

Professeurs Sans Fronteiers 2009/1388 (a.k.a. Summer Outreach in Afghanistan)

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Abstract

Engineering education is a global enterprise. Nowhere is that more evident than in countries where there is a severe shortage of this invaluable commodity. A study of the war in Afghanistan in an attempt to isolate the root causes of this conflict invariably points to the lack of education among the populace which serves as a breeding ground for extremists and insurgent indoctrination. In his book, *Three Cups of Tea*, Greg Mortenson describes the motivation for his campaign of promoting peace through education as follows: "If we try to resolve terrorism with military might and nothing else, then we will be no safer than we were before 911. If we truly want a legacy of peace for our children, we need to understand that this is a war that will ultimately be won with books, not with bombs." [1]

A by-product of the poor educational system is a shortage of engineers and the accompanying poor state of civil infrastructure that permeates the country. In addressing this problem, the national leadership of Afghanistan is working to reinvigorate the country's university system. Part of that effort has been the establishment of the National Military Academy of Afghanistan (NMAA); a four-year, bachelor degree granting institution modeled after the military academies of the United States. Two of the primary degrees offered by NMAA are in Civil and General Engineering.

As part of its rebuilding efforts in Afghanistan, the U.S. military has been heavily engaged in outreach, support and mentorship to the NMAA faculty. In the summer of 2009, the authors deployed with a joint Army/Air Force team as part of this on-going mission. The team members used Bloom's Theory of cognitive development and Joseph Lowman's model of college teaching in assessing levels of student and faculty development, as well as formulating and executing plans for continuing engagement.

This paper gives a brief overview of NMAA, its current status, what the authors did while there, what is still needed, and what issues must be considered when conducting this type of global outreach. It describes a practical application of learning theory as well as the teaching and reinforcement of that theory as part of continuing faculty development in an emerging educational system.

Introduction

What did you do with your summer vacation? In 2009, a group of faculty members from the United States Military Academy at West Point and the United States Air Force Academy joined forces and traveled to Afghanistan for the sole purpose of helping to build that nation's fledgling university system. Their focus of effort was at the National Military Academy of Afghanistan (NMAA) located in the capital city of Kabul. They joined the core cadre of advisors as rotating

members for the months of June and July. Their mission was to assist the NMAA administration and faculty in the continuing development of the engineering curriculum and to mentor the engineering faculty in their development as effective engineering educators. To fully understand the challenges this group faced and the opportunities that drew them to these challenges, some background on the situation is necessary.

The latest estimates place the population of Afghanistan at nearly 30 million, ranking it as the 40th most populous nation on earth. The life expectancy of 45 years for both males and females places it at 221st on the list; only Angola has a lower estimated life expectancy. The population is largely illiterate. Of those over the age of 15, only 28.1% can read and write; 43.1% of the male population and 12.6% of the female population. In Afghanistan, a young boy can expect eleven years of education and a young girl only five. This is based on the child's School Life Expectancy (SLE); the total number of years of schooling (primary to tertiary) that a child can expect to receive [2].



Figure 1. Dr. Grant Crawford and Dr. Elizabeth Bristow at NMAA

Formal Education in Afghanistan

The history of formal education in Afghanistan is closely tied to the state's turbulent political history. Modern secondary education was first established in 1903 to provide training and professional development for civil servants [7]. Postsecondary education developed a few decades later, from the 1930s through the 1970s. Engineering and technical education were similarly affected by the establishment of a pro-Communist government [10]. By 1978, undergraduate-level education in engineering was well-established; most formal postsecondary technical education took place at two premiere programs. The Faculty of Engineering of Kabul University, which was established in 1956 in collaboration with USAID, used American textbooks and curricula. Kabul Polytechnic Institute, established in 1968, was patterned after engineering instruction in the Soviet Union [10].

Postsecondary education degraded significantly beginning in 1978 with the establishment of the pro-Communist government. This decline occurred in spite of the new government's strong focus on education, which accounted for about 10% of Afghanistan's national budget during the 1980s [8]. This apparent contradiction was caused largely by a disconnect between nationally-imposed values and popular values: the focus on communist ideology and Russian as the primary language was rejected by people outside main population centers, so many Afghans opted out of formal education.

The establishment of the Islamic Republic of Afghanistan in 1992 prompted a renewed focus on education. The new government worked to replace Communist schools and establish basic education. Because of the complexity of this task, it initially neglected higher education [8].

