

Proceedings
Enhancement of the Global Perspective for
Engineering Students by Providing an
International Experience

Engineering Conferences International

Year 2003

Developing Global Perspectives for
Engineering Students: A North
American View

Axel Meisen
Memorial University of Newfoundland

This paper is posted at ECI Digital Archives.
<http://dc.engconfintl.org/enhancement/4>



Developing Global Perspectives for Engineering Students: A North American View[†]

Axel Meisen, Ph.D., P.Eng., Eurlng
President and Vice-Chancellor
Memorial University of Newfoundland, Canada

North American universities have created a wide range of initiatives to develop global perspectives amongst engineering students. Instead of providing an encyclopaedic overview of the situation in North America, this paper is written to provide the reader with a general understanding and to serve as a basis for discussing future initiatives.

The paper is divided into three main sections: a brief introduction to Memorial University of Newfoundland (a typical comprehensive university in North America), examples of current North American approaches for developing global perspectives amongst engineering students, and suggestions for new initiatives.

Introduction to Memorial University of Newfoundland

Like many universities around the world, Memorial University reflects its surroundings and history. Memorial University is located in the Province of Newfoundland and Labrador, the easternmost region of the North American continent and Canada. The distance to London, England is comparable to that to Chicago, USA.



While its location is frequently thought of as far north location, the southern regions of the province and its capital city St. John's are further south than Paris, Seattle and Vancouver.

Nevertheless, the climate can be quite harsh, being influenced by the cold Labrador Current to the east and the warm gulf stream to the south.

The Province is characterized by spectacular settings, abundant wild-life and a very small population.

[†] Presented at "Enhancement of the Global Perspective for Engineering Students by Providing an International Experience", Engineering Conference International, Inc., Tomar, Portugal, April 6 - 11, 2003.
(2003) Ref: U/AM/ENGI0625.DOC.DOC



Area and Population

	Area (sq.km)	People (million)	Persons / sq. km
Germany	357,000	82.0	230
Canada	10,000,000	31.9	3
Newfoundland and Labrador	404,000	0.5	1

Newfoundland was Great Britain’s first colony and a dominion, similar to Canada, until 1949. In that year and upon a referendum, Newfoundland joined Canada and became a province. Its official name is now the “Province of Newfoundland and Labrador”.

The origin of Memorial University lies in the First World War, in which the Newfoundland Regiment sustained extraordinary losses in the battle of the Somme. To commemorate and to create a living memory to this tragedy, Newfoundland founded Memorial College in 1925. It was a university-level college where students could study for two years before transferring to a university in Great Britain or in Canada (typically Dalhousie University, McGill University or the University of Toronto). In 1949, Memorial College was transformed into Memorial University of Newfoundland as one of the first acts of the new provincial legislature. Its objectives were to provide educational opportunities for the citizens of the province, be a most distinguished university for its size, and to play an important role in the economic, social and cultural development of the province.

Since its creation, Memorial University has undergone extraordinary growth. Today, the university has approximately 17,000 students studying on four campuses: two in St. John's, in the south-eastern region of the Island of Newfoundland, one in Corner Brook (Sir Wilfred Grenfell College) on the west coast of the Island of Newfoundland, and one in Harlow, near London, Great Britain. In addition, the university has a special language institute in St. Pierre, France (near the southern coast of the Island of Newfoundland), a state-of-the-art marine station in Gros Morne National Park (a UNESCO world heritage site)

and an institute in Happy Valley / Goose Bay (Labrador) supporting research and education.

Memorial University offers a comprehensive set of programs at the undergraduate and graduate levels. Research and similar highly creative activities are becoming increasingly important and are recognized as essential to the future economic, social and cultural prosperity of the Province.



Memorial University

- Arts
- Business
- Education
- **Engineering**
- Fine Arts
- Human Kinetics
- Maritime Studies
- Medicine
- Music
- Nursing
- Pharmacy
- Science
- Social Work
- Technology

The university's 50,000 alumni are found throughout the world and are well recognized for their competency, hard work and engaging attitude.

Memorial University is typical amongst the majority of public universities in North America. It serves not only regional but global needs and, like other universities, has certain distinguishing characteristics. These characteristics are shaped by history, location and opportunities. In Memorial University's case, they include a broad range of marine studies (including the fishery, oceanography, ocean engineering, marine history and economics), programs facilitating the responsible production of abundant off-shore oil and gas, rural health care, genetics and genomics based on the province's unique founder population originating from England and Ireland, and North Atlantic culture (literature, visual and performing arts) and archaeology.

