

## Developing Civil Engineering Faculty

**JAMES B. POCOCK and STEVEN T. KUENNEN**  
*Department of Civil and Environmental Engineering,  
United States Air Force Academy*

### Abstract

There is a wide variety of credentials and experience among civil engineering faculty in the United States. Instructors in the classroom may range from teaching assistants or adjunct faculty with a master's degree to full professors. Full-time faculty members in accredited civil engineering programs usually have doctoral degrees as well as teaching and research experience. At many schools, faculty development is dominated by committee service and research with tenure being the ultimate goal. Other universities, including some without graduate programs, have a much heavier emphasis on developing excellence in teaching.

The United States Air Force Academy is a four-year undergraduate institution without a traditional tenure system, but with a comprehensive faculty development program. Instructors in the Department of Civil and Environmental Engineering at the Air Force Academy may begin teaching with only a master's degree. However, they benefit from a variety of faculty development opportunities designed to improve their skills.

These include their own professional experience, new instructor orientation and training, required faculty development presentations during their first semester of teaching and unique, hands-on teaching experiences. Other facets of this faculty development program include regular feedback sessions with the department chair, interaction with a new visiting professor every year, attendance at professional conferences, a strong emphasis on professional registration and working experience early in the teaching career. Feedback to instructors includes peer classroom visits and student course critiques. This paper examines the total faculty development program with the intent of provoking discussion and sharing good ideas for faculty development.

### Background

The Department of Civil and Environmental Engineering at the United States Air Force Academy employs approximately 20 full-time faculty members, both military and civilian, and also sponsors one visiting professor each year. The department offers undergraduate degree programs in both civil engineering and environmental engineering. There are no graduate programs or graduate students at the Air Force Academy. Military officers must have at least a master's degree to begin teaching, while all four current civilian faculty members have Ph.D.'s. Of the 21 current faculty members, 10 have doctoral degrees and 18 have professional registration. There are no part-time instructors or teaching assistants.

Military instructors typically teach at the Academy for three years before returning to the Air Force civil engineering career field. The department selects some instructors to attend Ph.D. programs at civilian institutions, and these officers will eventually return to the faculty.

Civilian faculty members are hired for long-term positions. The initial contract is for three years, with five-year extensions. The Academy does not have a traditional tenure system, but as long as the department and individual professors are satisfied, the expectation is for contracts to be renewed if requirements don't change.

### **Instructor Professional Experience**

Since military instructors are Air Force officers, typically in the civil engineering career field, they have a wide variety of professional practice. Most have worked as design engineers, construction project managers, environmental engineers, and/or as military combat engineers. These professional engineering experiences enrich their teaching ability by providing many built-in classroom examples and anecdotes. Most of the civilian professors have similar professional experience with civilian engineering firms, government agencies and research laboratories, the military, or as consultants. The civilian professors also tend to have teaching experience at other universities. Professional experience is substantiated by the fact that most department members are registered professional engineers.

### **New Instructor Orientation**

Once a new instructor, whether military, civilian or visiting professor, arrives at the Academy, he or she participates in mandatory New Instructor Orientation. This comprehensive program has two main parts. The first portion, approximately one week long, is for new faculty members from all departments at the Academy. The Center for Educational Excellence, equivalent to an academic department, coordinates this orientation program as one of many services it provides to the faculty. It begins with the Dean of Faculty welcoming the new instructors and continues with a variety of briefings, tours and seminars to acquaint them with the unique aspects of the Air Force Academy. It covers such things as the cadet honor code, classroom decorum, ethics across the curriculum, student services, technology to support teaching, a new instructor survival guide, and many other topics. The Center for Educational Excellence surveys new instructors to assess the quality and impact of the program.

After a week to work on course material, the second part of orientation takes place within the department. It covers department organization and policies while preparing the new instructors to teach one of the Academy's core courses administered by the department (see Table 1). "Air Base Design and Performance" is a course that every student at the Academy (approximately 1,000 per year) is required to take. The maximum class size of 24 students means that many meeting times and instructors are required. New instructors teach practice lessons to each other and receive feedback from experienced instructors. By teaching this course, all department members begin with a common background. This week usually concludes with an outdoor team-building event (see Figure 1).

