P13: From pipeline to network: rethinking graduate training to embrace diversity and promote innovation.

Thursday, November 21st 3:30PM – 5:00PM.

Room: *202 AB*

The Panel

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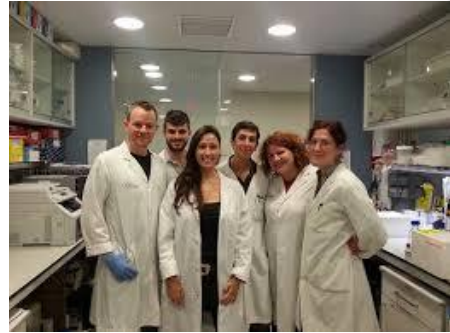Conestoga-Rovers &
Associates

We need to broaden graduate training in STEM to incorporate innovation and entrepreneurship. We also need to bring many more women into these training schemes because it is simply good business and good social practice..
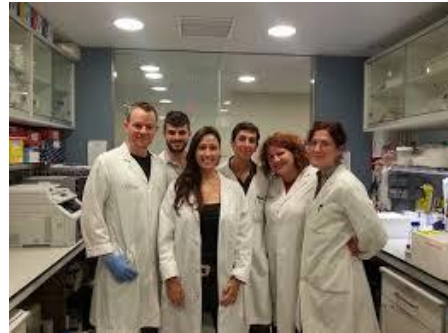
Traditional View

Academic Scientists and Engineers

STEM Graduate Training

Traditional View

Academic Scientists and Engineers

STEM Graduate Training

1980 – 35% PhDs from University of Toronto, Dept. Biochemistry went into academia
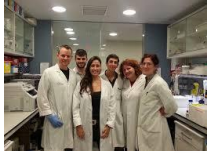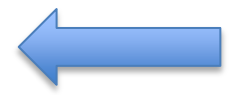
Academic Scientists and Engineers

2003-2013 – 15% graduates go into academia

- majority of Ph.D. graduates in the biomedical sciences do not obtain positions in academia.
- most graduates found rewarding careers in the public (government, university, hospital) and private (biotechnology, patent law, publishing, sales) sectors.

Innovation/Entrepreneurship

Business/Law

Policy/politics

Academic Science

21ˢᵗ Century View

STEM Graduate Training

http://www.newroutephd.ac.uk/

NewRoutePhD?

UK PhD - focus predominantly on research and developing research skills.

Integrates in-depth study (often inter-disciplinary), research training, and high level professional skills training.

Students gain a powerful combination of knowledge, skills and research experience that makes them highly employable in business, university teaching, government and public service.

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Professional Development

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Graduate Professional Skills (GPS) Program

Current Students

Academics

New Students

International Students

Graduate Fees

Financing Your Graduate Education

Registration & Enrolment

Student Forms & Letters

Services for Students

The Graduate Professional Skills (GPS) program, an initiative from the School of Graduate Studies, is designed to help all graduate students become fully prepared for their future.

GPS focuses on skills beyond those conventionally learned within a disciplinary program—skills that may be critical to success in the wide range of careers that graduates enter, both within and outside academe.

The program can help you to communicate better, plan and manage your time, learn entrepreneurial skills, understand and apply ethical practices, and work effectively in teams and as leaders.

GPS consists of a range of optional "offerings" with a time commitment roughly equivalent to 60 hours of work. Its successful completion will be recognized by a transcript notation.

gps

graduate professional skills program

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Perspective

A Graduate Course in Professional Development

CREDIT: Frank Flack (Public domain), via Wikimedia Commons

By Nana Lee, Reinhart Reithmeier
October 01, 2013

"It really has been life-changing for me. Without this course, I would have been just another Ph.D. student ... " —Kris Hon, Ph.D. candidate.

"I learned more skills here to better my career than I would have in my entire graduate degree otherwise." —David Gallo, Ph.D. candidate.

"I think that every graduate student should take this course ... I feel more prepared about the job application process, networking, and finding the job ... ." —Tina Sing,

We found that, while most students were intent on an academic career when they entered graduate school, most were also aware that the majority of the graduates pursued other opportunities.

