
North Africa Centre for Engineering and Technology Education (NACETE)

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The article describes the current situation, the role and the establishment of the *North Africa Centre for Engineering and Technology Education (NACETE)*. As of 24 September 2002, the date of the signing of the Memorandum of Agreement (MoA) between the University of Sciences and Technology *Houari Boumediène (USTHB)*, Algiers, Algeria, and the UNESCO International Centre for Engineering Education (UICEE), based at Monash University, Melbourne, Australia, the NACETE is located at the USTHB. A satellite centre of the UICEE, the NACETE espouses the aims and objectives of the UICEE. Despite the fact that the NACETE is not yet fully established structurally, it was nevertheless able to organise the *1st North African Seminar Region on Engineering and Technology Education*, covering around 12 important topics in engineering and technology education. This meeting permitted the first contact between the various elements implied in engineering education. In addition, the author describes in the article the host institution and the specific goals and objectives of the NACETE, and its role and perspectives within the UICEE global network.

INTRODUCTION

The *North Africa Centre for Engineering and Technology Education (NACETE)* has been established at the University of Sciences and Technology *Houari Boumediène (USTHB)* Algiers, Algeria, as a satellite centre of the UNESCO International Centre for Engineering Education (UICEE), which is based at Monash University, Melbourne, Australia. This has been accomplished within the framework of a Memorandum of Agreement that was signed between the USTHB and the UICEE, and which came into effect on 24 September 2002.

INSTITUTIONAL HOST OF THE NACETE

Located 15 km from the centre of Algiers, and 5 km from the *Houari Boumediène* Airport of Dar El-Beida, the USTHB extends over a surface area of 105 hectares and was built according to the plans of the Brazilian architect, Oscar Niemeyer. Moreover, in addition to its annexes and support of student life, the USTHB incorporates 24 amphitheatres (4 x 200 seats, 5 x 100 seats, 15 x 150 seats), 240 classrooms

(130 x 40 seats, 25 x 70 seats, 12 x 120 seats), from which 16 rooms are connected to the Intranet and Internet networks.

The University specialises in sciences and technology. It replaced the old Faculty of Science of the University of Algiers in the 1970s.

Specifically, the USTHB has eight faculties as follows: Mathematics, Physics, Chemistry, Biological Sciences, Earth Sciences (Geographical and Territory Management), Civil Engineering, Mechanical and Process Engineering (Chemical Engineering and Environmental Engineering), as well as Electronics and Computer Sciences. There is also the Institute for Qualified Technicians (ITS) based on campus.

This permits 66 courses of study in technology, earth sciences, natural and fundamentals sciences, with the majority being of a classical type and some interdisciplinary. The number of students at the USTHB approximates 19,800 in undergraduate studies and about 2,000 in postgraduate study, and are registered in 38 specialities. The teachers number 1,419, of which 290 are professors and associate professors.

The University also has 43 research laboratories, which have the following national research projects:

- National Committee of Evaluation and Programming of Scientific Research (CNEPRU);
- National Agency for the development of University Research (ANDRU);
- National Agency for the Development of Research in the field of health (ANDRS) or for Algero-French cooperation (CMEP, CNRS, INSERM).

These projects cover all of the specialities in the field of fundamental and applied sciences and transdisciplinary research.

The ambition of the University is to maintain the link between the fundamental and applied sciences, as well in the formation, as in research. The academic objectives of the University are, in priority:

- Doctoral studies, with the objective to form university teachers and researchers who are sanctioned by a postgraduate diploma (Master and Doctorate);
- Engineer diploma (five years);
- Diploma of higher education in fundamental sciences (DES in four years);
- Diploma of applied higher education in technical specialities (DEUA in three years).

The architecture of higher education study will evolve within the framework of reforms that will touch the Algerian university.

The University is endowed with three bodies namely:

- The local education authority, which consists of the following:
 - The Rector;
 - Vice-Rector in charge of research and foreign affairs;
 - Vice-Rector in charge of academic affairs;
 - Vice-Rector in charge of planning, counselling and information;
 - The Secretary-General.
- The Council of Orientation, which is comprised of the Rector, Vice-Rectors, Secretary-General, Deans, teacher representatives and students.
- The Scientific Council, which incorporates the Rector, Vice-Rectors, Deans, representatives of teachers/faculty and scientific committee president/faculty.

