

# **The Citadel 101 Freshman Initiative**

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## **Abstract**

During Spring 2000, The Citadel adopted the recommendation of a campus-wide committee studying the experience of first-year students to implement a new course (Citadel 101) to be required of all college freshmen. It was decided that the Department of Civil and Environmental Engineering would incorporate Citadel 101 goals by modifying the existing Introduction to Civil and Environmental Engineering course. One of the major changes made to the existing "Intro" course was to incorporate a substantial amount of additional material on academic success strategies in place of some of the hands-on mini-projects that had been successful in previous offerings of the course. This paper describes the changes made to the existing course and provides a student assessment of the first-semester college experience for civil engineering students enrolled in the new course.

## **Introduction**

Over a decade ago, the Department of Civil and Environmental Engineering at The Citadel established an Introduction to Civil and Environmental Engineering course for freshmen. In an effort to encourage young engineering students to continue their pursuit of an engineering degree as well as promote the academic preparation of engineering students, the course was gradually modified. Nonetheless, high attrition rates between the freshman and sophomore years persisted and a departmental Freshman Committee was established to assess the course and make recommendations that would potentially help improve the retention rate. Based on experience with the course and a review of the current literature, the Freshman Committee decided to modify the course to generate the type of energetic learning opportunities that help promote an enthusiasm for learning engineering. Specifically, several mini-projects used for a number of years in the course were replaced with competitive team exercises composed of visual/hands-on/laboratory activities deemed to be effective in fostering student motivation.

During Spring 2000, a campus-wide committee studying the experience of all first-year students proposed establishing "Citadel 101," a new course required of all freshmen at The Citadel. Among the primary reasons for creating Citadel 101 are to improve retention of first-year students, improve the academic skills of first-year students, and generally to enhance the experience of freshmen students. Following adoption of the Citadel 101 concept, it was decided that the existing Introduction to Civil and Environmental Engineering course should be modified to satisfy both the Citadel 101 requirements and the course objectives for Introduction to Civil and Environmental Engineering. This meant making significant changes to a course that had been carefully refined over the years, but it also meant exploring the effectiveness of adding more success-oriented strategies to the Introduction to Civil and Environmental Engineering course, an action that had been considered previously but not implemented.

The purpose of this paper is to address the effectiveness of the modifications made during Spring 2000 to the Introduction to Civil and Environmental Engineering course, describe the Citadel 101 initiative and the

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resulting modifications to the Introduction to Civil and Environmental Engineering course, and to provide a student assessment of the first-semester college experience for civil engineering students enrolled in the new course.

## **Background**

### **College Freshman Orientation Seminars**

A review of the growth of college orientation courses since the 1960's might suggest that such courses are a relatively recent development. The fraction of schools offering orientation courses grew from almost none in the 1960's<sup>1</sup> to two-thirds of college campuses in the 1990's<sup>2</sup>. In actuality, orientation courses were offered in the late 1800's on a non-credit basis and, beginning in 1911 at Reed College<sup>3</sup>, orientation courses for credit began to appear.

Among the benefits attributed to college orientation courses are academic and social integration and higher retention rates. While much of the research may be impacted by whether or not the course is optional and many other factors associated with student motivation and ability, there is a substantial amount of evidence that retention and academic performance can be positively affected by an effective orientation course<sup>4</sup>.

College Freshman Orientation Seminars vary from campus to campus, depending on the mission of the institution, course objectives, teaching methodologies, etc. Further, the same seminar may be taught to all students at a given institution or the seminars within a university may vary from school to school or department to department. However, the following represents a list of topics included in orientation seminars as reported on the 1991 Survey of Freshman Seminar Programming<sup>5</sup>, given in order of higher to lower frequencies.

- study skills
- time management
- campus facilities and resources
- wellness (alcohol/drug abuse, STD's, nutrition)
- relationship issues (roommates, dating, date rape)
- campus rules and regulations
- cultural diversity
- critical thinking and writing
- goal setting
- library use
- liberal arts/general education
- purpose of higher education
- values clarification
- history and mission of institution
- current societal issues

### **Freshman Engineering Courses**

A new program for freshman engineers at the University of Buffalo is a striking example of efforts underway in many schools across the country to enhance the freshman experience for engineering students. Ninety percent of the freshman students who took part in the Student Excellence Initiative in the School of Engineering and Applied Sciences returned for the sophomore year. In contrast, only 63 percent of the non-participants were retained. The overall program is based on personal attention, and includes an Opening Day with teams flying indoor kites, a newly enhanced faculty mentoring program, and modification of the Introduction to Engineering course to a team-oriented "Case Studies in Engineering" course<sup>6</sup>.

