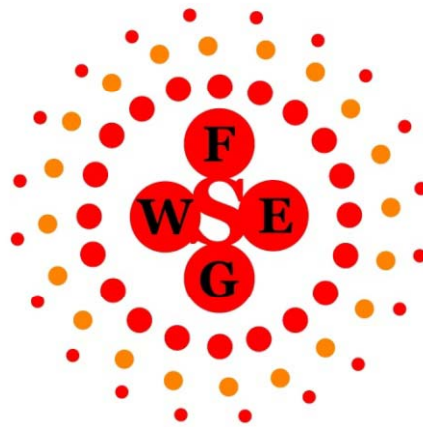


Report to CCWE +20



NSERC Chairs
for Women in Science & Engineering

Chaires CRSNG
pour les femmes en sciences & génie

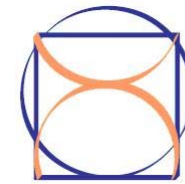
Current Chairs

Professor Nadia Ghazzali
Laval University, Quebec



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pour les femmes en sciences
et en génie au Québec

Professor Valerie Davidson
University of Guelph, Ontario



C W S E - O N

Professor Julita Vassileva
University of Saskatchewan, Prairies



Professor Elizabeth Croft
University of British Columbia, BC & Yukon



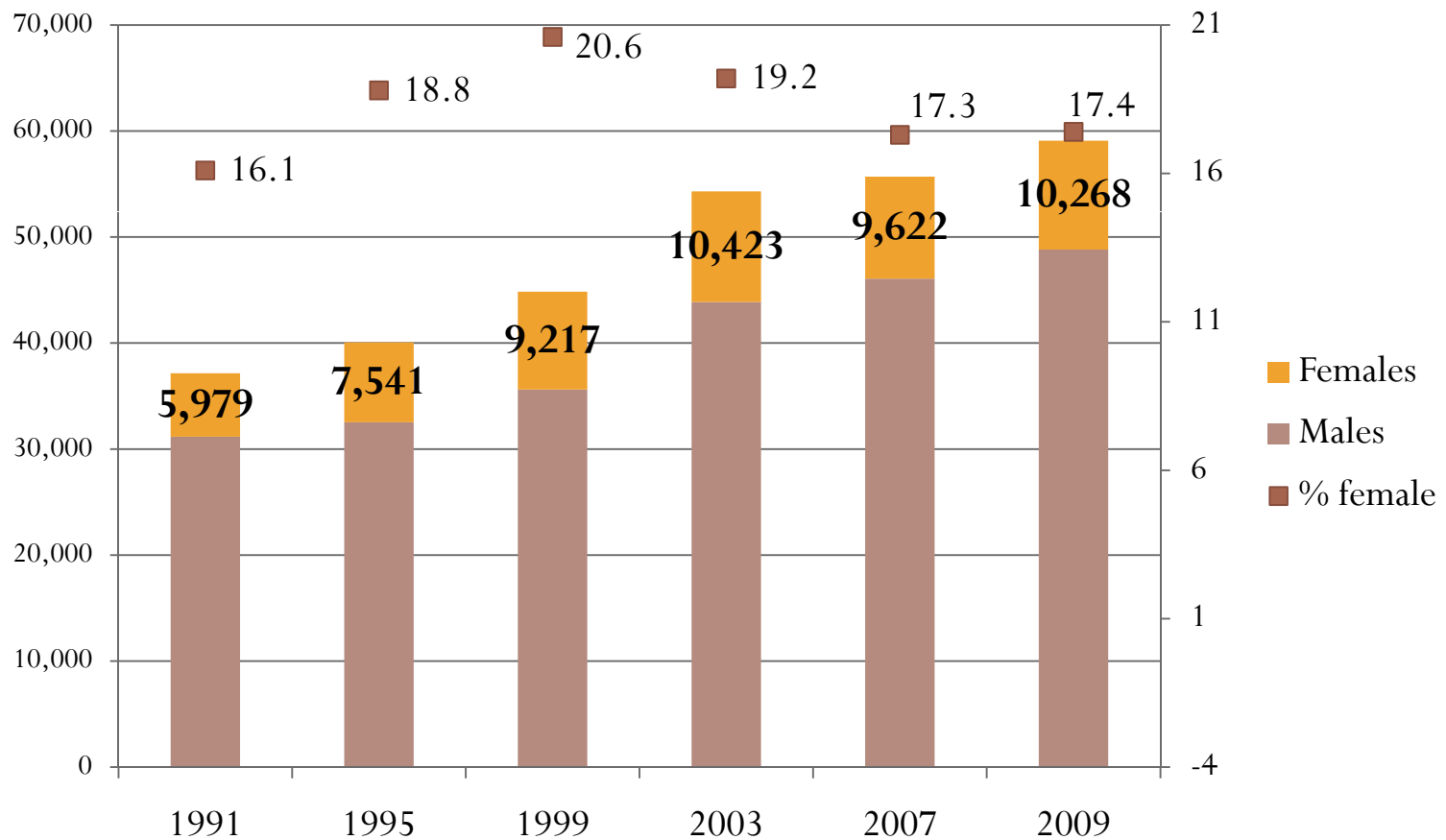


Outline

- National statistics – women in engineering
- Regional CWSE activities related to increasing participation of women in science, math & engineering:
 - Pre-university
 - University programs – undergraduate & graduate
 - Workplaces & Professional organizations