Progress was slowed only a few years later by the rise to power of the Taliban in 1995. Taliban leaders closed girls' schools in areas they controlled [8]. In these areas and elsewhere, basic and higher education continued to decline as the country was torn by insurgency and ethnic fighting [7].

At present, Afghanistan is missing many of its former lead academics, who were killed or fled during the turmoil [7]. In many fields and at many universities, higher education curriculum was frozen in the 1970s and the curricula, textbooks, and laboratory techniques are now decades old. Technical and vocational education is largely theoretical, and many engineering and technology students progress all the way through an undergraduate program without a laboratory or design experience [10].

The cultural issues that hinder the re-establishment of an effective educational system in Afghanistan are many. The country is a mix of ethnic groups that live in a primarily tribal society outside of the primary cities. The breakdown is: Pashtun 42%, Tajik 27%, Hazara 9%, Uzbek 9%, Aimak 4%, Turkmen 3%, Baloch 2%, other 4%. Afghanistan is an Islamic Republic consisting of the following split: Sunni Muslim 80%, Shia Muslim 19%, other 1%. While Dari (50%) and Pashto (35%) are the official languages, 11% of the country speaks a Turkic language (primarily Uzbek and Turkmen), and 4% speak one or more of 30 minor languages (primarily Balochi and Pashai) [2].

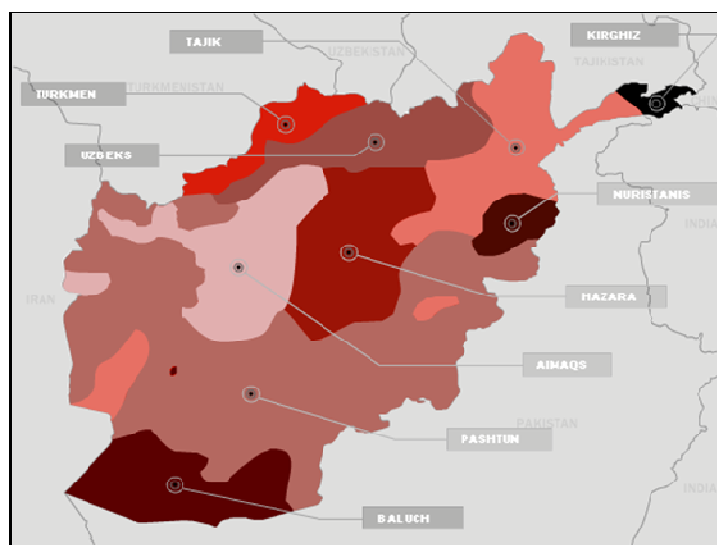


Figure 2. Ethnic Map of Afghanistan [3]

Overview of NMAA

In the current post-war period, the NMAA has become the self-described 'Crown Jewel of Afghanistan' by the country's leadership. The mission of the NMAA is to produce officers for the Afghan National Army who also have a four-year bachelor's degree. Following a period of assessment and evaluation, the Afghan government chose the United States Military Academy at

West Point as the model for its own academy. The academy brought in its first class of 120 in 2005 and graduated 84 male officers in January of 2009. The second class of 212 men graduated in March of 2010. This was the senior class during our visit in the summer of 2009. The third class of 299 men graduated in March of 2011. Current plans set future class sizes at approximately 600 cadets of which 10% to 20% will be women. The first ten women were attending the academy as part of the medical program during the summer of our visit [11].

The academy currently has 318 faculty and staff members; all Afghans. The faculty members all hold a bachelor's degree, with a few holding graduate degrees. The academy is currently located at the former Soviet Union aviation school campus, adjacent to the international airport in the capital city of Kabul. Plans and construction are underway that will move the academy to its permanent location in Qargha on the western outskirts of Kabul in the summer of 2011 [11].

Current Status of the Academic Program

The original four faculty members in the civil engineering program at the National Military Academy of Afghanistan were civilian adjunct professors from Kabul University [5]. Although the original policy of the Afghan Ministry of Defense was to employ only Afghan Army officers as teachers, the civilians were hired to contribute additional training and expertise. Since the program graduated its first students in January 2009, about half of the faculty has been comprised of the program's own recent graduates. Many of the junior engineering faculty members are rotating through Master's degree programs in the United States and liaison assignments with the U.S. Army Corps of Engineers in Afghanistan.

