

## **AC 2008-2792: DEVELOPING ENGINEERING EDUCATION IN THE MIDDLE EAST USING THE NORTH AMERICAN MODEL – WHAT ASSUMPTIONS ARE VALID?**

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# **Developing Engineering Education in the Middle East Using the North American Model – What Assumptions Are Valid?**

## **Abstract**

The development of aerospace and mechanical engineering programs at a new university in the United Arab Emirates is a challenging task. A new private, locally owned, university is providing all programs in English using the North American educational model in Dubai, United Arab Emirates. Program development and regulation is significantly different in the Gulf region than the United States and the diversity of student background and education challenging. Many established institutions have set up branch campuses to deliver programs with varying results.

Programs that enroll student-nationals have to achieve accreditation by a governmental regulatory body for student-nationals to be eligible to work for the government. The socio-political aspects in the Middle East provide for significant interlocking of control and ownership by key people in the government structure. Most major corporations have significant government, or government official, ownership. The large number of public-private owned company's means that student-national employment is affected for most engineering opportunities and government accreditation is required to be competitive.

Balancing accreditation (i.e. regulation) with pedagogy is problematic. Student preparation varies tremendously depending on where a student attended K-12. Options range from government operated public schools for nationals to private international baccalaureate programs. Considering that organized K-12 public education regionally has only been available for 25-40 years, preparation is less than desired and often the rote method of education has been the primary methodology used. Although English is not the first language for most students, English is the language of business in the Middle East. Issues related to language, mathematics preparation are on a scale beyond the experience of most North American, European, Australian, or Indian universities. These issues, along with cultural traditions such as being oral-based, must be understood to provide programs for students in the Gulf region.

All these factors combine to derail traditional assumptions on minimum student preparation. Programs that exactly follow the North American model experience reduced success. This paper will explore what assumptions are valid, what support mechanisms are critical for student success, and how to blend the regulatory requirements with innovative methodology to produce graduates for a region that needs and desires high quality education.

## **Introduction**

In the past ten years, many universities have opened branch programs in the Middle East, especially in Bahrain, Qatar, Kuwait, Saudi Arabia, and the United Arab Emirates. In addition, numerous local institutions have been established. According to Theodore Kattouf, former US ambassador "Even before September 11 there has been dissatisfaction with the quality of higher education in a number of Arab countries. Standards have declined as the number of young people

has exploded, filling schools well beyond their capacity.”<sup>1</sup> This region of the Middle East is stable, prosperous, and experiencing tremendous economic growth. Akili<sup>2</sup> discusses the early entrants into engineering education in the region and the need to rejuvenate these older programs. Early engineering programs range from start dates of the 1960’s in Saudi Arabia to the mid 1980’s in Oman. The need for quality programs is especially relevant to the aviation and aerospace industries. To meet this need, a new locally owned and based new university has begun operations in Dubai, United Arab Emirates. This new 4-year baccalaureate and master’s degree institution emphasizes aviation and aerospace in its degree offerings. This institution was licensed and accredited by the UAE Commission for Academic Accreditation, and began operations in 2007. Programs being offered currently, and planned for initial offering in fall 2008 at the undergraduate level include professional flight/management, aviation business, along with aeronautical and mechanic engineering. In addition, four master degree offering are planned for fall 2008 which include air transportation management, airport management, global logistics, and an aerospace M.B.A.<sup>1</sup>

The Middle East region has seen tremendous growth in need for aviation and aerospace professionals. Manpower is seen as the limiting factor in maintain double digit growth rates. Developing educations programs in the Middle East has foundational issues that make transferring of existing programs from western higher education institutions problematic. Institutions are highly regulated. In general, potential students from the region often have inadequate pre-college educational preparation in mathematics and science. Students do not have an educational background that is reading intensive and interactive. The timing of student decision-making regarding education is significantly different that the US. These issues and the effect on an institution are the focus of this paper.

Many western education institutions, or local universities using a western model, have been established in the Middle East. For this discussion, ‘western’ educational are models based on North American, British, European, Australian, and New Zealand universities. In these models, the North American and British structure are most widely used models. The North American system is a four year degree system with the baccalaureate degree as the undergraduate goal. The British system uses the higher diploma as an intermediate degree and a baccalaureate as the undergraduate goal. Generally the British system takes three years to complete the higher diploma and two to three additional years to complete the baccalaureate in the Middle East. Western style institutions have minimal English language requirements and recognize the Test of English as a Foreign Language (TEOFL) or the International English Language Testing System (IELTS) measures.

