



eQRm

ENGINEERING QUALIFICATION  
RECOGNITION MODEL

# THE WORKING IN CANADA COURSE

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## DISTANCE EDUCATION DELIVERY ALTERNATIVES

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## INTRODUCTION

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The Internationally Educated Engineers Qualification (IEEQ) Program at the University of Manitoba provides international engineering graduates (IEGs) with an alternative path to licensure by means of eight months of classroom education and a four-month paid work term.

In fulfilling the classroom component of the program, one of the courses that IEGs are required to take is *Practicing Professional Engineering in Manitoba (PPEM)*, a three-credit-hour university-level course developed specifically for the IEEQ Program. Its purpose is to assist IEGs in the process of transition to the culture of professional engineering in Canada.

This highly successful course has since been used as the basis for a more generalized course suitable for use in other jurisdictions as part of the engineering Qualifications Recognition model (eQRm) project. Renamed *Working in Canada*, the course maintains key components of the University of Manitoba course, while allowing other jurisdictions to adapt it to their circumstances.

As with the PPEM course, *Working in Canada* provides the eQRm participant with an introduction to Canadian engineering culture in 26 classroom sessions spread over an 8-month term. It is designed to be delivered in a classroom mainly by an instructor who is both a qualified instructor and a licensed professional engineer. In addition, guest speakers are used extensively, industry tours are encouraged as a means of exposing students to significant local industry sectors, and English-as-a-Second Language (ESL) tutoring is encouraged to help participants improve their command of English communication skills.

From the perspective of many students and faculty observers, an equally important feature of the *Working in Canada* course is that it provides a natural place for participants to meet other engineering students, professors and industry representatives in a non-confrontational setting. It also provides the opportunity to hear and understand the local acronyms, jargon, etc., both technical and non-technical, which are often missing from a newcomer's vocabulary.

In summary, essential features of the classroom version of *Working in Canada* are considered to be:

- A structured program of classroom presentations by a knowledgeable instructor;
- Frequent use of guest speakers who share their experience of professional engineering practices in Canada;
- Industry tours;
- Support for language learning; and
- Frequent access to other students, professors and industry representatives.

The combination of these elements has proven to be very successful in helping IEGs acclimatize themselves to engineering as it is practiced in Canada.



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## THE DISTANCE EDUCATION ALTERNATIVE

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The success of the classroom version of the *Working in Canada* course has raised interest in the possibility of making it available to a wider audience by means of distance education technology.

At present, the only IEGs able to benefit from the course are those who participate in person in the University of Manitoba IEEQ program (a second eQRm-type program offered by Ryerson University does not offer a *Working in Canada*-type course). In effect, this currently limits participation in the program to no more than a handful of Manitoba-based students each year. It is hoped that additional universities will eventually adopt eQRm-type programs that include a *Working in Canada* course offering. Even then, the number of available seats will remain small.

The need for greater access to eQRm and *Working in Canada* learning resources is underlined by the fact that thousands of international engineering graduates immigrate to Canada each year. From 1992 to 1997 alone, 34,926 immigrants who self-identified as having worked in engineering in their home country arrived in Canada, a three-fold increase over the decade before<sup>1</sup>. Unfortunately, only a small percentage of these skilled immigrants were eventually able to work in Canada as engineers due to a variety of circumstances and barriers.

So, having access to a distance education version of *Working in Canada* might give increased numbers of IEGs the opportunity to understand the nature of Canada's engineering workplace. Further, the existence of such an on-line course might also make it easier for additional institutions – freed of the need to create and support a classroom-based *Working in Canada* course of their own – to consider offering other components of an eQRm-type program.

The challenge is to offer a distance education version of *Working in Canada* that preserves the elements that makes the classroom version so successful, namely: structured content delivery, guest speakers, on-location industry tours, ESL support, and ready access to students, professors and industry representatives.

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<sup>1</sup> Zhao, John, *Brain Drain and Brain Gain: The Migration of Knowledge Workers from and to Canada*, Education Quarterly Review, Vol. 6, No. 3, 2000.





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## DISTANCE EDUCATION APPROACHES

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Fortunately, distance education has become a powerful and effective alternative / complement to classroom-based instruction in recent years. Some Canadian institutions<sup>2</sup> specialize in distance education delivery of university-level education, and virtually all Canadian institutions of higher learning use distance education approaches to some extent.

