

The ExCEED Teaching Workshop: Participants' Perspective And Assessment

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Abstract

The purpose of this paper is to assess the effectiveness of the ExCEED (**Ex**cellence in **C**ivil **E**ngineering **E**ducation) Teaching Workshop (ETW) through daily documented thoughts, feelings, and impressions of one team, consisting of four participants with less than four years of teaching experience and two mentors. The paper also includes a follow-up assessment one-year after the workshop. The following topics are covered: teaching principles implemented, overall results, proposed future adjustments, and realized benefits. ETW is an American Society of Civil Engineering (ASCE) sponsored one-week course offered at the U.S. Military Academy (USMA) and the University of Arkansas. The course provides participants with the foundation necessary for continued improvement of their teaching techniques over time.

I. Introduction

ETW is the direct descendent of the T⁴E workshop, **Teaching Teachers To Teach Engineering**¹. T⁴E was funded through the National Science Foundation (NSF) for three years and was provided at USMA for engineering professors with less than four years of teaching experience, i.e., civil, mechanical, aerospace, electrical, chemical, etc. T⁴E was such a huge success¹ that ASCE decided to continue the workshop under the moniker ExCEED with one caveat: the program is offered to only civil engineering professors with less than four years of teaching experience. To date, there have been three offerings of ETW: in 1999 and 2000 at USMA and in 2000 at the University of Arkansas with each session having 24 participants. There were nine observers from the ASCE Program Design Workshop² at USMA in 1999 and six observers (two each from ASME, IEEE, and AIChE) at USMA in 2000.

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. ETW, previously T⁴E, uses the six-week instructor-training model from the Department of Civil and Mechanical Engineering (C&ME) at USMA as its foundation.

To gain a better appreciation for the ETW experience, one team kept journals to document their experience during the workshop. The ETW schedule is presented to set the stage for the team's recorded thoughts, emotions, and perceptions at the completion of each day. These ETW experiences set the stage for what was implemented by each participant upon returning home, the assessment of the results, the future adjustments in teaching, and finally the realized benefits of ETW.

II. Organization

How is ETW organized? ETW is a one-week short course (Figure 1) providing seminars on the basics of excellent teaching (using Lowman³ and Wankat and Oreovicz⁴), demonstrations of effective teaching, laboratory exercises requiring the participants to teach lessons followed by group assessment, and discussions on how to apply the presented techniques at different university settings (laboratory, large classrooms or auditoriums, seminar groups, etc.).

Figure 1. Workshop Schedule

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

The most critical and transformational part of ETW is the opportunity to learn new techniques, then practice them in the three classes presented by each participant. Team members assume the role of students during the class and assessors at its conclusion. The senior mentor critiques the first class, while follow-on classes are critiqued by all with the actual participant instructor leading the last critique with a self-assessment – essential for continued improvement of excellent teaching techniques.

The 24 workshop participants are divided into four-person teams along with a senior and junior mentor. The participants are professors from across the nation with one to four years of teaching experience. The team presenting this paper came from both research and teaching institutions representing the following civil engineering disciplines: geotechnical, structural, transportation, and environmental. The senior mentors are current or retired C&ME Faculty or a graduate of T⁴E or ETW. The junior mentors at USMA are new C&ME faculty that have just completed the full six-week version of C&ME instructor training, while at the University of Arkansas they are recent graduates of T⁴E or ETW.

III. Thoughts, Emotions, and Perceptions During the Workshop

Watch for the participant's progression during the workshop represented by the change in their perceptions and incredible progress made as teachers.

Sunday, 25 July 1999:

Janet (Baldwin - Participant): We will certainly get the opportunity to practice the material that we will learn in the seminars. Excellent! Practice makes perfect. I hope (concern) that the program is not too rigid and allows for individual styles and creativity. For example – I do not feel that using the black board (almost always use) is the only way to effectively teach.

Dave (Bentler - Participant): The first day's experiences quickly established that a great deal of the workshop would involve participation from the attendees. This workshop is conducted by people who feel strongly about the need for teaching excellence in undergraduate education. I was pleased to see the case convincingly made that improving graduation numbers in engineering depends on improving teaching.