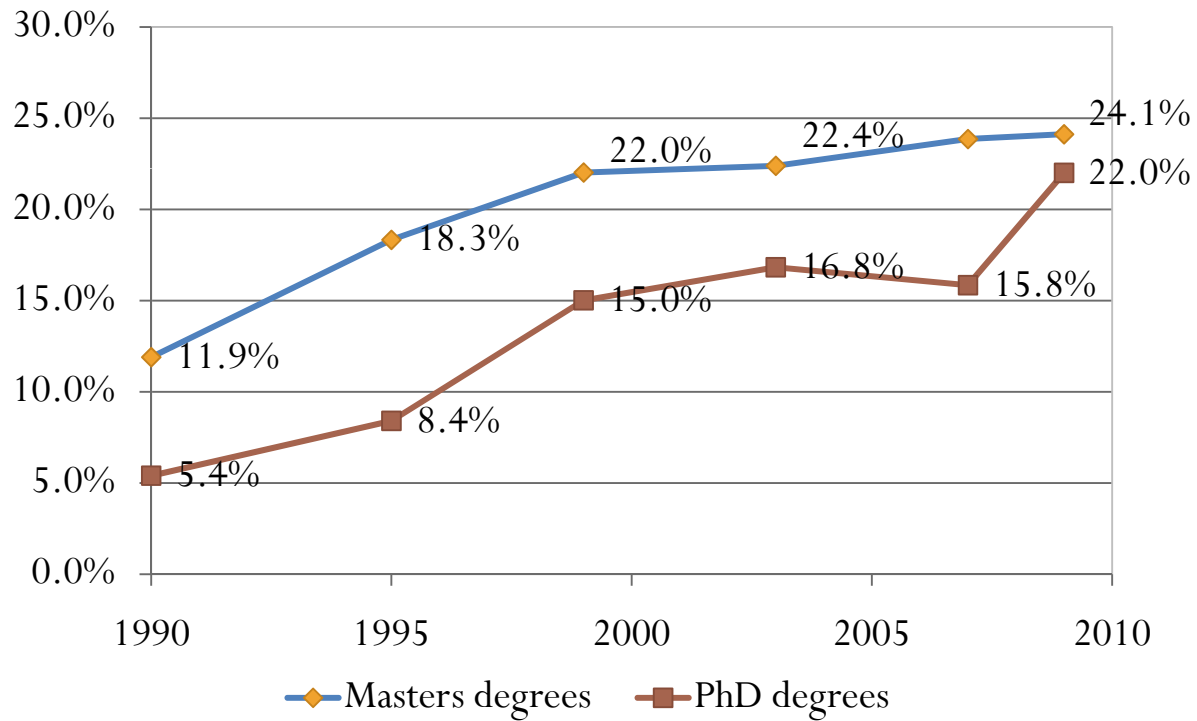
Undergraduate enrolments in engineering



Source: Engineers Canada, 2009



Graduate degrees awarded

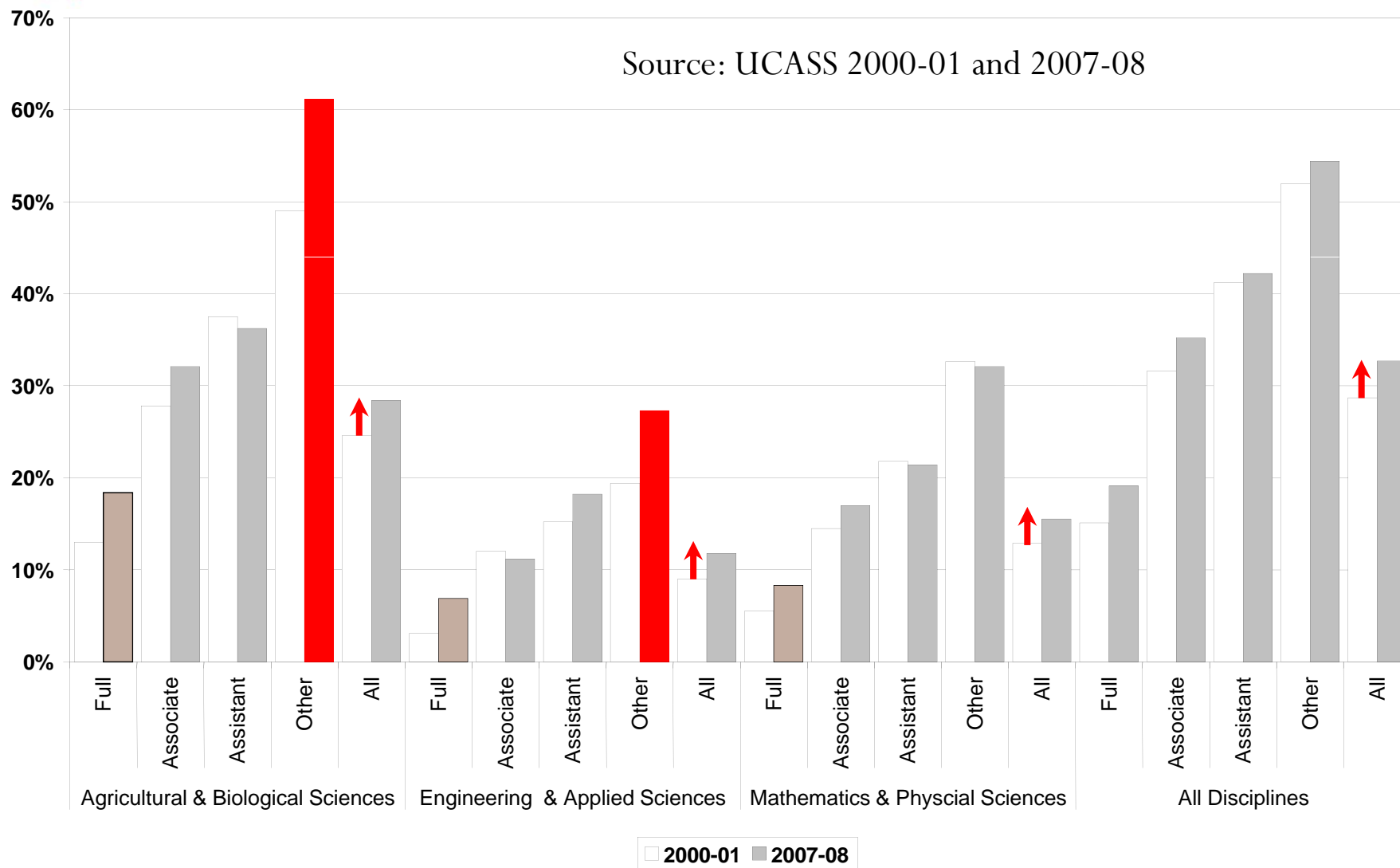


Source: Engineers Canada, 2009



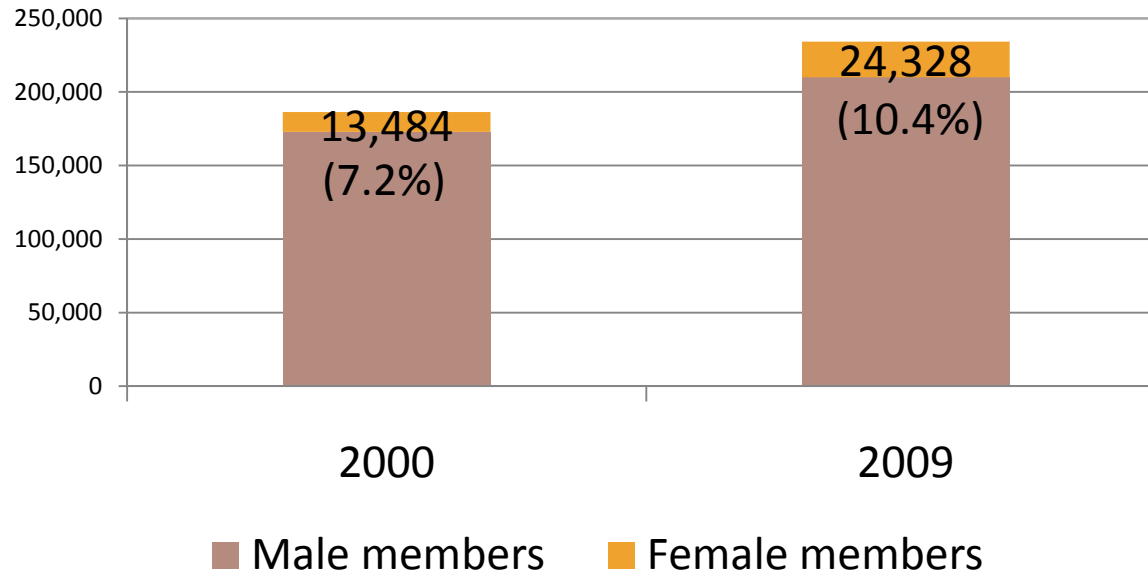
Faculty representation

Source: UCASS 2000-01 and 2007-08





Professional Engineers – in Canada



Engineer-in-training (EIT) statistics 2010:
Female EITs 18.6%

Source: Engineers Canada, 2009



LAYING THE FOUNDATION

- Chapters 1 – 6 in “More than Just Numbers”
- K-12 activities related to science, math and engineering



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“Les filles et les sciences, un duo électrisant!” (Girls and sciences, an electrifying duo!)

One day event, for girls from grades 8 and 9, a unique opportunity to discover the exciting careers in Science and Technology, through activities, discussions and experimentation workshops.

