

Required Faculty Training - How to Teach Civil Engineering

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Abstract

Most new civil engineering faculty are hired with the presumption that they know how to teach. However, the usual extent of their formal faculty training is occasionally filling in for their faculty advisor while in graduate school. At West Point, we could claim that since our new faculty trained soldiers every day prior to going to graduate school, there is no need to waste valuable time and resources on formal faculty training. But, is that enough? At West Point, that answer is a resounding no! Everyone can improve their performance with proper training, but especially anyone doing something for the first time – like new teachers! Every department at West Point has some form of instructor summer training for their new faculty. The training programs range from two to six weeks with all programs having some type of practice teaching sessions. Even with the formal training programs, United States Military Academy (USMA) new faculty are expected to continue to learn a lot about the basics of leading classroom instruction throughout their first and second semesters of teaching. However, the faculty training gives our new instructors a theoretical foundation, and tangible examples as well as in-class experience prior to their first day in front of students. The experience also provides our new instructors a much higher maturity and experience level before the first semester begins and prevents on-the-job training from interfering with the students' education.

The Department of Civil and Mechanical Engineering (CME) ensures that their new faculty are prepared to teach by administering an in-depth six-week training program. New faculty are so well prepared that students rarely can tell that they are brand new faculty teaching their first semester. This paper will describe the CME faculty training program that effectively prepares teachers to actively engage students in the learning process to increase their success. We will present the integrated schedule, program assessment, and an in-depth look at the key components – presentation of teaching pedagogy, veteran classes, new faculty practice classes, class assessments for both veteran and new faculty, and administrative classes that help smooth new faculty transition into the department. We will also highlight a one-week course for those schools that are not able to devote time to train their own faculty.

We will assess the CME faculty training program's effectiveness both through the comments of those new instructors who have participated in the program as well as comparison of their student ratings to other instructors at the USMA. Through this assessment, we will show whether the faculty training program is an effective use of department resources, as well as where it has been most effective in impacting the West Point educational experience.

I. Introduction

Training is an integral part of the Army culture. Lack of training or preparation has led to some of the biggest failures in combat. So naturally there is some type of instructor training in each department at the USMA. Many of these training programs have developed over the years, but some have evolved as faculty development and educational research have become important.

Of the fifteen teaching departments, eleven have similar formal summer programs for new faculty.¹ These departments require all new civilian and military faculty to participate in the summer programs ranging from four to six weeks in length. Six of these departments call the program a “workshop” (Faculty Development Workshop-5, Instructor Summer Workshop-1), while four call the experience “training” (New Instructor Training), and for one department it’s an orientation (New Instructor Orientation).

Of the four remaining departments, three have programs for new instructors. These three programs are called New Instructor Training and differ from the programs above in that they are shorter (one to two weeks), and not as structured or formal. In one of these cases, as well as in the final teaching department with no summer program, the department’s summer mission precludes a long formal summer workshop. These two departments conduct faculty development at other times during the academic year as well as some spontaneous training sessions during available summer slots.

II. USMA Faculty Development

All fifteen teaching departments require that all new faculty, both civilian and military, participate in these workshops whether they be one week or many weeks, and whether they be held in the summer or during the first academic term. Some departments require returning second-tour faculty to also attend all of the summer workshop activities as a refresher and to provide peer insight, while in other departments only certain classes/sessions are mandatory for second-tour faculty. The usual teaching assignment for a majority of our faculty is three years, i.e., rotating first and second tour faculty.

Three of the eleven departments with longer formal programs report that a senior faculty member runs the summer program. Eight departments report that a junior rotating (usually a 3rd year) faculty member runs the summer program with a senior faculty member (Program Director, Group Director, Division Chief) overseeing the program. In most cases, the rotating faculty director is the Course Director of the course that most of the new faculty will be teaching. Many of the departments report a team approach to the summer experience -- a rotating faculty member working closely with a senior faculty program or group director.

Nine of the eleven departments with longer formal programs report that all available faculty (senior, rotating, civilian and military) participate in the summer training program. These faculty members serve as students in practice classes and/or as

class observers. Additionally, many faculty members assist in providing orientation briefings about the department and the curriculum. One department uses war time augmenters doing summer reserve time to assist in the summer program and to act as mentors to new instructors. In a few departments, the Department Chair actively participates in these summer activities.

All departments with a formal program focus the program on preparing faculty to teach. To that end, the workshops review subject material and present teaching methods. Departments seem most interested in offering teaching experiences and developing confidence. They also want to assist faculty in their transition into the Department and the Academy – both an informational and a socialization process. To this end, the new faculty spends part of their first summer at USMA doing department policy orientations, tours of facilities and other departments, cadet training site tours and social functions.

