Professionals of Alberta (ASET).

The second stage of the program is the six-week placement. CRTP staff work on placing the participants as soon as they start the classroom part of the program. Employment facilitators interview the participants to develop their profiles which are then e-mailed to prospective employers in the database. When an employer expresses interest in a participant, CRTP sends the participant's updated profile to the interested company. At this stage, the interest in the participants becomes more focused and CRTP staff then work closely with the employers to confirm the placements. During the six-week placement period, CRTP staff offer support to both participants and host company supervisors and arrange a worksite visit in order to provide feedback to the participant.

During their placements, the participants receive feedback from their host company supervisors. The feedback from their supervisors, classmates and employment facilitators (CRTP staff) helps the participants learn about the Canadian workplace and culture.

CRTP has over 850 companies that span all sectors of the Calgary marketplace in its database. CRTP participants have had work placements with companies such as Suncor, EnCana, Fluor, Bantrel, City of Calgary, CP Rail, Colt Engineering, and Greyhound. In a recent intake, the process of placing 30 participants included:

1. Sending profiles of the participants' experience and skills to over 680 host company contacts
2. Contacting other companies in addition to those on the contact list
3. Distributing participants' resumes to 235 interested potential hosts
4. Making follow-up calls to all potential hosts
5. Arranging at least one interview for each of the participants with some having as many as five interviews



In 1999, there were two classes of 16-18 students. This was cut back to one class following the attacks on the United States on September 11, 2001. Lately, Bow Valley College has been able to renegotiate the contract with no cap on the number of students. Today, there are approximately 100 students registered in CRTP per year. Two program classes run simultaneously with a total of 43 students. The cost of the CRTP program is \$7,950/person. Before 2008, the placements have been unpaid but some engineering employers are now prepared to pay participants in placements to resolve liability issues. The program is totally funded by the Government of Canada and the Government of Alberta. If a CRTP participant is an EI recipient, his/her share of the program fee is funded only by the federal government. CRTP candidates qualify for the program based on income; those with a high income do not qualify. There is no limit on what employers can pay CRTP participants during their placements.

Although Bow Valley College is a public post-secondary institution, CRTP is a non-profit program so any CRTP profits are ploughed back into the program to pay salaries and purchase equipment. Up until recently, the students used to share computer labs with the rest of the College. It was thought that the students would benefit from having their own computers so a proposal was submitted to purchase 43 laptops and a computer lab costing \$20,000 for the program. CRTP received funding for 24 laptops and a wireless network from EnCana - worth almost \$35,000.

Based on the success of the CRTP program, Bow Valley College is going to receive funding from Human Resources and Skills Development's Office of Literacy and Essential Skills to launch an evening program called Success in the Workplace geared to CRTP alumni so that they can continue to build their communication skills. The program will include 48 hours in class and 48 hours on-line training. The online training will include support by the participants' supervisors from the jobs. Participant presentations will be uploaded so that their supervisors can give their input ('corporate feedback'). There will be mentorship training for the employers. An evaluation of the participant's performance at the end of the program can then be used as part of his/her performance appraisal.

Statistics compiled August 23, 2007, indicated that CRTP had a 91.58% success rate (these statistics do not include the follow-up periods for intakes 10, 11, or 12). At the 180 day follow-up point, there were 20 out of 24 participants from Intake No.11 working in their fields and 20 out of 25 participants from Intake No. 12. Only three or four students have dropped out of the program over the last ten years, for example, because they were successful in landing a job while attending the program, or for other reasons. Approximately, 70% of the employers hire participants on their completion of the program. CRTP staff continue to support those participants in their job search who are not hired by their employers on completion of the program. If the staff know that the participants are unemployed, they contact them daily and encourage them to come to Bow Valley College for support.

Awards and Recognition

Over the years, CRTP has been recognized as follows:

- Test of Workplace Essential Skills (TOWES) leader and Director of Workplace Learning Services, Conrad Murphy, was recognized with the Leadership award at the Association of Canadian Community Colleges Annual Conference, 2005-2006
- CRTP gained second place in 2004 in the Morgex Award for Innovation in Teaching, sponsored and administered by the Alberta Colleges and Technical Institutes Faculties Association
- Laurel Madro was awarded the Teacher of the Year award for Bow Valley College, 2001

Success Factors

Bow Valley College gets paid only upon meeting the deliverables specified in CRTP's contract with Alberta Employment and Immigration. All participants are contacted three and six months after the program's completion to determine where they are working and in what capacity. Final payment is made only when program graduates are working in their fields.

The following are CRTP's success factors:

Entry

- CRTP applicants are screened carefully for attitude and motivation.
- There are information sessions for people interested in applying for the CRTP course.
- Successful applicants attend an orientation session just before the first class.

Classroom Phase

In the ten weeks of classes, participants learn to:

1. Improve their English language skills in reading, writing, listening and speaking
2. Evaluate their computer skills through CBSA testing
3. Evaluate and improve their Workplace Essential Skills using TOWES
4. Understand and use a variety of Canadian expressions and idioms
5. Write an effective professional cover letter and resume
6. Successfully interview for a job
7. Work as a member of a team to complete various projects
8. Network to find job leads, meet people and further their career
9. Better understand Calgary's corporate culture
10. Present to colleagues and clients effectively
11. Understand the importance of volunteerism

"I recommend the program because it is a platform to get into the job market and get Canadian work experience. You establish networking and practise all the interview skills..."

Saif Khan, CRTP graduate 2008, now working at Fluor Canada Ltd. as a Design Engineering Specialist

12. Communicate with colleagues and clients formally and informally
13. Set short and long-term career goals
14. Conduct and participate in business meetings
15. Multi-task in a stressful environment, meet deadlines, and manage time effectively
16. Research the labour market for future opportunities

"As usual, good communication and interpersonal skills were vital parts of the classroom portion of the program... Hands-on experience was really very important as I was able to get a clearer perspective of Lafarge's operations..."