- Workshops in the morning (perfumes, math, etc.)
- “Magasine ton avenir” (*Shop your future*) on lunch break,
- Science creative activity in the afternoon





“Future Ingénieure?”

(Future Woman Engineer?)

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- activity to demystify the engineering profession, for grade 12 students, by spending four hours to a day with an engineer or a group of engineers, in the field of their choice
- initiated by the Marianne-Mareschal Chair,
- in collaboration with the Montreal Polytechnique, the OIQ (*Association of Professional Engineers of Quebec*) and the NSERC-Industrial Alliance Chair, in Quebec
- Visits held in winter, January or February, just before the end of the main application period in universities in Quebec





Sciences and Mathematics in Action

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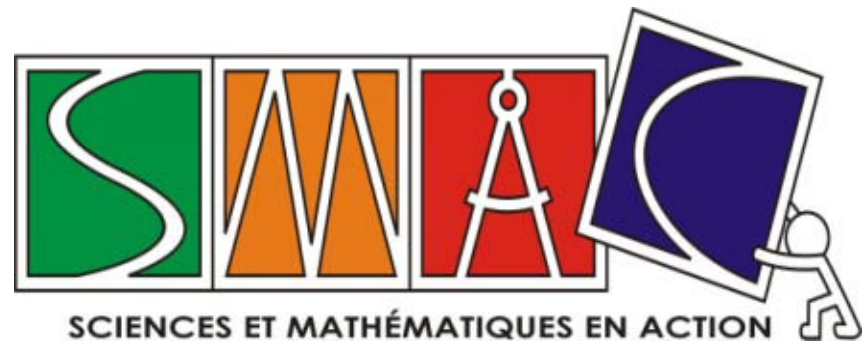
pour les femmes en sciences
et en génie au Québec

Started in 2005.