III. Civil and Mechanical Engineering Faculty Development – Instructor Summer Workshop

History

For over forty years², CME has believed that high quality classroom presentation enhances student learning. In its effort to provide this high quality learning environment, they have conducted a rigorous six-week teacher training program for their incoming faculty known as the Instructor Summer Workshop (ISW). The program allows instructors to learn by observing and then doing with no formal instruction on teaching pedagogy. New instructors were taught through observation of senior faculty presenting classes that were then assessed by other senior faculty. After a few demonstration classes that set the standard for excellence, the new faculty began presenting classes that were first assessed by senior faculty, then later in the process by peers and senior faculty, and eventually the new faculty would start the assessment process with a self-assessment. Amazingly all of the key aspects of superb teaching found in the literature would come out during the six week program either through assessments of good or bad examples of teaching or as an on-the-spot discussion lead by a senior faculty member based on when they felt the new instructors were ready for an advanced topic.

The influence of the department's instructor training program had been constantly commented on by the faculty receiving the training, and by the students enrolled in our courses. The students consistently rated the CME instructors higher than USMA norms in the standardized course-end surveys and the faculty reported having a higher level of confidence in their ability to present course material in both an organized and understandable fashion. When congress mandated the addition of civilian faculty at USMA in the early nineties, the thought of conducting a shorter version of ISW for faculty from other institutions was raised. Both the civilian and military faculty worked together to prepare a National Science Foundation (NSF) proposal for a one-week version of ISW. Teaching Teachers To Teach Engineering (T⁴E)² was the resulting one-week short course that provided engineering faculty, i.e., civil, mechanical, aerospace,

electrical, chemical, etc., with less than four years of teaching experience with a foundation of effective teaching.

The first step was to determine and then articulate what was the faculty development model in ISW – something that had not been done during the previous 40 years. The CME model that was labeled the “T⁴E Model” consisted of content, the fundamental teaching principles, and process, an environment to practice the application of these principles. Even though the content and process articulated in the T⁴E model had evolved and been passed down through participation in ISW, they were very consistent with the literature which included Lowman’s³ two-dimensional model of teaching effectiveness and Wankat and Oreovicz’s⁴ compendium of learning principles.

The T⁴E workshop eventually consisted of teaching pedagogy seminars, demonstration classes, and laboratories where the participants presented two classes to their peers acting as students and assessed by a senior mentor. The seminars presented in T⁴E covered the following principles: use structured organization of content to guide the learner; use effective communication to keep the learner engaged; demonstrate enthusiasm for the subject matter, for teaching, and learning; use homework and projects to promote learning outside the classroom; and use technology when and where it enhances the learning process. These seminars are now incorporated into ISW as a two plus day Teaching Techniques Workshop (discussed later) at the beginning of ISW, along with demonstration classes, before we have the new faculty present their classes.

The department has published “A Compendium of Best Teaching and Learning Principles for C&ME Faculty”⁵ that describe their beliefs in this area. The 16 principles are listed below:

1. Guide the student – communicate objectives and provide organization and structure.
2. Apply depth of subject matter to enhance learning – some organization should be clear, provide opportunities for students to do some structuring, and content includes concepts, applications, problem-solving.
3. Continue growth in the discipline.
4. Ensure that the student is an active participant – students must actively grapple with material, can be done by writing or speaking.
5. Shift control and ownership of the learning process to the learner.
6. Require practice – repetition is required for understanding, quickness, and accuracy, practice in a non-threatening environment.
7. Provide feedback – prompt and positive, prior to evaluation to provide opportunities to improve, provide a second chance to practice after feedback.
8. Have positive expectations of students.
9. Provide means for students to be challenged, yet successful – provide the proper background, provide sufficient time and achievable tasks.
10. Use a variety of teaching styles to appeal to different students – use images and visual learning.

11. Make the class more cooperative – use group exercises and grade against an absolute standard.
12. Ask thought-provoking questions.
13. Be enthusiastic, and demonstrate the joy of learning.
14. Encourage students to teach other students.
15. Care about what you are doing.
16. If possible, separate teaching from evaluation.