Annegirl Berin, CRTP participant 2008, speaking about her placement experience with Lafarge

- *Business skills best practices from other programs have been incorporated into CRTP.* For example, a course on organizational behaviour and culture was incorporated. Case studies from the Harvard School of Business have also been used.
- *External standards are used in the program to help learners evaluate their strengths and weaknesses so that they can build on their strengths and try to work on their weaknesses through a variety of in-class tasks and access to Essential Skills On-line (ESO).* External standards include the Test of Workplace Essential Skills (TOWES) test, the Test of Spoken English, and the Computer-Based Skills Assessment. TOWES helps focus on skill gaps and provide focused training.
- *Administering TOWES during the first week of the program (pre training) and again in Week 9 (post training), helps the instructor to evaluate the participants' work essential skills and makes the participants aware of the areas that need development.*

"Every portion of the syllabus was very informative and useful..."

Bilal Khan, CRTP graduate 2008, speaking about the CRTP program, now working as a Process Specialist for Equinox Engineering Ltd.

Placement Phase

- The six-week placement has the following features that contribute to the program's success:
 - a. CRTP staff work on placing the participants as soon as they are admitted into the program and work towards placing participants before the start of the placement period.
 - b. Members of the corporate community are invited to participate in the delivery of the program as guest speakers and volunteers. Many of those who volunteer their time and energy are previous students who found employment and wish to share their experience with the current intake.
 - c. During their placements, the participants receive feedback from their host company supervisors. The feedback from their supervisors, classmates and employment facilitators (CRTP staff) helps the participants learn about the Canadian workplace and culture.
 - d. During the six-week placement period, CRTP staff offer support to both participants and host company supervisors and arrange a work site visit in order to provide feedback to the participant.
 - e. Placement efforts are intensive and include:

- ◆ Sending profiles of the participants' experience and skills to over 680 host company contacts
- ◆ Contacting other companies in addition to this contact list
- ◆ Distributing participants' resumes to 235 interested potential hosts
- ◆ Making follow-up calls to all potential hosts
- ◆ Arranging at least one interview for each of the participants with some having as many as five interviews

Follow-up Phase

- *Study groups at Bow Valley College's drop-in Centre, funded by Alberta Employment and Immigration, will help CRTP participants work towards successfully passing APEGGA's ethics exam.*
- *CRTP staff continue to support the participants in their job search should they not get hired by their employers following completion of the program. If the staff know that the participants are unemployed, they contact them daily and encourage them to come to Bow Valley College for support.*
- *Profit is ploughed back into the program, for example to purchase laptop computers for the participants.*

Challenges

CRTP has the following challenges:

- Staying informed about changes in government policy, and being able to apply these to the needs of the program.
- Meeting the demands of a rapidly growing program in terms of staff, host companies and the competitive market place.
- Completing the contract's deliverables (including reporting) in addition to managing the program and intakes.
- The time factor in having placements ready for participants as soon as the classroom portion of the program is completed.
- The necessity of re-applying for additional funding to follow through on a recommendation to improve the program.

Looking into the future, the biggest challenge for CRTP is going to be managing the effect of changes in the financial markets.

Replicability

As far as Laurel Madro knows, CRTP has not been replicated. However, it has the potential to be, as it has replicable components such as its 10-week classroom portion and six-week placements. It is open to question whether the program is sustainable without external funding sources.





WARDROP

VISION

People, Passion, Performance, Trusted Globally.

Wardrop's interest in diversity programs arose from a business need. Wardrop Engineering Inc., a multidisciplinary engineering firm, wanted to bid on the Government of Canada Industrial Security Program contracts. To fulfil this desire, the company took proactive steps to increase the representation of visible minorities and women in senior positions among employees. Among the steps taken, an Employment Equity Committee was established in 2005 and Kanata Intercultural Consulting delivered a one-day workshop on the Racism-free Workplace Strategy to Human Resource staff.

History

Wardrop had been established as W.L. Wardrop and Associates in 1955 to work on housing subdivisions and public works projects. Ten years later, the company, having grown considerably, was providing consulting services across Canada and in other places as far away as West Africa. Today, it has grown even more and provides engineering consulting in many sectors: energy, infrastructure, and mining.

Locations

Company offices are located across Canada from Vancouver to Brockville with branches in the United States (Minneapolis), China (Beijing), United Kingdom (Swindon), and Ghana (Tamale). Its 1,200 employees, support operations in more than 30 countries in North, Central and South America, Europe, Asia, and Africa.

Employee Engagement

Part of the recruitment and retention strategy is to develop employee engagement. When Wardrop opened an office in India, the company applied the knowledge of two employees there to grow internationally. When evaluating South America as a potential business location, Wardrop asked its employees there to assist in the assessment.

Recruitment Partners

Wardrop acknowledges that the demand for engineering talent is greater than the supply. While much of the work is in Canada, the company is keen to find employees globally, for example, by recruiting in the United Kingdom. It is also important to find staff among newcomers to Canada. Organizations that support immigrant settlement are useful partners, and Wardrop works with the Maytree Foundation and the Toronto Region Immigrant Employment Council (TRIEC) to source new

Canadian staff. Wardrop supports Engineers Without Borders (EWB) and sponsored 30 students to attend the EWB Annual Conference recently, being the only employer to provide such sponsorship.

Employment Equity

Wardrop's employees in Canada originate from more than 55 countries. Visible minorities represent 24% of the employee total, about one-third of the core engineering and design staff, and are represented at all levels, including the Board of Directors.

Wardrop moved from a partnership to an ownership model a few years ago. In 2004, there were only two female owners; today (2008) there are five out of approximately 36 owners. Women are 27% of the staff and 21% of the 84 managers. These figures compare well with those for Canada's entire labour force where female employees are 24.3% and female managers are 22.4%.