Arouse and reinforce the interest of teenagers for mathematics and sciences and demystify mathematics for the general public.

Projects

- Show Math
- MathAmaze





CWSE-ON

Go ENG Girl/GÉNIales, les filles

- Coordinated by CWSE-ON in collaboration with the Ontario Network of Women in Engineering (ONWiE); support from 15 Schools/Faculties of Engineering
- 6 events since 2005 attended by about 8,000 girls and parents

2010 Post-event survey:

2/3

indicated they were more interested in engineering as a field of study or career choice

25%

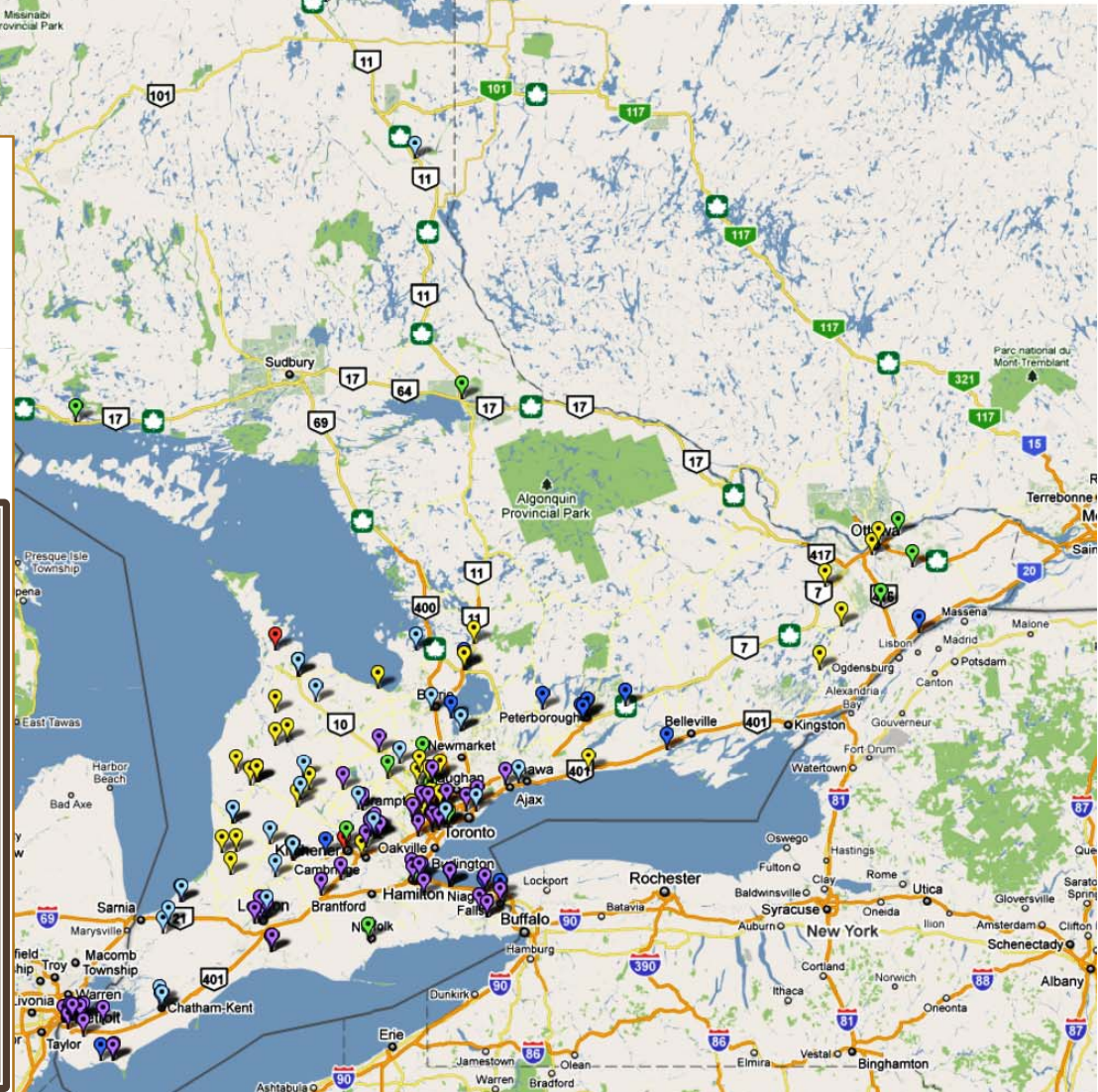
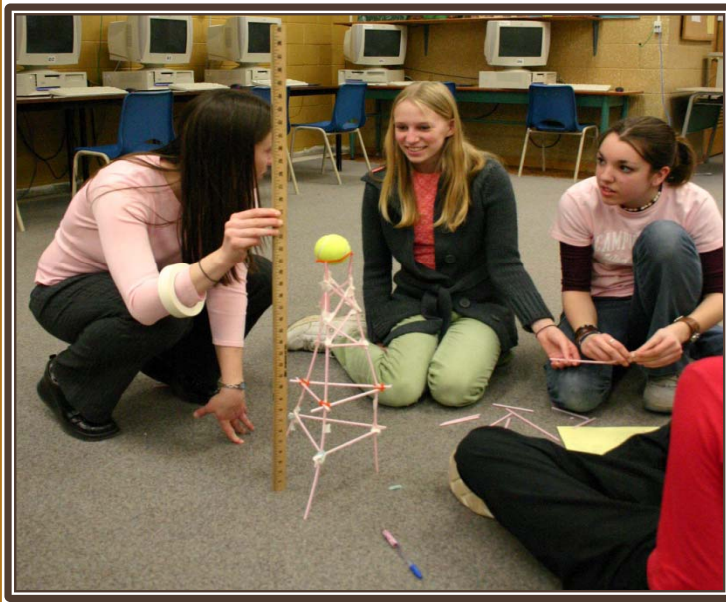
of the 2010 participants were attending for 2nd or 3rd time