David (Clarke - Participant): Excellent staff- very interesting discussion, great presentation. Material is thought provoking and illuminating.

Shawn (Gross - Participant): Many of us have no formal training on how to teach (good to see that I am not the only one!). This is exactly what I am looking for. I am probably a better teacher than I might assume based on the simple fact that I am here out of my own free will.

Joe (Hitt - Junior Mentor): I want to learn the finer points I may have missed while completing my own instructor training. "They" will be very critical about our methods. Hope to learn something from them. Our group seems open-minded and very interested in teaching.

Ron (Welch – Senior Mentor): Before meeting the group: I must make the experience valuable for four people in four different areas of civil engineering expertise. What if the participants are not excited about being here? Did they sign up as a step toward tenure, like building a resume, whether any improvement really occurs? After seeing our model, will the participants desire to learn/try our teaching model? Need to maintain positive, constructive feedback without turning them off before they listen to our critiques, try to adjust their teaching, and fully experience our model. Will some participants become hostile since they think they already know how to effectively teach? After meeting the group: Participants appear to be frustrated by their lack of teaching skills (trial by fire). They want to make teaching easier and fun so they are not frustrated by it when focusing on research (looking for balance). They want to meet the needs of their students, which is not always true of their past instructors. They want to know how to make learning easier for their students.

Monday 26 July, 1999

Janet: The seminars today were great – very informative. There is so much here! I would really like more time to digest it a bit before putting it to use.

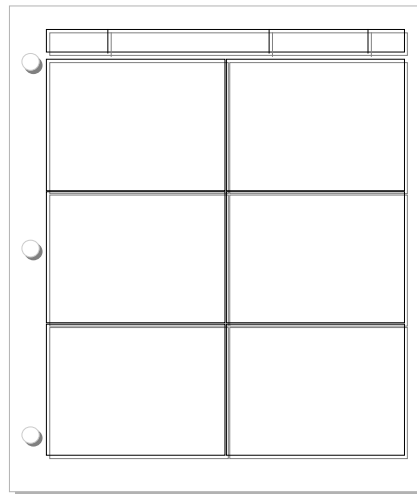
Dave: The demonstration class made a big impression on me today. The organization, energy, and sense of purpose were the things that impressed me most. I thought it was a great example for us. I was disappointed, but not surprised, when a few of the participants expressed their opinions that it would not work for them for one reason or another. I suspect that they were either rationalizing their methods or resisting change. I am envious of the emphasis on excellent

teaching here at West Point. Exposure to the ETW methods and effective teaching principals are making me determined and eager to go back and improve my teaching.

David: The presented material was excellent! The demonstration class was enlightening – a great role model. The material reviewed was stimulating, especially the discussion on black board usage. The course so far has been extremely well done, but intense. However, it is fun and the staff/instructors top notch.

Shawn: There is a certain intensity about the ETW method, as well as the teachers here. They love teaching and seem to have the time to dedicate themselves. My challenge will be to work this method into my classes without adding a significant time cost. I think this can be accomplished, although it may take some practice and thought. The crux of the method is organization. Presentation and preparation are also fundamentally important. These are important in any course and should be present – ETW simply formalizes it. Board notes (Figure 2 and 3 - determining prior to class how and where information is to be located on classroom board space) seem like a great tool for organization and practice. I also love the use of colored chalk (seriously!).

Figure 2. Blank Board Notes Page



Joe: Janet said she is teaching four different courses, how well is she going to implement this? Need to show them some of our training aids (models) that add significantly to the presentation.