Appropriate Learning Theory

In mentoring the faculty at NMAA, the team used Bloom's Taxonomy for the cognitive domain [9]. Depicted graphically in figure 3, Bloom's Taxonomy was particularly useful in mentoring the faculty through the process of scoping lesson objectives and lesson activities at the level appropriate for the course material, the stage of student development, and the overall objectives of the course.

The team also relied on Lowman's Model of College Teaching [4] as a tool to council and mentor faculty members in their own development as engineering educators. The faculty members clearly understood the need to be at a high level in the Intellectual Excitement dimension. This was a particular concern for

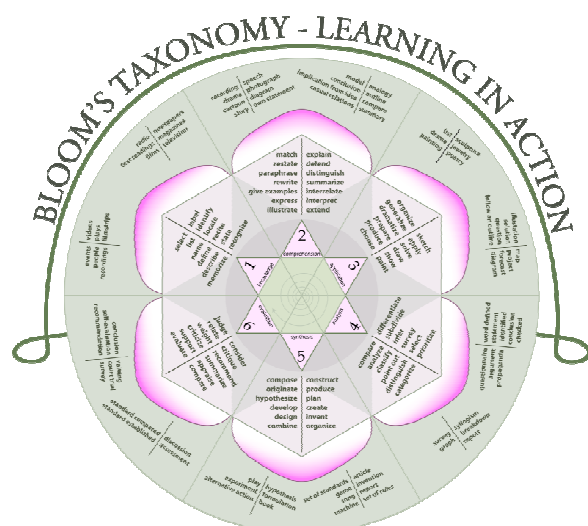


Figure 3 Bloom's Taxonomy Graphic [6]

the junior faculty members. The team worked with the faculty in also stressing Interpersonal Rapport dimension of Lowman's model. Our goal, of course, was to help them move towards becoming the 'Complete Exemplar' described by Lowman.

NMAA Mentorship Roles

Our mission was broad and deliberately unstructured so that we could find the ways we could best help once we were in country and familiar with the people involved. The most important motivation for sending people, rather than offering assistance via phone or internet, was the potential for mentoring made possible by face-to-face contact.

Because of the efforts of previous faculty mentors and the establishment of a rigorous teacher-training program, the faculty members in the engineering program were already fundamentally sound teachers. Their relative inexperience as instructors, however, made strategic tasks such as lesson and course planning more challenging for them. This was a main focus of our professional development efforts during the summer.

Civil Engineering Program Mentorship

In particular, the civil engineering department lacked a full hydrology course. An earlier faculty mentor had written a few lessons on open channel flow, but the larger course plan and most of the course lessons were still undeveloped. As an added challenge, the course was in session when we arrived: the instructors were teaching the established lessons without a larger strategic plan for the course and with only a short lead time before the prepared lessons were completed and new lesson plans were needed.

The first step in completing the hydrology course was to create an overall course plan. The scope of the course was patterned after a similar class at the U.S. Military Academy, which covers both open channel flow and hydrology in a single junior-level class. Although the scopes of these classes were similar, the Afghan course also needed a unit on closed-conduit flow (which is covered in a different course at USMA). The semester at NMAA was 70 lessons long – nearly half again as long as the semester at USMA – but local custom dictated a slower pace of instruction. In many cases, the starting point of the lesson plan was the corresponding USMA plan, but the concepts were expanded over more lessons, and logical break points were established at different points.

Dr. Bristow delivered about six lesson plans to the instructional team without extensive collaboration, in order to increase the lead time between the lesson currently being taught and the lesson currently being developed. Once the time between development and presentation was increased, she encouraged the instructional team to take a key role in development of the lesson plans. Dr. Bristow asked for their help in writing lesson objectives, in designing presentations, and in structuring concepts. The instructors were reluctant at first, stating that their inexperience disqualified them from participating in course planning and citing a wish to defer to the mentoring team's greater experience, but with some encouragement and coaching they produced lesson plans which were far more complete and realistic than we could have given them without

consultation. Once they had created a few lesson plans, their confidence and willingness to participate in planning increased considerably.

New Aeronautics Course

About six months prior to our trip, the NMAA Superintendent and Dean requested assistance in developing a 48-lesson course in aeronautics for senior cadets designated to be commissioned into the Afghan Air Corps. Unlike our country, all of the Afghan military aviation assets (fixed wing and rotary wing) are assigned to one organization. The young men who will become the pilots for these aircraft come from each of the academic majors at the academy. The leadership was adamant that the course would contain fundamental aeronautical engineering content and not be a flight training course. They wanted the students to understand the physical principles and design characteristics of the aircraft that they will someday fly.