Progressive Policies

James Popel, Wardrop's Vice-President of Human Resources, described other aspects of the company's progressive attitudes to employment: profit-sharing, charities, employee feedback, and diversity recruitment.

Profit-sharing

Approximately one-third of annual incremental profit is shared among the employees through performance bonuses. The company is working on a new open ownership structure to enable employees to become significant shareholders.

Charities

Wardrop supports a number of charities such as United Way, Christmas Cheer Board and Junior Achievement. About 2.5% of pre-tax profit is given to charities suggested by employees and the Charitable Giving Committee has spent \$300,000 in the six months since it was formed. Many employees are volunteer board members for local, national and international charities. When a Wardrop employee was elected to the Engineers Without Borders' Board of Directors, the event was celebrated at Wardrop and featured in the employee newsletter.

Employee Feedback

Every year, employees can use a comprehensive attitude survey to give managers vital feedback. They can also attend "town hall" meetings of 10-20 people at a time to talk about the company's vision, goals and future and exchange views with colleagues.

Diversity Recruitment

Recognising the changing nature of Canada's workforce, Wardrop seeks to remove all diversity-related barriers to employment and be the employer of preference for immigrants. The assistance of the Maytree Foundation and the Toronto Region Immigrant Employment Council (TRIEC) is



invaluable since both organizations help new arrivals integrate into the workforce by providing communication and culture training. The people who have used their services are reported to be more confident about their job prospects with Wardrop. Since other immigrant service organizations seem disjointed and there appears to be no established central resource for immigrants, Wardrop sees these two organizations as a "one-stop shop" for hiring recent immigrants. Wardrop sponsors internationally-educated engineering and technical graduates into Canada and assists them with the paperwork needed to achieve accreditation in their fields. Also provided are links to information on settlement, culture and climate, as well as information on how to get jobs. One example of these links is the webcasts that James Popel, Vice-President of Human Resources, is providing for the information of people in China.

Other very useful organizations are the Calgary Catholic Immigration Society -which launched the Engineering and Technology Upgrading Program (ETUP) - and Alberta Employment and Immigration, which has partnered with more than 150 Alberta companies to provide program participants with work placements and employment opportunities.

In a bid to accommodate immigrants and the varieties of religious practice, Wardrop provides prayer rooms for those who require them.

Publicity

Since Wardrop retained an external news agency there have been a number of news articles generated that promote diversity. The news agency interviews employees in much the same way as independent news agencies do whenever there is a positive news story that may interest other employees. These stories can lift morale and help employee motivation.

Cost

James Popel sees the overall cost of the company strategy of hiring from abroad as "nominal" and a small part of the cost of doing business. Most of the expense is incurred by attendance at international recruitment fairs and meetings over lunch. These expenses are anyway justified by the need to find qualified people abroad since the pool of talent in Canada is shrinking.

Award and Honours

Over the years, Wardrop has received the following recognition:

- Designated one of the Top 100 Employers to work for in Canada by Media Corp Inc and Maclean's magazine for the eighth time (only one of three employers to win so many times)
- Selected as one of the twenty Best Employers for New Canadians for 2008 (Toronto Region Immigrant Employment Council sets-up the guidelines for this award).
- Jane Scowcroft, a part-time Wardrop employee and a computer engineering graduate of the University of Manitoba, was recognized with Engineers Canada Gold Medal Student award in 2008. Not only was Jane the only woman in her class, she was just 21 years old. A former president of the university chapter of Engineers Without Borders (EWB), Jane recently spent four months working on sustainable development in a remote village in north-west Tanzania.

- Jane Scowcroft was selected for the future leaders' category of 100 Most Powerful Women in Canada 2007 by the Women's Executive Network, a Toronto-based networking and advocacy group.
- Gender Equity Achievement Award, 2002, by the Canadian International Development Agency (CIDA) in Ghana.

Success Factors

The success of Wardrop's programs is attributable to the following factors:

- *Positions are posted on local, national, and international job boards.*
- *The company tries to engage internationally-educated engineering graduates and bring their expertise to bear. This has had a direct effect on Wardrop's performance as a business.*
- *In addition to Wardrop supporting many charities including the United Way, Christmas Cheer Board and Junior Achievement, many employees are volunteer board members for local, national, and international charities.*
- *In addition to being able to offer critical feedback to managers through an annual comprehensive attitude survey, employees are invited to attend 'town hall meetings' up to 10-20 at a time to talk about the company's future and listen to their colleagues' views.*
- *Partnerships with Maytree Foundation and TRIEC have been set up to help Wardrop become the preferred employer of immigrants.*
- *Wardrop also works with programs such as the Engineering and Technology Upgrading Program (ETUP), launched by the Calgary Catholic Immigration Society, and with Alberta Employment and Immigration, which has partnered with more than 150 different companies in Alberta to provide program participants with work placements and employment opportunities.*
- *News articles promoting diversity have been generated since an external news agency was retained.*

"I don't have any of the horror stories that you hear from older female engineers..."

Neha Prasad, an Engineer In Training (EIT) recounting to a Wardrop reporter. She added that she felt very respected at Wardrop and was working on her fourth project since her start at the company a year and half ago.

"I feel that as a team we have achieved very good success in terms of establishing the production centre in India... Now we are getting inquiries from within the organization about work that we can do for them (in India)... So we are getting results."

Shailesh Dalwadi, an immigrant hired for Wardrop's Offshore Production Centre (OPC) who assisted in establishing the Centre in India, recounting his experience to a Wardrop reporter

"(The) next thing I know, I had an apartment for me and my family... I have found Wardrop's caring for the employee affects both the personal and professional aspects of my life."

Naveed Haider, an immigrant hired to work for Wardrop recounting his experience to a Wardrop reporter

Challenges

The following are some of the challenges encountered by Wardrop's programs:

- Shortage of skilled employees
- Quasi crown corporations, such as the former Ontario Hydro corporations, that are competing for qualified people with Wardrop, have mandated employment numbers whereas Wardrop's programs are driven by a vision, goals, and guiding principles. This makes it harder for people to understand Wardrop's approach as it is not as simple as just imposing quotas.
- University engineering and college technology programs do not graduate sufficient numbers, in particular women, to fill the available jobs.

