
UNESCO-Based Efforts at Capacity Building: from 1992 to 2005*

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Technical capacity building – developing a base of well qualified engineers in developing countries to allow them to effectively pursue economic development – has been a focus of the United Nations Educational, Scientific and Cultural Organization (UNESCO) and associated organisations for the past 15 years. In this article, the author summarises the evolution of advisory committees and programmes within UNESCO, the establishment of a centre for engineering education associated with UNESCO, and the formation and activities of a new Committee on Capacity Building by the World Federation of Engineering Organizations (WFEO).

UNESCO STEERING COMMITTEE

In 1992, the United Nations Educational, Scientific and Cultural Organization (UNESCO) established a Steering Committee on Human Resources Development for Technical Industry Stimulation. The aim of this committee was to develop the means to stimulate technical capacity building in developing countries, as a base for the development of industries that would serve the needs of such countries and allow them to compete in the emerging global economy.

The committee engaged in a number of activities over the four years of its existence to 1996, namely it:

- Conducted a series of conferences on engineering education;
- Assisted UNESCO in the establishment of a sister university programme, linking schools in developing and developed countries (UNITWIN);
- Promoted university-industry cooperation in support of technical capacity building in developing countries;
- Initiated the development of a database at UNESCO on engineering education worldwide;
- Assisted in the development of the UNESCO chairs programme, which recognises outstanding

faculty members around the world;

- Promoted engineering education quality assurance standards and cross-border equivalency agreements;
- Promoted the use of satellite technology for the distribution of continuing education offerings into developing areas of the world;
- Supported the development of a clearing house on equipment and courseware, which led to the creation of the UNESCO International Centre for Engineering Education (UICEE), hosted by Monash University, Melbourne, Australia.

THE UICEE AT MONASH UNIVERSITY

The UNESCO International Centre for Engineering Education (UICEE) was established in the Faculty of Engineering at Monash University in Melbourne, Australia, starting up in 1993-1994. Leadership for its development was provided by then Dean of Engineering, Prof. Peter LeP Darvall, and by its Founding Director, Prof. Zenon J. Pudlowski. The planned scope of the Centre, as outlined in its charter from UNESCO, included the following activities:

- Collect information on equipment, courseware and software for engineering education, and make appropriate recommendations to developing countries;
- Address the effectiveness of engineering education

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in developing countries and develop programmes to enhance it;

- Review research and development (R&D) on engineering education, and disseminate appropriate information to engineering educators in developing countries via modern techniques;
- Organise appropriate short courses and conferences on engineering education.

The UICEE continues its effective operation to the present time, still under the leadership of its Director, Prof. Zenon J. Pudlowski. Its current activities can be reviewed on its Web site and in its annual reports [1].

UNESCO INTERNATIONAL COMMITTEE ON ENGINEERING EDUCATION

The earlier UNESCO International Committee on Engineering Education (ICEE) evolved into a higher-level committee, reporting to the then Director-General of UNESCO, Dr Federico Mayor, from 1996 to 2000. The ICEE achieved several accomplishments during the years of its operation, as follows:

- Developed a centre for business development as a demonstration project at Kaunas University of Technology (KUT) in Kaunas, Lithuania, supported by the Technical University of Denmark (DTU), Copenhagen, Denmark;
- Prepared a special issue of the UICEE's *Global Journal of Engineering Education* (Vol.3, No.1) on *Quality Issues in Engineering Education* in 1999 [2];
- Participated in UNESCO World Conferences on Higher Education (1998) and Science (1999) to present an engineering perspective;
- Assisted in the planning for an Arab satellite university;
- Assisted the UICEE in expanding its offerings to include a journal, a series of international meetings and the development of sub-centres at several universities around the world.

The advisory committee to the Director General was disbanded in 2000 after a new Director General succeeded Dr Mayor.