In order to teach, and ensure others learn, by these principles, the faculty must be well prepared. As the data presented later will show, the department's Instructor Summer Workshop prepares the faculty well. The workshop provides the proper educational preparation for teaching by first teaching the new instructors how to teach. They are given the majority of what they need to know about successful teaching during the Teaching Techniques Workshop phase of ISW. The senior faculty also demonstrate examples of good teaching where the standards are clearly communicated. The new instructors are also given ample opportunity to practice by giving classes to other faculty members who role play as students. These "students" ask questions, video the class and provide assessment of the class from a student's perspective. Beside being assessed themselves, the new faculty learn how to assess others and eventually conduct self-assessment. Finally, new instructors are integrated into the organization with a series of classes and briefings. The teaching techniques workshop, veteran demonstration classes, practice classes, assessments, and integration briefings form the structure that makes ISW successful. The details of the workshop are discussed below.

Schedule

The Instructor Summer Workshop run by the Department of Civil and Mechanical Engineering lasts six weeks with one week spent as a junior mentor during the ExCEED Teaching Workshop (discussed later). In general, the new instructors teach six full-length classes, observe about eighteen other classes taught by their peers, and attend administrative briefings each week. The schedule from the 2002 ISW is shown in Figure 1 below. The schedule for the 2003 ISW workshop did not change in concept, but did require some minor modifications to accommodate the new calendar year.

ISW 2002

MONDAY		TUESDAY		WEDNESDAY		THURSDAY		FRIDAY	
17		18		19		20		21	
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> NOTE: Monday/Thursday – list names here Tuesday/Friday – list names here </div>						0800 Welcome by Dept. Head 0930 Staff Introduction 1000 Computer Basics 1030 ISW Overview 1200 Group Lunch		NO ISW TNG A.M. – 1-1, housing, AG (as necessary) 1215 CHN 2d floor hospital 1430 travel/finance	
24		25		26		27		28	
0730 Coffee and Donuts 0800 - 1700 Teaching Techniques Workshop Vet Class #1 Vet Class #2				0800 Design Process 0900 Vet Class #3 1100 Div Dir Time 1300 Scholarship		0800 - 1200 New Faculty Class #1, 30 min/each 1300-1600 USCGA class		1300 Vet Class	
1		2		3		4		5	
0800 - 1200 New Faculty Class #2, 55 min/each				0800 Math Dept Brief 0900 Calc. Training 1000 CTE Brief 1100 Vet Class #4		NO ISW TNG		NO ISW TNG	
8		9		10		11		12	
0800 - 1200 New Faculty Class #3, 55 min/each				0800 Chill in Classroom 0830 Computer Class 1100 Vet Class #5		0800 - 1200 New Faculty Class #4, 55 min/each			
15		16		17		18		19	
0800 - 1200 New Faculty Class #5, 55 min/each				0800 From Earth to the Moon video clip 0900 Mahan Hall Ops 1100 Vet Class #6		0800 - 1200 New Faculty Class #6, 55 min/each			
22		23		24		25		26	
0800 - 1200 New Faculty Class #7, 55 min/each				0800 Grade/Cut Class 0900 Grading System 1030 Leader Eval. and Dev. System 1300 Respect Brief		0800 CEP Brief 0915 ISW AAR 1015 ABET Brief 1300 Dean's Brief 1430 ExCEED OPORD 1600 Social Function			

Figure 1: ISW 2002 Schedule

Teaching Techniques Workshop

The teaching techniques workshop (TTW) consists of two full days of training in which new instructors are taught the fundamentals of teaching. Other than some introductions and administrative classes, TTW is the first training that occurs during ISW. New instructors must first be shown how to teach, and taught why we use certain tools and techniques, before they can be expected to be effective in the classroom. TTW consists of several seminars that are listed in Table 1 below. These seminars are taught by senior faculty from within the department. These senior faculty also give full-length demonstration classes with the new instructors simulating the students. This allows the senior faculty to demonstrate the standard and show new faculty what is expected from instructors in our department. You will see later that these seminars parallel the seminars during the ExCEED Teaching Workshop (presented later).

Table 1 Teaching Techniques Workshop 2002 Schedule

Day	Time	Event	Title of Seminar
MON	8:00-9:30	Seminar I	Learning to Teach
	9:30-10:30	Veteran Instructor Demonstration Class 1	
	10:30-11:00	Assessment of Vet Class 1	
	11:00-11:30	Seminar II	Principles of Effective Teaching and Learning
	11:30-12:30	Lunch	
	1:00-1:30	Seminar III	Introduction to Learning Styles
	1:30-2:30	Seminar IV	Organizing a Class 1 (Learning Objectives)
	2:30-3:30	Seminar V	Organizing a Class 2 (Planning a Class)
	3:30-4:30	Seminar VI	Instructional Technology 1 (The Chalkboard)
TUE	8:00-8:15	Admin	
	8:15-9:00	Seminar VII	Teaching Assessment (Worksheet)
	9:00-10:00	Veteran Instructor Demonstration Class 2	
	10:00-10:30	Assessment of Vet Class 2	
	10:30-11:30	Seminar VIII	Communication Skills: Speaking and Writing
	11:30-12:30	Lunch	
	1:00-1:45	Seminar IX	Communication Skills: Questioning
	1:45-2:00	Seminar X	Classroom Assessment Techniques
	2:00-3:30	Seminar XI	Transparencies and Computer Applications
WED	9:00-10:00	Veteran Instructor Demonstration Class 3	
	10:00-10:30	Assessment of Vet Class 3	

