2006-2343: PREVIEWS OF COMING ATTRACTIONS – EMPLOYING THE FIRST YEAR SEMINAR TO PREPARE ENGINEERING FRESHMEN FOR SUCCESS IN COLLEGE AND BEYOND

David Cottrell, University of North Carolina-Charlotte

DR. DAVID S. COTTRELL is an Assistant Professor in the Department of Engineering Technology, University of North Carolina at Charlotte. He graduated from the United States Military Academy in 1978 and retired in 2000 after more than 22 years of service with the US Army Corps of Engineers. Studies at Texas A&M University resulted in an MS Degree in Civil Engineering in 1987 and a PhD in 1995. He is a registered Professional Engineer and has taught courses in statics, dynamics, mechanics of materials, graphic communications, engineering economy, and construction planning, scheduling, estimating, and management.

Richard Ciocci, Pennsylvania State University-Harrisburg

DR. RICHARD CIOCCI is an Assistant Professor of Mechanical Engineering. He is a registered Professional Engineer and has a BS Degree, and MS Degree, and a PhD Degree from the University of Maryland.

Jerry Shoup, Pennsylvania State University-Harrisburg

DR. JERRY SHOUP is an Associate Professor in the School of Science and Engineering Technology at Pennsylvania State University at Harrisburg. His degrees include BS Degree in Electrical Engineering, an MS Degree, and a PhD from The Pennsylvania State University. He is currently the Program Chair for the Electrical Engineering and Electrical Engineering Technology Program.

Previews of Coming Attractions – Employing the First Year Seminar to Prepare Engineering Freshmen for Success in College and Beyond

Introduction

This paper describes an innovative teaching strategy for freshmen engineering students enrolled in a First-Year Seminar, a course deliberately designed to ease the student's transition from high school to college. At the Pennsylvania State University at Harrisburg – the Capital College – the First Year Seminar is generally offered during a typical student's first fall semester and aims to facilitate the successful transition of new students to Penn State through their introduction to the use of university and campus resources. Although this course is a new offering at the Harrisburg Campus, the other half of Capital College, Pennsylvania State University at Schuylkill has been offering First Year Seminars for five years.[1] The Penn State Harrisburg faculty members involved in teaching the initial seminars received training and assistance from their Schuylkill colleagues. Students are canvassed as to their intention for a major and then aligned with a corresponding section in the school of their choice. In terms of course goals, the First Year Seminar deliberately attempts to enhance the following:

- Student understanding of the cultural expectations of the Penn State community,
- Student information literacy skills though library and electronic research skills, by developing evaluate information sources critically, and their demonstrated electronic communication skills
- Student self -assessment and goal clarification abilities by attaining information about Penn State majors and academic programs
- Student skills needed to work collaboratively on both in-class and out-of-class assignments
- Student involvement in Penn State University activities and resources

This paper addresses the practical implementation of the First Year Seminar populated by students aligned with the School of Science, Engineering, and Technology. The course's classroom instruction incorporated traditional individual and group activities to enhance planning and organizational skills, team functioning, and time management, and provides Penn State University first-year seminars provide links for students to learning, service, and virtual communities.[2] The primary thrust of this article focuses on the inclusion of events outside the classroom. Specifically, this article addresses the use of (1) out-of-class University sponsored events including instruction of employment of computer and information systems and numerous seminars on a wide

range of topics such as achieving academic success, learning best-practices and procedures; and (2) Externships, that is, trips off campus to visit practicing professionals in a variety of engineering disciplines. Finally, student comments and feedback will be assessed to examine first-year student trends and expectations dealing with engineering academic, social and global issues.

Out-Of-Class, On-Campus University Sponsored Events

The First Year Seminar required students to attend a minimum of twelve (12) out-of-class, on-campus activities during the fall semester. The activities were noted inside the course syllabus as well as on an easily accessible web site at http://www.cl.psu.edu/fys *First Year Student Resources and Support Programs*. Inclusion of these out-of-class assignments stems from research that strongly suggests that student involvement in out-of-class activities increases satisfaction and success in college. Table 1 provides a listing of the specific events along with a brief description of its goals and intent. As can be seen, the events fell into three specific categories: (1) Mandatory events that dealt directly with skills and tools considered essential for student survival and success; (2) Learning Center Workshops covering a variety of student issues that add to the student's capabilities to study, write, and generally accomplish learning objectives either stated explicitly or contained inherently with the courses in their academic programs, and (3) Wellness Program Workshops designed to aid the student as a person in dealing with personal challenges associated with their transition to the college environment. When students attend an event, organizers of the event required students to complete a form entitled *First Year Student Resources and Support Program One-Minute Reflection*. This survey technique provided a significant amount of data with emerging results indicating that a clear majority felt that the out-of-class on-campus events were at least very or extremely helpful in assisting in the student's success at Penn State.