Although a wide range of distance education hardware and software technologies are currently in use, two major approaches – and one hybrid solution – appear to be particularly suited to the delivery of the *Working in Canada* course. They are:

**Instructional Television**, the delivery of lectures, workshops, seminars and special events to recipients at specific locations by means of dedicated video/audio links which support real-time interaction between the broadcast site and the receiving locations.

**Internet-Based Course Delivery**, in which pre-packaged course materials are available from virtually anywhere in the world at the user's convenience. Typically, such systems also feature a range of additional capabilities such as:

- Scheduled on-line chats with the course instructor(s) and other students by means of conferencing software
- Webcasts of special events, such as presentations by guest speakers
- Shared workspaces for group collaboration
- Personal profiles of participants, complete with photos
- Asynchronous chat rooms for on-going discussions and social interaction
- Access to large databases of learning resources
- ... and more.

**Residencies Interspersed with Distance Education**, in which course participants are expected to come to a centralized location in person for one or more short periods during a study term – typically 1-to-2 weeks at a time – to meet teaching staff and fellow students, build rapport, learn certain skills, and participate in special events. In the interval between residencies, learning continues by means of distance education.

All three of these approaches approximate the strengths of the in-classroom course by maintaining visual and conversational connections among the participants, providing a means to include guest lecturers, preserving group collaboration capabilities, and providing access to a rich resource of course materials and other learning resources.

Additional detail on each approach is provided on the following pages.

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<sup>2</sup> Among many examples of post-secondary institutions offering robust distance education programs are Athabasca University in Alberta, Royal Roads University and Thompson Rivers University in British Columbia, and the University of Ottawa and University of Guelph in Ontario.



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## INSTRUCTIONAL TELEVISION (ITV)

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Instructional Television is a powerful medium which integrates television and telecommunications technology. The most common configuration is a one-way television feed via fibre-optic cable or satellite to multiple pre-determined sites, supplemented by an audio link connecting all of the sites and sometimes by additional technologies such as digital white boards and computers to help capture and deliver notes recorded by the instructor during a class, as well as course resource materials. Two-way video may be implemented if there is a demonstrated need to do so, but at a greater cost. At the originating location, a support crew provides recording, switching and transmission services.

Live broadcasts can be supplemented by the presentation of pre-recorded videos, live question and answer sessions, and live feeds from remote sites. Because ITV sessions permit effective, simultaneous delivery to many different sites, they make good use of the time of busy instructors and guest subject matter experts.

A number of institutions have ITV broadcast facilities<sup>3</sup> (and some have dedicated receiving sites), offering the possibility that an ITV variant of the *Working in Canada* course could make use of these established resources.

Key ITV factors to consider:

### Pro's

- Closely approximates the ambiance of face-to-face presentations
- Permits distribution of learning materials to multiple sites
- Can incorporate live instruction and pre-taped materials
- Video quality is excellent
- Makes good use of the time of instructors and subject matter experts
- A number of institutions already have the required infrastructure in place

### Con's

- Start-up costs and overhead are high if facilities must be created from scratch
- Requires audiences to attend ITV sessions at fixed times and locations
- Large audience size may limit interactivity
- Requires support from skilled technical personnel

### Applications

- Lectures by subject matter experts
- Demonstrations
- Live coverage of special events
- Question and answer sessions with guests

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<sup>3</sup> Examples of Canadian Universities with ITV facilities that might be willing to deliver the *Working In Canada* course as part of an eQRm initiative include: Camosun College in British Columbia; the University of Alberta in Edmonton; the University of Saskatchewan in Saskatoon; Carleton University, the University of Ottawa, and the University of Toronto in Ontario; Dalhousie University in Nova Scotia – and others.





### Cost Factors

- Fixed facilities such as pre-equipped classrooms and studios
- Support crew and equipment
- Telecommunications costs

As indicated above, ITV can also easily incorporate pre-recorded video productions specially prepared for viewing by course participants. For instance, videos can be used to show highlights from a visit to an engineering worksite, to demonstrate work routines, or to capture presentations or demonstrations by experts. The video component of an ITV event often takes the form of several short modules, sometimes no more than a minute or two in length, designed to impart useful information and to add visual appeal.