Ron: They still doubt how our model can be fully applied at their institutions, but I think they are intrigued by the possibilities. They all want to be great teachers, which is part of the charter of their schools, but the real focus is on tenure – i.e., research. Everyone needs formal training by great teachers in order to discuss/show organization, techniques, energy, and varying teaching styles. Formal training will cut down preparation time for new courses, leaving time to practice classes, research, and prepare funding proposals. They are realizing that in preparing a course, they need course objectives before developing lesson objectives, which then leads to development of board notes. Few of their courses have formalized the course objectives. Their present classroom experience is writing out conscious thoughts (i.e., continuous notes). This is great for developing the thought process, but not necessarily for development of efficient board notes that increase/motivate student learning. I hope they will apply our techniques when they

return, in return they will get complimentary comments from their students, while arousing the interest of other professors in their departments or universities

Tuesday, 27 July 1999:

Janet: What was really great today was the practice class. I thought that its 25-minute length was the perfect amount of time to start with – you could get into the swing of the class, but didn't have to take it all the way to the end. The oral critique at the end was really helpful. Giving the class itself was definitely no threat.

Dave: I felt very nervous and apprehensive today about the first teaching lab. It was also intimidating to teach in front of other faculty members (should we be more apprehensive in front of students who depend on us to be experts in our field?). After my class was over, I was relieved but disappointed in my performance. The things that frustrated me the most were getting thrown off my plan and struggling with the transitions. I don't think I will be able to substantially alter and improve my enthusiasm while leading a class until I am completely comfortable with my class organization. I am looking forward to the remainder of the workshop, but I am starting to wonder just how much of what I have learned here I can implement this fall.

David: Tuesday was an intense day with presentation of my first class. Still, the presentation was a great experience - once it was over with. The comments and critique were extremely well delivered and created no sense of anxiety.

Shawn: This is difficult! I can see that only time and practice will make this second hand. The difficulty seems to be in teaching effectively (presentation, interaction, etc.) without thinking about it, because I have to think about what I am presenting – whether I need board notes (a way of laying out what is the minimum material and in what order on the black/white boards – Figure 3) in my hands or not. I like the models available here – visual aids are always effective. Still, I need to manage the effective and appropriate use of them during class that also applies to the use of colored chalk!

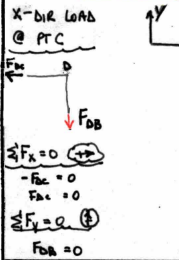
Joe: Our assessments after their teaching seem to be taken well. There is a big gap between the strongest and weakest class. I am interested in their self-assessment versus what I see. They are giving “our” system a try – colored chalk, board usage, etc. They all need to increase their pace, energy, and student interaction. I hope they will take some of this to heart and use it back home.

Ron: I was extremely excited that each participant included seminar techniques on the fly. Most are trying to use five colors of chalk; active questioning to develop the information to be presented on the black boards; full interaction with students away from the security of the black board; physical models for visual aids; posted lesson objectives to guide the class presentation; and prepared board notes (Figure 3) to organize the presented material. Some were frustrated about: the difficulty in putting effective teaching techniques together with technical content; the slower pace of active questioning; and the time sinks that develop when you allow (encourage) questioning from the students. Most are ready to take the next step and add more energy, enthusiasm, getting out more from the black board, tying the class into posted lesson objectives, and better integration of models into the class. Some still questioning whether any (all?) techniques can be really used at home.

Figure 3. Board Notes For Second Truss Class

Name WELCH Course EM302
 Date 21 June 2000
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LESSON S-10 TRUSS ANALYSIS II