Reinhart Reithmeier and Nana Lee

Skills needed outside of the lab

Our graduate professional development course made the participants aware of the skill set they will need for lifelong career development. Along with excellent research skills, employers seek skills in communication, teamwork, interpersonal relationships, administration, and leadership. Other in-demand skills include networking, creativity, initiative, mentorship, and maintaining life balance. The best education for a graduate student is one that fosters leadership, imagination, and creative thinking; so they can bring something new to an existing profession or even create their own positions.

Communication

Teamwork

Interpersonal relationships

Administration

Leadership

Networking

Creativity

Initiative

Mentorship

Maintaining life balance

Graduate Women in Science

Science, Math, Computer Science, and Engineering Graduates, 2010
(proportion of all graduates in 2010)

Grade: ■ A ■ B ■ C ■ D
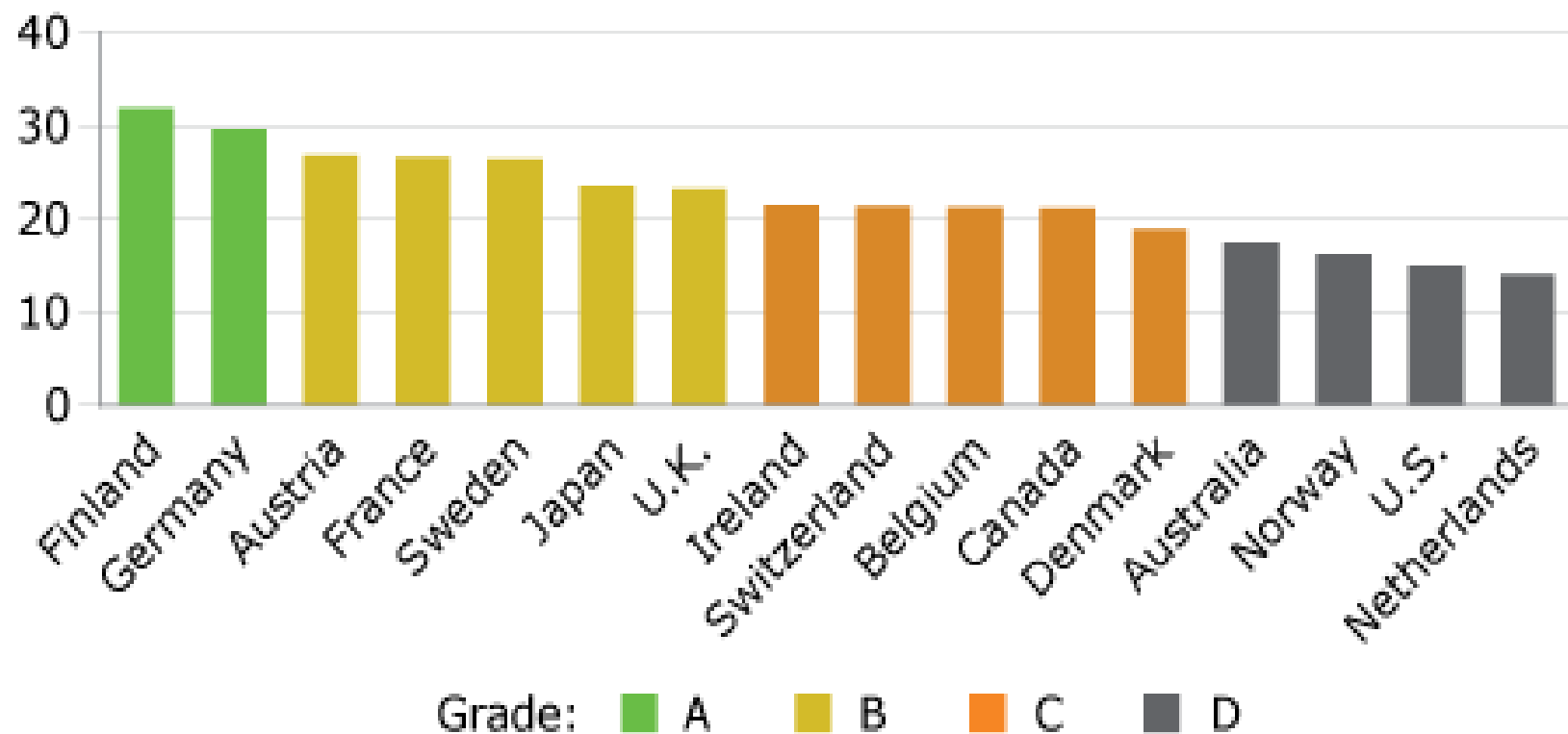
In 2010, Canada's proportion of overall graduates emerging from science, math, computer science, and engineering disciplines was 21.2 per cent.