Throughout TTW, various assessment techniques are used to determine how well the seminars are being received. Using these assessment techniques also introduces the new instructors to ways of receiving quick, end-of-lesson assessments during the semester. By the time Seminar X is conducted, the new instructors can better appreciate the advantages of various assessment tools by having seen many of them. In addition to the one to three minute end-of-class type assessments, detailed assessments are done during the veteran classes. Following the 55 minute class, a different senior faculty member leads an after action review of the class. The new instructors brainstorm what techniques used by the veteran instructor were good and what things could be improved. New instructors base their comments on what they have learned in the TTW seminars.

Besides demonstrating the department standard of teaching, these assessments prove that even the best and most experienced instructors can still improve their teaching.

Practice Classes

Probably the most important training conducted during ISW is the practice classes that the new faculty present. Each new instructor presents one half-length (30 minute) class and six full-length classes (55 minutes). These classes are spread out throughout the summer training. Half of the group presents classes on Monday and Thursday while the other half of the group present classes on Tuesday and Friday. It is very important to spread these classes out so that the new instructors have adequate time to prepare each class. The classes that they present will be from the same course that they will teach when the semester begins. Typically the classes will be selected from throughout the semester, as opposed to doing the first seven lessons, so that while the person is learning how to teach, they are also getting an overview of the course pedagogy for the course they will be teaching soon. If there is more than one person teaching the same course, they are given different classes to teach. This way they see even more of the course they are responsible for teaching.

There are three things that must be done in order to get the most out of the practice class training. First, an instructor who has taught the course previously must be available to conduct a lesson conference with the new instructor. At the lesson conference, the veteran instructor will cover the material, explain the class notes, point out where students have trouble, show what training aids are available and how to use them, and answer any questions that the new instructor might have. The veteran instructor does not have to be the same person for all seven classes, but it is important to put together a schedule for the lesson conferences and assign responsibility for each one so that the new instructor never goes into a practice class without having discussed the finer points of the lesson with someone who has taught it before.

The second thing that must be done to make the practice classes effective is to have other new instructors act as students during the class. There are many advantages to having students in the room when an instructor is practicing a class. Most importantly, the new instructor must assess how well the students are learning as the class progresses. Having students in the room allows the instructor to gauge facial expressions, to ask the students questions, and listen to student responses and questions to gauge their understanding. This is especially true if the instructors are not familiar with the course content – mechanical engineers in civil engineering courses, hydrologists in structural courses, etc. The new instructor will present a much better class the next time having been through this process with new instructors acting as students. Another advantage to having “students” in the practice class is that it allows the new instructor to work on classroom presence. In other words, being aware of what is happening in the room while teaching the new material. For example, is someone talking about their upcoming weekend instead of the class material, is someone sleeping, does someone have a question, or have I asked everyone a question to keep them engaged? In addition to these advantages, the new instructors who are role playing as students get a student perspective

on their newly learned skills. While sitting as a student they can vicariously learn how to implement the teaching techniques learned during TTW and understand how effectively such techniques can be used. These advantages make it well worth the time for other faculty to role-play as students.

Finally, the most important thing that should be done in order to maximize the training benefit of practice classes is a formal assessment. In ISW, the assessment of a practice class occurs immediately following the class. During the first week, the senior faculty member attending the class conducts the assessment, pointing out what the new instructor did well and what they need to improve. The assessment is always done verbally, but it includes written comments. The form found below in Figure 2 is what the Department of Civil and Mechanical Engineering uses for the written assessment. Notice that it includes a place to indicate the most important couple of things the instructor should work on for the next class. This is important because it is easy to list numerous small details that need improvement, and a new instructor must ensure that the critical tasks are improved first. The form, which follows closely the models presented by Lowman³ and Wankat and Oreovicz⁴, provides an efficient overall assessment at a glance.