| | |
|---|--|
| <p><u>LESSON OBJECTIVES</u> Bd 19</p> <ul style="list-style-type: none"> ✓ DEFINE AND ID ZERO-FORCE MEMBERS IN A TRUSS ✓ SOLVE FOR THE INTERNAL FORCES OF TRUSS MEMBERS USING: <ul style="list-style-type: none"> * CONCEPT OF 2-FORCE MEMBER * BY INSPECTION | <p><u>REVIEW</u> Bd 20/21</p> <p><u>Joint Cut</u></p> <ul style="list-style-type: none"> • CONCURRENT • $\sum F_x = 0$ • $\sum F_y = 0$ • MAX 2 UNKS <p><u>SECTION CUT</u></p> <ul style="list-style-type: none"> • NON CONCURRENT • $\sum F_x = 0$ • $\sum F_y = 0$ • $\sum Mpt = 0$ • MAX 3 UNKS <p><u>TIPS @ CUTTING</u></p> <ul style="list-style-type: none"> • CUT MEMBERS OF INTEREST • DO NOT CUT THROUGH JOINTS • CUT THROUGH ENTIRE STRUCTURE |
| <p><u>ZERO-FORCE MEMBERS</u> (START W/ DEMO) 22</p> <p>X-DIR LOAD @ PTC</p>  <p>$\sum F_x = 0$ (+)</p> <p>$-F_1 = 0$ $F_1 = 0$ $\sum F_y = 0$ (+)</p> <p>$F_{DB} = 0$</p> | <p><u>ZERO-FORCE MEMBERS</u> 25</p> <p><u>WHY?</u></p> <ul style="list-style-type: none"> • INCREASE STABILITY • SUPPORT IF LOAD CHANGES • AESTHETICALLY PLEASING <p><u>HOW?</u></p> <ul style="list-style-type: none"> • THROUGH CALCULATION • BY INSPECTION USING RULE OF THUMB (ROT) |
| <p><u>ROT #1 (2 MEMBERS)</u> (USE ZFM DETRO) 1</p> <ul style="list-style-type: none"> • 2 NON-COLLINEAR MEMBERS FORM A JOINT • NO EXTERNAL LOADS OR REACTIONS <p>BOTH ARE ZFM_s</p> | <p><u>ROT #2 (3 MEMBERS)</u> 2</p> <ul style="list-style-type: none"> • 3 MEMBERS FORMING A JOINT • 2 ARE COLLINEAR, 3rd NON-COLLINEAR • NO EXTERNAL LOADS OR REACTIONS <p>•• NON-COLLINEAR MEMBER IS A ZFM</p> |

Wednesday, 28 July 1999:

Janet: The demonstration class today was excellent. The instructor was way beyond anything I have ever seen. It was great to see him in action. I learned a lot. The labs today showed improvement for everybody. It was clear that we were all trying to work in a few things and recognized that we couldn't work on everything all at once. The classes really brought home the point that questioning the students is an art form. We all need more practice at it and the feed back from our mentors (and other "students") on that point was excellent. I found that the assessments from everybody really helped when I was developing today's class. Good feedback is invaluable.

Dave: It actually felt good to get back in the classroom and teach today after yesterday's experiences. I think that the feedback after teaching yesterday made it easier to feel comfortable and confident while teaching today. I think that the most useful parts of the workshop have been the demonstration classes and the teaching labs. One of the best features of the teaching labs is that they are based on small teams working together to improve each other's teaching skills. It is easy to get comfortable working with a small group, whereas a large group could be much more intimidating. One important lesson that I have learned at ETW is that I need to be observant of my teaching performances (i.e., assess each immediately). Another lesson is that there is much

to be gained by watching others teach (some mentioned it was against union contracts – needed change).

David: This course so far has been a great deal of work, but also a great deal of fun. Watching the demonstration classes has been nothing short of inspirational. Presenting our practice classes has been a great deal of hard work. They were great experiences though, and truly low threat. The comments were helpful to the extreme. This continues to be an excellent experience. The content and organization are superb! I would highly recommend it to any colleague, regardless of their experience level.

Shawn: WOW! The practice classes today were much better than yesterday. Everybody seemed more relaxed (key to great teaching?) and the seminars were great! Still there is tremendous room for improvement. I was not as good on class time management as I would have liked, but I knew how to “cover it up” and bring the lesson to a conclusion rather than leaving the students hanging. At this point, I would say that there are two main aspects to “the method” – organization and communication. The organization part is basic. It just literally takes time. The communication part will not come as easy – we have to work on this a little bit at a time and develop it with experience. It seems to be the biggest challenge for me at this point.

Joe: Good, thoughtful, meaningful assessments from everyone.

