

# **Educating and promoting women in engineering through an international conference for undergraduate and postgraduate engineering students.**

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***Abstract:** This paper presents one undergraduate's experience of attending the 2009 International Institute of Women in Engineering student conference in Paris. The program was devised to introduce students to global issues in engineering and to provide multidisciplinary and multicultural experience in learning and authentic engineering practice.*

## **Introduction**

Traditionally engineering has been a male dominated profession, yet despite both a growing interest among women for studying engineering and a level of acceptance for women working in the engineering industry, women in some engineering disciplines remain under-represented. As a result women experience particular challenges related to their studies as well as to their professional practice, including female engineers place in leadership, management and on site, and balancing professional and family life.

The International Institute of Women in Engineering (IIWE) was formed in 2001 to actively support women in engineering through seminars, courses, forums and network events. Whilst aimed at supporting women the IIWE is also inclusive of men, recognizing that an awareness of women's issues is also important to men.

This paper discusses the experience of the 2009 three week summer short course designed to 'introduce young engineers to broad global concepts and issues relating to their future professional practice, through (a program of) interdisciplinary and intercultural learning' (Hazelton, Malone & Gardner 2009 p.281). The program is examined by the author who, as participant in the 2009 program, is in a unique position to reflect and comment upon her own experience as well as that of peer participants.

## **Background**

The International Institute of Women in Engineering (IIWE) was established in 2001 and is based at Ecole d'Ingenieurs Generaliste (EPF) in Sceaux, a suburb of Paris, France. The first annual three week conference was held in July, 2001 as the IIWE's primary initiative to encourage women studying and working in engineering fields. The conference is open to all undergraduate and postgraduate engineering students, regardless of age, race, country, specialisation or gender. Although a main focus of the conference is on women in the field, men are welcomed as both genders need to work together in engineering industry and academic settings.

Since 2006 a central conference theme has been chosen, from a general focus on sustainability, as the IIWE's response to the 2005 launch of the UN Decade of Education for Sustainable Development

(Hazelton et al, 2009). The theme for the 2009, ‘Women Engineers: Working in a Changing Global Climate’, was chosen to highlight the social, economic and environmental issues facing engineers, especially female engineers. Highlighting issues relating to social, economic and environmental contexts of engineering is particularly relevant to women who are often attracted by ‘the social relevance of engineering’ (Daudt & Salgado 2005 p.467), and who are ‘apparently more interested than men in Technology and its socio-economic interdependence’ (Beraud, 2003, p.435).

The IIWE conference differs from many conferences in that it is similar to a summer school, with lectures, presentations, site visits, workshops and projects for assessment. A number of companies and individuals donate time and resources each year, providing many opportunities for networking by attendees through field visits to companies and meeting guest speakers presenting at the conference. Lectures are held, on various days throughout the conference, on a broad range of topics, including the history of engineering, engineering education around the world, ethics, project and risk management, economics, corporate social responsibility and decision making methods. The recurrent theme of sustainability is evident in all topics, in addition to being covered separately in those lectures discussing sustainable engineering and development.

Students attending are required to complete individual and team-based coursework during the three weeks of the conference. In 2009, the participants worked on five assessment tasks: a personal poster, an individual poster presentation, a reflective journal and two group projects, including presentations for each. The poster and corresponding presentation enabled each student to introduce themselves to the entire group within the first few days, and gave valuable experience in this popular presentation style (Hazelton & Gardner, n.d.). The journal enabled the students to take notes on the lectures, presentations and site visits, as well as record personal reflections, thoughts, ideas and opinions. In randomly selected teams of between five and seven, students researched, prepared and presented two research projects.

The team assessment tasks had to take into account the diversity of group members’ backgrounds and education in order to investigate a fictitious project or United Nations millennium development goal.

### **Site Visits**

Site visits are an integral part of the IIWE program, and provide the main opportunity for networking with industry professionals and exploring possible future employment whilst gaining an insight into the companies. The visits generally consisted of lectures about the company, the site being visited, career opportunities and a range of topics specific to each particular site, talks from employees about their time at their particular company, a tour and at least one meal or tea break to allow the students to chat with company representatives. The range of companies visited varies from year to year but diversity is maintained, to ensure that as many engineering fields are covered as possible. In 2009, the six sites visited, by conference participants, were L’Oreal, IBM, Thales, Societe Generale, Areva and Coca-Cola. All students attended sessions at IBM and L’Oreal, and were allocated two of the remaining four companies. If a student’s engineering specialisation related closely to a certain company, they were assigned to that site visit, otherwise students were placed depending on when they enrolled in the program and how many people could attend each site. IBM and Areva were full-day visits and all other companies were half-day visits.



Coca-Cola Grigny plant visit, 21<sup>st</sup> July 2009.