Department Head Welcome  
Department Roles and Responsibilities  
Opportunities to Serve Outside the Classroom  
Front Office Organization  
Computers, Printing, Logons, and E-mail  
Faculty Development Resources  
Core Course Overview  
Practice Teaching Selection/Lesson Preparation  
Cadet Advisor Orientation  
Core Course Lesson Topics  
Laboratory Safety Briefing  
Department Honor Liaison Officer  
Practice Teaching – Lesson Preparation  
Practice Teaching – Lessons  
Department Team-Building Exercise  
Tour of Field Engineering & Readiness Laboratory (FERL)  
Department Meeting

**Table 1. Department New Instructor Orientation Topics**



**Figure 1. Department Members during Ropes Course Team-Building Exercise**

Together, these two weeks of New Instructor Orientation have many of the same features found in the American Society of Civil Engineers' "Excellence in Civil Engineering" (ExCEED) teaching workshops, which have been "fulfilling a genuine need in providing new civil engineering educators with high quality instruction and practice in the art of teaching".<sup>2</sup> The ExCEED workshops had their origin at the United States Military Academy at West Point in their own new instructor orientation program known as "Teaching Teachers to Teach Engineering"<sup>2</sup>.

### **Faculty Development Workshops**

The Academy's Center for Educational Excellence also provides a series of follow-on workshops for instructors throughout the academic year. These are available for all instructors, monthly during the lunch hour. New instructors are required to attend during their first semester of teaching. These workshops provide additional information on such things as administrative issues, teaching tips and research opportunities. They also provide the opportunity for new instructors to share with each other what they have learned. These types of workshops have been shown to positively influence the teaching methods of instructors<sup>1</sup>.

### **Department and Division Meetings**

Another way that new personnel transition into their roles as instructors is through information provided at department and division meetings. The department holds monthly meetings for all faculty and staff to present awards, discuss department policies, cover upcoming events, make announcements and answer questions. Within the department, each of the four discipline-specific divisions also holds regular meetings, usually weekly to pass information from the senior staff and to receive feedback, concerns or questions.

### **Hands-on Teaching**

During June, all department instructors help teach "Civil Engineering Practices – Field Engineering". All civil and environmental Engineering majors take this course prior to their junior year. During this three-week course students complete 22 hands-on construction activities in field conditions under the supervision of faculty and enlisted craftsmen. A sampling of the activities includes wood-frame construction, heavy equipment operation, concrete placement, and asphalt paving. Each activity provides a foundation for design and theory in one or more subsequent major's courses.

These activities provide practical construction experience for students entering the program (see Figure 2). They also give instructors the opportunity to teach their students in a more interactive fashion. Instructors get to know the students in an outdoor setting different than the traditional classroom. These shared experiences lead to better rapport with students in later courses, as well as practical examples that instructors can use as illustrations in the classroom<sup>3</sup>.

### **Auditing Courses**

Before teaching a course for the first time, instructors are typically required to audit the course for a semester as a student. This not only ensures they are familiar with the academic material



**Figure 2. Instructors Provide Students with Practical Experiences**

before teaching the course, it also provides them a students' perspective. They can also consider alternative approaches to teaching the course, such as different teaching styles, new classroom examples and demonstrations, and innovative answers to anticipated student questions.

### **Feedback**

There are a variety of ways new instructors receive feedback on their teaching performance. All instructors have semi-annual (military) or annual (civilian) feedback sessions with their supervisor. These are two-way discussions in which the supervisor provides feedback to the instructor and the instructor can make comments or ask questions of the supervisor. The supervisor may advise instructors on what they need to do to earn their next promotion, and instructors may ask about possible job assignments within the department. These sessions are documented and are used in part to prepare performance reports.

Department members are also expected to visit each other's classes to learn from each other and to provide feedback. The department's goal is four class visits by each department member per semester. The visitor provides written feedback comments to the instructor.

Finally, the department also uses traditional student course critiques. These are required at mid-term for first-year instructors and at the end of the semester for all instructors. This year the

Academy has switched from paper to online critiques in an effort to ease the process of administering and analyzing the surveys. The critiques include 23 standard questions about the course and the instructor. The student also has the opportunity to provide additional comments. Every instructor receives an automated report for each section taught comparing their results to averages from others teaching the course, to other department members and to the rest of the faculty teaching other courses. Table 2 lists the items rated for diagnostic feedback to the instructor. Students rate the instructor on a 1 to 6 scale from Very Poor to Excellent. Instructors can actively make use of critique results to improve their teaching methods<sup>4</sup>.