Table 1. Out-of-Class, On-Campus Events Associated with the First Year Seminar

EVENT DESCRIPTION
• **Mandatory Events**
"**Putting Penn State Technology to Work for You.** Instructional Technology Workshop presented a review of Penn State Technology Resources, including the portal, e-portfolio, web-mail, and personal web space. Sponsored by IIT and Career Services.
Library Open House. This event introduced the student to the Library's collections and services.
"An Overview of the AAA's of Academic Success." A review of Academic Policies, Advising Responsibilities, and the Audit. All the information students need to know to be on top of the policies and to prepare for the mid-semester advising appointment. An information update was included detailing the use of "e-lion", the PSU web tool for academic affairs.
• **Learning Center Workshops**: (attend any three (3) of the following)
"The TI-89 and You." Employing a graphing calculator appropriately with calculus applications with examples and a question and answer session
"You Can't Exercise by Watching an Exercise Video." An overview of strategies for academic success in math and science courses was presented. HINT: Reading the text and going to class is NOT all that is needed
"That's Plagiarism?" Describes the different types of plagiarism, including cyber plagiarism, and emphasizes the importance of academic integrity and the need to document sources.
"How Do I Cite This Thing? A Brief Introduction to APA Style." The basics of APA documentation style, the style used most widely in technical writing. Information will focus particularly how APA differs from MLA style.
"A Good Paper Doesn't Require Good Writing Genes." Professional writing tutors from the LC offered a broad overview of the writing process, from idea-generating strategies to developing a thesis statement to planning and organizing a paper.
"Becoming a Better Editor." Answers to such eternal questions as: where do the commas (and other stuff) go? How do I make my sentences clearer and more concise?
"Finals: Overcoming the Fear Factor." How to study effectively for final exams? What to study for final exams?
• **Wellness Program Workshops** (attend any one (1) of the following)
"Street Smart and Savvy: Alcohol (AAA) Awareness/Attitude/Actions." Students learned about new laws regarding drinking and driving, University policy, and health/wellness considerations. Refreshments served.
"STI'S (Sexually Transmitted Infections)." Over 25 infections are spread primarily by sexual activity. Students learned how to "protect" themselves against one of the largest growing epidemics in college students.
"Contraception." Abstinence and contraceptive methods were discussed with the latest devices demonstrated.

Engineering Externships: Off-Campus Trips to Engineering Professionals

Trip destinations were meant to be entertaining as well as educational, and as a secondary goal, served as an effective medium to arrange for the students to depart the campus and experience sights and facilities within the local community thus indirectly supporting course objectives aimed at assisting the college freshman in his transition away from home to college. Destinations included a wide range of industrial, environmental, and research and testing facilities ranging from chocolate manufacturing, waste water treatment, nuclear power generation, high frequency signal transmission, rock mining & crushing, concrete and asphalt batch plants, and modern high speed mail sorting and distribution. Specifically, the actual companies or plants visited are presented below:

- Derry Township Municipal Authority Waster Water Treatment Facility.
- Pennsy Supply – Rock mining, crushing, ready-mix concrete, and asphalt/concrete batch plant.
- MA/COM (Tyco) – Pennsylvania's new statewide 800 MHz digital IP-based radio system.
- Harrisburg Post Office Area Distribution Center – Modern high speed mail sorting, optical character reading, bar code printing, and distribution center.
- Hershey Chocolate West Plant – Chocolate factory and manufacturing center, processing raw ingredients to final product including packaging.
- Penn State Hershey Medical Center – Artificial heart program: tour of research, development, and testing facilities including life animal laboratory.
- Tyco Electronics Corporate Test Laboratory – Mechanical and electrical testing facilities with structural, long-term testing, and product qualification.
- Three Mile Island Nuclear Power Plant – Tour of visitor center detailing nuclear power plant energy generation and control room training facility.

As discussed previously, students enrolled in the First Year Seminar were initially canvassed regarding their intention for a major and then aligned with a corresponding section in the school of their choice. The sections addressed by this article were almost exclusively inclined toward engineering. Nevertheless, coming out of secondary school systems even with advanced mathematics and science programs, the freshmen in this study typically failed to demonstrate an in-depth understanding of the fundamental engineering disciplines available as academic areas of study or as viable careers after graduation. Consequently, the off-campus trips were designed to specifically provide first-encounters with practicing engineers in a wide variety of disciplines. Table 2

Table 2. Off-Campus Trips for the First Year Seminars
Correlated with Engineering Disciplines/Applications