In the case of engineering, Memorial University is unusual insofar that its Faculty of Engineering and Applied Science is not departmentalized and that its undergraduate programs are offered in mandatory, co-operative education mode.

It is understood that the educational programs, research activities and outreach initiatives must be globally competitive and, increasingly, available by distance and via the web.

Current Approaches for Developing Global Perspectives

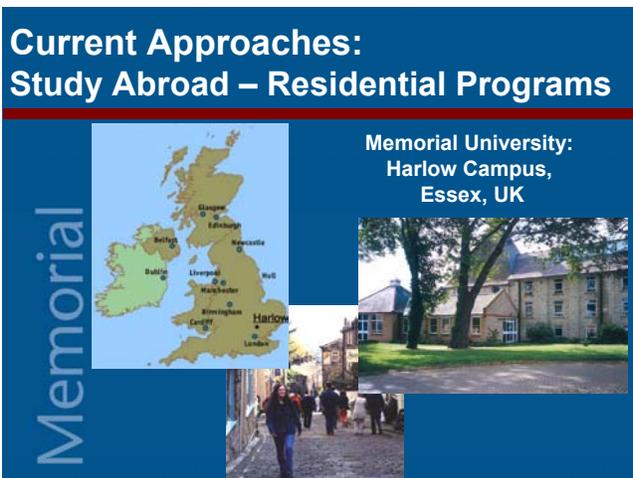
Since engineering is a profession that is practiced globally and the work of engineers frequently has global ramifications, North American universities have adopted a number of initiatives to develop global perspectives amongst their engineering students. Amongst the most common ones are study abroad and exchange programs.



These programs provide excellent academic and cross-cultural experience for students. However, the number of students travelling between pairs of universities is usually quite small and the administrative efforts to implement the programs are disproportionately high. Another problem is the fact that most engineering programs are tightly structured and it is difficult to match them to programs at other universities. As a result, it is difficult to sustain study abroad and exchange programs.

To overcome some of these difficulties, some universities have acquired overseas residential campuses for their students. For example, Memorial University has a campus in Harlow (United Kingdom),

which can accommodate approximately fifty students and several faculty members. Students typically go for one semester and travel widely in Europe, thereby becoming immersed in foreign cultures and practices.



Residential study abroad programs are now fairly common for students in the arts, humanities, education and business. They are far less common in engineering, except for engineering students who focus on courses in the

social sciences and humanities in order to complete their complementary studies requirements. Memorial University now offers courses as part of a European Studies minor on its Harlow campus. The courses, which deal with war, reconstruction and the European Union, are well suited to fulfill complementary studies requirements.

While the interest amongst engineering students in this type of opportunity is presently low, this will change as the advantages become better known.

A partial change is already evidenced by the fact that several engineering students, who have international work placements, are interested in staying on the Harlow Campus and taking courses on a part-time basis. Harlow is a global centre for research and development in the pharmaceutical and ICT industries. The combination of practical work experience with part-time study is therefore attractive.



International work placements provide, of course, another excellent opportunity for developing a global outlook amongst engineering students. Major efforts should be made to increase such placements and to have industry remunerate them properly. Unless this

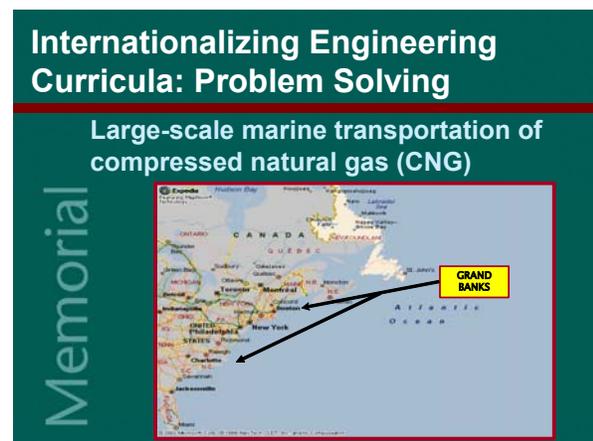
is done, students who are financially disadvantaged will not be able to participate easily in international work placements.

Suggestions for New Initiatives

Four new initiatives are suggested to foster the development of global perspectives amongst engineering students.