Students in the Middle East countries come from two sources: indigenous and expatriate. Indigenous students are national citizens and typically have the option of free K-12 education and some degree of higher education available at no cost. Expatriates are global as one would expect, although the majority of expatriates are from Southeast Asia and Indian subcontinent. In Dubai for example, the nearly 90% of the total population is expatriate. Economically, the majority expatriate groups are of middle or lower class status. Western expatriates, the minority numerically, are generally in the middle and upper class economically. In most Middle East countries, the public school system is closed to non-citizens. This has resulted in a significant private K-12 public education industry general based on the British and Indian K-12 models.

## Program Creation

Higher education programs often have to be licensed and accredited in order to operate, especially if Gulf citizens wish to attend and have government employment opportunities open to them. Most Gulf States control education via a Ministry of Education and associated regulatory arms. In the United Arab Emirates (UAE) for example, programs are licensed and accredited by the Commission for Academic Accreditation, a body controlled by the Ministry of Higher Education and Scientific Research.<sup>3</sup> Many of the Gulf state nations have established educational free zones, where accreditation may not be required but limits use of the degree within the country. There may also be local regulating bodies involved.

An inherent tension exists between the regulatory nature of national program accreditation and outcome-based accreditation such as ABET-EAC or ABET-TAC. The national accreditation tends to prefer a very methodical step-by-step curriculum approach over the more exploratory educational nature that the western model prefers.

This is somewhat due to the relative ease of program evaluation in the regulated model. Curriculum is highly structured. When programs are submitted for accreditation, a complete set of program needs, goals, learning outcomes, plan of study, course syllabi, week-by-week instruction, text books, and specific assignments is part of the submission package. An evaluation team visits the institution to review the submitted program. The team ensures that the educational accreditation standards are met, and will often require changes down to the week-by-week order of course content. Often, the rationale for micromanaging such changes is that the 'student will not be able to', a thought process tempered by the realities of student preparation. The concept of allowing an institution to develop a curriculum, with minimal guidelines, to a set of outcomes is not currently done.

The ABET model provides some minimum guidelines on the amount of credit, faculty qualifications, etc. ABET allows program development to be an institutional matter as long as it can provide evidence that the general and program specific outcomes are met. Currently, this method would not be approved in most Gulf educational systems. This places programs who plan to seek ABET (or similar for other programs) into a difficult situation that tends to hamper innovation. When one reads a typical set of Gulf accreditation standards, at first glance they look similar to outcomes assessment programs. They are very concerned with and desiring of high quality. At present, quality is attained by adherence to regulation. All programs are required to collect data and demonstrate institutional effectiveness programs in action. However these tend to be programs that show if the program is maintaining adherence to regulation rather than the true continuous improvement system ABET requires. This difference is illustrated by the fact that in an ABET accredited program, the institution can make changes and improvements without ABET approving the specific changes themselves in comparison to documenting outcomes are met. In the Gulf, you cannot make program changes contrary to accreditation regulatory guidelines. This difference is all-important in understanding why simple implementations of western programs without appreciation and modification for local issues struggle.

## **Student Attributes**

Gulf state students often require the completion of foundational courses to make up for deficiencies in mathematics, science, and language if the program is offered only in English. This new aerospace university has chosen 100% English delivery since English the official language of aviation and recognized as the world-wide language of business. Admissions requirements were set corresponding high for language. However what we have found is that the language score and the degree of student oral articulation do not adequately indicate the ability to fully process content in English.

Contributing to this problem is that the region uses an oral culture. History, stories, songs, and education are conveyed orally. There is very little reading done and students do not pleasure read. The first expectation that students would read the assignments was flawed. Not only did students not read much, they also struggle with reading comprehension.

Much of the K-12 experience, especially in the public schools, utilizes a rote memorization structure. Students have been passive learners, fully expecting the instructor to provide all information. A common complaint from students points out this issue – ‘why is the instructor asking me questions? The instructor is supposed to know all the content.’ Engaging the student is a slow process since part of the freshman experience is to instill a culture of learning in each student. Students have little to no experience with doing research, presentations, group projects, and similar secondary experiences that are taken for granted in most North American students. The necessity of teaching fundamental skills takes time and frustrates faculty who are used to students having foundational experience in the high school environment. Gulf State students aren’t dissimilar to freshmen worldwide. All universities have to guide freshmen in the transition from high school to university level work and expectations. However in the Gulf, this requires significantly more understanding of your student’s backgrounds and preparation.

Other common issues, not necessarily unique to this region, include lack of time management skills, setting of priorities, and taking personal responsibility for their education. Students don’t ask questions in class and rarely seek assistance. For many students, asking the professor for help, seeking an extension for an assignment, or attending help centers is a new concept. The western assumption that students are aware of these options can cause considerable misunderstanding. Another trait of Gulf culture is one of helping each other. When you need assistance, you ask for it from family and friends. This trait can cause issues in academic dishonesty. Students did not understand the concept of plagiarism and cheating. When you take the trait of helping, blend it with a lack of understanding about addressing issues with your professor, students will panic and turn to others for help. Institutions need to address the academic issue up front and begin associating cheating with stealing – a concept clearly understood. Students are receptive and understand once you cast many of the North American policies and procedures with a local perspective. The importance of building a culture of learning cannot be overstated.

