



**FOUR POINT**  
G E O M A T I C S

## ***Education for Geomatics Professionals: An Approach to Closing the Knowledge Gap***

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# Outcomes

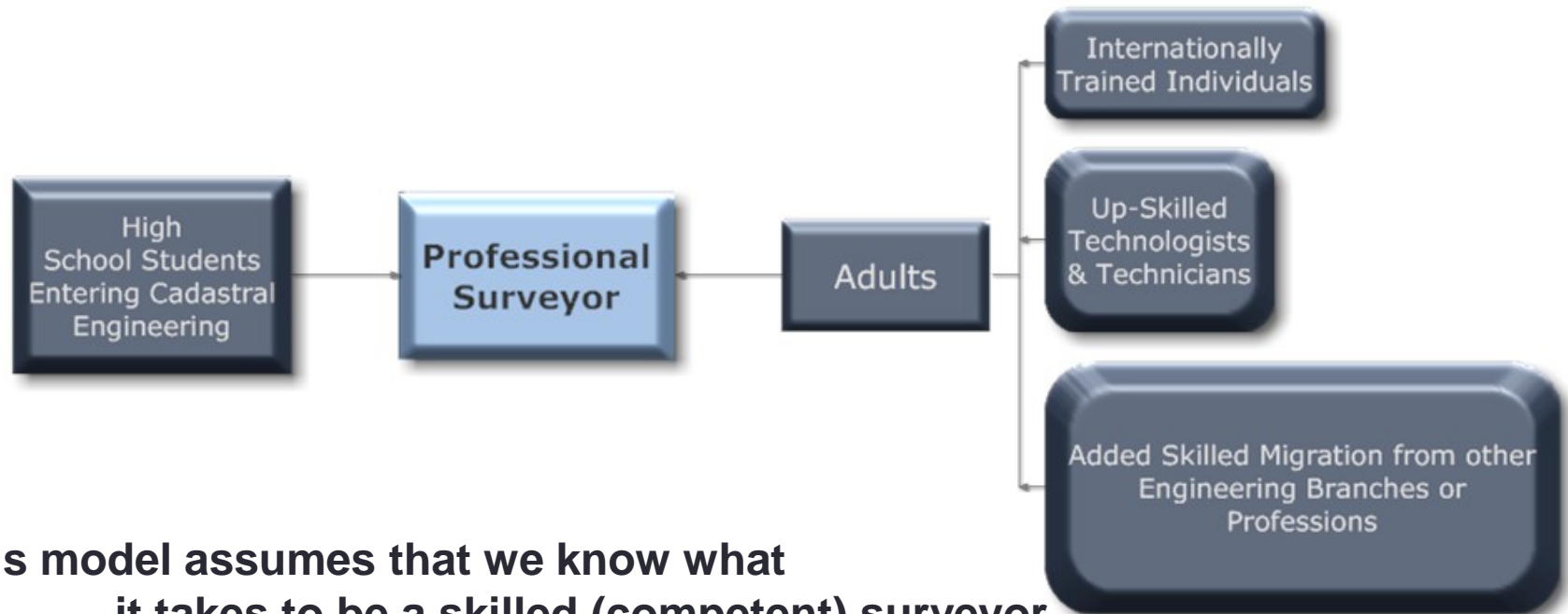
At the end of this presentation, you will have learned:

- why instructors of geomatics professionals need to rethink how learning takes place;
- some of the implications for how we improve our approach to the design of geomatics education programs – both undergraduate and CPD;
- some of the possible implications for how teaching takes place; and,
- that asking a student the right question to prompt reflection is more important than giving an answer which shuts down learning.

