AC 2008-695: ADVANCING A COMPUTER SCIENCE CURRICULUM IN AFGHANISTAN: A MENTOR'S PERSPECTIVE

Paul Stanton, United States Military Academy

ADVANCING A COMPUTER SCIENCE CURRICULUM IN AFGHANISTAN: A MENTOR'S PERSPECTIVE

The National Military Academy of Afghanistan (NMAA) recently requested assistance from the United States Military Academy to build a computer science program capable of producing the technological leaders needed by its nation and its army. We spent several months in Kabul, Afghanistan working alongside the host nation faculty to structure an ABET-style, goal oriented curriculum that can evolve alongside the technical needs of the growing country. We embarked on this mission of developing objectives, outcomes, and a curriculum while the faculty was in the process of teaching the initial courses in the CS major. The challenges we faced and the associated solutions we developed offer insight to other computer science faculty who may be called upon to provide similar assistance in developing programs around the world.

Introduction

Bringing information and communication technologies (ICT) to underdeveloped countries has been a goal of the international community for several years; the potential benefits derived from closing the "digital divide" have been well researched and documented. The role of education in the process cannot be understated, but a large part of the problem is that the institutional foundation for providing education is absent in many developing countries. Universities lack resources and management to prime the pump of domestic engineering specialists. As a result, undergraduate university programs in developing nations may need external advisors to provide experience-based recommendations for curriculum development. Until the "digital divide" is significantly reduced, computer science programs around the world must rely on the international community of technical faculty to provide mentorship and guidance. Mentors face the significant challenges associated with impacting the ability to start teaching immediately while simultaneously structuring the program for continual evolution that will eventually be unassisted.

Afghan university programs have recognized the need for outside assistance and have turned to counterparts in other nations to assist them in building appropriate curricula. After decades of war and destruction, Afghanistan is struggling to rebuild itself for the future with a large focus on the expansion of ICT[8]. Just as in other nations, many factors are rapidly expanding the use of computers, including the availability of satellite and wireless technologies, the decreasing cost of hardware, and increased exposure to international advisement. This rapid expansion has resulted in a relatively new dependency on computer technology that is forcing Afghanistan to develop its own technically competent workforce. However, the decades of instability and war that devastated the technological infrastructure have also created a void of skilled technicians and educators. To overcome this significant shortage, the Afghan government has recognized the need for computer science education at the college level to develop its own workforce[2], realizing that "improving welfare depends on the *domestic* capacity to apply and gain knowledge."[10]

The administration at the National Military Academy of Afghanistan (NMAA) requested advisors from the United States Military Academy (USMA) to help them build a computer

science program. Over a three year period, USMA has sent mentors to Afghanistan to guide the faculty through the curriculum development process so that they could begin teaching while simultaneously learning how to assess and improve their program without continual assistance. As Jones points out in his work regarding capacity building, it is critical for the people to take ownership of their own development in order to sustain improvements over the long term[9]. Similar efforts to build engineering programs are underway around the world with considerable assistance from technical mentors. Mentors must provide some direction while simultaneously encouraging the local instructors to develop their own ideas. The developing programs must overcome daily challenges associated with the competence and experience of the instructors, the availability of resources, the capabilities of the students, and the cultural differences between mentor and host nations that force divergence from the specific practices at mentor institutions. The faculty members must be creative in their approach so that they can put a curriculum into place immediately while students are actively taking courses, yet provide suitable flexibility for expansion and adaptation as the educational environment evolves. The ability to adjust to the volatile external environment is critical.

This paper outlines our experiences in a general context such that our solutions could easily be adapted to suit other faculty members faced with mentoring the development of a computer science curriculum in a different developing region. We first describe our approach to defining the educational environment, then we discuss how we applied an ABET-style process that was tailored to the region-specific resource constraints, and we finally offer concluding remarks.