Conference Board of Canada, 2012

According to Human Resources and Skills Development Canada, the sectors with the highest number of future job openings include mining, information and communications technology, transportation equipment, oil and gas, science services, and health care – all fields where STEM education is important.

CEO Council, 2012

[ForbesWoman](#), 2013

STEM Fields And The Gender Gap: Where Are the Women?

Steering Girls toward STEM: Statistics and Solutions

Women in Science, Technology, Engineering and Mathematics: From Classroom to Boardroom

UK WISE Campaign, 2013

From the Department for Professional Employees:

Women account for better than 57% of the workforce, but only 47% of science professionals, 25% percent of computer and math professionals, and about 14% of architectural and engineering professionals.

Women are very well represented in medical sciences, where they are actually in the majority, at 54% plus; in the biological sciences, they represent a healthy 48% of all workers.

Men continue to outearn women in STEM fields, making an average of 20% more than women.

Stemspire, 2013

From the National Science Foundation (NSF):

In 1966 women earned fewer than 5% of all bachelor's degrees in physics; in 2006 they earned more than 20% of them.

In those same years, women earning engineering degrees grew from .4% to more than 19%.

In chemistry, the leap was from 18% to more than 50%.

[L]ingering gender stereotypes in the workplace lead to ongoing preconceived notions that a woman's place is not in the STEM disciplines.

Stemspire

In the workforce, women have been closing the gender gap in both rate of employment and income nearly year after year. During the recession that started in 2008, when job loss was approaching Great Depression numbers, women held onto jobs at much higher rates than men did. Currently, the number of women in the workforce is on the brink of surpassing men for the first time in American history.

Stemspire

According to the
[Economics and Statistics Administration](#):

Women in STEM jobs earn about 33% more than women in non-STEM jobs

Women also make less than their male counterparts. InformationWeek's [2013 IT Salary Survey](#) reports the median base salary for women IT staffers is $10,000 lower than for males; the gap also persists at higher levels, with female managers earning a median base salary that's $9,000 less than male managers.

This Chairs for Women in Science and Engineering Program (CWSE) was launched in 1996. The goal of the program is to increase the participation of women in science and engineering, and to provide role models for women active in, and considering, careers in these fields. NSERC funding must be matched by cash contributions from corporate sponsors.

NSERC, 2013

In 2010, female undergraduate enrolment also varied by the type of engineering program, with their highest representation:

- environmental (39.7 per cent)

- biosystems (38.9 per cent)

- geological engineering (36.9 per cent)

- software engineering (9.7 per cent)

- computer engineering (10.3 per cent)

- mechanical engineering (10.4 per cent)

- Communication and Planning

- Connecting with the Outside World

- Validating Professional Skills Development

- Career Services

- There should be a central repository of all opportunities/initiatives in support of students' professional skills development and career training. As the hub at the centre of the graduate student ecosystem, graduate schools are well positioned to coordinate and disseminate much of this information, though department-specific initiatives are also important in some areas.

- Methods of communication need to be improved to ensure that there are multiple paths students can take to get information (email, websites, in-class visits, direction from programs).