Replicability

James Popel is unaware whether Wardrop's programs have been replicated elsewhere, but various components of the programs are certainly replicable and do not cost much, while they can result in awards, a reputation for a positive attitude towards hiring diverse groups, and satisfied employees.





MISSION STATEMENT

Stopping the cycle of poverty through career education

Purpose

Career Trek's Executive Director, Darrell Cole, says that Career Trek was launched 'to fight poverty through career development'. The program fulfills this aim by offering children ten years and older and their families the opportunity to understand the importance of formal education, careers, and "lifelong learning". Children who join the Career Trek program can get to know first-hand the post-secondary institutions which partner with Career Trek.

Origins

A social worker by profession, Darrell worked one summer at a university camp and then wrote a 70-page evaluation of his experience. Career fairs are ineffective, he decided, and students needed hands-on experience if they are to make informed decisions about their future careers. As a result of his work, he was approached by the University of Manitoba and the Winnipeg Development Agreement administrators to develop a stay-in-school program, which he would run and would involve all post-secondary institutions. The Winnipeg Development Agreement provided annual funding for the program initially renewable for three years, although the province has continued to provide some funding for the program ever since. The launch of Career Trek in Manitoba in 1996 broke new ground.

Program

Career Trek's program has three phases: Phase I, Phase II, and Junior Staff. Phase I involves a partnership of five school divisions, 60 schools, three post-secondary institutions (University of Manitoba, University of Winnipeg, and Red River College) and 17 post-secondary departments/faculties. Approximately 240 young people are selected each year to experience 80 different careers in 17 different fields, over 20 Saturdays, from mid-October to April. Schools nominate children whom they judge to have post-secondary education potential, but who may need the Career Trek program to achieve it. Each participating school has a liaison person who may be a Grade 5 teacher, the school counsellor, or even the principal, and is equipped with a handbook that lists the selection criteria. The program's catchment area is the City of Winnipeg and the surrounding rural areas within 40 minutes of travel. The intention is to mix suburban/inner-city and urban/rural children since these areas do not normally interact much. There is no streaming according to aptitude within each class. This breaks down barriers and helps the children build large social networks. The program for the Skownan First Nation is described below.

Participants, their families, and partnering schools are expected to demonstrate a high level of commitment to the program so that the children will demonstrate high levels of attendance and performance. Both the children attending the program and their parents are expected to sign a contract and the children must be prepared to attend every one of the days scheduled for them. It is interesting to note that the required commitment is not a deterrent as there are 'huge' waiting lists of candidates for this program. The graduation rate for Phase I is 88%.

To overcome any travel difficulties, Career Trek provides bus transportation at no cost to the participants. Because parents often feel out of the picture when their children are in high school yet want to encourage them, the program provides "Family Days" where parents can be involved with the children's education and form social networks with other parents too. Buses are provided for Family Days.

The brochures promoting each phase are addressed to the appropriate age group for that phase. They are written in easy-to-read language, are colourful, and show pictures of young persons for that age group in various program settings.

Phase I

In Phase I, four hours a day are spent in hands-on learning in fields such as environmental science, engineering and aerospace. In the biology section of environmental science, for example, the children can work on animal carcasses instead of just listening to lectures or watching demonstrations. Phase I has two supports: family involvement and part-time staff. The four "Family Days" in the program year are included to encourage family involvement. Post-secondary students are hired as part-time staff for Phase I. Their labour cost is low, as they are paid \$9 an hour, but they qualify for a \$1 an hour increase for every year they work with Career Trek. Many of them are graduates of the program, passionate about their field of study and wanting to make a difference in the lives of the young people they work with. Their Career Trek earnings help them pay for their own education.

Phase II

Graduates of the Phase I program, now 13-14 years of age, are selected to attend Phase II. Phase II participants must choose a career and spend an entire year experiencing it. They attend a weekly, two-hour class offering in-depth, targeted career education, which is taught by working professionals in real working environments. One clear benefit is the experience of sticking to one career for a reasonable length of time. At this point, the children are in the critical Grade 9 year when it is recognized that the children have to start with broad choices and then narrow them down. The children need to understand what certain careers are like so that they can make informed choices about those that do and those that don't appeal to them.

Phase II Partners

Many organizations have been partners in Phase II: for example, the University of Manitoba Bison Sports, the University's School of Radiation Therapy, Standard Aero, and Engineers Without Borders (EWB). Participants studying engineering with EWB have brainstormed problems faced by people in developing countries. They work at designing creative solutions such as a water purifier, food dryers and simple engines to meet everyday needs. They investigate the science behind the processes and

designs, and learn about various African cultures. They correspond with overseas EWB volunteers to learn about new ideas and directions for the projects they are assigned to. Aerospace participants with Manitoba Aerospace learn such things as how airplanes stay up in the air and how to fix an aircraft engine. They work with composite materials, build a remote control aircraft, and learn how to fly it.

Junior Staff

A Junior Staff person is a graduate of Career Trek's Phase I and now in Grade 10. Applicants for the Junior Staff phase are interviewed for commitment, passion, and attitude to the opportunity. Junior Staff assist Career Trek instructors and group leaders in the Phase I Saturday program. They also encourage the Phase I participants and motivate them to experience the career they have chosen. As the Junior Staff develop relationships with the younger people, they learn how to be both friends and authority figures, developing the skills they need to become mentors and leaders. This experience can have a powerful and uplifting effect on their lives. A Junior Staff person can also receive a high school credit for her or his time at Career Trek. Junior Staff submit their resumes for evaluation by the group leaders and/or instructors during the course of the year, and credits are negotiated with the school division and individual schools.