INTERNATIONAL COOPERATION

The USTHB has signed Memoranda of Agreement with the following universities and organisations:

- Association of African Universities (AUA);
- Agence Universitaire de la Francophonie (AUF);
- UNESCO International Centre for Engineering Education (UICEE);
- Community of the Mediterranean University;
- Rome III University;
- Université des Iles Baléares;
- Tetis University (Mediterranean Consortium University);
- Some French and American institutions.

MISSION OF THE NACETE

The NACETE seeks to accomplish several objectives by establishing a set of priorities and terms; these are described in more detail below.

The short-term priorities are as follows:

1. The establishment of an effective NACETE secretariat, an Academic Advisory Board and an editorial board of the NACETE Newsletter;
2. The development of databases on engineering institutions in Algeria and the North African region;
3. Developing an awareness campaign in Algeria and in neighbouring countries;
4. Initiation and enhancement of University-Industry cooperation;
5. The soliciting of funds.

The medium to long-term priorities are as follows:

1. The promotion of pedagogy in engineering in institutions of higher education in the region.
2. The development of databases on high technologies, research services and qualified specialists and appropriate educational programmes. These will have a target to foster cooperation between universities, research institutes and industrial enterprises in Algeria and the North African region.
3. The exchange of information, experience and knowledge in the field of engineering education between higher educational institutions, research institutes and industrial enterprises in Algeria and other North African countries.
4. The organisation of regional seminars and conferences, and the provision of assistance in holding international fora to discuss problems in the internationalisation of engineering education, as well as quality assurance in engineering and technology education.
5. The dissemination of periodicals and other materials on issues of internationalisation and the advancement of education and the use of new

information technologies and other relevant matter related to engineering education.

6. The development and implementation of inter-university programmes in engineering and technology education.
7. Assistance in attracting international funds for higher educational institutions of the North African region for the purpose of supporting innovation in engineering and technology education.
8. Assistance in importing educational programmes from advanced universities in different parts of the world to the North African region with a view to expand engineering education globally.
9. Assistance in structuring memoranda, contracts and agreements between universities of different countries.
10. The generation of reports focusing on engineering education.
11. The development and implementation of educational programmes at different levels in the field of high technologies (BE, MSc, PhD), as well as the advanced training and retraining of specialists, which is related to the reform initiated by the Minister of Higher Education.

SPECIFIC ROLE WITHIN THE UICEE GLOBAL NETWORK

As a satellite centre of the UICEE, the principal purpose of the NACETE is to further the mission, aims and objectives of the UICEE. These are as follows:

- To facilitate the transfer of information, expertise and research on engineering education;
- To act as a clearinghouse for the transfer of information on textbooks, engineering teaching courseware, software and equipment, in particular from developed to developing countries.

The NACETE's emphasis is on facilitating research, plus the development and dissemination of information in Algeria and in neighbouring countries. It is envisaged that this will provide a focus for academic and research activities related to the work on engineering and technology education within the UICEE global network of engineering education and, in particular, on the transfer of information on engineering and technology education from developed countries to North Africa and Algeria. Special attention will be given to the development of the Centre's capabilities in advancing technologies and business incubation, especially with regard to advancing and reinforcing capabilities in order to support modern information technologies development in the region.

ORGANISATIONAL STRUCTURE OF THE CENTRE

The actual structure of the NACETE has not yet been formally established; however, the interim structure is as follows:

Advisory Board

The Advisory Board of the NACETE is comprised as follows:

- Chairman: Rector of the USTHB, Prof. B. Benzaghrou;
- Vice-Chairman: Vice-Rector in charge of research and foreign affairs, Prof. M. Drir;
- Director of NACETE: Prof K. Allia.

In addition, membership of the Board includes one professor from each engineering faculty, namely:

- Prof. D. Benouar (Civil Engineering);
- Prof. S. Chikh (Mechanical Engineering);
- Prof. L. Oufer (Process Engineering);
- Prof. R. Toumi (Electronic Engineering);
- Dr F. Youcef Ettoumi (Electronic Engineering).