### **UNESCO Visit**

A visit to the United Nations Education, Scientific and Cultural Organisation (UNESCO) site was a highlight of the 2009 conference. All students attended a full day of lectures and seminars hosted in a UN conference room and conducted by the IIWE lecturers and guest speakers Dr Tony Majoram, Head of Engineering at UNESCO and Tahani Youssef, Head of the World Federation of Engineering Organisations. Presentations involved outlining the purposes and initiatives of both UNESCO and WFEO, and discussion about challenges posed to women in engineering and engineering education pertaining to the UN millennium development goals.



IIWE conference participants, UNESCO seminar day, 10<sup>th</sup> July 2009.

## Participants

Whilst the IIWE initially targeted women in engineering as the principal participants of the student conferences, these meetings are open to both female and male students. This principle acknowledges that issues that affect women in engineering may also affect men in engineering, albeit in different ways.

Table 3: Gender of 2009 participants  
43 (including 4 student interns)

Female	Male
40	3

Students attending the 2009 IIWE Conference comprised 40 females and three males. Two of the male students were interns undertaking engineering work experience and the third male was a regular student participant.

Students attending the 2009 Conference were drawn from 15 different countries, as seen in Table 2 below. Interestingly, the largest number of student delegates, 16 in all, was drawn from different regions of Australia. The second largest contingent, of six students, were French, and the third largest group, of four, was from Norway.

Table 2: Number of participants by country of origin  
43 (including 4 student interns)

Country of Origin	Number of Participants
Australia	16
Canada	1
China	2
Ethiopia	1
France	6
Ghana	1
Greece	1
India	1
Israel	1
Malaysia	1
Mexico	3
New Zealand	2
Nigeria	1
Norway	4
USA	2

The diversity of countries represented reflects the IIWE philosophy of providing opportunities for women from a variety of cultural backgrounds as well as an attempt to replicate current global engineering trends.

Participants were drawn from 16 different fields of engineering ranging from Chemical to Optics, from Computer to Agricultural. Table 3, below, lists the diversity of disciplines represented at the 2009 Conference, the largest group, of 13 participants, being students from the combined fields of Civil Engineering and Civil/Environmental Engineering.

Table 3: Number of participants by engineering discipline  
43 (including 4 student interns)

Discipline Specialties	Number of Participants
Aerospace	2
Agricultural	1
Chemical	4
Civil	7
Civil/Environmental	6
Computer/IT	3
Electrical	3
General	2
Industrial	2
Instrumentation and control	1
Materials	1
Mechanical	6
Mechatronic	1
Mining	1
Optronics	2
Systems	1

Six of the 16 fields were represented by one student only. The range of engineering fields represented reflects the IIWE philosophy of encouraging multidisciplinary learning as important to both encouraging innovation and in replicating authentic engineering projects which increasingly involve large diverse teams.

### Discussion and Reflection

Over the three weeks of the 2009 IIWE conference, there was a great deal to learn through all of the activities on offer. The lectures provided information on a diverse range of topics that are of interest to engineers, especially females, but are rarely offered as part of tertiary engineering studies. A 2001/2002 European study on women and engineering education showed that the inclusion of socio-economic subjects to engineering degrees, comprising 25% of the total coursework, made the degrees more attractive to female students [Beraud, 2003]. Studies conducted by the directors of IIWE in 2006 have shown that after participating in the conference, students' knowledge of the definition, concept and components of sustainable development greatly increased: around 70% of students felt they 'knew a lot' about these topics post-conference, and all students felt they had at least some knowledge [Hazelton et al, 2009]. Knowledge in areas outside the traditional technical subjects is becoming more and more sought after in companies, as trained engineers no longer work purely in engineering firms or strictly in positions labelled 'engineer'. As Molly Malone, IIWE director, said, 'Students must realise that to be an engineer is truly a profession that can allow you to do *anything* career-wise: research, construction, HR, banking, government, communication, activism, design... the list is inexhaustible' (pers.comm, 3<sup>rd</sup> August 2009). Girls too often overlook engineering as a career path because they don't think it will make a difference in the wider world, affecting issues such as poverty, healthcare and the environment [Patel-Predd, 2005]. The IIWE program has shown the attendees that they can make a difference in the world, proven by the testimony of companies and individual speakers about the work they are doing.

Another important aspect of IIWE is learning from peers. As evidenced in this paper, there was great diversity in the 43 students that attended IIWE 2009. Working together, both in class and on projects, provided opportunities to learn about engineering education and the engineering industry in other countries, degree programs different from our own and hear about individual experiences. This sharing of knowledge and experience was greatly encouraged by the first project, where each student

discussed their education and engineering background, information that assisted in finding solutions to a problem posed by the group. In the second project, the focus was mainly on the engineering specialisations within the group and how each could contribute to the sustainable development project proposed to the students. Groups had to meet outside class hours to work on the projects, and the range of people within one group provided great discussions and debates. There was so much insight gained from other group members and each group benefited from the differences in the content and the way students had studied engineering.

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