Program Management

There are four permanent members of Career Trek:

- o Darrell Cole, Executive Director
- o Manager of entry level programs
- o Manager of the business programs for half the time who runs programs with Skownan First Nation the rest of the time
- o Manager of Phase II programs for half the time who solicits charitable donations for the other half of the time

There are 90 part-time staff, all students, implementing the various phases of the program. There is a Board of 11 Directors who are members of a number of committees: finance, membership, special events, corporate relationships, research, and personnel.

Financing

After the program had started with funding from the Government of Manitoba, Darrell began fundraising as well. In the program's tenth year (2006), Career Trek registered as a charity and the province increased its funding in 2008.

Potential program partners are solicited for gifts, donations, and scholarships to the Phase I graduation ceremony. Phase II partners have traditionally funded all or most of the cost of running a career education program in their occupational field or industry.

Career Trek also receives PromoScience funding through the Natural Sciences and Engineering Research Council of Canada (NSERC), for example, \$80,000 over three years. School divisions that pay a sponsorship fee per child have also been a stable source of funding. Many one-time funding



sources are through solicited donations and fundraising. The highest number of funding sources in any given year was 21.

Provincial funding may increase substantially in the future if some proposals that Darrell has been working on come to pass. One proposal involves the Government of Manitoba and another involves provincial-federal labour market channels.

The relationship with the post-secondary institutions is a true partnership: Career Trek promotes and showcases the various departments and provides part-time employment for the students while the post-secondary institutions respond with contributions of up to \$450,000 a year. The institutions also provide some supplies. There are no other costs to the institutions as most of the Career Trek's scheduling is based on a university school year.

Since 1996, Career Trek has assisted over 2,750 young people aged 10 and older, along with their families. Coming soon are: a Registered Education Savings Plan (RESP), mentorship programs, scholarships, paid employment where work skills and references are developed, and catalogues that will offer the children more careers to choose from.

There is a customized Career Trek program for the Skownan First Nation. In Career Trek's entry level program (for 10-11 year-olds), Aboriginal participants have averaged an annual graduation rate of 80% (compared to an average program graduation rate of 87%). When undertaking a detailed examination of the participants who did not graduate from Career Trek's entry level program (about 13% of the annual intake), Darrell found that half of those not finishing were of Aboriginal descent. There appeared to be two primary reasons for these children not completing the program: lack of family commitment (the same as with non-Aboriginal youth) and movement from the City of Winnipeg back to a reserve. In response to this situation, a partnership was developed with Skownan First Nation to provide Aboriginal families freedom to move between Winnipeg and Skownan, yet remain in the program. The program's structure is fluid and provides continuity for the participants, the family, and the community.

Honours and Awards

Over the years, Career Trek has been recognized as follows:

- the Natural Sciences and Engineering Research Council of Canada (NSERC) Michael Smith Award for Science Promotion, 2007
- People Forward Award for innovation in HR in Manitoba, 2006
- Endowment award, the Canadian Career Development Foundation, 2001
- National Competition for Not-for-Profit Innovation, Peter F. Drucker Foundation - Honourable Mention, 2001

Success Factors

As a reflection of its success, 49% of the children who graduated from Career Trek went directly from high school to post-secondary education. This is higher than the provincial average for Manitoba (approximately 35%).

Career Trek's success is attributed to the following factors:

- *The realistic and empowering experiences enable the young people to make educated choices for their future, learn important life skills, and realize their potential with commitment and passion.*
- *Career Trek's model involves an early start to experiential long-term learning and a holistic, performance-based approach to education.*
- *Phase I involves a partnership between five school divisions, 60 schools, three post-secondary institutions.*
- *Recognizing that there is not much interaction between communities, Career Trek mixes suburban with inter-city children.*
- *Family involvement is encouraged by having four "Family Days" throughout the program year. Participants, their families, and partnering schools are expected to demonstrate a high level of commitment to the program.*
- *Phase II participants must choose a career and spend an entire year experiencing it.*
- *The young people benefit from being taught by working professionals within real-life workplaces.*
- *University students are hired as group leaders.*
- *Prospective applicants for the Junior Staff phase are interviewed for commitment, passion, and attitude to the opportunity.*
- *Recognizing that travel to the program may be an issue for many of the participants, Career Trek provides bus transportation at no cost to the participant.*
- *The brochures promoting each phase are geared and addressed to the appropriate age group for that phase.*
- *By simultaneously learning how to be a friend and a figure of authority in the classroom, Junior Staff learn the skills they need to become a mentor and leader.*
- *A Junior Staff person can receive a high school credit for her or his time volunteering at Career Trek.*
- *There is a Board of 11 Directors who are members of various committees: finance, membership, special events, corporate relationships, research, and personnel.*

"My name is Liza Angelopoulos and I have completed the Career Trek program. I can honestly say that the program has opened my eyes to many career options. When we started at Red River I thought that Civil technology was going to be boring but I liked it so much that I wanted to take it..."

Liza Angelopoulos, Career Trek graduate

"As you know, our school division is both rural and urban....For students in the rural areas and their parents, one of the greatest benefits has been to actually visit the university and college campuses. Many did not consider university or college because of not knowing about the campuses or how to access services..."

Lesley Weisshaar, Seine River School Division

"...Also for us as parents, we know that we can put (our children) through college or university, that financially it's not that impossible. There are many options out there if we need them..."

Kimberly Delorme, parent of Career Trek participants

"Career Trek has had a very positive effect on my students. It seems like I have 2 classes within my room: Career Trek students and non-Career Trek students. During the last 6 weeks, I have noticed a significant positive change in the work ethic of the students enrolled in Career Trek in my class..."