## **Engineering Education in the Gulf States**

The trend during the past ten years in western engineering education has been toward outcome-based education and the inclusion of early design experience. These have proven successful in maintaining student interest and expanding student abilities. In the Gulf States, the inputs-based accreditation process tends to restrict programs to a step-by-step program structure and may discourage or not allow seminars and design experiences in the first or second year. These restrictions are premised on the fact that the students don't know anything about design – hence you have to teach the design process as a concept, teaching about all the materials and processes, before you can let students design something. Allowing early exploration and use of simple design projects as a teaching tool are not the practice.

Many of the procedures used to regulate education are based on the British system. Many of the countries in the Gulf region were under colonial rule and the legacy of that remains. The fact that many students are inadequately prepared reinforces the notion that a very methodic program structure in higher education is both necessary and correct. Therefore, simple implementations of successful western engineering programs often do poorly in the region. It is possible to blend current western engineering educational program elements into curriculum in the Gulf, but it needs to be done in a more measured way with clear outcomes and measurements appropriate to the level of student.

Western education is highly sought after and respected in the region. So much so that if a purely local university isn't affiliated with a strong western university, there is skepticism about the quality of the local institution. This is one reason why well known western universities are so welcome in the Gulf region. In addition, many of the Gulf leaders have attend western universities. After 9/11, there has been a significant growth of western universities in the Gulf due to the difficulties of going abroad, especially to the United States.

## **Student Success**

University programs are only as successful as their students in the workplace. In the Gulf, many students struggle in university due to their inadequate preparation and general lack of educational process skills. In the region, universities address this in several ways. One common method is the offering of a foundations program. In effect, the student is placed in a series of courses and experience to provide what the K-12 experience failed to do. Students may spend one or two years in such a program before meeting the requirements for unconditional admission. There are many cases of institutions finding they simply could not attract enough students eligible for unconditional admission and created foundation programs of necessity. Another risk is when a program perceived to be very prestigious that pressure is applied to admit students unable to meet the requirement. Such pressure cannot simply be ignored.

In our university, we have consciously chosen not to offer a foundations program. During our initial accreditation submission, we proposed a remedial mathematics, English, and reading course for student close to our standards but lacking in a single area. However, the accreditation standards at the time did not allow the offering of such courses unless we had a full foundation program. As a result, a number of students have struggled in courses where in reality they

should not have been placed. A significant effort in offering help centers and faculty mentoring improved the situation for some, but the cultural issues and student lack of educational process knowledge made these efforts less effective than planned. Faculty who previously taught in western universities had to rethink delivery methods and assumptions of student skill levels. Many faculty sessions were held discussing student progress and what changes we needed to consider how to improve student success.

All students were required to enroll in a university success course which covered many of the process issues these students need. It helped, but after the first semester the need for a comprehensive support and success system that is interwoven into the full four years has become essential. Fortunately, the 2007 accreditation standards which were introduced after we began operation, allow for remedial courses to be offered.

## Summary

What lessons have we learned then, about establishing western educational program in the Middle East? First, assumptions of student abilities and underlying learning culture may be flawed. Students require development in learning methods, organization, note taking, participation, reading, time management, and interaction with faculty. The students are talented, bright, and motivated to learn – but often don't have sufficient experience and habits to succeed at the university level.

Outcomes-based engineering curriculum, freshman design, and undergraduate research are concepts contrary to the accreditation/regulation methodology employed to accredit programs. The Gulf States seek high quality programs and see regulation and continuous improvement as a way to ensure quality. However the used of regulatory standards versus true outcomes-based methods, tends to force programs into a methodic and traditional engineering education model.

Programs need to development a comprehensive set of student support and success mechanisms for students. For non-mandatory programs, programs need to educate students about using and accessing support.

Finally, while programs must start with a set of underlying assumptions, a continual effort must be made to learn about and understand the local culture and student characteristics and motivations. Such effort is worthwhile and will greatly benefit both student and institution.

## References

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2. Akili, W (2002). Engineering Education in the Arab Gulf States: Stagnation versus Change. Proceedings of the 2002 American Society of Engineering Education Annual Conference & Exposition. Session 3160.

3. Commission for Academic Accreditation <http://www.caa.ae>

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<sup>i</sup> Proposed programs are subject to approval by the Commission for Academic Accreditation before they may be offered.