Ron: Everyone made strong advancement in using the ETW model: five colors of chalk, active student participation through focused questioning, and well integrated physical training aids. Each participant experienced the one pitfall of active teaching – asking the students too many questions bogs down the class and prevents timely completion, but classroom student-teacher interaction is so much fun! Insight: First practice class, few of the participants asked questions of the instructor, even though the class was very discipline specific (different from their own area of expertise). Second practice class, there was very engaging instruction with numerous questions from the “students” – the ideal experience when students learn that asking questions is a two-way street.

Thursday, 29 July 1999:

Janet: Today’s lab classes were obviously good for some; I, however, did not feel comfortable with my “performance”. I was focusing on clarity of explanations and forgot to include the strengths from my second class (humor, enthusiasm, getting away from hugging the black board). When I came on Sunday, I thought it would be very difficult to work on my teaching. However, now I find that if I concentrate on one or two things each lecture, it isn’t all that hard and the payback is significant. Over the next year and the subsequent years, I will try to incorporate many aspects of what we learned here. Including: colored chalk, getting out to the students and away from the black board, humor, active questioning, energy level (enthusiasm), class demonstrations, lesson objectives, prepared board notes, student assessments, group in-class activities, etc.

Dave: I think today was the highlight in terms of the teaching labs, because we could look back to Tuesday and measure how far we have come. On Sunday, I felt that the amount of material to be presented in the workshop would be overwhelming. Today, it can be boiled down to having objectives, organization, enjoying teaching (happy) and evaluation of students. On Sunday, I was unsure whether or not the workshop would make an impact on my teaching, but now I know it will! The first thing I want to do is to give a brown bag session to the faculty in my department early in the week.

David: It has been a long week, but it is a letdown that the time is almost over. I am excited about getting back and applying what I have experienced this week in my fall classes. I really believe that ETW will help me make a dramatic improvement in my teaching ability. This has definitely been a remarkable experience, and a very worthwhile one. There is very little I would recommend for change. I especially like the practice classes and would expand this aspect. I would recommend this workshop to anybody wholeheartedly!

Shawn: This went by so fast. It is great to be around passionate teachers! The points I can work on most: energy level (day in and day out), idiosyncracies, questioning techniques (and answering techniques), organization (day in, day out), lesson objectives, and visual aids. I would have to say that I probably got more out of this than expected. The program looked to be set up so well, but the lab classes (Tuesday, Wednesday, and Thursday) taught me so much more than I would have guessed. There simply is no replacement for feedback from students or other faculty sitting in your classroom. This really was a workshop, and not just a seminar or conference. I guess the secret is – working the method into any course can be done by focusing on the specifics of the method rather than the whole method itself, i.e., don't try to emulate one of the master teachers here or even my practice class – work on the fundamental techniques and let the process evolve naturally. When I arrived, I was conscious that I could improve my teaching, but did not know how to improve. Now I know where there is room for improvement. ETW has been enlightening, and has provided me a structure for improvement!

Joe: I think everyone benefited from the experience. I think they will take back: board notes technique (Figure 2 and 3), use of more color in classroom presentations, and a sense of what active learning is. I do not think they will take back: taking notes out of their hand and placing them on a desk for reference if needed, rehearsals prior to teaching, and consistent use/integration of models/training aids. Overall it was a success. We all benefited.

Ron: They are believers! There was a full transition – the students wanted to actively participate in class (it is catching). All participants were willing to give very critical assessments (i.e., down in the weeds) and understood the need to be assessed. Participants must come prepared to try the entire method down to using 5 colors of chalk, active questioning, getting away from the black board to talk with the students eye-to-eye, preparing prior to class what is to be placed on the board, etc. Everyone showed much movement toward what is classified as effective teaching.

IV. Implementation of Teaching Principles

Janet: One thing, among many, that I learned at ETW was that good teaching requires skills in presentation, lesson organization, and interpersonal relationships. I therefore tried to work on several aspects of all three of these skill areas. Presentation skills were my main focus; I incorporated use of colored chalk, a variety of visual aids, getting “out of the pit (away from the security of the chalk-board)”, varying lectures with in class problems and demonstrations, and allowing my enthusiasm for the subject to come through. Organizational skills I incorporated were use of board notes and lesson objectives (Figure 3). Although I have always made it a point to know my student's names, after ETW I made that a priority along with other interpersonal relationship techniques like getting to know the students (where they are from, interests, sports, hobbies, etc.). I even accomplished the previously unimaginable: I gave up clutching feverishly to my lecture notes. I found that this was very easy to do after having implemented the other techniques because they made me much more organized and ready for each lesson.