## *Changing demographics; the situation in Ontario today:*

Number of Surveyors by Age								
AGE	2009	2011	2012	Cad	Photo	Hyd	Geod	GIM
Total	639	626	610	521	10	1	16	62
20 - 29	5	6	3	3	0	0	0	0
30 - 39	40	32	26	25	0	0	0	1
40 - 49	189	162	143	116	1	0	3	23
50 - 59	237	244	247	203	8	0	8	28
60 - 69	117	128	137	122	1	0	5	9
70 - 79	46	46	48	46	0	1	0	1
80 - 89	5	8	6	6	0	0	0	0
Percentage over 50	63%	68%	72%	72%	90%	100%	81%	61%
Percentage over 60	26%	29%	31%	33%	10%	100%	31%	16%

# Potential sources of new Geomatics professionals / land surveyors



**This model assumes that we know what it takes to be a skilled (competent) surveyor**

# What is Knowledge?

Knowledge is a familiarity with someone or something, which can include facts, information, descriptions, or **skills acquired through experience or education**. It can refer to the theoretical or practical understanding of a subject. It can be implicit (as with practical skill or expertise) or explicit (as with the theoretical understanding of a subject); and it can be more or less formal or systematic.

- From Learning at: <http://en.wikipedia.org/wiki/Knowledge>

# The knowledge gap at a macro level

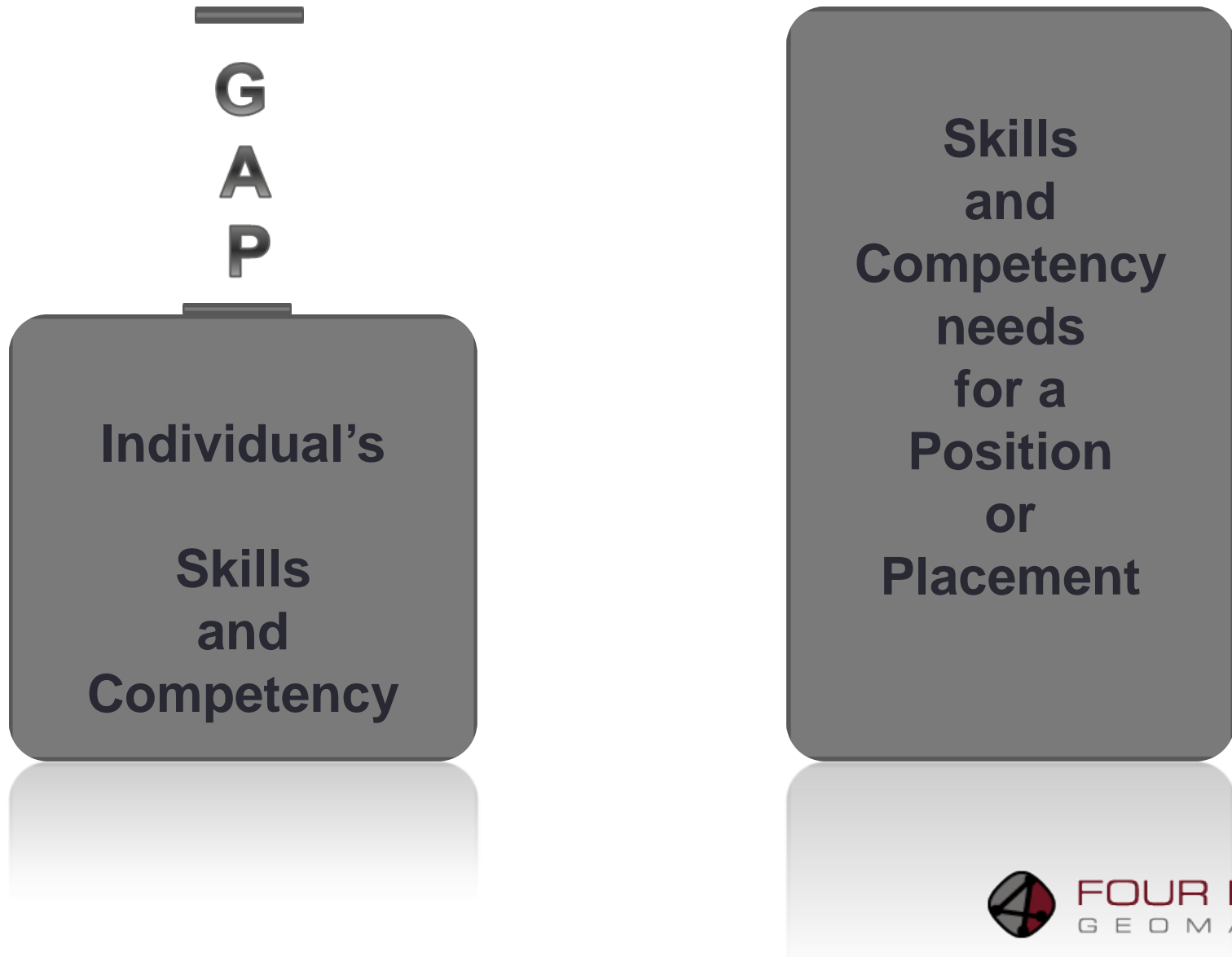


# What is Learning?

Learning is not compulsory, it is contextual. It does not happen all at once, but builds upon and is shaped by what we already know. To that end, learning may be viewed as a process, rather than a collection of factual and procedural **knowledge**.

- From Learning at: <http://en.wikipedia.org/wiki/Learning>

# The knowledge gap at an individual level





## Forecasted 11 years ago

*“The pathways to learning no longer lead automatically to traditional institutions of higher education. Instead they lead most directly to learning opportunities in which competencies are defined explicitly and delivery options are multiple. This new paradigm will ultimately redefine the roles of faculty, institutions, and accreditors.”*

From: Voorhees, R.A., *Competency-Based Learning Models: A Necessary Future*, in: NEW DIRECTIONS FOR INSTITUTIONAL RESEARCH, no. 110, Summer, 2001, at: <http://www.medbev.umontreal.ca/gtea/Competency-Based%20Learning%20Models.pdf>

## What does it mean, in a professional context, to be “Competent”?

“As members of the legal profession, lawyers are held to a high standard. The public trusts that lawyers will not only know the law, but will have the skills and practical knowledge and experience to help them resolve or work through their issues and problems. A competent entry-level general practitioner should be able to meet this expectation.”