Developing Perspective of the Educational Environment

In order to make recommendations that are tailored to the specific needs of the nation requesting support, a mentor must perform an assessment of the academic environment. Establishing the proper perspective regarding the academic atmosphere in the country and at the university permits a mentor to help the faculty build an effective curriculum that matches the nation's specific needs for college graduates. Although their work addresses IT infrastructure in a different, non-education specific context, Brewer et al stressed the requirement for developing perspective so heavily that they incorporated social scientists into their research to study the region[6]. Establishing perspective requires understanding the capabilities of the faculty, the physical resource limitations of the institution, and the academic capabilities of entering students. Each of these areas is addressed in turn.

Faculty

Effective teachers are essential in any educational setting; "the faculty is the heart of any educational program"[1]. To be effective, teachers must have a deep understanding of the subject matter and the ability to convey it to the student population. Developing countries may lack personnel who possess both or either critical aspect due to inexperience. An honest assessment of the faculty's competencies establishes parameters for building a curriculum; the course material must be within the limits of understanding and the capabilities of those who are going to teach it. In the absence of a personal interview, determining the limits of a faculty member's understanding of technical material may prove difficult. Standards for what can be placed in

curriculum vitae may be radically different than those in a technically advanced country, and degrees from local institutions will not likely match those from accredited institutions around the world. Face-to-face discussions of technical topics and first hand accounts of technical skills are the only reliable means of determining faculty competencies. Additionally, witnessing how a faculty member handles him or herself in front of a classroom of students provides the best insight into his or her teaching capabilities. Short of these first hand accounts, it is difficult to truly define the limits of faculty capabilities.

In Afghanistan most experienced professors were either killed or forced to flee the country in the years following the Soviet invasion[4], limiting the list of potential instructors to those who had recently earned an undergraduate degree from Kabul University. Although they lacked teaching experience and their undergraduate background was less than that expected of new professors in developed countries, they overcompensated for their shortcomings with an incredible motivation and willingness to put forth the effort to learn. The young, vibrant teachers were very open to recommendations for teaching methods and they learned very quickly. Finding intrinsically motivated individuals to serve on the faculty is a major benefit while building a program since the amount of work to be done requires a tremendous work ethic. A slightly less qualified person with a better work ethic is the better option for helping to build an academic program from the ground up. In Afghanistan, the instructors are hard workers, but their work capacity is limited by a shortage of physical resources. Most of the faculty at NMAA lives many miles away from the campus, requiring vehicular transportation to and from work each day. Very few can afford cars or gas which forces them to rely on public transportation. The last bus that leaves NMAA for the central Kabul bus station departs at 4pm, placing an external limit on the ability of the individuals to work. This also places considerable limitations on the opportunities for student-teacher interaction outside of the classroom.

The educational background of the new faculty at NMAA limited the breadth and depth of course material in the curriculum, but their inexperience with teaching actually proved to be a strengthening quality for the institution. The fact that new instructors hadn't spent years applying a rigid, lecture-only classroom technique left them with an open mind to explore pedagogical approaches that promote classroom interaction. Mentors should embrace such open-mindedness and demonstrate various teaching techniques through seminars and workshops. Taking advantage of opportunities to develop the faculty must remain a priority throughout the mentorship and curriculum development processes. While initial faculty limitations may constrain curriculum options, teaching inexperienced faculty how to teach and helping them understand how to build courses provides flexibility for the evolution of the curriculum in the future. Additionally, inspiring the faculty by continuing to reinforce their motivation ensures that everyone's efforts remain in place after mentors leave.

Physical Resources

The faculty is arguably the most critical resource to explore, but it is certainly not the only factor in helping a mentor gain the proper perspective of the environment. More traditional resource limitations will play a large role in determining how certain subjects may be taught or if they may be taught at all. Developing a CS curriculum requires consideration of available computing resources to include labs, faculty machines, and student computers. Most CS topics

are best learned when reinforced with hands-on experience at a computer. In many modernized universities this does not present a problem since there are robust networks connecting multiple computer labs and most students possess their own computer, but courses designed for this environment simply cannot translate to developing nations.