UNESCO PLANS FOR CAPACITY BUILDING: 2003 TO THE PRESENT

Stimulated by the rejoining to UNESCO by the United States of America after an 18-year absence, the engineering community in the USA and at UNESCO

developed a proposal for the enhancement of engineering programmes at UNESCO, *Engineering for a Better World*. The vision embodied in that proposal was to promote human and institutional capacity building in developing countries, for poverty reduction, and sustainable economic and social development. The focus of *Engineering for a Better World* included the following areas:

- Strengthen engineering education, training and continued professional development in developing countries;
- Promote standards, quality assurance and accreditation for engineering education in developing countries;
- Develop appropriate curricula, learning and teaching materials and methods;
- Promote distance and interactive learning, including virtual universities and libraries;
- Support the development of engineering ethics and codes of practice;
- Promote public understanding of engineering and technology;
- Develop indicators, information and communication systems for engineering;
- Address gender issues in engineering and technology;
- Promote inter-university and institutional cooperation;
- Develop policies and planning in support of the above items.

As the new US ambassador to UNESCO was appointed and began work, it was determined that UNESCO would prefer to address technical capacity building on an even broader level – by a new cross-sectoral programme. Such a programme was proposed to the UNESCO Executive Council at its Spring 2005 meeting, and was unanimously approved. It is to be implemented across three UNESCO sectors, namely: science and engineering, education, and information and computer technologies.

WFEO COMMITTEE ON CAPACITY BUILDING

In recognition and support of the internal UNESCO efforts at technical capacity building, the World Federation of Engineering Organizations has established a Standing Committee on Capacity Building to collaborate with UNESCO and other efforts. The WFEO committee was established at its General Assembly at Tunis, Tunisia, in November 2003, based on a proposal from the USA. It is hosted by the American

Association of Engineering Societies in Washington, DC, and is chaired by Russel C. Jones, the author of this paper.

The projected activities of this WFEO committee are as follows:

- Make the expertise of professional and technical societies in the developed world available to engineers in the developing world through publications, conferences, codes of practice and ethics, etc;
- Deliver needed information to engineers and engineering educators in developing countries via distance learning techniques;
- Strengthen engineering education in developing countries via the sharing of best practices in curricular reform and in engineering practice;
- Provide an information resource for the engineering education needs of developing countries – teaching and learning materials, laboratory equipment, software, etc;
- Address pipeline and diversity issues in providing the needed quality and quantity of engineer;
- Promote collaboration between institutions in developing and developed worlds;
- Promulgate quality assurance standards;
- Facilitate volunteer efforts by engineers and engineering students.

The following is a status report on the WFEO Committee on Capacity Building (CCB), covering its activities in its first two years of operation:

- Engineering for the Americas: Working in conjunction with the Organization of American States, the CCB has taken a leadership role in developing plans for enhancing engineering education and engineering practice throughout Latin America and the Caribbean. A major declaration in support of this capacity building effort was prepared for the meeting of the OAS Ministers of Science and Technology in Lima, Peru, in November 2004 and adopted unanimously. The next major step is a Symposium in Lima at the end of November 2005, to bring together representatives of industry, academia and governments to develop plans for implementing the *Lima Declaration*, adopted by the Ministers. Major funding for this conference is being provided by industry and government sources.
- African initiatives: Members of the CCB have developed plans and proposals for several initiatives in technical capacity building in sub-Saharan Africa, such as a series of workshops for

engineering educators on current best practices in engineering education internationally; the stimulation of quality assurance systems for engineering education in Africa, built upon South African expertise; workshops on entrepreneurship, involving African business schools and engineering schools in joint activities; and an internship programme for African engineering students providing work experiences in multinational companies with operations in Africa. Proposals for the funding of these initiatives are under development, and a development consultant to assist in proposal preparation and pursuit is being retained through funding by UNESCO with a US State Department grant.