Regarding the pre-recorded video components of an ITV event:

### Pro's

- Strong visual appeal
- Suitable for many applications
- Once captured, can be used again and again

### Con's

- Linear presentation format
- Non-interactive
- Not easily updated
- Can be expensive

### Applications

- Recording of field visits
- Guest lectures and demonstrations
- Technical training

### Cost Factors

- Production tools and facilities required (recording, editing and playback equipment)
- Personnel for recording, editing and playback
- Cataloguing and storage tasks to be performed



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## INTERNET-BASED COURSE DELIVERY

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Internet-based course delivery has made dramatic advances in recent years. Today, the hardware and software used to capture, organize and deliver on-line distance education is versatile, reliable and reasonably priced. More important, the understanding of how to use the medium to deliver effective learning has also advanced by leaps and bounds. Long-gone are the days of page-turner programs. In their place is a dynamic mix of multimedia presentation materials, real-time video and audio communication, shared on-line workspaces, and much more. As with instructional television, Internet-based courses are able to make effective use of pre-recorded digital video productions to show highlights from a visit to an engineering worksite, demonstrate work routines, or capture presentations by experts. In short, the best on-line courses preserve much of the direct interaction and visual appeal that is so important to face-to-face learning, while introducing new tools, such as hyperlinks to enrichment materials, which can actually improve learning results when compared to classroom-based approaches.

Converting an existing classroom-based course into an effective on-line version presents some special challenges. It is clearly not enough to convert presentation notes into scrolling text screens. The ideal is to package existing materials in a way that makes full use of the Internet's rich visual environment as well as its ability to hyperlink presentation materials to related resources. This may require a course developer to go well beyond his or her original classroom materials to satisfy the curiosity of an on-line student.

In addition to the packaging of presentation materials, there is a need to find ways to simulate the questions and answers, the sharing of anecdotes, the opportunities to follow an interesting line of thought, the follow-up meetings with instructors or fellow students, and the other person-to-person activities that are so important to classroom learning. While the Internet offers a number of ways to introduce this kind of interactivity, the challenge is to select an appropriate mix of tools, to teach participants how to use them, and to sustain interest and involvement throughout the course period.

If the long-term goal is to create a suite of related on-line course materials, it may make sense to develop a "virtual campus" environment from the outset. A virtual campus is a repository for on-line courses, together with a digital infrastructure to manage course selection, registration, session logins, usage tracking, test score recording, and other features. Virtual campuses of this kind have already been established at many Canadian colleges and universities<sup>4</sup>, opening the possibility of finding a collaborative arrangement in which an existing virtual campus could host the *Working in Canada* course at an attractive cost.

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<sup>4</sup> Examples of Canadian universities and colleges that have invested heavily in Virtual Campus environments are Royal Roads University in Victoria, British Columbia, Athabasca University in Athabasca, Alberta, and Algonquin College in Ottawa, Ontario.





When evaluating an Internet-based approach to distance learning, things to consider include:

### Pro's

- Equipment and software are readily available to host on-line courses
- Learners have continuous as-needed access to most course materials
- A mix of presentation and communications features enlivens the learning experience
- Learners can participate from their own homes (i.e. they don't have to go to a specially equipped facility)
- Participation builds computer skills
- Some routine functions (e.g. registration, recording of test scores, etc.) are automated, relieving the instructor of some tedious responsibilities
- The dialogues generated in conferencing can become a source of new learning materials (e.g. personal anecdotes, answers to intriguing questions, etc.)

### Con's

- There is a heavy time requirement at the outset to create or repurpose course materials
- There may be a need to invest in the creation of a virtual campus environment if one does not already exist
- Not all individuals have access to high bandwidth Internet services
- Participants must own or have access to a computer (not always a given for immigrant communities)
- Participants require writing, typing and computer skills
- Interaction may seem impersonal
- Instructors may not be able to form a clear impression of each student – and vice versa
- Active class participation in dialogues, chats and email communication may make heavy, unpredictable demands on instructor time
- Participants often do not form the same long-term ties with the learning institution that is fostered by classroom-based courses

### Applications

- Learning that does not require hands-on practice
- Courses that lend themselves to visual presentations, guest lectures and special events  
Webcasts

### Cost Factors

- Initial investment in a supporting infrastructure (i.e. a host server, high bandwidth access, authoring software, course management software, virtual campus environment)
- On-going server hosting and technical support
- Personnel to keep abreast of student queries, postings, submissions, etc.
- Student investment in computers and Internet access





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## A HYBRID APPROACH: RESIDENCIES & DISTANCE EDUCATION

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To preserve one of the most appealing and effective aspects of classroom learning – direct face-to-face interaction among students, teaching staff, and guest lecturers – a number of institutions offer a hybrid approach to adult education that combines a distance education program with short face-to-face residencies at the host institution. This approach is particularly well suited to adult professionals who wish to pursue additional credentials but cannot be away from their workplaces for extended periods<sup>5</sup>.