From: Canadian Centre for Professional Legal Education at:  
<http://www.cpled.ca/competency.html>

This centre is “a non-profit organization mandated with the task of administering one portion of the pre-call process in Alberta, Manitoba and Saskatchewan.”

# Competencies

- Competencies reflect accurately what a person can do and knows (their “knowledge”);
- Competency Based Assessment (CBA), is respectful of an adult Learner’s abilities and experience;
- CBA is more rigorous and professional;
- CBA provides a Candidate with full information about what is required to attain a licence.

# Traditional Assessment and Evaluation

- Rigid – scrutiny of paper transcripts
- Impersonal – no validation of course deliverables in transcript
  - Documents sent to regulator with little or no direct interaction – the process is “blind”;
  - Only certified originals accepted - regardless of Candidate’s circumstances;
  - Candidate receives a letter outlining “courses” required;
  - No follow up, support, or consideration of Candidate’s circumstances:
    - Family
    - Work commitment
    - Financial resources

# Academic Credentials vs Competencies

- Universities grant “Credentials”:
  - Grades
  - Transcripts
  - Degrees
- Self-Regulating Professions deal with establishing member “Competency”.
- There are only 2 ways to lose a professional surveying licence in Canada: (1) unethical behaviour or (2) *incompetence*.
- The irony lies in fact that at the point of obtaining a licence, competence is presumed - based on the credentials obtained.

# Professional Surveying Regulators in Canada

Professional Surveying Regulators in Canada are charged with the responsibility of defining and ensuring that members of the profession possess the skills and competencies required to discharge their professional responsibilities ***in the best interests of, and to protect, the public.***

The stage for competency based assessment is set - competency based learning aligns itself with the legislated mandate of land surveying regulators across Canada. Examples of a finding of ***incompetence*** can lead to a loss of the privilege to practise:

New Brunswick's *Land Surveyors Act*, 1986, s. 23(3)(a): incompetence = "... a lack of knowledge, skill, or judgment..."

Ontario's *Surveyors Act*, s. 26(3)(a): incompetence = "...a lack of knowledge, skill or judgment..."

Saskatchewan's *The Land Surveyors and Professional Surveyors Act*, s. 29(a): incompetence = "...a lack of knowledge, skill or judgment..."