Ready, SET, Go! workshops

1. Examples of engineers at study & work.
2. Team design activity
3. Role models





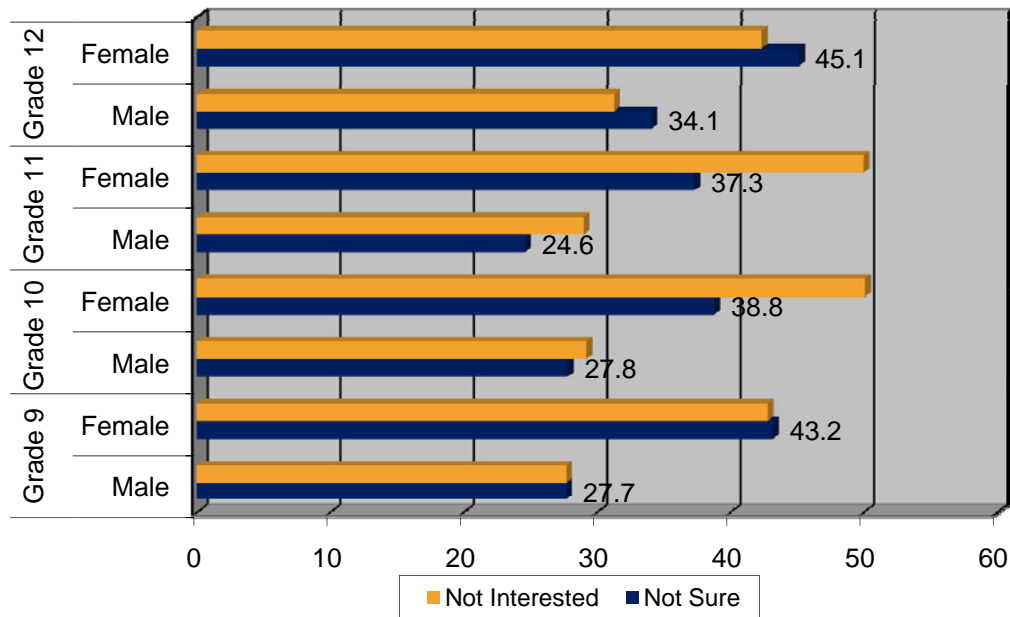
CWSE-ON

Ready, SET, Go! workshops

Interest in Science & Engineering (pre-workshop survey)

Science: No significant difference in interest by gender.

Engineering: Significant difference at all grades. Significant % of female students are “Not Sure”. Workshop is an opportunity to influence.



WVWEST Partners

- Funding and training for community organizations that are undertaking activities to promote outreach, recruitment and retention for girls, young women and industry professionals



- Above: Networking at a WISE event



- Left: WVWEST Partners training session





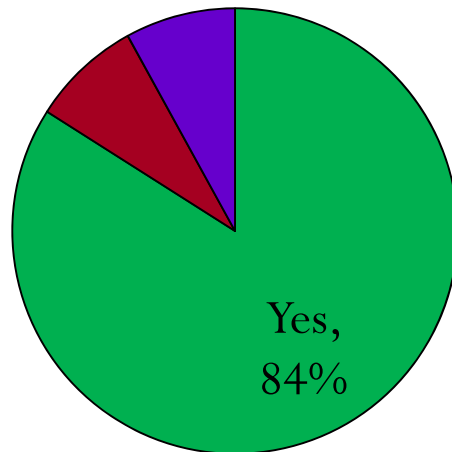
Partners Projects

- **Women in Engineering (Vancouver Region)**
 - Networking and professional development group for industry, back-to-work and immigrant women
- **Girl Guides Canada**
 - STEM activities at an international camp for girls aged 11-18
- **UBC Women in Engineering**
 - Support for female students, hold events such as WISE networking events, salary seminar
- **UBC Okanagan Women in Science**
 - Workshops, seminars and mentoring for undergraduate women
- **UBC GIRLsmarts**
 - Computer science workshops for grade 6 girls
- **Girls Exploring Physics**
 - Workshops at SFU for girls in grades 9-10 to introduce girls to physics
- **GEERing Up! UBC Science & Engineering for Kids**
 - Workshops and summer camps for BC youth to investigate engineering, science and technology
- **IEEE WIE Affinity Group Vancouver**
 - Group for women electrical and electronics engineers, holding STAR (Student, Teachers and Research) program for gr. 8-10 students to increase awareness about careers in science and engineering