- Information about relevant events and initiatives should be provided as early as possible, to enable students to be proactive in their planning.

- Programming should be provided in shorter sessions scheduled at various times, including some on evenings and weekends, since it is often difficult for students to devote large periods of work days to workshops.

- Where possible, online courses should be offered to develop professional skills. Opportunities may exist here for collaboration between Ontario universities.

- Clearer statements of the content and relevance of workshops and other events should be provided, as students often cannot infer this from the title. Care should be taken to ensure that appropriate language is used so that the content is understood by students in SSHRC, CIHR, and NSERC disciplines.

- Additional programming should be offered that is targeted specifically to students in SSHRC disciplines. Mitacs has already been working toward this, but universities can help guide the development of those programs and ensure that students are aware of the new offerings.

- Students should be made aware of the current state of the job market and of the full range of their career options as early as possible – ideally before they begin their graduate programs. Students should understand the extent to which their opportunities may be expanded if they broaden their job search geographically.

- Supervisors should be informed about their role in supporting and facilitating professional skills and development, and be encouraged to take the initiative in this regard.

- Universities should provide more opportunities for graduate students to gain teaching experience and provide training and support for pedagogical innovation.

- Information about successful approaches to professional skills training should be shared openly across programs within universities, and across universities. Ideally, a clearinghouse of approaches would be developed to enhance graduate education more generally.

- Universities should promote graduate-level internship opportunities and support participation by graduate students and professors, particularly in SSHRC disciplines and others where internships are less common. This could be done with logistical and financial support from Mitacs, whose ability to support internships is currently limited by a lack of student and faculty awareness about the opportunities available.

- Networks of mentors should be established and include industry partners, non-profit and government research partners, and alumni. Such mentors could provide students with useful career guidance information, and could serve as role models for alt-ac careers.

- Career nights, including information on both academic and alt-ac streams, should be regular occurrences.

- Universities should do more to raise awareness of the potential links for students with private and non-profit partners, and highlight the services that Mitacs provides to help build partnership opportunities.

- Programs should be flexible in recognizing the value of internships, and could consider building internships into their programs.

- Mentors with experience in international settings should be made available to international students, both to provide information about working in Canada but also to ensure that students are aware of their opportunities and can build networks beyond our borders.

- Universities should consider developing certificates of completion to encourage students to attend professional skills development sessions and to validate the importance of this training. Some universities already have done this, and many others are currently developing such programs.

- Faculty need to be educated about the importance of developing students' professional skills as a complement to traditional academic skills.

- Faculty should also be educated about the importance of considering alt-ac careers, particularly in some disciplines. Faculty should encourage students to explore all appropriate options, and should support students in their chosen career path.

- Since students are seeking guidance in determining the best ways to use their time outside of their traditional programs, faculty and departments should provide students with information on which workshops and events to attend. This will reassure students that attendance is not only appropriate, but that the university views these experiences as important for the students' education.

- Universities should pursue a wide range of approaches to delivering skills training, in recognition that different students have different interests and needs, and that universities have different degrees of resources. In keeping with the ecosystem concept, programs should range from fully in-house, integrated programs, to the coordination of third-party providers (including Mitacs, online providers, and other universities).

- Universities should provide opportunities for students to be rewarded for the transferable skills they have learned. An example might include using 3 Minute Thesis (3MT) contests, in which students compete on the basis of their communication skills.

- Students should have university-sanctioned opportunities to enhance their transferable skills beyond standard workshops. For example, universities could sponsor student-proposed initiatives in which students determine the best way to collaborate across disciplines and build communication, leadership, creativity, and knowledge translation skills.

- Universities, programs, and faculty would value professional skills development and a variety of career outcomes more if they were included in our quality assurance processes.

- This year, 16 Ontario universities are taking part in the 3MT contest, with the first provincial final to be held at Queen's University in April.

- McMaster University recently began such a program, called SPICES – Student Proposals for Intellectual Communities and Engaged Scholarship).