TEACHING ASSESSMENT WORKSHEET			
INSTRUCTOR: _____	ASSESSED BY: _____		
LESSON TOPIC: _____	DATE: _____		
STRENGTHS:			
1	_____		
2	_____		
3	_____		
4	_____		
5	_____		
6	_____		
7	_____		
8	_____		
9	_____		
10	_____		
11	_____		
12	_____		
AREAS FOR IMPROVEMENT:			
13	_____		
14	_____		
15	_____		
16	_____		
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28	_____		
29	_____		
30	_____		
31	_____		
32	_____		
33	_____		
34	_____		
35	_____		

	Needs Work	Good	Excellent	Remarks
TECHNICAL EXPERTISE				
Command of the Subject Matter				
LESSON ORGANIZATION				
Lesson Objectives				
Organization of Boards & Classroom Activities				
CONDUCT OF THE CLASS				
Enthusiasm, Energy, and Confidence				
Orientation to the Subject Matter				
Clarity of Presentation (<i>boards, viewgraphs, etc.</i>)				
Clarity & Precision of Explanations				
Voice (<i>volume, speed, variation</i>)				
Questioning & Answering Questions				
Contact with Students				
Visual Aids and Demonstrations				
Time Management				
Appropriate Use of Textbook				
THE CLASSROOM ENVIRONMENT				
Classroom Appearance				
OVERALL ASSESSMENT: Are the students who attended this class adequately prepared to accomplish the Lesson Objectives? <input type="checkbox"/> No <input type="checkbox"/> Not sure <input type="checkbox"/> Yes				
Specific areas on which to focus during your next class:				
1.	_____			
2.	_____			
3.	_____			

Figure 2 Teaching Assessment Worksheet

It is also extremely important that an instructor can assess their own class. Once the academic term begins, there will only be a few times that an instructor has a peer or a

member of the senior faculty attend a class for assessment purposes. The majority of assessments must come from being able to objectively conduct a self-assessment. In order to train the new instructors in this skill, there is a progression of assessment techniques used throughout ISW. During the first week, only the senior faculty assesses the practice classes verbally. However, all of the new instructors fill out the Teaching Assessment Worksheet and provide it to their peers. During the second week, all new instructors provide their peers verbal assessments followed by senior faculty wrap-ups. This continues the new instructors' training to critically assess their own performance. It also allows them to observe senior faculty assessments that may or may not reinforce their comments. Finally, for the last three lessons, the new instructor conducts a self-assessment of their class prior to receiving comments from peers and senior faculty thereby training themselves to objectively assess their own presentation as they continuously improve their teaching throughout the semester. In addition to this progression in assessments, every practice class is filmed for the student allowing new instructors to observe themselves after receiving an assessment. It is an invaluable tool as many people are not aware of some things they are doing or how they present themselves when they first begin teaching.

Veteran Instructor Classes

Veteran instructor demonstration classes are an important component of ISW. Three of these classes are given in conjunction with the Teaching Techniques Workshop, and veteran instruction does not end with the conclusion of TTW. Once a week a different experienced instructor gives a full-length class in which the new instructors role-play students and another veteran instructor leads the assessment. Discussion of the good things and the things that could be improved continues the development of new faculty assessment skills. This also helps them learn how to assess a class. More importantly, it lets the new instructors see another example of good teaching, while demonstrating that the best instructors can improve their teaching. Since there are so many different types of personalities in the department, it is important for the new instructors to see different examples so that they realize a particular personality is not an excuse for poor teaching. Additionally, a new instructor might see their perceived style in one of the senior faculty and reach out to establish a mentor relationship, each observing each other's classes. When we schedule the veteran instructor classes, we make them as diverse as possible. Some examples of this are using different personalities, using people with only a year experience and those with many years, giving a class in a computer lab, teaching from a variety of courses, teaching classes that involve group work, using various technologies such as PowerPoint or overheads, and teaching classes that involve extensive use of physical models.

Administrative Classes, Briefings, and Appointments

Another large part of ISW is teaching the new instructors about the processes, systems, and administrative details associated with being an instructor at the United States Military Academy or any university. These types of classes or briefings are generally reserved for Wednesdays. The primary reason for this is that it provides the

instructors with an additional day of preparation (afternoon) for their next practice class. The specific things coordinated during this time can be seen on the ISW schedule (Figure 1). Examples include learning about institutional resources such as the Center for Enhanced Performance and the Center for Teaching Excellence, learning about the institutional regulations that the students are governed by, and learning the departmental policies and procedures such as attendance and grade reporting, term-end procedures, and research expectations. Wednesday also serves as the best day to schedule the veteran instructor demonstration classes previously mentioned.