At NMAA there are six computer labs with twenty machines each. These are the only computers on campus that must serve all computing needs, including class use, instructor preparation, and student hands-on time outside of class. Additionally, these labs are not exclusively for the CS department, but rather must be available to all disciplines that have computing requirements. All of the computer labs are occupied for classroom activity from 7AM to 4PM. Since the population who require computer use is in excess of 250 students (60 of whom are CS majors), it quickly becomes evident that the 120 available computers provide scarce opportunities for students to do homework requiring a computer. The structure of the courses must account for this limitation by offering increased amounts of time during regularly scheduled class hours for active hands-on exercises, while limiting the expectations for outside-of-class assignments that require computer use. The courses must be designed such that students perform work that doesn't require the machine outside of class and then capitalize on the availability of the machine while in class. As an example from NMAA, the programming course (CS301 Fundamentals of Programming) has students develop their algorithm on paper for homework and then translate it into code during class time.

The problems presented by the limited number of computers may be exasperated by the availability of the proper software. While black market bootleg copies of software may be available in some countries, responsible mentorship dictates using properly licensed software. Teaching the faculty and students to be good computer professionals includes making them stewards of the associated ethical responsibilities. Campus license agreements for software are very expensive and may well exceed the budget limitations of the institution. Mentors should be prepared to explore open source options that provide similar benefits to the costly products they may be accustomed to at their own universities. However, course designs and subsequent instructor preparation must account for associated challenges. For instance, the instructors at NMAA experienced difficulties transitioning to an open source version of the MySQL database management system since the faculty only had experience using Microsoft Access. They were able to overcome the challenge, but it took additional time for the course design and preparation.

The status of the internal and external network will also adjust planning. If there is no internal network, the approach to classroom preparation and the dissemination of lesson materials must account for the absence. Directory services and shared file storage provide tremendous benefits if they are available, but mentors and the faculty members must consider alternative options if they are not. Similarly, if there is no connectivity to the Internet it may hinder access to resources. In fact, the above recommendation for using open-source software implies the ability to download products from the Internet. These obstacles may easily be overcome, but they must be considered during the curriculum development process. Designing a course that it is not feasible due to reliance on unavailable resources would be disastrous since the just-in-time development environment relies on a course being ready since students will be taking it immediately. Developing the curriculum while students are taking courses implies that

the courses for the subsequent semester must be prepared as the students finish the current semester.

Initially at NMAA, thumb drives were the only solution to data storage and retrieval. There was no means of distributing an example problem or exercise to all students simultaneously, the instructors had to spend time downloading their lecture materials at the beginning of class, and there was no way to electronically submit answers to homework problems. While the faculty was still effectively communicating lesson material under these conditions, understanding the limitations of the network helped the mentor to develop a proper appreciation for the amount of time required to accomplish classroom activities. This, in turn, may adjust the amount of course material that teachers can realistically present during each lesson and the amount of overall material that can be covered during the course.

Language considerations may present other significant limitations. Depending on the language of the host nation, there may or may not be software or textbooks that cover lesson material. In the event that there are no resources developed in the native tongue, the pace of the course must be slowed since students and teachers will have to labor through the translation process. Additional considerations must also be accounted for in the curriculum; students must develop a degree of proficiency in the language that the course material will be presented in, requiring that time and resources be allocated specifically to language development. In Afghanistan instructors teach classes in Dari, but there are very few textbooks written in the language. Most off-the-shelf, usable texts in the region are imported from Iran and written in Farsi. Often times there are no suitable texts, requiring instructors or translators to convert an English text into the native language. This process is very time consuming and error-prone; most translators will not be skilled in technical topics and they will have difficulty translating scientific terms. In fact, the problems associated with improper translations directly led to the NMAA CS Department Head adjusting the program outcomes for CS to include a basic understanding of English. This, in turn, led to the Dean establishing a minimal proficiency in English as a prerequisite to becoming a CS major.