***A Comparison of elements of Traditional Learning  
with elements of a competency based approach:***

	Reason for Participating	Resources	Teaching Environment	Assessment
T R A D I T I O N A L	<ul style="list-style-type: none"> <li>- “I have to”</li> <li>- Academic Credit</li> <li>- Necessary for degree to be taught</li> </ul>	<ul style="list-style-type: none"> <li>- Textbook</li> <li>- Library</li> <li>- Lecture</li> </ul>	<ul style="list-style-type: none"> <li>- Classroom</li> <li>- Lab</li> <li>- Lecture</li> </ul>	<ul style="list-style-type: none"> <li>- Final Exam</li> <li>- Course Work</li> <li>- Tests</li> </ul>
M O D E R N	<ul style="list-style-type: none"> <li>- Learning Contract</li> <li>- Desire to acquire competence</li> <li>- Learner motivated</li> </ul>	<ul style="list-style-type: none"> <li>- Textbook (if available)</li> <li>- Video clips</li> <li>- Audio clips</li> <li>- Internet based</li> </ul>	<ul style="list-style-type: none"> <li>- Virtual Classroom</li> <li>- Classroom</li> <li>- Mixed Formats</li> <li>- Discussion Questions</li> </ul>	<ul style="list-style-type: none"> <li>- Individual self-assessment</li> <li>- Objective tools</li> <li>- Subjective metrics</li> </ul>



# Implications for Assessment

- In order for competency-based assessment to offer high-quality education, the following must be put into place:
  - Schools embrace a strong emphasis on formative assessment.
  - Teachers collaborate to develop understanding of what is an adequate demonstration of proficiency.
  - Teachers assess skills or concepts in multiple contexts and multiple ways.
  - Attention on student learning, not student grades.
  - Summative assessments are adaptive and timely.



# Implementing Competency Based Assessment

## – linked to competencies which define the knowledge base

- A Competency Framework must be developed for each subject area:
  - Geodesy, hydrography, error theory and adjustments, survey law, etc.
- For each competency, a mastery or attainment benchmark must be identified;
- Each competency needs one or more professional assessment methodologies identified;
- Each competency has links to identified resources, designed to facilitate acquisition of the competency by adult learners.

# Assessment itself is a Meaningful and Positive Learning Experience for Students

In a competency-based model, the traditional approach to assessment and accountability “of learning” is turned on its head with assessments “for learning.” Formative assessments are aligned with learning objectives. Students receive immediate feedback when assessment occurs. This is used to encourage students to return to difficult concepts and skills until they achieve mastery. It is essential that assessments are student-centered in which students are assessed on material with which they are familiar.

From: <https://sites.google.com/site/competencybasedpathways/home/understanding-competency-based-approaches/definition>






# Anticipated resistance from instructors - this arises from holding fast to a traditional learning paradigm:

- Learners cannot be trusted:
  - Students come with an expectation of being taught – my job is to do that
  - Open ended questions are useless – they represent confusion and uncertainty
  - After a class is finished, students just want to know how to get a passing mark in the course
- Learners are inherently lazy:
  - Students cheat
  - Plagiarism is an academic offence that must be punished
- I trust only my teaching process:
  - Dishing out answers is what I am paid to do
  - I am in control and direct what students need to learn
  - Have confidence in your own knowledge and experience
  - A “course” does not start until arrival for the first “class”

# Implications for How Geomatics is Taught

- Trust learners' own learning:
  - Engage learners' own curiosity and interest
  - Ask questions that are open ended
  - Use passage of time and reflection to allow for “eureka!” moments
- Treat learners as adults:
  - Turn negative consequences into a learning opportunity
  - Do not punish plagiarism
- Trust the learning process:
  - Resist dishing out answers
  - Avoid control
  - Have confidence in your own knowledge and experience
  - A “course” starts well before the first “class”