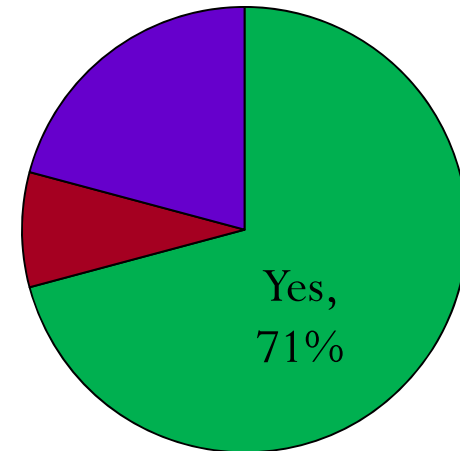


Teacher's Conference Outcomes

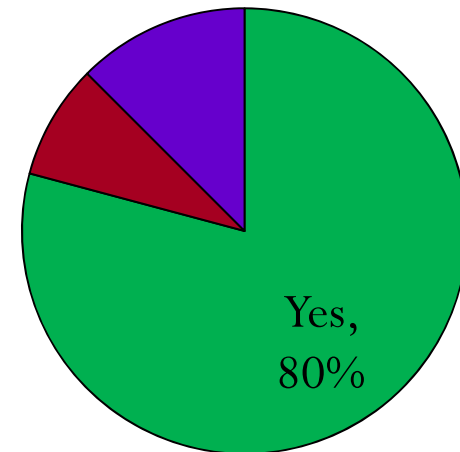
- More likely to recommend engineering to female students?



- Plan on trying engineering activities in class?



- Better understanding of engineering?





2011 Science Ambassador Program

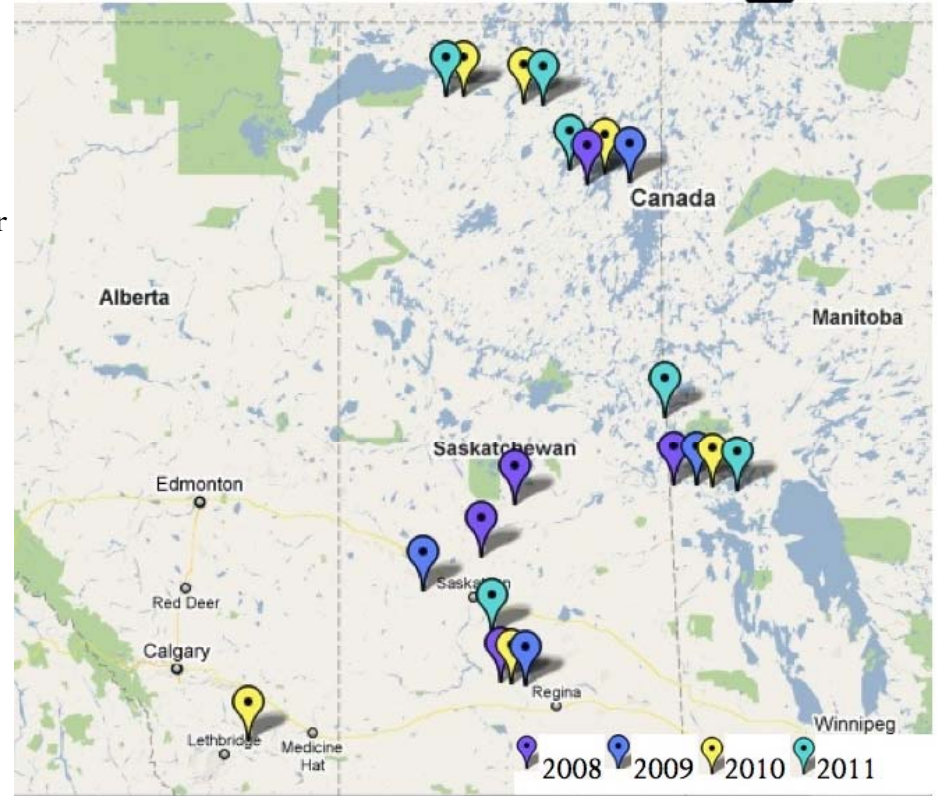
2011 Participating Communities: Wollaston Lake, Fond Du Lac, Black Lake, Flin Flon, The Pas and Opaskwayak Cree Nation, and Mistawasis.

Ambassadors' Academic Discipline: Biology, Computer Science, mathematics, Physiology, Chemistry, Biotechnology, Food Sciences, Engineering, and Science Education.

Ambassadors' Achievements

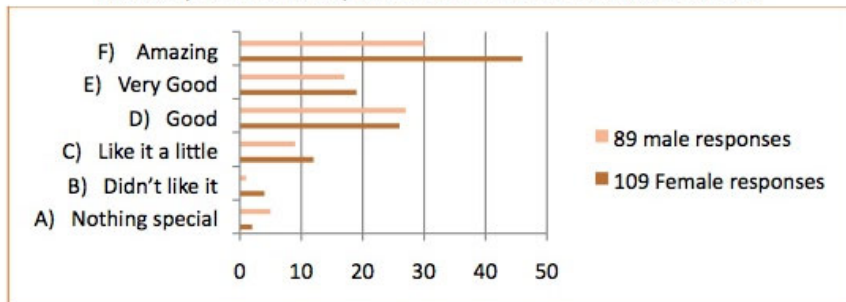
- Three former or current NSERC Scholarship student holders
- Four dean's honor roll students
- Academic All-Canadian Student
- Two University Athletes

Since its inception in 2007, the Science Ambassador Program has reached over 2300 students, in 12 communities, across Saskatchewan, Manitoba, and Alberta.

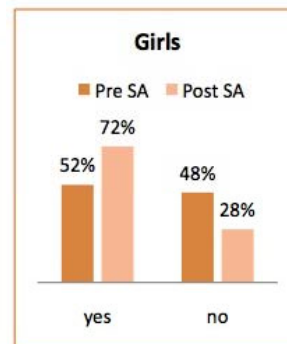


Results

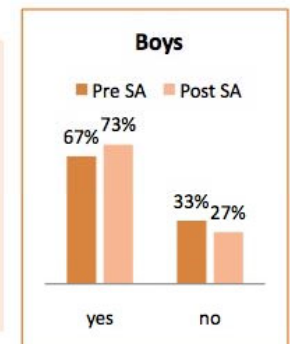
How do you rate the experience with the science ambassadors?