Institutional Limitations

Other limitations will be introduced by the overarching structure of the institution. While developing a program, faculty members must consider the entire student curriculum and the potential for competing requirements and constraints like the number of courses (or semester hours) outside of the major that a student must take, extracurricular activities, the number of courses a student can take in a semester, and the number of years over which the courses in the major can span. Arguably since NMAA is a military academy with many extracurricular requirements the environment is far more constrained than at other foreign universities, but it serves to highlight the point. The Afghan Military Academy requires much of its cadets in addition to coursework in the major. Cadets must complete physical and military training along with an extensive core curriculum in basic sciences and humanities. The outline in Table 1 below demonstrates the NMAA four year plan. Note that cadets must take all of the courses (annotated by “elective”) in their majors during the last 2.5 years of their development:

NMAA Academic Curriculum and Military Training as of: 4 October 2006								
	CADET BASIC TRAINING							
	Foreign Language	Afghan, Regional, & Islamic History and Culture	Composition (native lang)	Information Technology	Pre-Calculus & Modeling	Ethics, Moral Theory & Islam	Intro to the Military Profession	Physical Education
1st Year	Foreign Language	World History	Composition (native lang)	Chemistry	Calculus I	Psychology	Introduction to Warfighting	Physical Education
	CADET ADVANCED TRAINING							
	Foreign Language	Military Geography	Economics	Physics I	Calculus II	Small-Unit Tactics	Physical Education	
2nd Year	Foreign Language	Information Systems	Government	Physics II	Statistics	Combined Arms Warfare	Physical Education	
	BRANCH ORIENTATION TRAINING							
	Foreign Language	Intro to Engineering I	International Relations	Military Leadership	Elective	Elective	Branch Training I	
3rd Year	Foreign Language	Intro to Engineering II	Constitution and Law	Elective	Elective	Elective	Branch Training II	
	BRANCH SPECIFIC TRAINING							
	Military History I	Elective (AIS)	Elective	Elective	Branch Training IIIA	Branch Training IIIB		
4th Year	Military History II	Elective (AIS)	Elective	Elective	Elective	Branch Training IV		
	COMMISSION							

Table 1
4 year Education at NMAA

Determining the model for a semester includes assessing the number of lesson hours and/or labs, the length of class periods, and the frequency that classes meet. These factors will largely be controlled at the institutional level forcing the programs to fit within the limitations. The limitations will play a large role in the curriculum development process since they dictate how many courses can be taught and how much material can be covered in a particular course.

Capabilities of the students

As a final environmental consideration, mentors and the faculty members must gain an understanding of the students' capabilities. Realistic expectations for academic development must account for the general population's background and level of educational experience. For a CS curriculum, consideration must be given to the degree of exposure to computing resources. If there has been no exposure, then entry level courses must account for very simple tasks and an introduction to using basic applications. A more robust background can lead to much more advanced topics in the initial courses. In Afghanistan, many cadets come from remote areas with a very limited number of computers and no network connectivity. Simply turning the computer on and manipulating basic software packages presented a challenge necessitating an introductory IT course for all students.

As mentioned earlier, proficiency in English is a strong consideration in regard to the CS students' capabilities. Even if the textbooks are written in the native language, most code and technical terms are exclusively in English. The instructors may opt to lecture in the mother tongue, but students will still have to be able to read and write programming languages. Developing an appreciation for their abilities will help to determine the pace at which they can

present material. At NMAA the language barrier forced a 3 to 1 ratio of classes to topics. The instructors would present the topic during one class period, reinforce the topic with some standardized exercises during a second, and then spend a final lesson giving the students time to work on projects.

Accreditation Board for Engineering and Technology (ABET)-Style Curriculum Development

Outcome Development

After developing an understanding of the academic environment and assessing the impact it will have on education, mentors can begin to help the host nation faculty develop the curriculum. Although it would be unrealistic to expect a developing program to achieve ABET accreditation within a short period of time, the process that ABET requires for assessment lends itself to developing an effective program that can strive for accreditation in the future. An ABET focused process forces the faculty to think in terms of objectives and outcomes such that the program has organized goals and that the courses within the curriculum are tied together into a coherent whole.