Martin Simmons, Grade 7 Teacher

- *The relationship with the post-secondary institutions is a true partnership: Career Trek promotes and showcases the various departments and provides part-time employment for the students, while the post-secondary institutions respond with contributions worth up to \$450,000 a year.*

Challenges

Career Trek has the following challenges:

- *Under funding and over demand.* There is great demand for the program: 120 schools are currently on the waiting list and additional funding was being sought at the time this research was conducted.
- *Understaffing and high staff turnover.* Darrell feels that understaffing causes the program to achieve less than its full potential. In the natural course of events, the graduate students that the program relies on eventually graduate and this means that the program is perpetually in staff training mode.
- *Difficulty of tracking the career progression of Career Trek graduates.* The mobility of both students and Junior Staff means that it is a challenge to track the career progression of Career Trek graduates. For example, although 49% of Career Trek graduates go on to post-secondary education from high school, it is not known whether they actually complete their courses.
- *The organization's governance structure (the Board and its committees) must continue to mature.* At the present time, Darrell feels that the organization must continue to evolve. He is encouraging greater Board capacity and skill development, as well as assembling a more balanced, industry-focused Board.

Replicability

Darrell Cole is not aware of any programs like Career Trek. The program originated in his experience as a social worker, and his own earlier frustrating contact with education (he went to college then on to university as a mature student).

Even though it appears that Career Trek has not been replicated yet, it has the potential to be, for example in diversity programs. The program is sustainable in that it uses Career Trek graduates to either volunteer their time or act as group leaders in its later phases. There appears to be a huge demand for the program and it has shown success by having 49% of Career Trek graduates go on to post-secondary education after high school.

14. What is to be Learned from the Ten Strategies that Work?

1. *The first, and most important, conclusion is that well focused programs succeed.*

All of the programs profiled in this report have a track record. Each of the ten programs can point to tangible results. The success of these programs, and others like them, needs to be brought to the attention of a wider audience in engineering and technology. Professional associations at the national and provincial level can take a lead bringing these success stories to the attention of industry associations and technical associations.

Recruitment and Diversity:

2. *Wardrop Engineering has demonstrated that employers can significantly increase diversity in their workforce by partnering with settlement and community organizations that can channel qualified job-seekers to them.*

The Wardrop diversity program was launched in 2005 with the establishment of an Employment Equity Committee. By 2008, the program had already achieved significant results in diversifying Wardrop's professional and managerial ranks. The key to accomplishing this change was to expand recruitment channels, with the assistance of settlement and community organizations.

3. *Taking deliberate steps to expand recruitment channels entails few, if any financial costs. Nor does it require a significant investment of executive time. Professional associations can help to make the link between potential community-based partners and engineering and technology employers.*

A senior executive of Wardrop Engineering described their recruitment partners - Maytree Foundation⁴ and the Toronto Region Immigrant Employment Council⁵ - as "one-stop shops" for hiring internationally educated professionals.

In most large communities, there are settlement and community organizations that can channel professionally qualified candidates to an employer for consideration. Many of these organizations operate integration programs that specifically identify and work with highly motivated immigrant professionals. The Engineering and Technology Labour Market Study developed a list of approximately 400 such organizations. *Professional associations could assist employers by developing a list of settlement and community organizations that understand the needs of engineering and technology employers and could be of assistance in channelling qualified job-seekers to employers seeking to diversify their recruitment. In many cases, these relationships with professional associations already exist. The missing link is the connection to engineering and technology employers. This is a link that professional associations are well - positioned to assist in making.*

⁴ Maytree Foundation Website: <http://www.maytree.com>

⁵ Toronto Region Immigrant Employment Council Website: <http://www.triec.ca>

Attracting Under-Represented Groups:

4. *Programs that seek to increase post-secondary enrolments in engineering and technology of currently under-represented groups are most successful when they have four elements:*
 - First, programs must *start in elementary school* at least by grade 5 or 6, if not sooner. Starting with senior high school grades is too late to alter educational choices, except perhaps at the margin (i.e., a change from life sciences to technology or engineering).
 - Second, while programs must start in grade school, they cannot end there. Programs must *continue through secondary school*. Continuation means carrying through the relationships established with students in grade school.
 - Third, support cannot end at the high school level, but needs to *continue into post-secondary years in the form of mentorship and support networks*.
 - Fourth, outreach programs at the grade school and high school level need to be *activity focused*. Career promotion materials, regardless of the media in which they are presented, are of limited value, except when explicitly linked to hands-on activities that are associated with an engineering or technology career. For many students, maths and sciences are not intrinsically exciting. Maths and sciences only become exciting when they are seen as the keys that unlock the door to do things that are truly exciting.
5. *For any under-represented group, role models are important.* Professional associations can supply those role models, whether as presenters or as mentors.
6. In the case of some under-represented groups, there are likely to be deficiencies in the secondary school maths and sciences credits required for admission into engineering or technology programs. *Bridging programs will be needed that enable motivated students from under-represented groups to acquire the necessary high school credits.*

It should be assumed that secondary school students from groups that are under-represented in engineering and technology will have a significantly lower rate of completing the secondary school maths and sciences courses that are pre-requisites for entering engineering and technology programs.

The 'make-up term' in the Engineering Access Program (see Chapter 6) is an example of how a bridging program is used to support increased participation in engineering studies by Aboriginal youth. The bridging program concept is relevant to other under-represented groups, as well. *Post-secondary departments of engineering and technology should be urged to explore the scope for developing bridging programs that allows admission standards to be maintained while at the same time addressing secondary school credit deficiencies, rather than permitting those deficiencies to be insurmountable barriers.* These bridging programs could have a broader

relevance to engineering and technology programs, in light of the declining size of the youth cohort which historically has supplied virtually all first year entrants to these programs.