- Universities should invest in graduate-focused career services, recognizing that the needs of graduate students, and particularly Ph.D. students, differ significantly from the needs of undergraduates.

- A network of job opportunities requiring graduate degrees should be developed. This might be most effectively done by a third party, which could make information available to students at universities across Ontario.

- Students should receive discipline-appropriate training concerning interviewing and resume/CV preparation.

- Universities should track career outcomes of their students, and provide incoming students with statistics regarding possible career paths and the skills required to pursue them.

- Career service centres should ensure that counselors have adequate training and background in areas relevant to graduate students. For example, counselors should have specialized knowledge about employment fields, to best ensure a match between the student and the career direction. Career service centres might also find ways to connect graduate students with head-hunters, who focus on placement in more specialized careers.

- Care should be taken to highlight the importance of interdisciplinary training, and the ways in which students should approach career planning when engaged in such research.

- International students should also be given special consideration and additional guidance, to maximize their long-term success whether or not they choose to remain in Canada

From Pipeline to Network:
Rethinking Graduate Training to Embrace Diversity and Promote Innovation

Gabrielle L. Boulianne

The Hospital for Sick Children

Who are we training?

Where are they going?

Government
Academia
Law
Industry
Consulting
?
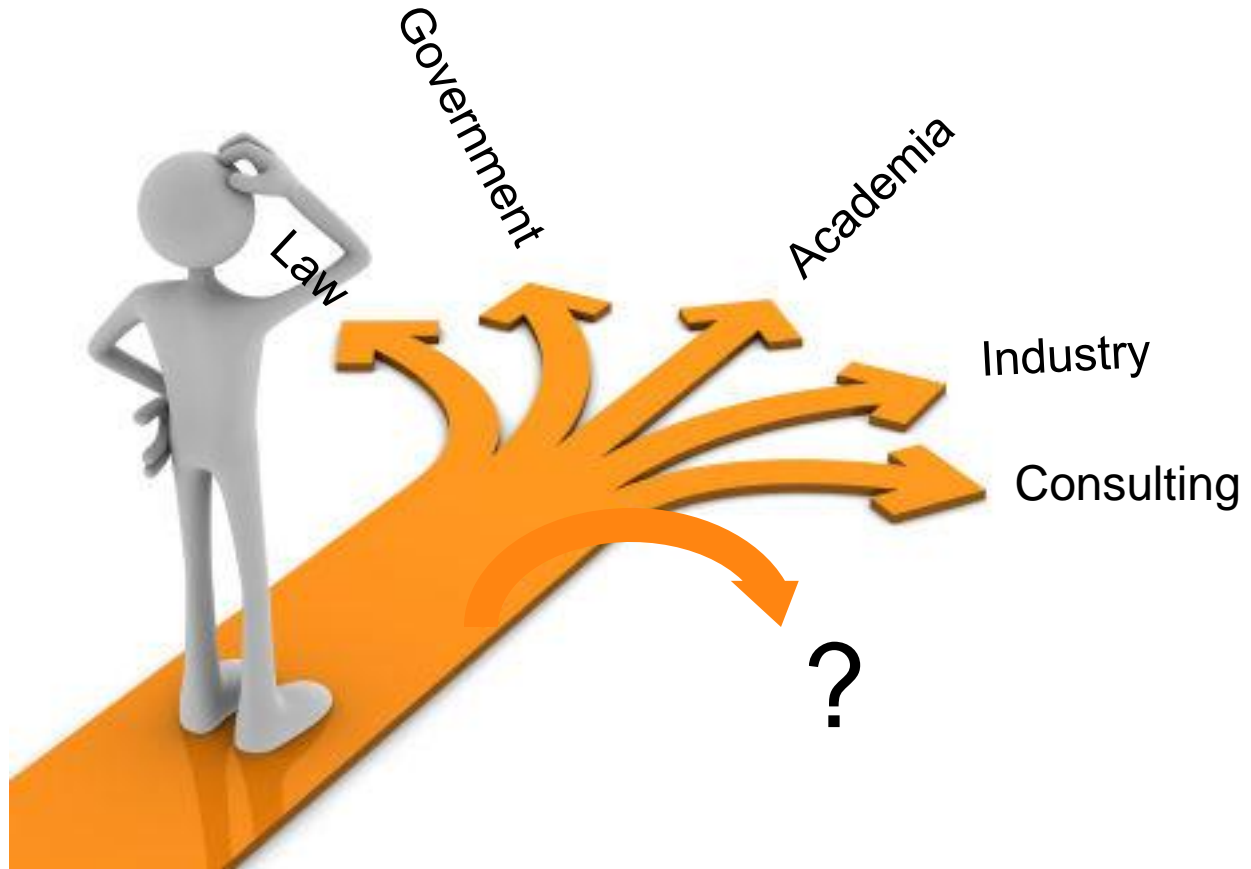
Whatever you're offering, it's NOT GOOD ENOUGH