Question 3: A job as an engineer would be good? Why?



Note:
The number of students that picked answer A ("I like to build, design, or invent things"- the most popular explanation) increased by 11% for girls (from 21% to 32%) and by 3% for boys (from 29% to 30%)



Prairies Science Outreach Activities



CONNECTED 2010- Held on December 8th 2010, **CONNECTED** is a one-day interactive hands on computer science event for female secondary students. Over 60 students from 5 different Saskatchewan school division partook.

On-Campus Outreach- Each year the Prairie Chair supports on-campus science activities and events including: Girl-Power, Nobel Symposium, On-Campus Day, and Digitize



SASKATCHEWAN SCIENCE NETWORK

- Home
- Scientist of the Month
- Outreach Organizations
- Organization Descriptions
- PD for Teachers
- Specialized Programs
- Science Competitions
- Links
- SSN in the News
- About Us
- Contact Us
- Events Calendar

July/August 2010 Scientist of the Month

Sarah Gauthier- M.Sc. Candidate, College of Engineering, University of Saskatchewan

Sarah Gauthier is a Water Resources Engineer with Golder Associates in Saskatoon. Golder Associates is a multi-disciplinary consulting company that specializes in ground engineering and environmental services. Many of the projects that Sarah has been involved in are for the mining industry; she has had the opportunity to travel to project locations all around Saskatchewan, the Northwest Territories, and Nunavut. Her work provides a lot of variety; typical projects include water balance studies, river surveys, water supply studies, and design of engineering works. This type of work is essentially focused on answering the following questions: How much water is there? Where is it going? How can we keep it clean?

Sarah was born in Elliot Lake, Ontario and grew up in the northern

April 2011

Su	Mo	Tu	We	Th	Fr	Sa
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

Saskatchewan Science Network:

The SSN serves to connect scientists, Science educators, and science enthusiasts alike. The goal of the site is to increase scientific literacy and promote science culture within the schools and general community through partnerships with the education, science and business communities.



Mentorship: Online Communities



myWISEmentor provides girls in Saskatchewan an opportunity to be mentored by women in science and engineering. It is a free email mentoring program for girls aged 11 – 18 and who live in Saskatchewan. It has paired 20 girls with female scientist mentors since 2009.



The WiseBlog is used for posting news articles, research, videos or other interesting information related to women in science, engineering, and technology. The Blog receives approximately 2,000 views per year and 6,000 views since its creation in 2009.



Universities

- ***EDUCATION FOR AND BY WOMEN ENGINEERS***
- Chapters 7 – 12 in “More than Just Numbers”
- Recommendations related to recruitment and retention of undergraduates, graduate students and faculty



Studies of Undergraduate Students

- Study of the attitudes of undergraduate students enrolled in science and engineering classes
 - Perceived friendliness and approachability of faculty main factor in choosing a major
- Study of an intervention in first-year CompSci class to encourage students to continue in CS
 - Personal encouragement by instructor good predictor for men (too few women to show effect)



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Excelle Science 2009-2010

- Partnership for the program, which aims to encourage women to persevere in the field of Science and Engineering, in university
- Evaluation of applications and Award “Stage dans un laboratoire universitaire” (Internship in a University laboratory), provided jointly with the Marianne-Mareschal Chair to Evelyne Brown Dussault



Community Service Learning



- Richmond Nature Park
- Terra Nova Sharing Farm
- Free Geek
- Great Canadian Shoreline Cleanup



128 Student Participants (2nd Year MECH)





Engineering Curriculum That Makes a Difference

- **Mech 410E – Global Engineering Leadership**
 - A technical elective to help students understand the role of engineering leadership through a socially responsible, global perspective
 - Partnership with UBC Go-Global and Engineers Without Borders (UBC)

- **Mech 410P – GEL Practicum in Mexico**
 - 7 week placement with a community partner (Impact of Technology on Society)



Research activities

Boiteau and Ghazzali (2008)

“Profils des inscriptions des étudiants aux trois cycles universitaires au Québec de 1999 à 2007” (*Students registration profiles at undergraduate and graduate levels in Quebec from 1999 to 2007*)

Davidson and Stiver (2008)

“Computer-based design tools in engineering – steps to ensure a gender-inclusive learning environment”

Assessment in second year design course for students in biological, environmental and engineering systems and computing programs.

Gender differences: Confidence in hands-on activities in machine shop.



National Survey of Graduating students

- Pilot 2010; French and English surveys in 2011
- Students in **engineering** and **computer science**
- 2010 pilot study results:
 - 75% of students indicated positive or very positive experiences
 - 70% of female engineering students would make the same choice of program
 - 90% of engineering students plan to seek employment or further studies in their field of study (no gender differences)

2/3 of female engineering students expect to face gender-based discrimination in the workplace.