ABET defines program objectives as "broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve"[1] and outcomes as "statements that describe what students are expected to know and be able to do by the time of graduation."[1] These goals must be developed and shaped to meet the needs of the institution's constituency. Thinking in these terms from the context of a developing nation requires the program administration and mentors to analyze what the developing nation needs from its graduates. After four years at the institution what should a student be able to accomplish and how should a student act in an academic setting when faced with a challenging problem? What attitudes should a graduate hold toward further education? What jobs is the institution preparing its graduates for? What skills does the developing nation require in the job market? The answers to these questions may vary widely from region to region based on the external environment, but the requirement to perform the analysis remains constant. Mentors must keep in mind that the resultant objectives and outcomes must fit within a scope applicable to the nation and the environment that graduates will be expected to help develop.

At NMAA the faculty employed a process that loosely followed the model outlined by ABET to approach the curriculum development process in an orderly, logical, goal-oriented manner. Using the ABET lexicon, they purposefully began the process by establishing outcomes instead of objectives because of the evolving nature of the entire country. The Ministry of Higher Education, the Ministry of Defense, and the Ministry of Communications are still establishing their vision for the future of Afghanistan. It would be overzealous for NMAA, in isolation, to look out years past the national government, but it is not unrealistic to help the academy's administration to determine the immediate expectations of a graduating student. Outlining outcomes and developing a firm understanding of the process involved leaves suitable room for the CS program to reassess and determine the objectives as the national strategic plan becomes more clearly defined.

In determining outcomes, it is important to analyze the constituents' requirements of a graduate. Without a realistic goal for the end state, it is difficult to focus and build the supporting course structure. In the case of NMAA, Afghanistan needs technically competent workers who can make an impact on the country's development addressing "the current needs for the immediate future of Afghanistan."[2] In a developing nation, seeking out and engaging the local national experts to determine the specific needs and skills required of college graduates translates into discussions with key officials. In Afghanistan, these officials were the Director of Communications for the Afghan National Army (ANA) and the Director of the Ministry of Communications in Kabul. A meeting with these key individuals and a quick analysis of their operations, their equipment, and their personnel provided great insight for the skills required of a NMAA CS graduate. Discussions with the Afghan Army's leadership helped to refine the specific requirements for the Academy. This facilitated answering questions such as: what does an ANA lieutenant do, what are the communications requirements of the ANA, and what equipment does the Army use? Armed with the answers the faculty could help focus the program's outcomes. The NMAA faculty realized that although many technologically advanced universities use curricula based on theoretical studies, Afghanistan needed practical courses more suited for the immediate future of the nation.

At this point, the CS department was able to write down its initial program outcomes:

- Develop a solution using current technical concepts and practices
- Analyze a problem to identify and define the computing requirements appropriate to its solution
- Function effectively on teams to accomplish common goals
- Understand professional, ethical, and social responsibilities expected of a computer scientist and military officer
- Communicate with military and non-military audiences and with technical and non-technical audiences
- Design effective and usable IT-based solutions and integrate them into the current environment
- Recognize the need for, and engage in, continuing professional development
- Develop proficiency, both oral and written, in the English language

These should evolve over time as the CS department continues to implement its curriculum and the faculty collectively develops a better understanding of what it actually wants from graduates, but establishing a foundation and teaching the faculty an appropriate model for the development process is essential to the mentor's role. The mentor must ensure that the faculty will continue to ask, answer, and evaluate key questions: What should a graduate be able to do? What attitudes should a graduate have? What does a graduate need to know? How will a graduate continue to learn on his own? How can we, as faculty, teach the students to learn in this way while they are at the university?

Course Selection

Having developed outcomes for the program, the next step is to select the courses that will shape the students over a four year education to meet the specified goals. Initially this selection should be performed from an unconstrained mindset without considering all of the limitations identified during the educational environment assessment; if anything is possible, which courses would best prepare graduates to meet the expectations? This initial set of ideal courses becomes the baseline for a later discussion of how to build the curriculum within the environmental limitations. Even though there may be many obstacles to achieving the baseline plan, establishing the baseline helps to focus simultaneous efforts to develop the infrastructure.