Integrating Internationally Educated Professionals (IEPs):

7. *After several years of experimentation and pilot projects, a model is now emerging for accelerating the integration of internationally educated professional (IEPs). The model succeeds because it 'connects all of the dots'. The seven elements that make for success are:*

- First, programs need to be *directly linked to certification or licensure requirements* and therefore should be explicitly *designed as pathways to recognition, either as a professional engineer or a certified technician/technologist.*
- Second, programs must strengthen language skills at least to a Canadian *Benchmarks Language Level of 6 or 7 for technology jobs and Level 8 for engineering jobs.* Accomplishing this requires language upgrade training that is specific to the engineering and technology professions.
- Third, programs need to systematically *evaluate technical skills* and determine whether there are *deficiencies that require upgrading.* Virtually all internationally educated professionals will require formal training in Canadian codes and standards and in professional ethics. The methods that are used to evaluate skills should be endorsed by professional associations. Similarly *courses that address skill upgrade requirements should be reviewed by professional associations for conformity with their standards.*
- Fourth, in addition to covering technical subject matter, *programs need to deal with the culture of the Canadian workplace.*
- Fifth, *programs should include a placement period with industry (either paid or unpaid).* The need for placement programs is relevant to all regions and can only be set aside, if at all, in regions where labour shortages are so acute that employers are setting aside their normal requirements for Canadian experience. These placement programs should link to experience requirements for professional licensure or certification.
- Sixth, programs should include *one-on-one counselling or mentorship by a professional engineer or a certified technologist,* depending on the focus of the program and the qualifications of the participants.
- Seventh, the duration of successful programs, including placement, is approximately 12-18 months. Programs that are less rigorous are likely to fall short of meeting *internationally educated professionals' needs. Prospective professional immigrants should be made aware of these programs, and the*



time and tuition costs associated with them, before immigrating to Canada. In light of the costs that may be incurred for tuition, books, unpaid placement, etc., there is potentially a role for bursary and student loan programs.

8. Implementing integration programs that contain the seven elements that make for success requires a complex, *four-cornered partnership*. The four partners are:
 - professional associations
 - settlement organizations
 - a post-secondary institution
 - industry

Each partner has a specific role and contribution in the model. The model cannot be implemented without this four-cornered partnership. *Since they play a key role in the success of programs that integrate IEPs, professional associations are well-positioned to play a role in forging these four-cornered partnerships*

9. The Engineering Qualification Recognition Model (eQRm) that was developed by Engineers Canada, based on the experience of IEEQ (see Chapter 8) and a similar initiative at the University of Ryerson, should be reviewed by the provincial and territorial constituent members of Engineers Canada with a view to its adoption or modification, as required, in their respective jurisdictions. The Canadian Council of Technicians and Technologists should review the eQRm approach, as well as the competency tests developed by Association of Science and Engineering Technology Professionals of Alberta (ASET) for the Engineers' and Technologists' Integration Program (see Chapter 7), with a view to their adoption or modification, as required, in other jurisdictions.

Success is not Easy:

10. There are many programs that share objectives that are similar to the 10 programs profiled in this report. Many of those programs are equally successful. However, *there are also many programs that do not share the elements that we have identified as the keys to success, including, in particular, the often complex partnerships that are required to put the key elements for success in place*. Lacking some of the essential success factors, these programs are often less effective and may encourage some to draw pessimistic conclusions on the scope for increasing diversity in engineering and technology. *It is important to stress, therefore, that success is not easy, but it is possible.*

Funding and Resources:

11. Virtually every program studied has had to deal with funding instability. While most programs receive public sector financial support (with the exception of Wardrop's diversity initiatives), that support is often ad hoc. Long-term planning is hindered by funding instability. Engineers Canada, the Canadian Council of Technicians and Technologists, and at the provincial level, their respective constituent members, could play an invaluable role in *opening a dialogue with*

governments and other public sector bodies on a framework for stable program funding of diversity initiatives in engineering and technology that have a proven track record and formal partnerships with industry and professional associations.

12. Engineers Canada, the Canadian Council of Technicians and Technologists, and at the provincial level, regulatory and certifying bodies, *should explore options for securing financial and other resources for successful programs, as part of more encompassing partnerships.*

Partnerships at the National, Provincial/Territorial, and Local Level:

13. *Partnerships are critical factors in the success of programs that address diversity challenges.*
While financial support is important to any program, a partnership does not necessarily entail a financial engagement, nor, if it involves financial support, is a partnership limited to the provision of that support. Partnerships involve the commitment of organizational resources. These include, but are not limited to: financial support, staff assistance, assistance in recruiting mentors and presenters, providing web resources, opening doors to industry, and formal linkages to professional recognition procedures. Increasing diversity in the engineering and technology workforce will require partnerships with community and settlement organizations, post-secondary institutions, and industry bodies.

Partnerships will be needed at the national, provincial/territorial, and local level.

- Provincial and territorial associations are the best informed on how to structure those partnerships at the provincial/territorial and local level.
- Engineers Canada and the Canadian Council of Technicians and Technologists are the best positioned to structure those partnerships at the national level.





Case Study No. 1: Women in Scholarship, Engineering, Science and Technology (WISEST, Alberta)

Interviews:

Name	Title	Organization
Powley, Gail	Vice-Chair	WISEST
Ennis, Grace	Co-ordinator	WISEST
Archer, Shaina	Program Graduate	WISEST
Dacyk, Valerie	Program Graduate	WISEST
Shinbine, Alyssa	Program Graduate	WISEST
Unrau, Stephanie Powley	Program Graduate	WISEST

Additional Sources:

- *WISEST Summer Research Program (2006)*
- *Evaluation of the WISEST Student Summer Employment Program (April, 2008)*
- Website: <http://www.wisest.ualberta.ca/>

Case Study No. 2: Discover Engineering (Ryerson University, Ontario)

Name	Title	Organization
Stewart, Frankie, Dr.	Program Administrator	Discover Engineering
Anderson, Lisa	Past Program Co-ordinator	Discover Engineering
Zolfaghari, Nika	Program Graduate	Discover Engineering
Ganguly, Akanksha	Program Graduate	Discover Engineering

Additional Sources:

- *Discover Engineering Annual Report (2005 and 2006)*
- *ROPES Student Report Book (2007)*