ACTIVITIES

1st North African Region Seminar on Engineering and Technology Education

Until now, the role and functions of the Advisory Board were to prepare the *1st North African Region Seminar on Engineering and Technology Education (NARSETE)*, and to develop the legislative text of the scientific association, named the Promotion of Engineering Sciences in Algeria (PROSCINA), which has not yet been accredited.

The 1st North African Region Seminar was held at the USTHB between 23 and 25 September 2003. There was a good number of participants and the debate around the topics fruitful. In particular, the Seminar showed the necessity for such meetings to take place. The principal recommendations made at the Seminar are listed below.

The Seminar was addressed by the President of the Seminar and representatives for the Minister of the Higher Education, the Minister of Energy and Mines, and the Minister delegated to research. Some representatives gave an address about the history of engineering in Algeria, their sector's vision, the perspectives concerning the industry itself and new trends, as well as their future requirements with

regard to engineering education.

Eighty percent of the technical programme was achieved, with 29 out of 38 presentations given. Furthermore, there was also an interesting debate concerning the following topics:

- Education strategies being delivered at North African universities;
- Recent developments in engineering education;
- Models, tools and methods devoted to new technologies in engineering;
- International examples of engineering and technology education;
- Specific technology education programmes;
- Learning strategies and methods in engineering education;
- The importance of science subjects in engineering;
- Course development in engineering;
- New trends and approaches to technology education;
- Contributions by technology education to R&D;
- The environment in engineering education.

Following these debates, the following recommendations were made;

1. The establishment of a taskforce within the NACETE that would gather specialists and educators from various relevant industries, Ministries and non-governmental organisations. This could then undertake the following:
 - Meet periodically to exchange ideas and develop actions plans;
 - Enforce university requirement courses for students in all specialities in the English language in order to elevate the level and proficiency in English to acceptable levels;
 - Establish links with other universities and centres so as to facilitate the exchange of know-how, and utilise this know-how in order to develop and introduce appropriate courses for engineers;
 - Create a regional training centre to equip/train engineers with the appropriate know-how that would specifically cover markets' needs;
 - *Green* the curriculum of engineers at the undergraduate level and introduce one or two courses so as to raise student awareness about environmental issues, needs and impacts;
 - Move towards more applied projects and move students into the community instead of laboratory-based experiments;
 - Orient the engineer to produce and/or design technologies that, at the same time, serve

the community and protect environmental resources;

- Motivate engineers to be proactive in tackling problems facing their immediate community in particular, and the country in general, ie *think global and act local*.
2. The enhanced use of computers and the relevant applicable software and programs were recommended as forming a basis for every engineering education programme; this includes Computer-Aided Design (CAD), Computer-Aided Manufacturing (CAM) and computer-aided software engineering programs that are highly recommended for use by all students who are enrolled in engineering and technology programmes. In addition, the use of the Internet and e-learning were also highly recommended.
 3. The urgent need to implement a philosophy of competition in Algerian universities and the introduction of new organisations to act as assessment and evaluation mechanisms in engineering education, which would lead to a convergence on accreditation.
 4. The Conceive-Design-Implement-Operate (CDIO) Initiative was found to be of relevance to a new common engineering education vision for Africa. Information on the CDIO Initiative can be found elsewhere [1-3].
 5. An increase in the time volume of human science, particularly engineer and society courses, has led to three prime objectives:
 - Students acquiring a sociological culture that would help them to understand sociological phenomena with the assimilation of concepts and keys notions of sociology.
 - Engineers should be supplied with tools and instruments that would support the capacity for analysis and reflection at the time of technical decision-making. Too often, excellence and the primacy of the technique influence engineers' decisions. Being able to take a measure of distance and to observe with certain vigilance are behaviours required of modern engineers.
 - Engineers should be made aware of their impact upon society, while being vectors of transmission of the human securities, which revolve around the concept of ethics and responsibility.

FUTURE STRUCTURE OF THE NACETE

The evolution of the structure will be in line with the method and work of the UICEE.