The desire for an engineering course that contained both fixed wing and rotary wing content and that would be accessible to the non-engineering majors required a unique course design with a custom text. Preparations for developing the syllabus and writing the text (gathering references and resources) were completed prior to departure from the U.S. Actual work on the text could not be started until the team arrived at NMAA and made an initial assessment of the knowledge and skills possessed by the prospective students and obtained detailed input from one of the primary constituents of the course, the Afghan Air Corps.

From the first week in country, it was obvious to both the mentor team and the NMAA administration that the involvement of this constituent would be necessary for the course to fulfill its mandate. Dr. Crawford and representatives of the NMAA faculty met each Saturday with various leaders of the Afghan Air Corps; typically over several cups of *chai* (green tea). One of these meetings was with the commander of the Air Corps, Lieutenant General Dawran, a former Soviet-trained cosmonaut. With his full support, the NMAA team was able to obtain various aircraft parts, including an unserviceable gas turbine engine, to use as physical models in the class. Access to the Air Corps' various aircraft and technical information aided in the formulation of realistic aircraft performance models and example problems for use in the course.



Figure 4. Dr. Crawford (center right) and LTG Dawran (center left) with NMAA Department Heads

The development of the aeronautics course consumed nearly all of two months in planning, writing, translation, development of course problems, acquisition of physical models for the course, and preparation of a new classroom. The text needed to be in English and Dari and the Afghan instructor prepared and ready to begin instruction in the fall of 2009. As the team left NMAA at the end of July, the course was ready for its initial offering.



Figure 5. New Aeronautics Course Classroom

Textbooks

Educational assessments of higher education in Afghanistan frequently cite decaying educational infrastructure, outdated lecture notes, and lack of access to textbooks as key issues [10]. Access to textbooks was a significant challenge during this collaboration. In contrast to many American college and graduate-level programs, the Afghan students were not expected to purchase their own textbooks, but neither do they retain them for reference once the course is complete. The course textbooks remain the property of the Academy and are re-issued to the next year's students.

Course textbooks for the hydrology course were ordered in spring of 2008 by a previous faculty mentor. The long lead time was intended to compensate for the difficulty of shipping and moving goods within Afghanistan; however, the books had not arrived at the Academy as of June 2009. Students had no access to the textbook while the course was being taught; even the faculty members had only limited access, as the single copy of the textbook was kept locked in the Department Head's office and only released on request. The students' only reference materials were the lecture notes they copied in class and a faculty-developed study guide which highlighted key concepts in each lesson.

The interim solution to this problem was to greatly expand the study guide, since it served as a permanent reference which the students could carry with them in future deployments. Key course concepts were expanded, and with the permission of the textbook publisher, we included copies of critical diagrams and charts.

A longer-term solution to the lack of course textbooks came only when the unit's logistics officer began an investigation into the fate of the original course textbooks. After several weeks of searching, the class set of course textbooks was located, along with many other textbooks, in a local warehouse within Kabul. Complete reconstruction of the events which led them there was unclear, but it seemed likely that the shipping chain was interrupted at that point. With some negotiation of local politics and navigation through the acquisition process, the Academy took possession of the textbooks and transported them to an on-site warehouse for inventory and distribution. This one seemingly simple victory – though in application it was not simple at all to locate and take possession of the textbooks – had a significant impact on instructional effectiveness.

Professional Development of Faculty

A primary aspect of the team's mission at NMAA involved the professional development of the faculty with regard to their continuing growth as teachers. The team worked with faculty members, focusing on their understanding and application of Bloom's Taxonomy as a foundation for assessing the abilities of their students and as a tool for planning objectives for each lesson. Team members visited classes and provided individual feedback to faculty members using Lowman's model as a template; recommending areas in which faculty members could focus efforts to improve.

During the summer, each academic department at NMAA went through an assessment of its programs, conducted by an internal committee of administrators and department heads. It was an initial step towards what we hope will be the future pursuit of external accreditation.



Figure 6. Assessment Day for the Department of Civil and Mechanical Engineering

Current Needs and Continued Engagement

The current needs of the NMAA with regard to the authors involve continued mentorship for individual faculty members. This is ongoing through email and other social media. Some continual improvement is ongoing in the aeronautics course, again via email. Faculty members from West Point and the Air Force Academy continue to volunteer for mentorship positions at the NMAA. They provide an additional conduit for continued contact and involvement with our Afghan colleagues.