The recent history of the creation and improvement of freshman engineering courses is similar to general college orientation courses. By 1992, two-thirds of engineering programs had an introduction to engineering course, and 89 percent of those expressed an interest in improving their course. Goals of the courses and the associated freshman engineering support structure include helping freshmen to develop study skills for academic success, teaching fundamental knowledge needed for progressing to upper level courses, and generating enough enthusiasm about engineering that will encourage students to continue in engineering beyond the freshman year.

Different schools attempt to achieve these goals in various ways. One widespread method is to offer an introduction to engineering course. "Intro" courses may vary in content, depending on the school's emphasis, and may include topics such as community building, success strategies, career opportunities in engineering, engineering ethics, and problem solving. Some courses focus more heavily on problem solving and may involve computer solutions. Another approach is to create an introductory design course, highlighting hands-on activities and teamwork. Many schools offer seminars that focus on special engineering topics. Guest speakers and multimedia presentations in first-year seminars can help capture interest. Peer and faculty mentoring can supply valuable support for young students.

Over the last few years, much has been published providing examples of innovative approaches to enhancing the freshman experience. A cross section of selected works illustrating the variety of approaches is summarized in Table 1.

Reference(s)	Description
<i>Help Outside the Classroom</i>	
7	Counselor-Tutorial program for high-risk students
8	Second-term probation program
8, 9, 10	Information-gathering through surveys and interviews
11	Voluntarily attended review sessions for high-risk students
<i>Help Inside the Classroom</i>	
12, 13	Success-oriented first year course
14	Freshman advisor seminars to increase contact with advisors
8	Freshman seminars using peer-mentored cooperative learning groups
15	Peer mentoring in first-year course
16	Smaller classes to increase student-faculty contact
<i>Motivational first-year courses (active-learning exercises, hands-on laboratory projects, first year design experiences, etc.)</i>	
17	Estimating/verifying number of students that can fit into a VW Beetle
18	Reverse engineering integrated with design graphics project
19	Design, evaluate, race edible cars
15	Development of lab-based, team-oriented, hands-on first-year course (doubled retention rate)
20	<ul style="list-style-type: none"> <li>demonstrations between lectures</li> <li>weekly hands-on mini-projects for individuals</li> <li>group projects - e.g., design and construction of steam-powered generator and steam-powered car followed by competition</li> </ul>
21	Design and construction of handicap access for buildings at a historic site
22	Elective laboratory course
23	Re-design of paper clip

**Table 1. Typical Approaches for Enhancing the Freshman Engineering Experience**

## **The Citadel 101 Initiative**

During the 1999-2000 school term, a campus-wide committee examined the feasibility and advisability of developing a First Year Experience course to be completed by Citadel freshmen. One of the authors of this paper (Fallon) served on the committee. Initially, the committee determined what skills and information students needed to succeed at The Citadel. To determine student perspectives on what was needed, each committee member conducted focus group interviews with cadets. In addition to reviewing the literature and sample textbooks on first year courses, the committee attended a one-day workshop on developing a first-year course. The committee recommendation was to add the course to the school's core curriculum.

Based on the committee's recommendation, the school decided to implement Citadel 101 during the Fall 2000 semester. Most students would take the same one-credit-hour, two-contact-hour course administered to students enrolled in various disciplines. However, it was decided that the engineering departments would modify the existing introduction to engineering courses to appropriately accommodate the goals of Citadel 101 and that engineering students would take their department-specific course instead of the general college course. Modifications to the Introduction to Civil and Environmental Engineering course will be discussed in greater detail in the following section.

After faculty from a variety of disciplines had been identified to teach the new course, these faculty members attended a two-day workshop on teaching first-year courses. Initial work on developing specific course outlines was begun at the workshop. Course goals proposed by the campus-wide committee during its study served as a basis for developing course content. Those goals included:

- assist students in making a successful transition from high school to college
- examine purposes of higher education and practice of intellectual engagement
- identify what college faculty expect of students and what students can expect of college faculty
- help students develop critical thinking skills
- provide students with library and computer skills needed to succeed academically
- provide students with learning strategies needed to succeed academically
- help students plan a course of study consistent with and supportive of their interest, abilities, and career goals
- provide students with effective time-management strategies
- provide students with strategies for managing fatigue and stress
- provide cultural enrichment opportunities for students through fine arts performances, films, lectures, etc.
- acquaint students with study abroad and internship opportunities
- help students develop an appreciation for and an ability to interact with people from different racial and ethnic backgrounds
- acquaint students with campus resources and support services

Another meeting of faculty members preparing to teach the course was held just prior to Fall 2000 classes. Emphasized during this meeting were teaching strategies and information unique to Citadel freshmen (e.g., military demands and schedules). After classes had met for a number of weeks during the fall semester, a meeting of all Citadel 101 instructors was held to discuss successes and problems encountered while teaching the course.