Dave: When I returned from ETW, I decided to focus on improving rapport with students, class organization, and class presentation. I made learning the name of all my students as early in the semester as possible a high priority. I planned out each lesson throughout the semester using the board note format (Figure 2 and 3) suggested to us at ETW. I also focused on increasing my energy during class and projecting and varying my voice. I also used several teaching assessment techniques such as un-graded, unannounced quizzes and muddy point (i.e., what is the point least understood in today's class) papers.

David: I was extremely "charged" upon my return from ETW and eagerly started revising my courses to incorporate the principles I had learned. The two courses I taught during Fall 1999 (both repeat courses for me) were open to seniors and graduate students. The first course had heavy design content with many lectures oriented towards approaches and procedures. This course adapted extremely well to the techniques learned at ETW. The second course was policy oriented, with much outside reading followed by in-class discussion. This course was more of a challenge to adapt to the model, but I attempted to nonetheless. In both courses, I used every technique presented at ETW, from board notes and colored chalk to active learning techniques. The most successful, in my opinion were those that dealt with my in-class presentation, with the board notes and colored chalk being outstanding successes. I found that the use of board notes completely solved a problem I had experienced in judging the time required to present material. It also helped me to better organize my material. Furthermore, the students greatly appreciated the clarity provided by the notes and the use of colors to differentiate content. With everything so well organized, I was able to maintain a high level of presentation energy, which the students enjoyed. All of this was evidenced by numerous positive comments in my teaching evaluations. Although I cannot say for sure if presentation was the reason, my course enrollment (both courses) doubled for Fall 2000.

Shawn: I returned from ETW excited about teaching and eager to implement some of the specific techniques into my classes. In my first semester after ETW, I tried to implement some of the techniques into a graduate-level course (one night per week, 3 hour class format) and in the second semester I tried to implement some of the techniques into an undergraduate level course (three days per week, 50 minute classes format). I found the board notes format to be extremely valuable, especially in the undergraduate course, because it forced me to view the notes from the students' perspective as opposed to my own. The preparation of board notes allowed me both a better gauge of timing my lectures to the class period and a chance to review my lecture *before* class. The board notes were so successful that the colleague with whom I was co-teaching the undergraduate course also adopted the format after seeing its merits. Unfortunately, I was unsuccessful in my attempt to use board notes in the graduate-level course because I was already spending the overwhelming majority of my time on preparing my own set of basic notes before the course (which I was teaching for the first time). In all of my classes, I made it a point to identify specific lecture objectives and learning objectives, and I encouraged the students to use the list of objectives as a "study aid". I also refined my use of colored chalk to a more systematic approach that made my lectures clearer, and worked very hard on active questioning and maintaining a dynamic format with my students during lectures. I tried several active learning techniques from ETW, including the use of short in-class group problems, student surveys, and the preparation of a few simple models for in-class demonstrations.

Joe: I focused on three areas: (1) maintain a positive student centered environment, (2) provide time for independent work during class hour, and (3) demonstrate a zeal for learning. I tried to focus on the student when trying to establish a learning environment. Can the students see the

board? Is it comfortable in the classroom? Play a little music before the start of class. Intro each class with a discussion about current events related to class. Good discipline specific interest boards in the classroom. Relate to the students in a little more personal way. Continually assess the instruction. Add more examples. Try to end each topic with an in class worksheet done in groups. I can see what they are learning and I can give them immediate feedback. Send them out with a solution to the worksheet. Stay energetic!!