Lessons Learned

The authors learned many valuable lessons from their short two-month experience. First and foremost; this was an extremely rewarding endeavor. For anyone considering this type of professional service, we offer the following advice.

This takes a lot of time and energy...a lot. Don't plan on accomplishing anything else during your time at the foreign institution. If you find that you are able to, so much the better. We were completely immersed during our time in Afghanistan.

Ideally, an outreach such as this starts at least a year before the trip. It is important to have a clear sense of the scope of work that will be accomplished and begin to establish a relationship with colleagues at the host institution. This also allows time to learn about the people, culture and needs of the host country. Sources include the CIA's World Factbook at (<https://www.cia.gov/library/publications/the-world-factbook/>) and the U.S Department of State

travel website at (<http://travel.state.gov/travel/>). The Department of State has additional information needed to prepare for traveling overseas. Enrollment in their Smart Traveler Enrollment Program (STEP) allows access to the most current information about the country you are traveling to and allows you to receive automatic updates. This information includes their travel advisories and warnings which can be accessed directly from the website. It also has information on passport and visa requirements, some of which require significant lead times.

Ensure that you have adequate funding for the entire trip and contingencies. How are you getting there and back? Where will you stay? Where will you eat? If you are in an area of questionable stability, do you have the funds to quickly get to a place of safety? You should also have a plan for how you will access additional funds during the trip. You cannot always count on a functional ATM on every corner or the ability (or desirability) to use a credit card. In planning your funding needs, you should also plan for personal expenditures. Trips of this nature offer the opportunity to acquire a unique memento or two.

Medical planning is critical for a trip like this; both before the trip and during it. Determine what immunizations are required or recommended for area you will be visiting and allow plenty of time to complete any series. You should also ensure that you have an adequate supply of prescription medication for the duration of the trip. If this is not possible, you will need a plan to replenish these critical supplies. You should also know the locations and capabilities of medical care facilities in the event emergency care is required.

If at all possible, you should obtain a good mailing address prior to departure. Any consumables that you routinely use and desire while away may need to be sent from the U.S. This obviously includes your favorite toothpaste, soap, shampoo, and deodorant. It may also include any office supplies that you foresee using while away. Standard paper sizes differ between the U.S. and European; the European standard A4 paper size is what was available in Afghanistan. If we had realized this, we would have included printer paper in our ‘care package’ that we mailed prior to our departure. A modified packing list that we used for Afghanistan is included as Appendix A at the end of this paper.

Finally, some thought should be given to communications planning. What telephone and internet access is available at the host institution? What is available in the host country? Will you need to arrange for special hardware or software support? This is particularly important if software that you use requires a network license.

Outreach Opportunities

Most engineering educational professionals do not have the ability to participate in an outreach through the military channels that we used. Outreach is still possible. Nongovernmental organizations currently operating in Afghanistan and other developing nations are too numerous to list here. Major areas of focus include healthcare, women’s outreach and professional development, and education. One well-established organization which provides opportunities for engineering faculty to volunteer their time or make monetary contributions is Engineers Without Borders (EWB). EWB “supports community-driven development programs worldwide by

collaborating with local partners to design and implement sustainable engineering projects, while creating transformative experiences and responsible leaders” [12]. EWB-USA members participate in professional or student chapters on a wide variety of projects in locations across the world. Members have the opportunity to travel but need not do so in order to make valuable contributions to their chapter's project.

Conclusion

Our experience is only one example of how a few engineers can make a significant impact beyond their normal scope of influence. We took the knowledge and skills that we have developed in our careers and used them in a capacity we had never anticipated. When asked, “What did you do with your summer vacation?”, in 2009 we can honestly say that, “We made a difference.” If asked, “Was it worth it?”, the answer is a resounding, “YES!”

Acknowledgments

The views expressed herein are those of the authors and do not purport to reflect the position of the United States Military Academy, the Department of the Army, or the Department of Defense.