## **Modifications to Introduction to Civil and Environmental Engineering**

Although the existing Introduction to Civil and Environmental engineering course had been carefully refined over the years, it was necessary to modify the course content appropriately to address goals of the Citadel 101 initiative. At the time the Citadel 101 initiative was announced, the departmental Freshman Committee had only recently modified the course<sup>24</sup> and had been eager to evaluate the impact of those changes. Unfortunately, while the 1999-2000 modifications appeared to be highly successful based on feedback from freshmen, the course had not been taught long enough to gather meaningful information regarding how the course may have affected retention.

For the first offering of Citadel 101 the decision had to be made whether the Civil and Environmental Engineering (CEE) Department would teach either a course combining the Citadel 101 and Introduction to Civil and Environmental Engineering topics or to teach a shortened "Intro" course and have CEE students enroll in the college-wide Citadel 101 course. The faculty in the engineering departments stated that there were enough unique aspects of their programs to justify combining the Citadel success strategies and the departmental Introduction to Engineering courses. Further, the CEE faculty members who had worked with the Introduction to CEE course in previous years whole-heartedly subscribed to the idea that students' decisions to stay in or leave the department may be strongly influenced by contact with departmental faculty members. Contact with students has been recognized as a strong influence on the general college student population and on engineering, math and science majors<sup>6, 16, 25</sup>. Establishing a positive connection with the students was the reason the college recruited volunteers from across the faculty and staff to teach the college-wide course to classes of about 18 students. Further, it was no surprise that more departmental faculty volunteered to teach the combined course to the civil engineering freshmen class than there were sections to be taught. The enrollment in each of the modified Introduction to CEE sections was limited to 15 students during Fall 2000.

To ensure that the modified Introduction to CEE course was fully consistent with the college-wide Citadel 101 course, the department head and civil engineering faculty who would be developing and teaching the departmental course participated in the two-day workshop and all subsequent planning and assessment meetings. The proposed course outline was reviewed by the Citadel's Dean of Undergraduate Studies and the dean's comments were incorporated following the review. During the semester CEE faculty teaching Introduction to CEE received all correspondence sent to Citadel 101 faculty.

Some of the new changes required in addressing Citadel 101 objectives involved the inclusion of additional material on strategies for academic success. Similar changes had been considered in the past, but had not yet been implemented to the extent needed to be consistent with Citadel 101 objectives. In order to emphasize strategies for academic success in sufficient detail, it was necessary to eliminate some of the civil engineering applications including some hands-on, team-oriented exercises. A list of the changes made is shown in Table 2. It should be noted that there were a number of activities associated with the Citadel 101 initiative that are not listed as topics in Table 2.

## **Course Assessment**

Following the initial offering of the modified Introduction to CEE course, the 51 students completing the course were asked to assess the course through two surveys administered in the CEE computer laboratory. The student responses were submitted directly to the CEE server to preserve student anonymity and to facilitate analysis of the data. The two surveys were administered on separate days at the end of the semester. Citadel 101 topics included in the Introduction to CEE course were evaluated in the first survey and Civil and Environmental Engineering discipline-specific topics included in the course were evaluated in the second survey. All students completed the Citadel 101 Topics survey and 49 students completed the CEE Topics survey. Note that the percentages in the following discussion are calculated on the number of responses for each question, which may vary slightly (a difference of no more than three) from the numbers

1999-2000 Topics	2000-2001 Topics
<u>General Academic Success Strategies</u> <ul style="list-style-type: none"> <li>• Honor system*</li> <li>• Time management*</li> <li>• Windows operating environment</li> </ul>	<u>General Academic Success Strategies</u> <ul style="list-style-type: none"> <li>• College: what to expect and what is expected</li> <li>• Campus resources</li> <li>• Honor system</li> <li>• Time management</li> <li>• Note taking</li> <li>• Test taking</li> <li>• Computer skills</li> <li>• Library – information gathering</li> <li>• Roles of your major advisor and professors</li> <li>• Monitoring your academic progress</li> </ul>
<u>Career Planning</u> <ul style="list-style-type: none"> <li>• What is engineering?*</li> <li>• Civil engineering and other branches of engineering*</li> <li>• Ethics and Professionalism*</li> </ul>	<u>Career Planning</u> <ul style="list-style-type: none"> <li>• Career path planning</li> <li>• What is engineering?</li> <li>• Civil engineering and other branches of engineering</li> <li>• Ethics and Professionalism</li> <li>• Field trip to construction site</li> </ul>
<u>Engineering Skills, Tools and Techniques</u> <ul style="list-style-type: none"> <li>• Foundations of problem solving (significant figures, angular measurement, rectangular/polar coordinates, etc.)*</li> <li>• Problem solving techniques, organization, and presentation*</li> <li>• Problem solving tools: Mathcad*</li> <li>• Engineering Drawings – plans and profiles*</li> <li>• Contour plots*</li> <li>• Problem Solving tools: Spreadsheets*</li> <li>• Data Analysis and Graphing Engineering Data*</li> <li>• Parking lot project and presentations*</li> <li>• Transportation/Highways application</li> <li>• Geotechnical application</li> <li>• Environmental application</li> <li>• Construction and Testing: Concrete Cylinders</li> <li>• Structural application</li> <li>• Office layout project and presentations*</li> </ul>	<u>Engineering Skills, Tools and Techniques</u> <ul style="list-style-type: none"> <li>• Foundations of problem solving (significant figures, angular measurement, rectangular/polar coordinates, etc.)</li> <li>• Problem solving techniques, organization, and presentation</li> <li>• Problem solving tools: Mathcad</li> <li>• Engineering Drawings – plans and profiles</li> <li>• Contour plots</li> <li>• Problem Solving tools: Spreadsheets</li> <li>• Data Analysis and Graphing Engineering Data</li> <li>• Parking lot project and presentations</li> <li>• Office layout project and presentations</li> </ul>
* Topics retained for 2000-2001 academic year	