ExCEED

The glowing participant assessments² of T⁴E suggested that a program following the T⁴E model might be a wonderful faculty development addition for any university. In 1999, when the NSF funding ended for T⁴E, the American Society of Civil Engineers (ASCE) continued the program as the ExCEED Teaching Workshop (ETW) that became part of their educational initiative Excellence in Civil Engineering Education or ExCEED. ETW is the direct descendent of the T⁴E workshop with one caveat: the program is offered to only civil engineering professors. To date, there have been eight offerings of ETW⁶: in 1999, 2000, 2001, 2002 and 2003 at USMA, in 2000, 2001, 2002 and 2003 at the University of Arkansas and in 2002 and 2003 at Northern Arizona University with each session having 24 participants. Only two locations will offer the workshop during the summer of 2004 and the participants will be civil, mechanical, electrical, and chemical engineers. Modifications to the original one-week T⁴E program have been relatively minor. Most changes have dealt with addition or deletion of a few supplemental topics in certain seminars.

The 24 workshop participants are divided into four-person teams along with a senior and assistant mentor. The participants are engineering professors from across the nation with usually one to four years of teaching experience. The senior mentors are current or retired CME Faculty or a graduate of T⁴E or ETW. The assistant mentors at USMA are new CME faculty that have just completed the full five-week version of ISW, while at the University of Arkansas and Northern Arizona University they are recent graduates of T⁴E or ETW. The role of assistant mentors during ETW has become the post-graduation requirement where we ask our new faculty to assist and mentor other relatively new faculty in their rapid transition through the seminars and demonstration classes to application of the content during practice classes. Since the assistant mentors have just completed ISW, they are extremely critical in erasing doubts of success by relating their own doubts about being able to incorporate what is being presented during the seminars and encouraging risk taking since they can also relate the exhilarating feeling when thoroughly engaging the students in a class. The recent experience wrestling with the same information overload and how to eventually incorporate it all (key is to try one or two new things each time you teach a class) into their teaching style is immeasurable to the success of the participants, such as the ability to relate how they have adjusted their teaching style to incorporate new teaching techniques. You should see many similarities in Table 1 and Figure 3⁷.

COURSE SCHEDULE						
	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
8:00		Admin & Gift	Admin & Gift	Admin & Gift	Admin & Gift	Admin & Gift
		Demo Class I	Lab II Practice Class 1	Lab III Practice Class 2	Lab IV Practice Class 3	Seminar XIII Interpersonal Rapport
10:00		Seminars II, III, IV Teaching & Learning				ASCE Programs
12:00		Lunch	Lunch	Lunch	Lunch	ETW Assessment
		Seminars V, VI Organizing A Class	Demo Class II	Lab III (continued)	Seminar XI Design of Instruction	Graduation
2:00		Lab I Organizing A Class	Seminars VII, VIII, IX Communication Skills	Demo Class III	Seminar XII Making It Work	
4:00	Intro To ETW			Seminar X Technology		
6:00	Seminar I Learning To Teach	Working Dinner & Class Prep (optional)				
	Reception and Dinner				Hudson River Cruise	

Figure 3 ETW Schedule

IV. Assessment

The USMA Department of Civil and Mechanical Engineering’s Instructor Summer Workshop is an impressive training regimen on paper and in practice by any standard, but does it produce results? To assess ISW’s effectiveness we chose to look at four different perspectives of the training. First, we looked at how the Department of Civil and Mechanical Engineering fared against other USMA faculty. Second, we examined the last three years of student feedback data for our new instructor ISW graduates. Third, we asked the new instructor participants themselves how the Instructor Summer Workshop helped them prepare for their first semester teaching at USMA. Finally, we looked at student performance on the Fundamentals of Engineering Exam (FE).

C&ME Faculty Compared to USMA

Figure 4 shows the nine questions that USMA asks every student at the end of a semester from the USMA course end feedback system. All students are required to respond using a standard one to five rating with one being strongly disagree and five being strongly agree. The results in Figure 4 are from the Fall 2003 semester, which was the most recent semester of data available. Figure 4 shows that in eight of nine categories, CME faculty outperform other USMA faculty from the students’ perspective. This is strong evidence that what the Department of Civil and Mechanical Engineering is doing to prepare its teachers is having significant results, especially considering that our students take classes from every department at West point as part of the core curriculum.