Typically, learners accepted into such a program assemble at the host university at the very beginning of the study period, often living in university residence for a period of 1-2 weeks while they attend kick-off classes and events. The purpose of such a residency is to enable students and teaching staff to meet one another, form work groups, participate in an introductory course module, and receive instruction in the on-line learning skills they will need for the distance education portions of the course. A second residency may be scheduled to coincide with the start of a second semester of studies, with a third scheduled to coincide with an exam, evaluation or graduation period at the end of studies. Residencies are often scheduled to coincide with “quiet periods” at the university (e.g. during the summer or spring break) to ensure that residence rooms are available.

Participants in residencies of this kind say that they are extremely important in creating bonds among course participants, fostering enthusiasm and commitment, teaching on-line learning skills, and heading off problems that might otherwise develop when distance learning activities begin. Instructors report that they have a much better sense of the strengths, weaknesses and needs of each student as a result of meeting and working with them in person than they could ever hope to gain by distance communications methods alone.

Features of the hybrid approach are:

### Pro's

- Ensure that students, teaching staff, and guest lecturers have at least some direct face-to-face interaction with one another
- Skills required to participate effectively in distance education activities are imparted at the outset of studies
- Participants are better motivated to continue and thrive in their studies
- Learners do not have to leave their homes or places of work for extended periods
- Participants feel more connected to the host institution and are more likely to form long-term ties to it

### Con's

- Students may face significant travel and accommodation costs
- Short residencies may not provide enough time to achieve the acculturation that is so important to IEGs

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<sup>5</sup> A good example of an institution offering this approach is Royal Roads University in British Columbia, the first university in Canada to make extensive use of a learning model that blends short residencies and collaborative Internet learning.





## Cost Factors

- Administrative support for student registrations and arrivals
- Classroom and other facilities required during the residencies
- Travel and accommodation costs (for students)



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## CONCLUSION

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The strengths of the classroom-based *Working in Canada* course are that it delivers much-needed information about the practice of engineering in Canada, while also providing ESL support and ready access to teaching staff, industry representatives, other IEGs, and students in the regular engineering program stream.

Is distance education a viable alternative?

The answer, based on the materials presented above, appears to be a qualified YES. Present-generation distance learning technologies can certainly deliver instructional materials in a compelling way. They also provide several proven methods of creating synchronous and asynchronous connections between and among students, teaching staff, and subject matter experts. These capabilities offer an attractive means of expanding the reach of the *Working in Canada* course to include many IEGs who would not otherwise be able to participate.

The major shortcoming of distance education techniques alone is the lack of direct face-to-face interaction among course participants, which limits opportunities to meet other engineering students, professors and industry representatives, to learn local jargon, and to feel a true part of an engineering community. It would be unfortunate, indeed, to lose these important aspects of the classroom-based course.

Combining the best of these two worlds – the reach and rich informational content of on-line studies with the face-to-face intimacy of classroom studies – currently shows the best promise for next-generation delivery of the *Working in Canada* course.

It is important to keep in mind, however, that all distance education technologies are evolving rapidly at the present time. New capabilities are emerging that may, in short order, change the attractiveness of a particular delivery method compared to others. When it comes time for an eQRm partnership to consider distance delivery of the *Working in Canada* course, a more detailed review of client requirements and of the technical capabilities, availability, reach and cost structure of competing distance education delivery channels will certainly be required.