Training the next generation of Leaders
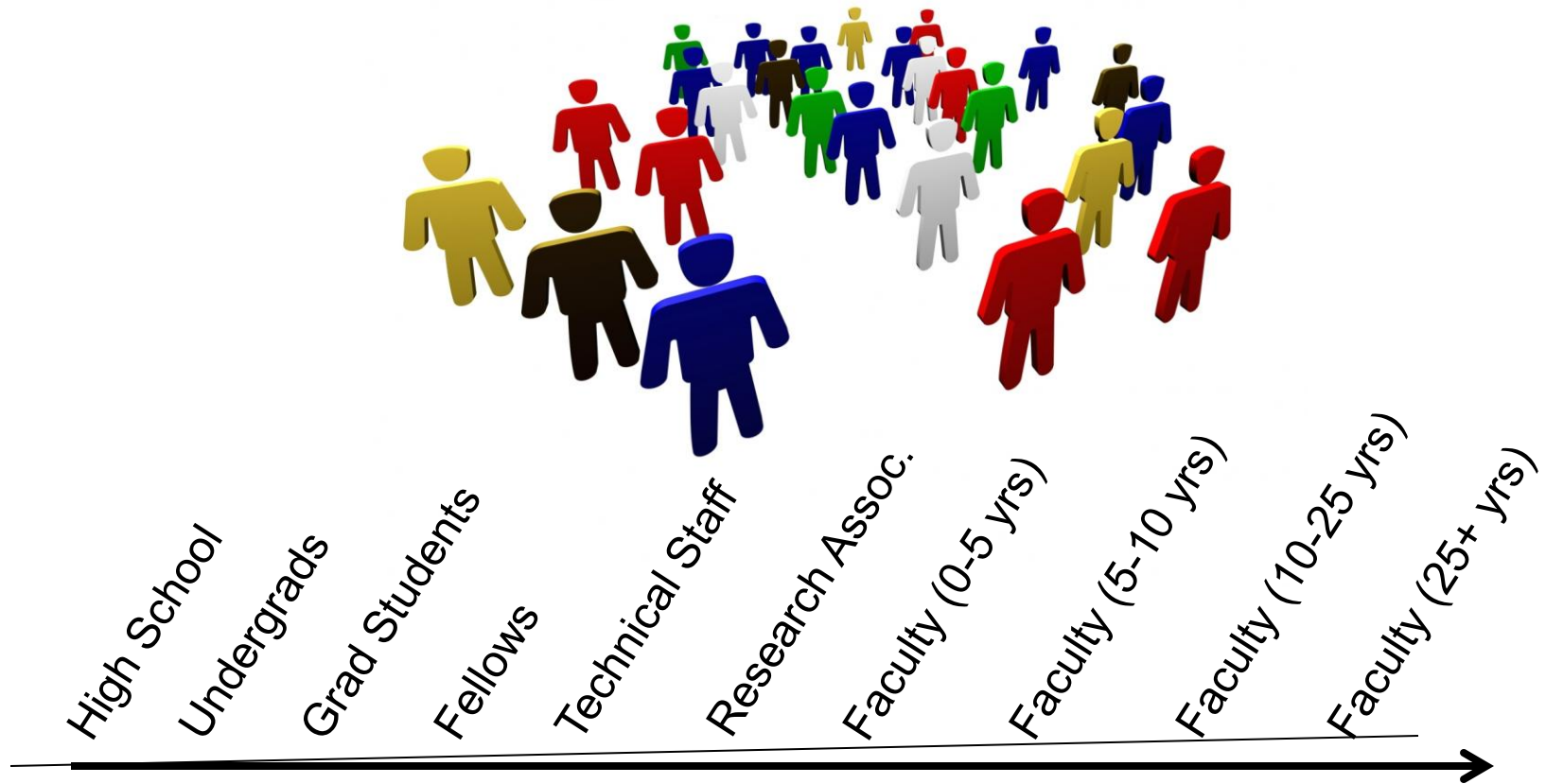
High School