- UNESCO interactions: With the rejoining of UNESCO by the USA after an 18-year absence, the US engineering community and WFEO have worked closely with the new US Ambassador to UNESCO to move towards enhancing engineering programmes and establishing capacity building programmes within the UNESCO structure. The CCB Chairman, Russel C. Jones, spent two weeks in Paris, France, in late 2004 developing a proposal for a cross-sectoral capacity building a programme that would draw upon UNESCO units in science and engineering, education, and information technology. The proposal was submitted to the UNESCO Executive Council at its spring 2005 meeting, and was unanimously adopted. The WFEO President, Dato Lee, was instrumental in developing co-sponsors and support for the proposal from WFEO member countries.
- Other activities:
 - *Virtual engineering education exhibit* – planning to capture the major exhibit of educational materials at the annual meeting of the American Society for Engineering Education (ASEE) for electronic distribution to engineering educators worldwide;
 - *Entrepreneurship conference* – planning a conference on teaching entrepreneurship to engineering students in Eastern Europe in 2006;
 - *South-South interactions* – pursuing a model of capacity building assistance to developing countries by countries that are part way up the development ladder (Chairman Jones participated in such an event in southern Africa recently);
 - *Collaborative efforts* – actively interacting with organisations like Engineers Without Borders International (EWB-I) and several

women in engineering groups to collaborate on capacity building efforts (Chairman Jones recently participated in an EWB-I meeting in Paris, France);

- *Virtual conference* – planning an electronic conference for engineering educators in developing countries who cannot get to international meetings, to be held in conjunction with an international conference in Brazil in 2006;
- *Distribution of newsletter* – monthly issues of the *International Engineering Education Digest*, edited by Russel Jones and Bethany Oberst, are being broadly distributed by the CCB through WFEO channels;
- *Presentations on the CCB's efforts* – capacity building presentations have been made at several international conferences, including the *2004 International Conference on Engineering Education*, the *2005 Annual Meeting of the European Society for Engineering Education*, the *2005 Annual Meeting of the American Society for Engineering Education*, the *2004 UPADI Congress*, etc.

These activities represent a comprehensive approach to the charter of the WFEO Committee on Capacity Building, and are synergistic with internal UNESCO efforts.

SUMMARY AND CONCLUSIONS

Over the past 15 years, efforts at utilising UNESCO and affiliated organisations to assist developing countries through technical capacity building have evolved and matured. The establishment and operation of the UNESCO International Centre for Engineering Education (UICEE) in Australia, the establishment and activity of the Committee on Capacity Building of the World Federation of Engineering Organizations, as well as the prospective development of a cross-sectoral unit on capacity building within UNESCO, are all contributing to beneficial forward motion in addressing the needs of developing countries.

REFERENCES

1. UNESCO International Centre for Engineering Education (2005), <http://www.eng.monash.edu.au/uicee/>
2. *Global Journal of Engineering Education*, Volume 3 Number 1 (1999), <http://>

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BIOGRAPHY



Russel Jones is a private consultant, working through World Expertise LLC to offer services to a select clientele. He is Editor of the *International Engineering Education Digest*, a periodic electronic newsletter. Prior to forming World Expertise LLC as Managing Partner, he served as Executive

Director of the National Society of Professional Engineers, an individual member society for licensed professional engineers with offices in Alexandria, USA.

Dr Jones received his education at Carnegie Institute of Technology, earning degrees in civil engineering and materials science. Prior to returning to Carnegie for his doctoral study, he worked as a practicing civil engineer. He has spent much of his career as an educator, starting with engineering education and broadening to higher education as a whole. After completing his doctoral degree in 1963, he taught for eight years at the Massachusetts Institute of Technology (MIT). He then served in a succession of administrative posts in higher education, for several years each: Chairman of Civil Engineering at Ohio State University, Dean of Engineering at the University of Massachusetts, Academic Vice President at Boston University, and President and University Research Professor at the University of Delaware.

Long active in the engineering profession, Dr Jones has served as a national officer of the American Society of Civil Engineers, has chaired major task committees for such groups as the American Society for Engineering Education (ASEE) and the American Association of Engineering Societies (AAES), and has served as President of the Accreditation Board for Engineering and Technology (ABET). He was General Chairman for *UPADI '90*, the biannual meeting of the Pan American Association of Engineering Societies, and has served as Co-chairman of the UNESCO Steering Committee on Human Resources Development for Technical Industry Stimulation. Prior to becoming its Executive Director, Dr Jones was active as a volunteer in the National Society of Professional Engineers, and served as President of its Delaware Engineering Society. He has

been an elected member of the Council of the Delaware Association of Professional Engineers, the state PE registration board. He is licensed as a Professional Engineer in several states, and as a Euro Engineer with the European Federation of National Engineering Associations (FEANI).