Bibliography

- [1] Greg Mortenson and David Oliver Relin, *Three Cups of Tea: One Man's Mission to Fight Terrorism and Build Nations – One School at a Time*, Viking, New York, 2006.
- [2] CIA World Fact book for Afghanistan found at <https://www.cia.gov/library/publications/the-world-factbook/geos/af.html>, accessed on 22 March 2011.
- [3] Ethnic Map of Afghanistan found at http://www.pbs.org/newshour/indepth_coverage/asia/afghanistan/map_flash.html, accessed on 24 February 2011.
- [4] Joseph Lowman, *Mastering the Techniques of Teaching*, 2nd edition, Jossey-Bass, San Francisco, 1995.
- [5] Stephen Ressler, Eugene Ressler, and Paul Stanton, “Developing Information Technology Infrastructure and Civil Engineering Education at the National Military Academy of Afghanistan,” *Proceedings of the 2010 IEEE Workshop on Transforming Engineering Education*, Dublin, Ireland, April 2010.
- [6] Bloom’s Taxonomy Graphic, http://upload.wikimedia.org/wikipedia/commons/thumb/2/24/Blooms_rose.svg/2000px-Blooms_rose.svg.png, accessed on February 15, 2011.
- [7] Bahawodin Baha and Tim Katz, *The Effect of Partnerships on Engineering Education in Afghanistan*, 3rd International Symposium for Engineering Education, 2010, University of College Cork, Ireland.
- [8] Saif Samady, *Education and Afghan Society in the Twentieth Century*, United Nations Educational, Scientific and Cultural Organization (UNESCO), 2001.
- [9] Benjamin Bloom, et.al., *Taxonomy of Educational Objectives: The Classification of Educational Goals, Handbook I: Cognitive Domain*, David McKay Company, Inc., New York, 1956.
- [10] Baha, B. and Baha, *Vocational and Engineering Education in Afghanistan*, American Society of Engineering Education (ASEE) Conference, Philadelphia, USA, June 2008.
- [11] National Military Academy of Afghanistan Information Briefing, U.S. Army Staff Document, March 2011.
- [12] *Engineers Without Borders - USA Strategic Plan*, Engineers Without Borders - USA, Boulder, CO, 2010.

Appendix A – Afghanistan Packing List

Bring with Us

Bags with:

Clothes

Sturdy Shoes

Exercise clothes

Pajamas w/ house shoes

Seasonal clothing (fleece/coat/gloves)

Towels/Wash Cloths

Personal Hygiene Items - Pack a one month supply in bags.

Pack a TSA authorized toiletry kit to account for 36 hours of travel to Manas/Kabul.

Underwear

Cap

TSA Locks for bags (4)

Locks for bags and locker (3)

After-Hours Clothes

Shower Shoes

Eyewear

Glasses

Sun Glasses

Prescription Medications

Books

Inflatable Pillow

Laptop – wth Skype, (Satellite Internet Optional)

Camera

iPod

Thumb Drive/USB Hard Drive

Phone Card

Passport/Visa

Cash for purchases. *NOTE: \$1000 recommended for us*

Early Shipping to NMAA

Twin Sheets (2 sets)

Foam Pad

Pillow

Books

Personal Items

Razor Blades

Shampoo

Lotion

Soap

Deodorant

Toothpaste
Toothbrushes
Shaving Cream
Q-Tips
Wet Wipes
Sun Block
Games/Cards
Stationary
Medications
 Tylenol, etc.
Docking Station
Extra Power Cord
Computer Keyboard
Optical Mouse
Writable CDs
USB Hard Drive
European Adapters

Reading Lists (for Afghanistan)

*Hosseini, K. (2003). The Kite Runner, Riverhead Hardcover.
*Hosseini, K. (2007). A Thousand Splendid Suns
*Michener, J. A. (1986). Caravans, Fawcett.
*Mortenson, G. and D. O. Relin (2006). Three Cups of Tea: One Man's Mission to Promote Peace . . . One School at a Time, Viking Adult
*Seierstad, A. (2003). The Bookseller of Kabul Little, Brown and Company

Ahmedi, F. and T. Ansary (2005). The Story of My Life: An Afghan Girl on the Other Side of the Sky Simon Spotlight Entertainment
Chayes, S. (2006). The Punishment of Virtue: Inside Afghanistan After the Taliban The Penguin Press HC
Stewart, R. (2006). The Places In Between, Harvest Books.
Tanner, S. (2003). Afghanistan: A Military History from Alexander the Great to the Fall of the Taliban Perseus Books Group.

Electronic Files

Email Address List
Work Files
Course/Teaching Files
Research Files
Email .pst File