Future Academic Advisory Board

The NACETE is projected to be the focus of engineering and technology education in the region. The establishment of this UICEE satellite centre that concentrates on engineering and technology education is expected to offer great advantages to the entire university community, academic and research institutions, industry, funding agencies, as well as individuals. Therefore, it is important to solicit partnerships with, and the cooperation and rapport of, as many stakeholders in the region as possible.

In line with the UICEE's method of work, the following categories of membership will be as follows:

- Partner;
- Sponsor;
- Supporter;
- Contributor.

The contribution of each participant has not yet been defined; it has still to be discussed within the Academic Advisory Board (AAB). It is envisaged that the AAB of the NACETE will gradually expand to include membership from identified partners nationally, regionally and internationally; this would be on top of the Algerian group (scientists and industrials). In addition, the role and functions of each organisational body will be examined.

CONCLUSION

Despite financial, legal and organisational challenges, the NACETE has initiated several important activities. These key accomplishments include the organisation of the *1st North African Seminar on Engineering and Technology Education*, and achieving the legislative text for the scientific society PROSCINA to legally support the Centre. However, it still has to establish the necessary elements cited above and find a way to properly assume the objectives.

PUBLICATIONS

1. Allia, K., The University of Sciences and Technology Houari Boumedienne: current state and perspectives. *Proc. 6th Baltic Region Seminar on Engng. Educ.*, Wismar/Warnemünde, Germany, 97-98 (2002).
2. Allia, K., Current issues in engineering education in Algeria. *Proc. 3rd Global Congress on Engng. Educ.*, Glasgow, Scotland, UK, 258-261 (2003).
3. Allia, K., A new reform for the Algerian higher

educational system. *Proc. 7th UICEE Annual Conf. On Engng. Educ.*, Mumbai, India, 35-37 (2004).

LOCATION AND CONTACTS

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REFERENCES

1. Berggren, K-F., Brodeur, D., Crawley, E.F., Ingemarsson, I., Litant, W.T.G., Malmqvist, J. and Östlund, S., CDIO: An international initiative for reforming engineering education. *World Trans. on Engng. and Technology Educ.*, 2, 1, 49-52 (2003).
2. Mbanguta, Z., North-South collaboration advancement on engineering education through the Conceive-Design-Implement-Operate (CDIO) initiative. *World Trans. on Engng. and Technology Educ.*, 2, 2, 263-267 (2003).
3. Malmqvist, J., Young, P.W., Östlund, S. and Berggren, K-F. and Crawley, E.F., Designing Design Education: An Approach Based on the CDIO Syllabus, http://www.cdio.org/papers/designing_education.pdf

BIOGRAPHY



Khedidja Allia is a professor of chemical engineering and a research director at the University of Sciences and Technology *Houari Boumediène* (USTHB), Algiers. She received her Diploma of Engineering at a polytechnic school (ENP) in 1974 and the Doctorate Es Science in 1982.

Between 1994 and 2000, she occupied several posts as a Director of Higher Education. She was the Director of the Industrial Chemistry Institute at the USTHB from 1984-1991, and was President of the Scientific Committee - Industrial Chemistry Institute and Head of the Chemical Engineering Department

at the National Polytechnic School of Algiers (ENP) between 1981 and 1984, as well as a researcher in the Research and Development Department at SONATRACH from 1974 to 1976.

She has taken part in many commissions focusing on higher education reforms since 1984, and she held the position of National Coordinator of the Higher Education Commission (Technology) of Maghreb Equivalence from 1992 to 1994.

In 1992, she was a Fulbright Researcher at the Department of Mechanical and Aerospace Engineering at Cornell University, Ithaca, USA.

Prof. Khedidja Allia has published several scientific works in the fields of chemical engineering,

including pneumatic conveying, fluidisation, semi-fluidisation and wastewater treatment, and has been involved with a number of research projects and expert reports.

She has participated in several international gatherings on engineering education, such as the *3rd Global Congress on Engineering Education*, held in Glasgow, Scotland, UK, in mid-2002, and the *6th Baltic Region Seminar on Engineering Education*, held in Wismar/Warnemünde, Germany, in late September 2002. She also presented a Keynote Address at the *7th UICEE Annual Conference on Engineering Education*, held in Mumbai, India, in February 2004.