Undergrads

Grad Students

Fellows

Technical Staff

Research Assoc.

Faculty (0-5 yrs)

Faculty (5-10 yrs)

Faculty (10-25 yrs)

Faculty (25+ yrs)

Seminar Series	Topic	Event	Undergraduate	Graduate Student	Research Fellow	Research Associate	Lab Techs	Faculty
Skills Development	Research Integrity	Research Integrity for Trainees (Mandatory)	✓	✓	✓	✓	✓	
	SSuRe	Summer Seminar Series/ Symposium Day	✓					
		Time Management (Proposed)	✓	✓				
		How to take initiative	✓					
		CV Development	✓					
		Conducting Oral Presentations	✓	✓				
		Preparing/ Preparing Successful Posters	✓	✓				
		Effective Literature Searches	✓					
		LinkedIn Workshop	✓					
		Graphic Skills (Proposed)		✓				
	Industry Partnerships and Commercialization	Introduction to IP&C		✓	✓	✓	✓	✓
		Entrepreneurial Discussion Panel		✓	✓	✓		✓
		Site Visits		✓	✓	✓		
		Mentorship Program		✓	✓			✓
	Grant Writing	How to write a grant		✓	✓	✓		✓
		CIHR/NSERC Grant Writing			✓	✓	✓	✓
		Team Grant Writing				✓	✓	✓
		Infastructure Grant Writing						✓
	Management	Relationship Management		✓	✓	✓		✓
		Crisis & Performance Management			✓	✓		✓
		Financial Management			✓	✓		✓
		Mentoring Trainees			✓	✓		✓
		LEAD Program/Precision Leadership			✓	✓		✓
		Project Management						