Case Study No. 3: Canadian Association for Girls in Science (CAGIS, national)

Interviews:

Name	Title	Organization
Jaremko-Vingilis, Larissa	Founder and President	CAGIS
Grimes, Nuree	Program Graduate	CAGIS
Harper, Beth	Program Graduate	CAGIS

Additional Sources:

- Websites: <http://www.cagis.ca/>, <http://www.unbf.ca/>

Case Study No. 4: Engineering Access Program (ENGAP, Manitoba)

Interviews:

Name	Title	Organization
Herrmann, Randy	Program Director	ENGAP
Laurie Klassen, Diana	Undergraduate Coordinator	ENGAP
Ruth, Douglas Dr.	Dean	University of Manitoba
Elders, Rachel	Program Graduate	ENGAP
Massey, Jim	Program Participant	ENGAP
Tremblay, Kirsty	Program Participant	ENGAP

Additional Sources:

- *ENGAP Report to Faculty Council (2004/2005)*
- *A Review of the Engineering Access Program (ENGAP) (November, 2003)*
- Website: <http://www.engap.com/>

Case Study No. 5: Native Access to Engineering Programme (NAEP, Quebec)

Interviews:

Name	Title	Organization
Jetté-Pleasant Mount, Corinne	President	Mount Pleasant Educational Services Inc.
Wiseman, Dawn	Program Administrator	Mount Pleasant Educational Services Inc.
Cree, Duncan	Program Volunteer	NAEP
Hannah, Barry	Program Presenter	NAEP

Additional Sources:

- Various NAEP publications, including:
 - *Programme Review (2000-2004)*
 - *Report on Activity (2005-2006)*
 - Additional curriculum samples
- Website: <http://www.nativeaccess.com/>

Case Study No. 6: Internationally Educated Engineers Qualification Program (IEEQ, Manitoba)

Interviews:



Name	Title	Organization
Ennis, Dave	Founder	IEEQ
Friesen, Marcia	Program Director	IEEQ
Woods, John	eQRm Coordinator	University of Manitoba
Sankar, Sharon	Director of Admissions	APEGM
Soler Nodarse, Yuriem	Program Graduate	IEEQ
Murgas, Nini	Program Participant	IEEQ

Additional Sources:

- *Implementation Framework – eQRm, Working in Canada Seminar – eQRm*
- *IEEQ – Information for Employers and Participant Resumes (2007/2008)*
- Website: <http://umanitoba.ca/faculties/engineering/programs/ieeq/>

Case Study No. 7: Engineers' and Technologists' Integration Program (ETIP, Alberta)

Interviews:

Name	Title	Organization
Gaultier, Luella	Program Manager	ETIP
Varzaru, Doina	Program Graduate	ETIP
Pena Tristan, Aaron	Program Graduate	ETIP
Rukande, Manikayi	Program Participant	ETIP
Suvorav, Alexander	Program Participant	ETIP
Kazmi, Ali	Program Participant	ETIP

Additional Sources:

Various ETIP publications, including:

- *Your Bridge to Success: Linking Past Experience with Future Goals*
- *ASET PLAR Assessment*
- Website: http://www.emcn.ab.ca/Career_Services/Programs/ETIP

Case Study No. 8: Corporate Readiness Training Program (CRTP, Alberta)

Name	Title	Organization
Madro, Laurel	Team Lead	CRTP
Khan, Bilal	Program Graduate	CRTP
Khan, Rumeena	Program Graduate	CRTP
Khan, Saif	Program Graduate	CRTP
Lee Min, Jong	Program Graduate	CRTP
Berin, Annegirl	Program Participant	CRTP

Additional Sources:

- Website: <http://www.bowvalleycollege.ca/crtp/>

Case Study No. 9: Wardrop Engineering Inc. (Manitoba)

Name	Title	Organization
Popel, James	Vice-President of Human Resources	Wardrop Engineering Inc
Williams, Valerie	Human Resource Advisor	Wardrop Engineering Inc

Additional Sources:

- Website: <http://mywardrop/PressReleases/Pages>

Case Study No. 10: Career Trek (Manitoba)

Name	Title	Organization
Cole, Darrell	Executive Director	Career Trek

Additional Sources:

- Various Career Trek pamphlets, including:
 - *Phase I*
 - *Phase II*
 - *Career Trek's Junior Staff Program*
 - *Phases of Success*
- Website: <http://www.xnet.rrc.mb.ca/careertrek/>



Appendix B Members of Steering Committee



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Professional Engineers Ontario

Jean Luc Archambault
Order des Technologues Professionels du Quebec

Michelle Branigan
Electricity Sector Council

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Association of Professional Engineers,
Geologists and Geophysicists of Alberta

Samantha Colasante
Engineers Canada

Manjeet Dhiman
ACCES Employment Services

Brian George
Northwest Territories and Nunavut Association
of Professional Engineers, Geoscientists

Stephen Gould
Canadian Council of Technicians
and Technologists

Kevin Hodgins
Northwest Territories and Nunavut Association
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Cheryl Jensen
Mohawk College

Ellie Khaksar
Diversity Integration and Retention Services Inc.

Lise Lauzon
Réseau des ingénieurs du Québec

Edward Leslie
New Brunswick Society of Certified Engineering
Technicians and Technologists

Andrew McLeod
Engineers and Geoscientists New Brunswick

Perry Nelson
The Association of Science and Engineering
Technology Professionals of Alberta

Robert Okabe
City of Winnipeg

D'Arcy Phillips
Manitoba Aerospace

Pat Quinn
Professional Engineers Ontario

Colette Rivet
BioTalent Canada

Tom Roemer
Camosun College

Kyle Ruttan
Canadian Federation of Engineering Students

Deborah Shaman
Human Resources and Skills Development Canada

Len Shrimpton
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Geophysicists of Alberta

Andrew Steeves
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Engineers Nova Scotia

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