The first course of action for overcoming an obstacle is to try to eliminate the limitation by changing the environment. For instance, if the institution is constrained by unqualified or too few teachers to teach a particular course, attempts should be made to hire more competent personnel or to educate those already on the faculty. If the time and resources to modify the environment are available such that the baseline courses can remain in the curriculum, then the administration should pursue the modification without adjusting the courses. Likewise, if the infrastructure limits the ability to teach a course, efforts should first be made toward focused improvements. As an example from NMAA, the baseline courses included a networks course, but the institution lacked an experienced instructor and the desired networking equipment. After searching for a qualified teacher and analyzing the feasibility of purchasing the equipment, NMAA successfully adjusted the environment to keep the course in the curriculum without modifications. This highlights the correct initial approach which involves an attempt to change the environment.

If the assessment results in determining that the institution does not have the ability to dramatically impact the environment, the next step is to pursue minor modifications to the baseline plan for the courses that still accomplish the departmental outcomes. Perhaps restructuring the order that courses are taught will provide the correct opportunity to change the environment. At NMAA, the initial baseline plan included teaching network operating systems during the second semester with considerable hands-on programming of routers, but the academy did not have the hardware available. The result was to adjust the ordering of the courses to push the course one semester later in the curriculum with the knowledge that additional funds for equipment purchase would become available. The outcomes could still be met without adjustment and without significantly impacting other courses. Rearranging the baseline plan to provide additional time may provide increased opportunities to change the environment with more time to educate teachers, more opportunities to purchase equipment, and more opportunities to raise funds.

If reordering the courses is not an option due to a prerequisite structure, the next step is to attempt to restructure the design of the individual course in question. For example, if the baseline plan includes teaching a hands-on networking course where students actively program routers and switches, perhaps adjusting the course structure to one that is more theoretically based can still help achieve the desired outcomes without a reliance on equipment that isn't available. However, there may be circumstances that even after trying to overcome obstacles, there are simply no options to teach particular courses. This is okay, but identifying such constraints early in the curriculum development process is a priority. Unrealistically

programming a course into the curriculum may have second or third order effects based on other courses' prerequisites or expectations for students having met particular learning objectives.

After significant efforts to modify the environment, reordering the courses, and several iterations of restructuring the plan for some courses, the NMAA CS faculty developed the curriculum for the CS major outlined in Table 2.

5	**Fundamentals of Programming (CS 301)**	**Fundamentals of IT (CS 302)**	Intro to Engineering Mechanics (CE 301)	International Relations	Foreign Language	Military Leadership	Branch Training I
6	**Web Design & Graphics (CS 323)**	**Computer Networks (CS 355)**	**Database I (CS 321)**	Engineering Mechanics CE302	Foreign Language	Constitution and Law	Branch Training II
7	**Web Development & Application (CS 423)**	**Computer Network Administration (CS 453)**	**Database II (CS 421)**	**Advanced Programming (CS 409)**	**Network Operating Systems (CS 455)**	Military History	Branch Training IIIA
8	**Data Structures & Algorithms (CS 404)**	**Software Engineering (CS 409)**	**Network Security (CS 459)**	**Project (CS 499)**	Branch Training IIIB	Military History	Branch Training IV

Table 2
Final four semesters at NMAA for a CS Major

Develop Course Objectives

After identifying the courses that can be realistically taught while providing support to the identified outcomes, the faculty must begin to develop the objectives for each course. The course objectives have a much more narrow focus concentrated on what each student should learn about a particular subject during a semester; they help to tie the course topics into a coherent set of lessons for the semester. The host nation faculty must develop their course objectives such that the foundation of the effort is their own. This is a critical aspect of the process, because the faculty must focus the course material on what they are capable of teaching. They also must be intimately familiar with what goes into the course so that they take ownership and maintain the course long after mentors have left.

At NMAA, developing course objectives proved to be a considerable challenge because of the novelty of the concept. When asked to develop course objectives, the instructors initially returned with a long list of topics that were related to the course material – more closely resembling a syllabus than a set of objectives. It was a foreign concept to think about a course in more abstract terms from the perspective of what students should learn. They went through several iterations and revisions with each getting closer to our goal of manageable course objectives. Given the faculty background, limitations on their time, and the resource constrained environment, they had to concentrate on the core objectives for a subject. They did not have the luxury of pursuing tangential topics. For each course in the CS program, the instructors reviewed the lists of topics, paired them down, and then shaped them into manageable objectives.