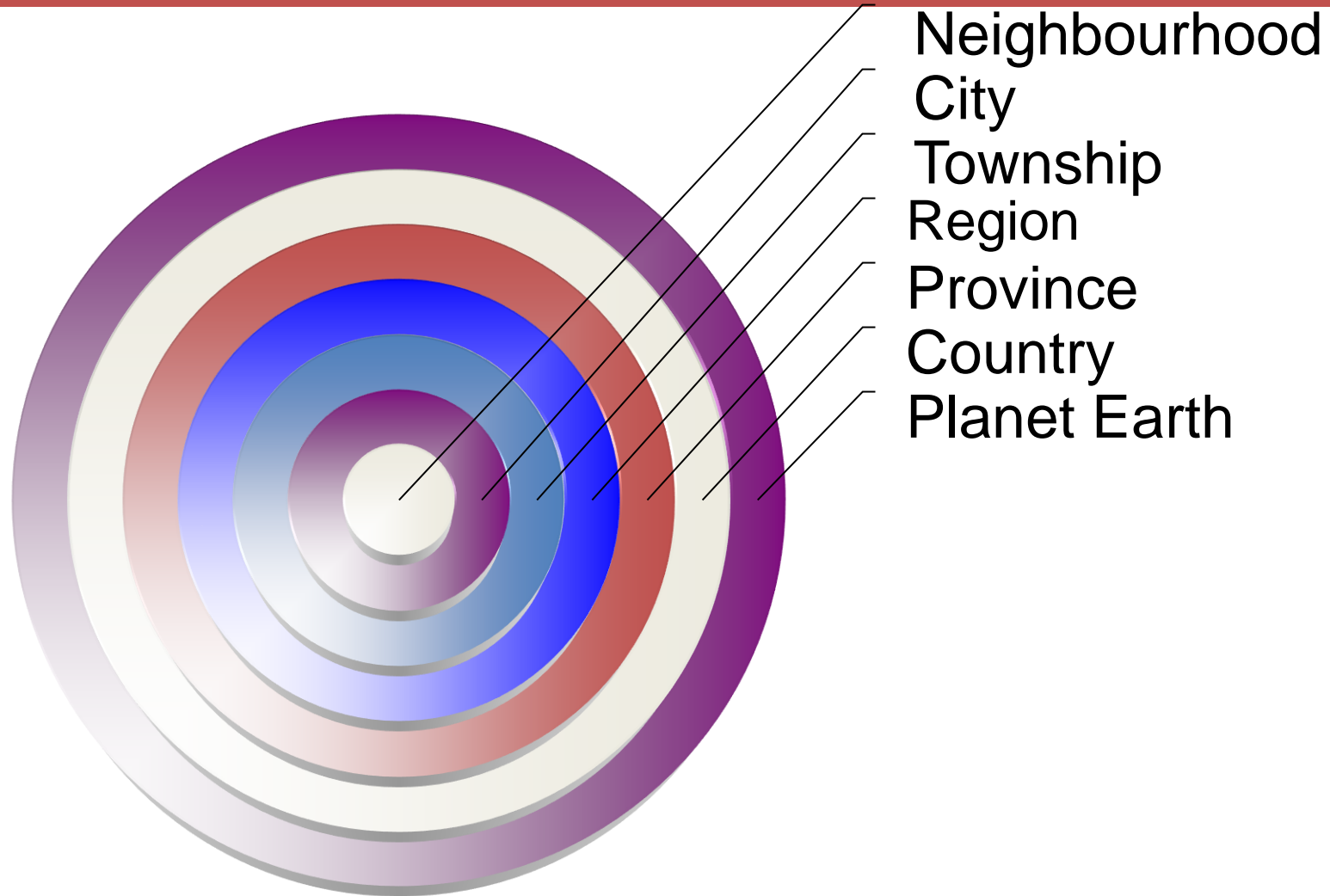| Seminar Series	Topic	Event	Undergraduate	Graduate Student	Research Fellow	Research Associate	Lab Techs	Faculty
Career Paths	Transitions	Finding a good laboratory	✓	✓				
		From graduate student to postdoc fellow		✓	✓			
		From postdoc fellow to research associate			✓	✓		
	PI Prep	Recruitment Panel			✓			
		Introduction to PI Prep School			✓			
		Interview Day			✓			
		Establishing a Sucessful Laboratory			✓	✓		
	Career Opportunities/ IEP	Career Night		✓	✓	✓		
		How to complete a biosketch - insight into hiring process		✓	✓	✓		
		Bridging academia with industry		✓	✓	✓		
		Informational & behavioural interviews		✓	✓	✓		
		Industry panel discussion		✓	✓	✓		
		Transferable skills		✓	✓	✓		

Building a Community

"Good public policy is developed when the policy-makers can keep in their mind's eye the people affected."

Jane Jacobs

Members of a Community

Neighbourhood
City
Township
Region
Province
Country
Planet Earth

Called to Serve

I see running for politics as a calling. When I received my engineering iron ring I accepted that engineers are called to serve others.

Photo credit: www.peo.on.ca

A Role for STEM Professionals

• bring an analytical "mind" to decision making

• collaborative and are used to working on teams

• willingness to set out the ground rules or the 'GIVENS' of a decision

Photo credit: http://mayaangelou.com/

"I've learned that people will forget what you said, people will forget what you did, but people will never forget how you made them feel."

- **Thank You**

- **Questions?**