- |  |
|--|
| <ol style="list-style-type: none"> <li>1. Instructor's ability to stimulate my interest was:</li> <li>2. Quality and timeliness of feedback on graded work was:</li> <li>3. Instructor's ability to provide clear, well-organized instruction was:</li> <li>4. Instructor's ability to present alternative explanations when needed was:</li> <li>5. Instructor's use of examples and illustrations was:</li> <li>6. Value of questions and problems raised by instructor was:</li> <li>7. Instructor's knowledge of course material was:</li> <li>8. As a military role model or civilian professional role model, my instructor was:</li> <li>9. Encouragement given students to express themselves/participate was:</li> <li>10. Instructor's concern for my learning was:</li> <li>11. Availability of extra help when needed was:</li> <li>12. Instructor's enthusiasm was:</li> <li>13. The instructor's effectiveness in facilitating my learning in the course was:</li> </ol> |
|--|

**Table 2. Diagnostic Feedback to the Instructor from Student Course Critiques**

### **Professional Development**

All faculty members are given one professional development opportunity per year. These are typically trips made to national or international conferences such as those sponsored by the American Society of Civil Engineers, the American Society for Engineering Education or the Society of American Military Engineers. These opportunities allow instructors to attend many sessions on the latest developments in civil engineering and education, and to make contacts with their colleagues at other schools and organizations. Other possibilities include attending continuing education courses. If a faculty member has a conference paper accepted, he or she may be able to make more than one trip in order to present the paper.

### **Rotating Faculty**

One challenge for the service academies is that their military instructors typically leave the faculty after only three years to return to their operational careers. This makes the role of senior department members and civilian professors vital to providing department continuity. Fortunately, many of the military instructors that depart will eventually return to the department. Some are sent on temporary three- or four-month deployments as needed to meet military requirements. Although the department may be short-handed while these instructors are gone, they return with more “real-world” experience and classroom examples.

Others leave because they have been selected to complete their Ph.D. and then return to the Academy. Even so, they will have an “operational tour” in the civil engineering career field before returning to the faculty. These instructors will return with their doctoral degree and increased technical knowledge and insight, as well as more professional civil engineering experience. Some faculty members have chosen to complete a Doctor of Engineering program, rather than a traditional Ph.D. The Doctor of Engineering program includes a one-year professional internship and report, rather than research and a dissertation.

Civilian professors have some opportunities for research with Air Force or other government agencies during the summers. The Air Force Academy also has a traditional academic sabbatical program for civilian professors.

## **Conclusion**

A broad faculty development program supports the unique undergraduate program at the U.S. Air Force Academy. Military and civilian instructors within the Department of Civil and Environmental Engineering arrive with various backgrounds and experiences, and are immersed into faculty development upon arrival at New Instructor Orientation. The Academy continues to provide various tools for instructors to develop their skills as they progress through their teaching tours and careers. Through its Center for Educational Excellence, the Academy expands instructor proficiency by formal survey-based course critiques and periodic educational workshops and seminars. The Department supplements this faculty development with hands-on experiences, team-building exercises, supervisor and colleague feedback, required course audits, and professional development trips and courses, all in an effort to prepare students to become future Air Force leaders.

## **Bibliography**

1. Brawner, C.E., et al, “A Survey of Faculty Teaching Practices and Involvement in faculty Development Activities”. *Journal of Engineering Education*. 91(4): 393-396.
2. Estes, A.C., and Ressler, S.J., “ExCEED Teaching Workshop, Fulfilling a Critical Need”, *Proceedings of the 2001 American Society for Engineering Education Annual Conference & Exposition*, Albuquerque, 2001.
3. Kuennen, S.T. and Pocock, J.B., “Bringing Construction Experience into the Classroom”, *American Society of Civil Engineers Construction Congress*, Honolulu, 2003.
4. Rockland, R.H., “Effective Teaching Training for New Faculty through Analysis of a Student Evaluation Form”, *Proceedings of the 2002 American Society for Engineering Education Annual Conference & Exposition*, Montreal, 2002.

## Biography

JAMES B. POCOCK is an associate professor in the Department of Civil and Environmental Engineering at the U.S. Air Force Academy. Dr. Pocock has an undergraduate degree in architecture from the University of Michigan, a master's degree in architectural engineering from the Pennsylvania State University and a Ph.D. in civil engineering from the University of Illinois. He is a retired Air Force civil engineering officer and a registered architect.

STEVEN T. KUENNEN is an assistant professor in the Department of Civil and Environmental Engineering at the U.S. Air Force Academy. Lt. Colonel Kuennen has a B.S. in civil engineering from the U.S. Air Force Academy, a master's degree in civil engineering from Columbia University, and a Doctor of Engineering in civil engineering from Texas A&M University. He is an active duty Air Force civil engineering officer and a professional engineer.