Course Feedback - USMA Questions

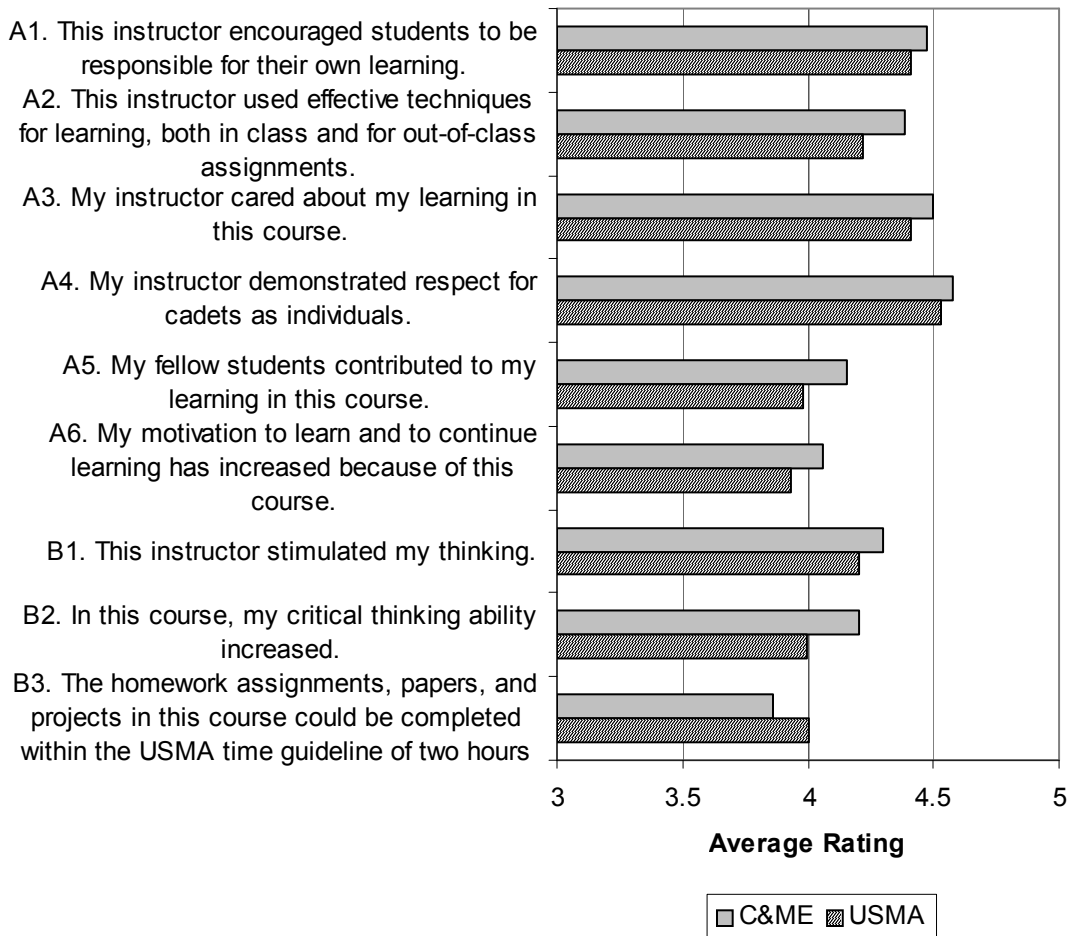


Figure 4 Fall 2003 USMA Feedback

Student Feedback

To further assess the success of ISW we investigated question A2 (This instructor used effective techniques) and B1 (My critical thinking ability increased) (see figure 4) for our new instructors in their first term of teaching. We compared student mean responses over the last three years for courses taught by our 28 new instructors during their first semester of teaching to the responses for all courses taught outside of the department at the Academy, as well as courses taught by our department senior faculty. Only the first semester of the new instructor's ratings was used to compile the new instructor data, and only data from veteran instructors with more than three years of teaching experience was used to compile the department senior faculty figures. We then

used a series of t-tests to determine the confidence in the differences in the mean responses. The analysis results are shown in Table 2.

Table 2 Results of Course End Feedback Comparison

Term (1)	Question (2)	USMA mean (3)	Dept. senior instructor mean (4)	Department New Instructors				
				Mean (5)	Δ - USMA (6)	Δ -dept. senior instructors (7)	Confidence USMA (%) (8)	Confidence senior instructors (%) (9)
03-1	A2	4.22	4.25	4.52	0.30	0.27	100.00	100.00
03-1	B1	4.21	4.21	4.34	0.13	0.13	98.38	93.72
02-1	A2	4.21	4.14	4.50	0.29	0.35	100.00	100.00
02-1	B1	4.21	4.21	4.39	0.18	0.17	100.00	99.61
01-1	A2	4.20	4.26	4.37	0.16	0.10	100.00	96.31
01-1	B1	4.19	4.28	4.20	0.01	-0.08	17.41	88.69

The results from question A2, the instructor used effective techniques, are perhaps the most revealing. For the last three years, students of our first term instructors have reported that our new instructors have more effective teaching techniques than any other educators at the academy - even better than the courses taught by our own senior faculty. All of these results are significant if we use the standard p-value of 0.05. While there may be other contributing factors to these high ratings, such as time and departmental resources devoted to teaching (all first term instructors primarily focus on teaching in the classroom), we must consider this analysis as a strong indication that ISW is an effective method of preparing new instructors to teach in their first semester.