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## APPENDIX

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### 1) Implementation path for the creation of an Electronic Classroom

- a. Determine locations to be interconnected and if any of the specific areas are served by existing facilities, specifically University or Community Colleges.
- b. Determine enrolment potential, numbers in main location and remote locations.
- c. Determine operational plan and budget for operations staff and ongoing maintenance and upgrades.
  - i. Number of staff, hiring process and reporting structure along with job descriptions
  - ii. Standard operating procedures to be established for day-to-day operations, including bookings, rates (if applicable) and third party contracting for services when required.
- d. Contract AV Engineers with respect to design and implementation plans for electronic classrooms as well as prepare bid documentation for AV suppliers. Estimated cost \$12,000.00. Plan should incorporate two possible scenarios as well as hybrid model.
  - i. A main or host classroom site that is fixed with fixed remote sites.
  - ii. Specific geographic location is not a requirement for either host site or remote sites. Plan incorporates creating a mobile (air pack) host site and a mobile (air pack) remote site.
  - iii. Hybrid is combination of both of the above determined primarily on feasibility and potential partners/agencies
- e. Hire staff
- f. Call for bids
  - i. RFP regarding equipment requirements
  - ii. RFP regarding installation
- g. Contracting
- h. Implementation, testing and training
- i. Ongoing operations





2) Example equipment list of an electronic classroom Host studio (Instructor on-site)

EQUIPMENT LIST	COST
HDX8400 XLP - Polycom HD (720p Max Resolution) Videoconferencing Codec <i>Comes complete with HD Camera, People + Content, People + Content IP and 4 way Multipoint Bridge</i>	\$6,500.00
QuadBRI - Polycom QuadBRI ISDN Interface	\$1,320.00
NT1 Quad - Quad NT1 ISDN BRI Interface	\$645.00
T-17SXL - Hitachi Interactive Display Tablet	\$2,400.00
TH50PF10UKA - Panasonic 1080P High Definition Plasma Display	\$3,120.00
MXA75 - Biamp 6 Channel Audio Mixer with 75W Amp	\$600.00
SI 26 - Extron Surface Mount Two Way Speaker- Pair	\$345.00
EW 112 GZ - Sennheiser Evolution Series Wireless Lapel Mic	\$750.00
Miscellaneous Cables and Hardware	\$1,500.00
Installation and training	\$3,500.00
<b>Total estimated costs</b>	<b>\$30,680.00</b>

3) Example Equipment list of an Electronic Classroom remote student studio/site

EQUIPMENT LIST	COST
HDX8400 XLP - Polycom HD (720p Max Resolution) Videoconferencing Codec <i>Comes complete with HD Camera, People + Content, People On Content</i>	\$11,600.00
QuadBRI - Polycom QuadBRI ISDN Interface	\$1,320.00
NT1 Quad - Quad NT1 ISDN BRI Interface	\$650.00
TH50PF10UKA - Panasonic 1080P High Definition Plasma Display	\$3,120.00
MXA75 - Biamp 6 Channel Audio Mixer with 75W Amp	\$600.00
SI 26 - Extron Surface Mount Two Way Speaker- Pair	\$345.00
EW 112 GZ - Sennheiser Evolution Series Wireless Lapel Mic	\$750.00
Miscellaneous Cables and Hardware	\$1,500.00
Installation and training	\$3,500.00
<b>Total estimated costs</b>	<b>\$23,385.00</b>

Host site, remote site, including \$12,000 in engineering fees \$69,065

Capabilities would include the ability to send and receive, camera source, computer source (Word, Excel, PowerPoint) or white board (at Hosts site based on the above costing scenario).

Transmission in real-time using ISDN connection most cost effective, secure and reliable.





#### 4) Example of Operating costs breakdown (per annum)

OPERATIONS	COST
Staff	\$55,000.00
Maintenance & software upgrades	\$4,000.00
Rent (Host site only)	\$24,000.00
Materials/Tape/Media	\$6,000.00
Professional Services	\$10,000.00
Travel	\$10,000.00
Freelancers (based on 50 full days of use)	\$24,000.00
Communications/IT (includes ISDN services)	\$65,000.00
<b>Total estimate costs</b>	<b>\$198,000.00</b>

**Total estimated project costs<sup>6</sup>**

**\$267,065.00**

It is important to note that pricing can change significantly and that technology will change and different solutions can be adapted. The significant cost is in fact the actual day-to-day operations and staffing that would be required to run an independent operation. This is why our recommendation would be to look at partnering with existing Universities and Colleges across the country, many, such as Carleton University are running many courses and therefore can invest in the staff and technology of distance learning.

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<sup>6</sup> Please note that all costs are estimated in 2008 Canadian dollars for a major metropolitan area in Canada.