With a draft of the course objectives completed, the next step is to assess whether or not the objectives collectively meet the outcomes for graduates. Many courses may address a subset of the objectives, but every course must at least address some objective, and the overlap of courses must cover the entire set of outcomes. First map the course objectives to outcomes to ensure that each outcome is covered, next verify that every course objective is related to at least one outcome, and finally identify areas of weakness where the collective coverage is only minimally addressing an outcome. This mapping provides the ability to strengthen the curriculum's coverage of program outcomes by making minor adjustments to the course objectives.

At NMAA, the Afghan CS faculty determined that proficiency in the English language needed to be an outcome since most programming languages and computer concepts are defined in English (in fact, most terms are not even translated into native Afghan languages, but rather left in English as new vocabulary words). After mapping the course objectives to the outcomes, however, they identified that very few courses were actually addressing this outcome. In fact, only one objective from one course addressed the English language. Collectively they decided that they were not going to produce English proficient graduates unless they made some modifications to the course objectives. They readdressed some of the courses and identified four that included some form of project. They modified the objectives for these courses to include English proficiency through oral presentations of the project material. They made similar modifications to other course objectives to strengthen their approach to meeting other outcomes.

Conclusion

Satisfied that the program had a solid foundation with appropriate courses and strategic vision, the faculty members were forced to switch focus to preparing for the immediate future. The faculty at NMAA is preparing courses "just-in-time" for the impending semester while teaching the current semester's courses. Upon our mentor team's departure from Afghanistan, the program still had considerable challenges associated with actually teaching the courses and then assessing their effectiveness. We are continuing to provide assistance via e-mail and phone communication, and we have plans to send additional mentors in the future. Our future work must include establishing an assessment plan to refine courses and ensure that the curriculum remains focused.

Our experiences have shown that developing nations have special socioeconomic considerations that will greatly affect what and how particular courses can be taught. However, these limitations do not prohibit the use of a proven approach to curriculum development, but rather they serve as parameters for shaping how the process is applied in a resource constrained environment. Mentors working with these CS programs must first recognize the specific characteristics of the educational environment and then guide the host nation faculty along an ABET-style path for determining the curriculum. Mentors cannot let a sense of immediacy to begin teaching courses override the need to develop a coherent, goal-oriented program.

Bibliography

1. ABET Accreditation Commission. "Criteria for Accrediting Computer Programs 2008-2009", http://www.abet.org, November 2007.

2. B. Baha. "The Challenges to Re-Establish Engineering and Technical Education in Afghanistan." Proceedings of the 2004 ASEE e-Conference, 2004.

3. B. Baha. "Depoliticizing and Improving Higher Education in Afghanistan." http://www.uobkupartnership.talktalk.net/higher%20education%20in%20Afghanistan.pdf 30 May, 2007.

4. B. Baha. "Information and Communication Technology (ICT) and Education in Afghanistan." 1st National Conference in Afghanistan, 25-26 April 2006.

5. B. Baha. "Modernizing the Curriculum for the Department of Electrical Engineering of Kabul University." SAE Conference, Kabul University, 17-18 December, 2005.

6. Brewer, Eric. "A Scalable Enabling IT Infrastructure for Developing Regions,"

7. Conference Transcription. "Conference on Strategic Planning of Higher Education for Afghanistan." Indiana University, Bloomington, IA, 2002.

8. E. Ghashghai, R. Lewis. "Issues Affecting Internet Use in Afghanistan and Developing Countries in the Middle East." RAND Issue Paper 2002.

9. Jones, Russel. "Engineering Capacity Building in Developing Countries." *American Society for Engineering Education*, 2007.

10. Ministry of Higher Education, Afghanistan and International Institute for Educational Planning UNESCO, "Strategic Action Plan for the Development of Higher Education in Afghanistan," May 2004.