One detractor from this analysis may be that some will say our new instructors are simply providing the answers to students or not fully challenging them. This is why we analyzed question B1 as well. Question B1 asks the students how successful the instructor was in stimulating thinking. The results in Table 2 clearly show that our new instructors performed better than the rest of the academy in this area and showed better performance in one year and no significant difference in two of the three years tested against our own senior faculty. According to these student survey results ISW prepares our new instructors to be effective and challenging educators.

New Instructor Feedback

Next we wanted to find out if there was some other facet in our new instructor's preparation to teach that was more helpful than Instructor Summer Workshop. After all, there may be another common experience that our new instructors shared that could be responsible for making them excel in their first semester of instruction. After they had been teaching one semester or more, we asked our new instructors two questions. First we asked our new instructors that had attended the workshop over the last three years (26 of 28 responded) to rate the effectiveness of several common sources that prepared them to teach. We used a standard scale of one to five with five being strongly agree and

conducted t-tests to test for significance in the difference of the means. The results are shown below in Table 3.

Table 3. New Instructor Ratings for the Effectiveness of Teaching Preparation Programs

Instructor Summer Workshop	Graduate School			Previous Professional/Work Experience			Other Formal Presentation/Educational Training			
	Mean (1)	Mean (2)	Δ-ISW (%) (3)	Confidence (%) (4)	Mean (5)	Δ-ISW (%) (6)	Confidence (%) (7)	Mean (8)	Δ-ISW (%) (9)	Confidence (%) (10)
	4.74	4.04	0.70	98.70	3.96	0.78	99.54	3.44	1.30	100.00

From the results in Table 3, it is clear that the participants in ISW felt that it was the single most important factor in preparing them to teach. All the differences in mean above are significant to a p-value of .01.

The second question we asked was whether ISW helped to improve their ability to teach. The mean response rating was 4.81. Once again, this was a strong indicator that the new faculty felt that ISW was a major factor in preparing them to teach. Furthermore this number is significant since our new instructors have significant work experience both in academia and in the military and other professions. So their preparation to teach and lead is not limited to their ISW experience.

Student Performance

As a final measure of the effectiveness of ISW, we wanted to know if our students were learning the basics of engineering as well as other students from other schools. Since all of the students in the USMA Civil and Mechanical Engineering Department are required to take the Fundamentals of Engineering Examination (sickness and national athletic competitions being the exceptions), it serves as a good tool to compare our students to other students across the nation where it is normally optional to take the FE and only those who feel fully prepared opt to take the test. Table 4 shows the passing rates for our department and the nation-wide passing rates.

Table 4. Fundamental of Engineering Exam Passing Rates for USMA Civil and Mechanical Engineering Students

Year (1)	Total C&ME students eligible for FEE (2)	Number of C&ME students who took FEE (3)	C&ME student passing rate (%) (4)	Nation-wide passing rate (5)
2003	124	105	88	84
2002	121	113	92	81
2001	138	116	89	78
2000	111	111	89	81

The results in Table 4 show that our students historically exceed the national passing rate for the Fundamentals of Engineering Exam. While we can't completely credit ISW for this success, this evidence taken with the previously reported survey data from our students and new instructors paints a very positive picture about the formal education training our new and experienced instructors receive at the Instructor Summer Workshop.

V. Conclusions and Recommendations

Providing a structured teaching workshop for new instructors is very beneficial. The benefits have been proven and documented within this paper. The key to having an effective teaching workshop is making the program grounded in pedagogy, taught and supported by the senior faculty of the department, and made hands on. Having the new instructors give practice classes and then receive an honest assessment of those is extremely valuable. It also allows the new instructor to become integrated within the department and the institution – learning the standing operating procedures of each, and meeting the senior faculty.

Every department should have some kind of developmental program that is focused around being a good teacher. Some programs will be hesitant to agree because of the inability to dedicate five weeks from a summer towards teaching workshop. The teaching program described in this paper can easily be modified to use a more compressed schedule, however. This program can still pay huge dividends if it were run on as short as a one-week timeline. This is evidenced in the ExCEED model previously mentioned⁶. We recommend that academic departments with time concerns use the ExCEED training schedule to prepare their future teachers.

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