V. Results

Janet: By my third semester after ETW, these techniques are so ingrained in my teaching style that I don't think about them as being tasks, they are just part of teaching. As a result of incorporating these techniques, I find I can concentrate more on the material and be much more relaxed in the classroom. This, in turn, allows me to have a stronger rapport with the students and therefore the atmosphere in the classroom is more conducive to learning. My teaching evaluations improved after ETW: although I gave tough exams, the students rated my teaching effectiveness highly. Comments I see frequently see on my evaluations now is "very enthusiastic" and "the instructor made the learning fun". The students have also appreciated the organization of the board notes: "the notes on the board are great".

Dave: I won the Department of Civil Engineering 's Outstanding Teacher Award for the 1999-2000 school year. This award was determined by votes from the junior and senior civil engineering undergraduate students. I found that learning the student's first names was very rewarding both for the students and myself. In fact, when I taught an undergraduate lecture section of 47 students in the spring semester, many students at first seemed taken aback by my knowing their names. Several of them informed me that they were surprised initially because few of their previous instructors had learned their names. All of the students appeared to be happy that I knew them by name. Learning student names was also very rewarding to me, because it greatly improved my rapport with students in and out of the classroom. **Student evaluation comments have changed significantly since attending ETW.** Compliments in student comments now outnumber suggestions on how to improve. Phrases like "very effective teaching", "excellent professor", and "well organized lectures" now appear in comments from students on my teaching evaluation forms.

David: While my teaching reviews (all important at Clemson) were good before I attended ETW, they were even better afterwards, as evidenced from numerous comments relating to the techniques employed. Students really appreciated the organization and the enthusiasm. I personally feel that I am a much more effective teacher because of the ETW experience.

Shawn: Before attending ETW, I was already receiving good teaching reviews from students, probably because I have been able to interact with students well, present reasonably organized lectures, and showed genuine interest in students' learning. Regardless, my teaching reviews still improved after ETW. I attribute this to even better organization, clearer notes (thanks to the use of board notes), more dynamic lectures, and forcing the students to learn more *outside* of the classroom. Most importantly, I personally feel that in several subtle ways I am a better teacher. I have a better understanding of different learning styles, I feel more organized, and I feel totally "in command" of the classroom during lectures. I am also more willing to try new techniques in an effort to continue improving my teaching.

Joe: Nominated for a department teaching award.

VI. Future Adjustments

Janet: There are many techniques that I would like to do more of in my classes, such as using demonstrations, incorporate classroom assessment techniques, and developing appropriate applications for students. I would like to incorporate more demonstrations in my classes. This has been very hard because I was never taught that way (although I would have benefited greatly) and therefore I have to develop all the demonstrations myself. I feel that demonstrations are very effective teaching tools, especially for those visual and hands-on learners. I also would like to incorporate more classroom assessment techniques because I teach students with a wide variety of math skills and I know that some students do not speak up when they do not understand something. Classroom assessment would help me to identify areas where students need more help. Another area that I have identified for future work is the opportunities for students to apply the knowledge gained in the classroom to problems. Having learned about Bloom's taxonomy at ETW, I see that in many textbooks that I use in my classes, the example and homework problems do not allow students to achieve a wide range of learning levels. I need to examine these problems in order to provide students with problems that cover basic understanding of the subject as well as more in-depth use, as appropriate.

Dave: The most significant impact of attending ETW and applying the principles taught was to the lecture courses that I taught. Although I noticed a slight improvement in student evaluations in the lab sections that I taught, it was not as marked as the lecture courses. I believe that I can become more effective when teaching lab classes by finding more opportunities to demonstrate testing equipment and techniques and emphasizing the applications of the data gathered by the tests performed (i.e., motivate the students).

David: I am still working to revise my course presentations and to update and perfect the board notes. It has taken a great deal of time to get the notes organized initially, but it saves me time on subsequent offerings of a course. One technique that I have not been as successful in employing is the use of some of the active learning (in-class group or individual problem solving exercises). These exercises are hard to fit in time wise, but I do plan to keep trying.