# Learners commit to learning by signing a contract

- ▼ My courses
  - ▶ CPD-Roads
  - ▼ IntroLaw
    - ▶ Participants
    - ▼ General
      -  Announcements to Learners
      -  **Terms of Use and Participation Agreement**
      -  Legal Relationship
      -  Agreement, Undertaking and Declaration
      -  Setting the Context for Learning: Message from the...
- ▶ COURSE RESOURCES
- ▶ SESSION 1 - May 23rd OR 24th
- ▶ SESSION 2 - May 30th OR 31th
- ▶ SESSION 3 - June 5th OR 6th
- ▶ SESSION 4 - June 19th OR 20th

The AOLS courses are based on mutual respect, adult learning principles and are offered in an environment built on trust. Cadastral surveying is both a competency and an ethics-based profession and as such the rigorous application of professional standards is expected and required. As a Learner participating in an AOLS course, you agree to conduct yourself in a professional manner. You also agree to:

1. *Participate Meaningfully*: As an adult Learner, your participation is to be contributory. In other words, your interests, work/life experience and knowledge are part of the learning process. AOLS — and its designated course Instructors — promote collaboration, information exchange, and sharing of best practices.
2. *Mutual Fairness*: The Instructor is committed to facilitating your learning process to increase the likelihood of successful completion of a course. In turn, you agree to study the materials provided and to use reasonable effort to attain competencies.
3. *Communicate Courteously*: All writing, posting or submission in a forum, blog, email or skype chat with other Learners is to be respectful, civil, and free of any offensive remarks, insults, slander, or defamation. Such misconduct will result in appropriate action, including termination of your participation in the course.
4. *Submit Original Work*: All contributions (e.g., assignments, tests, essays) submitted as your personal work are to be your original works. If plagiarism is suspected, the Registrar of AOLS will investigate and determine appropriate action in consultation with the Instructor and other relevant stakeholders.
5. *Respect Copyright*: All copyright and intellectual property rights in course materials are to be respected. Recording, re-distribution or re-publication of teaching material and audio-visual remote sessions requires prior permission of the owner. You consent to the use of your picture, likeness and voice in the re-broadcast, distribution and teaching of this course as often as AOLS requires, without your further permission or compensation.
6. *Not Treat Information as Legal Advice*: Information shared during course discussions is not to be construed as legal opinion. Likewise, the materials made available are for teaching purposes only and cannot serve as a substitute for proper legal advice.



# Integrated LMS and web-based “community” of learners



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Research and Learning in Geomatics

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audio educating evaluation communication online school lecturing role computer-supported program  
web space auto system blended information initiative  
success zeal lms content based internet  
learning interaction distance learner process animation virtual simulation  
motivation video learning platform wisen cooperative interactivity attention management mind