Academic workplaces

- Émond and Ghazzali (2009)

“Analyse du corps professoral universitaire en sciences et génie au Québec, de 1997 à 2007” (*Analysis of the situation of the women professors in Science and Engineering, for all universities of Quebec, from 1997 to 2007*)

- Ghazzali and Morin-Rivest (2010)

“Profil des inscriptions des étudiants étrangers aux trois cycles universitaires au Québec de 2001 à 2007” (*International students profiles at undergraduate and graduate levels in Quebec from 2001 to 2007*)

- CWSE national network (2009)

Smit-Quosai, Davidson, Ghazzali, Moloney, Vassileva “*Defining Equity Indicators to Assess Science and Engineering Faculties in Canada*”

(presented in Canada & at international meetings)

Recruitment stats

Women as a percent of **new faculty appointments** (CAUT Almanac 2007-08, 2008-09, 2009-10)

	2003- 2004	2004- 2005	2005- 2006	2006- 2007	3 year average
Agricultural and Biological Sciences		32.7%	37.0%	29.8%	33.1%
Engineering and Applied Sciences		21.3%	22.4%	13.0%	19.2%
Computer Science and Mathematics		23.1%	26.8%	21.0%	23.7%
Physical Sciences		17.9%	22.4%	20.4%	20.1%
All Disciplines		39.4%	41.0%	40.6%	40.3%

Women as a percent of **earned doctorates** (SED 2003-04, 2004-05 and 2006-07)

	2003- 2004	2004- 2005	2005- 2006	2006- 2007
Agricultural Sciences	33.8%	39.6%		38.1%
Biological Sciences	43.5%	47.2%		50.5%
Engineering	15.2%	15.5%		16.8%
Computer Science and Mathematics	20.2%	30.0%		23.7%
Physical Sciences	22.9%	28.7%		34.4%
All Disciplines				44.3%

ENGINEERING WORKPLACES

- Chapters 13 -20 in “More than Just Numbers”
- Recommendations for employers and professional associations



Industry Workshops



- Partnership with National WinSETT Centre
- Leadership development focus
- Address challenges such as work/life balance, glass ceiling, goal setting, self efficacy



- Becoming Leaders: An Introduction to Leadership Skills and Strategies for Women Engineers and Technologists
- Two sessions at local companies
- 45 participants total

Workshop Results



Going forward, I feel..

Q1: ...I will remain calm when facing difficulties in my job because I can rely on my abilities.

Q2: ...that when I am confronted with a problem in my job, I will usually find several solutions.

Q3: ...whatever comes my way in my job, I will usually handle it.

Q4: ...well prepared for my occupational future.

Q5: ...I will meet the goals that I set for myself in my job.

	Company 1	Company 2
Q1	+ 7.5 %	+18.4 %
Q2	-1.25 %	+8.2 %
Q3	+1.25 %	+15.5 %
Q4	+5 %	+8.1 %
Q5	+12.5 %	+18.2 %

- No statistically significant difference between pre- and post- survey
- Statistically significant (p=0.05) difference between pre- and post- survey



Mentorship and Communication through Online Communities



OurWISEtales is an online community for women in science and engineering where they can share personal stories of achievement and failure, reflect on their experiences and learn from the stories and advice of other women. Since 2008, it has 55 registered users who have contributed 35 stories.



Canadian Women in Computing website is part of the Activities as an Ambassador for Canada to ACM-W. It contains a searchable database of female CS faculty and instructional staff, and a yearly newsletter featuring the achievements of female CS academics in Canada.

Workshops at CCWESTT'2006

Immigrant Women in Science and Engineering

Work-Family Balance

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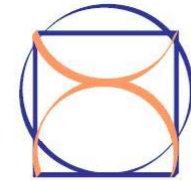
2010 Survey of Working Conditions for Engineers



ONTARIO
SOCIETY
OF PROFESSIONAL
ENGINEERS



Professional Engineers
Ontario



CWSE-ON



engineerscanada

ingénieurscanada

Follows up on 1994 survey

Addresses workplace culture, discrimination and career implications of family and personal obligations

Results to be presented at OSPE AGM May 4th



Closing thoughts

- Strengths of NSERC CWSE program:
 - Broad mandate but flexible; chair-holders choose points of focus based on region, resources and personal experience
 - Chair-holders work within many communities to effect change
- Under-representation of women in engineering has deep social, cultural, and organizational roots. Sustained change requires continued efforts by many stakeholders.
- On-going challenges remain (20 years later)



On-going challenges

- Understanding how today's youth engage with the sciences and engineering
- Updating teaching methods in science and engineering (at all levels of education) to reflect diverse motivations and interests
- Understanding the values and career aspirations of new graduates
- Professional environment where many women succeed - diverse set of roles models will be a strong attractor
- Raising the level at which engineering is viewed as a profession to benefit all



Acknowledgements

The current CWSEs recognise the important contributions made by the past regional Chairs for Women in Science & Engineering:

	Region	Term
Professor Cecilia Moloney	Atlantic	2004 - 2009
Professor Anne Condon	BC & Yukon	2004 - 2009
Professor Claire Deschênes	Quebec	1997 - 2004
Professor Mary Williams	Atlantic	1997 - 2002
Professor Elizabeth Cannon	Prairie	1997 - 2002
Professor Maria Klawe	BC & Yukon	1997 - 2002
Professor Monique Frize	National & Ontario	1989 - 2002



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NSERC-Industrial Alliance Chair for
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Quebec

www.chaire-crsng-inal.fsg.ulaval.ca/en

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www.cwse-on.ca

NSERC Cameco Chair for Women in
Science & Engineering – Prairie Region

<http://wise.usask.ca>

NSERC Chair for Women in Science &
Engineering – BC & Yukon Region

Westcoast Women in Engineering,
Science & Technology
<http://www.wwest.ca/>



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<http://wwest.mech.ubc.ca/cc/>

ONWIE

www.onwie.ca