Shawn: Last year, I found it difficult to apply the use of board notes to a graduate course that I was teaching for the first time. This year, I will be teaching a graduate course for a second time and will have the opportunity to prepare board notes from my current set of lecture notes. In addition, I will look for better ways to present lectures when a large amount of material has to be covered in a short amount of time, including the use of appropriate handouts (especially for example problems). Furthermore, I will be reassessing specific learning objectives for each course that I teach. I will also attempt to vary the style and type of homework problems that I assign, including assigning group homework problems, in an attempt to accommodate the different learning styles that students in a single class may have.

Joe: I plan to try ways to motivate students to do their reading assignments and start their homework earlier. I think more quizzes focused on the reading assignment will help them to stay on top of their reading assignments. I will try to design homework to make it something that we can use to help drive the classroom discussions. Maybe spend portion of the class time for group work on the homework. Entirely too many students wait till the last minute to do their homework and I'm not sure if the benefits are maximized.

VII. Benefits

Janet: I can say that I now truly enjoy teaching. I am relaxed and enthusiastic in the classroom, partly due to experience, but mostly due to the lessons learned at ETW. I remember well my first class I taught as a teaching assistant many years ago: I approached the classroom with a feeling of dread. What a change! This change has benefited me as well as the students.

Dave: The biggest benefit for me of attending ETW is that I feel much more comfortable as an instructor and am able to better enjoy teaching. The improved rapport with students is also a very valuable benefit, because it makes being a faculty member more enjoyable. Although revising my teaching methods to incorporate the teaching principals advocated by ETW was a significant investment in time, I found that I was more effective in my teaching preparation activities and was better able to manage my time. I look for continuing improvement in my efficiency with respect to teaching activities as I gain experience.

David: I am significantly more effective in the classroom now, thanks to ETW. The biggest benefit, as far as I am concerned, is in time management. I find that my teaching evaluations reflect numerous positive comments directly attributable to ETW. After three semesters, I remain committed to the ETW approach and continue to incorporate the techniques in all my courses.

Shawn: I am undoubtedly more prepared to teach after ETW, and am more confident in my teaching ability. Although there are aspects of teaching that I believe some people are born with and some without, ETW identifies several objective approaches to improve any faculty member's teaching ability. Implementing certain aspects of ETW does take time, but the methods discussed in the program are adaptable to any engineering professor's individual teaching situation. The one-week program is undoubtedly rigorous, but its benefits should last a lifetime. Ultimately, it is the students who benefit most by a program such as ETW.

Joe: The workshop gives you a sense of confidence. You know that you have been through a successful program taught by successful teachers. This gives you the ability to move beyond your preparation and look more closely at the student. How are they doing? Is the pace right for them? Do they understand? Who is having trouble?

VIII. Conclusion

Based on their experience in ETW and back at their home universities, team members conclude that formal instructor training should be required for every professor AND every teaching assistant. The granting of a degree (Ph.D. or MS) does not automatically bestow teaching skills, especially effective teaching skills. Most professors simply try to emulate observed styles without any justification as to the effectiveness of different teaching styles. The lack of formal training programs at most universities, and nearly nonexistent programs to provide constructive criticism from peers relegates most faculty to the very slow process of developing effective (if they are lucky and persistent) teaching styles through a long career of trial and error. Add the demands of research and the appearance at many universities (probably true) of the greater importance of research over teaching, and it is easy to understand the reason for the large number of ineffective teachers at the college level. However, it only takes a relatively small amount of focused effort in an exceptional program like ETW to lay the necessary foundation to become an effective teacher. Even though the workshop does not have to necessarily look exactly like ETW, the workshop must present the principals of effective teaching (i.e., presentation skills and class

organization), demonstrate effective teaching styles and techniques, and require the participants to practice their skills under a mentor's gaze and assessment.

ETW is a valuable experience for any faculty member no matter their level of experience. We all can continue to improve our teaching techniques – the students deserve no less. Teaching should be fun. Focused improvements in presentation and organizational skills will make it a reality.⁵ Teachers have the greatest impact on our nations youth by influencing, and hopefully inspiring, major selection, elective selection, and possibly the desire for advanced degrees.

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