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Topic outline

## Intro to Canadian Common Law for Surveyors

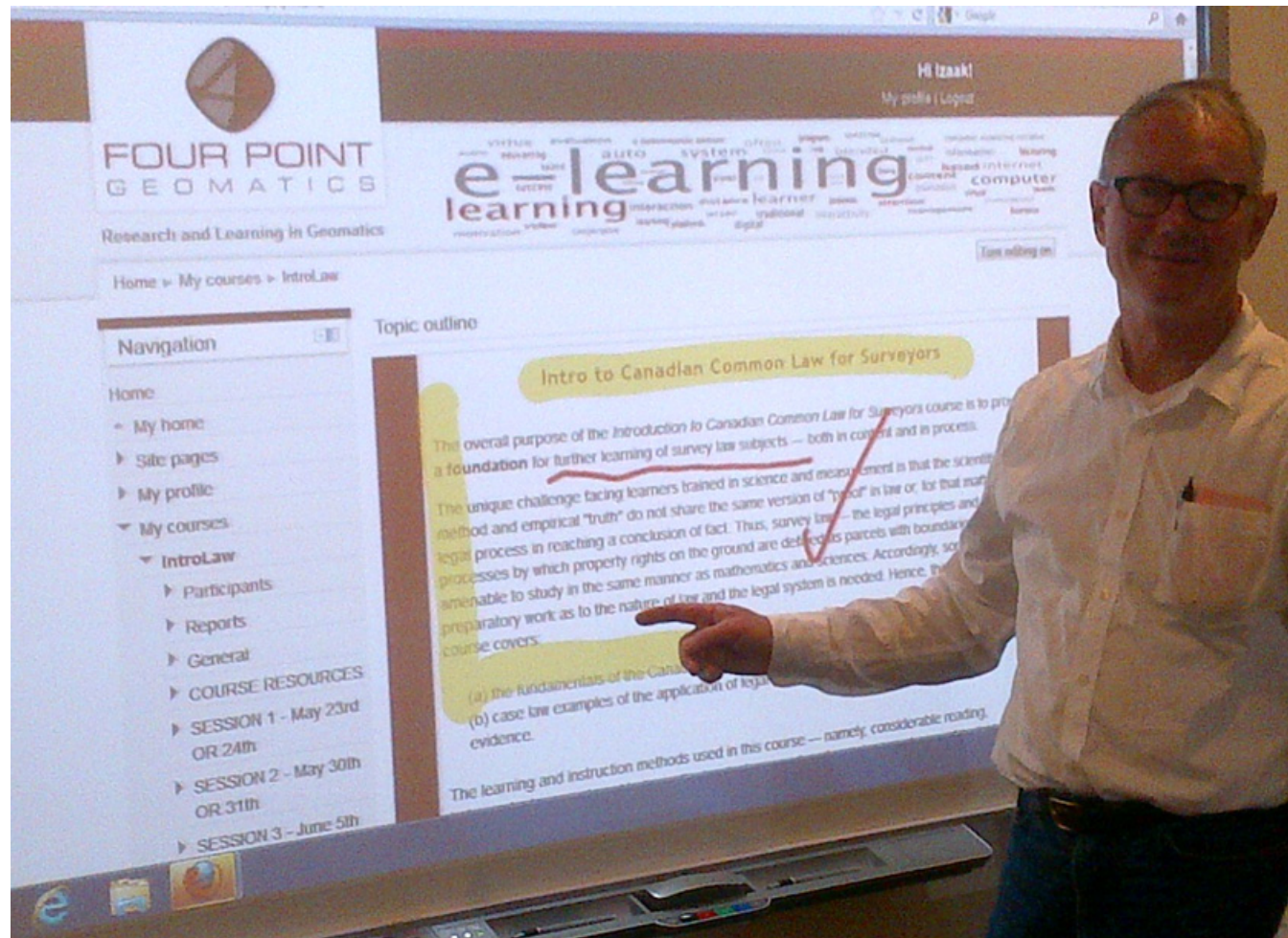
The overall purpose of the *Introduction to Canadian Common Law for Surveyors* course is to provide a **foundation** for further learning of survey law subjects — both in content and in process.

The unique challenge facing learners trained in science and measurement is that the scientific method and empirical "truth" do not share the same version of "proof" in law or, for that matter, the legal process in reaching a conclusion of fact. Thus, survey law — the legal principles and processes by which property rights on the ground are defined as parcels with boundaries — is not amenable to study in the same manner as mathematics and sciences. Accordingly, some preparatory work as to the nature of law and the legal system is needed. Hence, this forerunner course covers:





# Interactive whiteboard produced by Smart™ Technology



# Online Resources



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Research and Learning in Geomatics

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## Online Resources

### Introduction to Canadian Law

- Canada's System of Justice — brief outline of Canada's laws and the whole justice system, including: what the law is, where it comes from, what it is for, and how it operates
- Nova Scotia Education Services [Introduction to Canadian Law](#) — basic overview of the nature of law, how it operates, and types of law. If you do not have Microsoft PowerPoint software installed on your computer, click [here](#) for the PDF equivalent of this 18-slide presentation.
- University of Ottawa's [Principles of Legal Research](#) — introductory tutorial on the many resources available online
- McGill University Law School's [Introduction to Canadian Private Law: Common, Civil & Mixed](#) — overview of Canadian history with an emphasis on Quebec's civil law and civil code. If you do not have Microsoft PowerPoint software installed on your computer, click [here](#) for the PDF equivalent of this 109-slide presentation.
- The Law That Rules — This narrated powerpoint on Canadian law presents information on how the legal structure of Canada is organized, the history of our laws and an explanation of the Rule of Law.