Internationalization of Engineering Curricula

Even without going abroad, engineering students can develop global perspectives if their curricula include international problems. An example for students in Chemical and Mechanical Engineering is the large-scale marine transportation of natural gas.

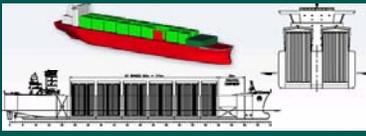


At present, it is known that there are substantial quantities of natural gas off the coast of Newfoundland as well as in North Africa. To take the gas to market in the United States or Europe, conventional pipelines or liquefied natural gas (LNG) transportation may not be technically or financially feasible.

A potential alternative is marine transportation in the form of compressed natural gas (CNG).

Internationalizing Engineering Curricula: CNG Transportation





Internationalizing Engineering Curricula: CNG Transportation





Loading Facilities

- Compression & chilling
- Loading lines
- Shuttle loading systems



Receiving Facilities

- Flowlines
- Gas handling systems
- Storage
- Public acceptance

CNG transportation poses significant engineering design challenges, including vessel design, shipboard storage, loading and off-loading and on-shore storage. The acceptance by international certification agencies and the public are also required. These requirements can only be fulfilled if the engineer understands the environment within which decisions are made.

The international experience can be further enhanced if the engineering students from different universities are collaborating in the design study. At present, discussions are underway between Memorial University and King Fahd University of Petroleum and Minerals (Dhahran, Saudi Arabia) to create joint engineering design projects and to conduct them on Memorial University campus in Harlow, England. Since the campus is close to some of the world's premier engineering design firms, the students could draw on local, international experts.

International Engineering Practice

Some opportunities also exist to engage students in international engineering practice. A good example was the evaluation of designs for entries into the America's Cup race. The contract for the design evaluation of the Swiss entry (the Alinghi) was held by Oceanic Consulting Corp., a Newfoundland company. Although the work was conducted in a strictly confidential manner, engineering students subsequently learnt about the basic methodologies and highly competitive international standards.

International Engineering Practice



The fact that the Alinghi won the Cup added to the realism and thrill of the learning experience.

Executing Large-Scale Collaborative Research Projects

While the focus of this paper has been largely on providing undergraduate engineering students with international perspectives, there is a similar need for graduate students.

Executing Large-Scale Collaborative Research Projects



This need can be addressed by collaborative, international research projects. Examples of such projects are the development of autonomous underwater vehicles (AUV) and telemedicine. Both types of projects require considerable financial and intellectual resources, resources that are not usually held by a single university. Partnering is therefore required and, if the partners are selected from different countries, good international learning opportunities result.

As in the case of international design projects, the development of AUV's and telemedicine also provide major cross-cultural learning opportunities. A major impediment to such projects is that there are relatively few countries willing to support university-based R&D on an international scale. The European Union provides a major exception.

Internationalizing the Engineering Professoriate

The development of global perspectives amongst engineering students is greatly assisted when the engineering professoriate has international experience.



It is particularly difficult for engineering professors in developing countries to acquire and maintain such experience. Memorial University has therefore started to pursue joint appointments of academic staff at foreign universities. The staff members could, by agreement amongst the universities, departments, unions and individuals, be contracted for one term per year to engage in teaching and research. To provide stability, the contract period should extend over several years thereby

allowing repeat visits. This arrangement seems to be of great interest to faculty in developing countries since it would also keep them conversant with technological advances in the developed world, provide additional income and access to research facilities. The faculty members from the developing countries would bring an international orientation to the teaching of North American students.

Conclusions

Although many North American universities provide their engineering students with opportunities to acquire global perspectives through study abroad and exchange programs, these measures do not usually involve large numbers of engineering students and are difficult to sustain. The following measures are currently under consideration and their full implementation should lead to significant advances:

- Internationalization of engineering curricula through innovative international design experiences;
- Participation in international engineering practice, including design competitions;
- Executing large-scale collaborative research projects, a measure that is particularly well suited for graduate students
- Internationalizing the engineering professoriate through joint appointments

Memorial University is interested in pursuing these opportunities with international partners, particularly partners interested in using Memorial University's residential campus in Harlow, England.

I would welcome expressions of interest. I can be contacted at: Prof. Axel Meisen, President's Office, Memorial University of Newfoundland, St. John's, NL, Canada A1C 5S7; Tel.: (709) 737-8212; Fax: (709) 737-2059; E-mail: president@mun.ca.