Trip Destination	Engineer Discipline or Application										
	Architectural	Bio-Medical	Chemical	Civil/Structural	Computer	Construction	Electrical	Environmental	Mechanical	Nuclear	Industrial
Waste Treatment Facility			✓	✓	✓		✓	✓	✓		✓
Concrete Batch Plant			✓	✓	✓	✓	✓	✓	✓		✓
MA/COM Electronics	✓			✓	✓		✓	✓	✓	✓	
Post Office	✓		✓	✓	✓		✓		✓		✓
Chocolate Factory	✓		✓	✓	✓	✓	✓	✓	✓		✓
Medical Center	✓	✓	✓		✓	✓	✓	✓	✓		✓
TYCO Testing Lab			✓		✓		✓	✓	✓		
TMI Nuclear Power Plant	✓		✓	✓	✓	✓	✓	✓	✓	✓	

correlates respective field trips and the engineering disciplines encountered by the students on the site. Coordination prior to the trip appraised the host organizations with the specific intent of the tours, and consequently, in most cases, the briefings and subsequent site visits and demonstrations easily presented clear examples of engineering in practice in a variety of disciplines. Students were required to examine the various facets of each trip presentations and deliberately track the various types of engineering presented. Additionally, faculty participants assessed the trip both during the actual visit and afterwards during formal "after action reviews" or critiques. The student and faculty assessments are summarized in Table 2, and certainly indicate the breath of exposure to various types of engineering applications.

Cost-Benefit: Assessing the Impact of the Program

Without question, the trips proved to be a powerful draw for the students. However, to be effective, the externships should have an impact in developing a better understanding of engineering and perhaps even promoting a heightened commitment to engineering both as a field of study as well as a future career choice. Initially, assessment

processes focused on the individual out-of-class events both on as well as off campus to solicit immediate input from the students on the effectiveness of the event itself. Student surveys were completed for each event by respective participants. Figure 1 below catalogues student responses to their level of interest in engineering at the conclusion of each off-campus trip. The relative distribution of the data as well as the mean responses provide a clear inference that the trips succeeded in not only providing timely exposure to a variety of engineering professionals as discussed earlier but also that the trips reinforced the students' interest in the field of engineering.

Trip Destination	Level of Student Interest After the Trip				
	Not at All (1)	Some (2)	Moderate (3)	Very (4)	Extremely (5)
Waste Treatment Facility		11%	22%	44%	22%
	Mean Response = 3.78				
Concrete Batch Plant			12%	38%	50%
	Mean Response = 4.38				
MA/COM Electronics		14%	36%	29%	21%
	Mean Response = 3.57				
Post Office		10%	30%	50%	10%
	Mean Response = 3.60				
Chocolate Factory			4%	38%	58%
	Mean Response = 4.54				
Medical Center			8%	54%	38%
	Mean Response = 4.31				
TYCO Testing Lab				50%	50%
	Mean Response = 4.50				
TMI Nuclear Power Plant			10%	45%	45%
	Mean Response = 4.36				

Figure 1. Response Data Indicating the Level of Student Interest after Each Respective Trip

As a further indicator of the collective success of this program, students were tracked after leaving the program to examine whether they demonstrated any continued commitment to engineering at Penn State. Although, continuation in the engineering is certainly a complex, and multi-faceted variable, the retention data for graduates of the seminar program tended to support a positive assessment of the seminar. Of those who started in the program in the Fall Semester of 2003, 72.5% have remained in the engineering major either at the Harrisburg campus or at the main campus at State College.

The additional cost for executing the innovative policies of this program was very minimal and tracked with costs and overhead normally found with other academic courses. The exception, of course, dealt with transportation to and from the off-campus sites. Students were not permitted to drive their own cars but rather due to liability issues were moved collectively by bus or vans either available through the University fleet or from local rental agencies. Rentals were operated by faculty in each case. The transportation costs were fully absorbed from within the operating budget of the School and considered a sound investment in the future of the engineering programs.

Conclusion

This paper describes an innovative teaching strategy for freshmen engineering students enrolled in a First-Year Seminar, a course deliberately designed to ease the student's transition from high school to college. The teaching philosophy reached beyond the classroom to effectively integrate learning workshops and wellness clinics to augment classroom topics and more effectively support a smooth transition by the students from their previous high school education to the academic challenges of Penn State. Further, off-campus trips provided vocational orientation to the freshmen at a critical time in their scholastic endeavors as they strive to identify and plan future careers. Although this paper addresses the practical implementation within a First Year Seminar populated by students aligned with the School of Science, Engineering, and Technology, the methodology is certainly applicable to other courses as well. Certainly, the course's classroom instruction incorporated traditional individual and group activities to enhance planning and organizational skills, team functioning, and time management. But based on student feed-back, and faculty assessment, the inclusion of out-of-class University sponsored events and off-campus field trips proved to be highly successful and innovative and is worthy of emulation.

Bibliography

1. Goodfellow, M., T. Eberlein, and S. Barrows, "Piloting Linked Courses and Integrated Student Support Services at a Small Campus Penn State College, Schuylkill," Southwest Regional Learning Communities Conference, Tempe, AZ, February 28 - March 1, 2002.

2. Hillen, P., "Initiative for the Betterment of the First-Year Experience at Penn State University, Delaware County," 16th International Conference on the First-year Experience, Vancouver, BC, July 7-10, 2003.