Adapting Engineering Design Model to Middle Eastern Culture: The Colorado School of Mines Brings Engineering Design Program to The Petroleum Institute

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The translation of an engineering design program to a foreign culture brings many challenges, including overcoming the broad barriers of language, religion, values, manners, and ethnocentrism. In addition, the unique aspects of engineering design – problem-solving, decision-making, teamwork, and communication skills are put to the test when transferred to a new cultural plane. The 2003-4 academic year at the Petroleum Institute in Abu Dhabi has been the site of a rewarding and revealing experiment in implementing Western engineering design to higher academia in the Arab world.

With funding from a consortium of major oil companies including The Abu Dhabi National Oil Company, Shell, BP, and JODCO and led by a team from the Colorado School of Mines, the Petroleum Institute was established in 2001. The goals of the Institute include educating UAE nationals in fields of engineering (Chemical, Electrical, Mechanical, Petroleum and Petroleum Geosciences) that will serve the on-going needs of the oil and gas industry in the Gulf region.

The Abu Dhabi National Oil Company signed a nine-year agreement with the Colorado School of Mines to provide leadership in programs and curriculum design, with the goal of achieving ABET accreditation for the Petroleum Institute. As part of that effort, experienced faculty from CSM were brought over during the 2003-4 academic year to establish an engineering design program on the new campus. The program, modeled after CSM's cutting edge EPICS Program (Engineering Practices Introductory Course Sequence) was given the new acronym of STEPS (Strategies for Team-based Engineering Problem Solving).

The STEPS Program is currently conceived to guide students through an "experience" of engineering design methodology that incorporates open-ended problem solving, teamwork, communication skills, and engineering graphics. Mentored by multi-disciplinary faculty, students experience the challenge of finding solutions to client-solicited projects. During the Program's flagship year, first-semester students were introduced to design and build projects (miniature solar racing cars and the construction of balsa wood bridges), while second-semester students tackled discipline-specific projects such as the design of an oil field .

The translation of the program to the other-cultural setting has brought challenges to all major emphases of the Program – teamwork, communications, problem-solving, mentoring, and graphics. This paper will attempt to identify the unique Arabic cultural aspects which either resist or embrace the Western design model.

While teamwork skills are generally excellent, because of a strong sense of

loyalty to friends and neighbors in Arab culture, Arab students will avoid confronting an irresponsible teammate. In the area of communications, writing is weak, while oral presentations are strong, supported by an historically oral culture. Open-ended problem solving is resisted, in favor of preferring one solution. Mentoring is also resisted, because Arab students are used to lecture-style learning. Some Arab students have had no exposure to simple tools, making design-and-build a new experience. Sharing of homework with classmates is accepted as part of "helping a friend," and assignments are often procrastinated until the last minute. The STEPS Program's goal is to modify the Western curriculum in ways that will accommodate these and other differences while strengthening skills.

Nearing the completion of its first year, the STEPS Program at the Petroleum Institute hopes to lead an effort to identify, study, and record helpful information that will effect the ongoing development of new engineering curriculum in the Middle East.