Dr Jones has been honoured with the Collingwood Prize and the Friedman Professional Recognition Award of the American Society of Civil Engineers (ASCE), and was elected to Honorary Member status in ASCE in 2004. He has been awarded the International Medal for Distinguished Contributions to Engineering Education of the Australasian Association for Engineering Education, and has been honoured as the Outstanding Delaware Engineer of the Year for 1994. He was awarded the UICEE Silver Badge of Honour for his outstanding contributions to the global engineering education and the UICEE in 1998 at the *1st Global Congress on Engineering Education*. Dr Jones has been honoured as the recipient of the 2005 Chair's Award of the American Association

of Engineering Societies. He is a Fellow of the American Society of Civil Engineers, the American Society for Engineering Education, the American Association for the Advancement of Science, the Institution of Engineers of Ireland, the Accreditation Board for Engineering and Technology, the National Society of Professional Engineers, and the Royal Society for the Encouragement of Arts, Manufacture and Commerce. He was a Senior Fellow of the American Council on Education from 1988-1990.

Currently, Dr Jones is most active in consulting on the enhancement of engineering education in developing countries, and in chairing volunteer activities in that area. He is President of the World Federation of Engineering Organizations (WFEO) Committee on Capacity Building, developing programmes to build technical capacity in developing countries in order to stimulate economic development there. He is also President of the Committee on Engineering Education of the Pan American Union of Engineering Associations (UPADI).

**Conference Proceedings of the
8th UICEE Annual Conference on Engineering Education
under the theme: *Bringing Engineering Educators Together***

edited by Zenon J. Pudlowski

The 8th UICEE Annual Conference on Engineering Education, held under the theme of *Bringing Engineering Educators Together*, was organised by the UNESCO International Centre for Engineering Education (UICEE) and was staged in Kingston, Jamaica, between 7 and 11 February 2005, with the University of Technology Jamaica (UTech) as the host and principal co-sponsor.

This volume of Proceedings includes a range of diverse papers submitted to this Conference that detail various international approaches to engineering education research and development related to the Conference theme, as well as other specific activities.

The 76 published papers from authors representing 25 countries offer an exemplary collection that address fundamental issues, concepts and achievements of individual researchers. The papers have been organised into the following groups:

- Opening and Keynote addresses
- Case studies
- Conceiving – designing – implementing – operating: CDIO initiative
- Effective methods in engineering education
- Important issues and challenges in engineering education
- Innovation and alternatives in engineering education
- International examples of engineering education and training
- Multimedia and the Internet in engineering education
- New trends and approaches to engineering education
- Quality issues and improvements in engineering education
- Research and development activities in engineering education in Jamaica
- Specific engineering education programmes

It is significant to note that, as well as the international input into the Conference, contributions have come from academics representing the University of Technology Jamaica (UTech), as well as from authors focusing on the CDIO initiative. The variation of subjects, concepts, ideas and international backgrounds in this volume of Proceedings demonstrate the global nature of UICEE-run Conferences, as well as its relevance within the worldwide affairs concerning engineering and technology education.

In order to ensure the high quality and value of the Proceedings into the future, all of the papers have undergone assessment by independent international peer referees and have been professionally edited. As such, it is envisaged that this volume will become a useful source of information on research and development activities in engineering and technology education within the context of a collaborative engineering education environment.

In order to purchase a copy of the Proceedings, a cheque for \$A100 (+ \$A10 for postage within Australia, and \$A20 for overseas postage) should be made payable to Monash University - UICEE, and sent to: Administrative Officer, UICEE, Faculty of Engineering, Monash University, Clayton, Victoria 3800, Australia. Tel: +61 3 990-54977 Fax: +61 3 990-51547

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