**Table 2. Comparison of Introduction to Environmental Engineering Topics: Citadel 101 version (2000-2001) to Previous Year.**

above, since the surveys could be submitted without a response for each question. Each of these surveys is about two and one-half pages long and requests about 25 student responses. The surveys were typically completed in 10 to 15 minutes. Anyone interested in obtaining information about the surveys should contact one of the authors.

### **Citadel 101 Topics**

A heavy percentage of the students (86 percent) favored combining the Citadel 101 topics with the Introduction to CEE topics, as had been done in the newly modified Introduction to CEE course. The comment most often associated with the students preferring the college-wide course was that they expected the grades in the college-wide freshman year experience course to be higher than the grades in the department's combined course. Considering this and the fact that the students are typically well aware of what students were doing in the college-wide course, the students overwhelmingly supported the decision of the college to allow the engineering departments to teach the combined sections. When asked about the success strategies presented in the course, 84 percent of these students said the topics were relevant to their academic experience in the first semester.

Students were asked to indicate using a scale ranging from 5 (very useful) – to 0 (not at all useful) how useful a number of skills and issues stressed during the course had been during the first semester. Students also were asked if they would like to see more, less or the same emphasis on certain topics in the course. Interestingly, the students' concerns very closely match the concerns expressed by many faculty members: time management, test taking, what faculty expect and note-taking/classroom skills. There was also significant interest in the topics of learning styles and in the effects and management of fatigue and stress. These responses are presented in Table 3.

Skill or Topic	Average Rating	Emphasis		
		Same	More	Less
Campus resources	3.75	67%	14%	20%
The Honor System	4.24	71%	8%	22%
Time management	4.14	41%	53%	6%
Note Taking – Classroom skills	3.72	45%	39%	16%
Computer skills	3.63	56%	22%	22%
Library resources and research skills	3.51	57%	22%	22%
Test taking	3.51	57%	35%	8%
What faculty expect	3.70	68%	20%	12%
Fatigue and stress management	Not Rated	37%	45%	18%
Learning styles		49%	37%	14%

**Table 3. Student responses to Citadel 101 Topics Survey**

### **Civil and Environmental Engineering Discipline-Specific Topics**

From a curriculum development perspective, the most obvious goal of the Introduction to CEE course is to help students learn about their choice of academic major and the careers it may open for them. In this course the students learn that they are facing a long and demanding journey. In order to succeed in the tasks before them, they must have more than academic and intellectual skills – they must have a strong desire and commitment to success. During the course students are regularly reminded, “wanting something is not enough; you must be willing to work for it.” When a sense of excitement and enthusiasm is developed and fostered among the students, they are more likely to develop the commitment needed to succeed as civil engineering majors. Therefore, a second survey was made to determine the students’ opinions of how these discipline-specific topics affected their perception of Civil and Environmental Engineering.

Questions on this survey were focused on two primary areas. One set of questions targeted the general level of interest and understanding about CEE as an academic major and profession. These responses are summarized in Table 4. More than 60 percent of the students felt that the course raised their interest in CEE and was very successful in teaching them about civil engineering. About a fourth of the students indicated that the course did not change their interest in CEE. This should not necessarily be interpreted to mean that those students were not interested in CEE at the end of the course – many of these may have been highly motivated when they began the course, and that motivation was not diminished. It should also be noted that the small percentage of students whose interest was lowered in CEE during the course apparently concluded that they would prefer another career field, were not sufficiently motivated, or were not capable of pursuing a career in engineering. Historically, students leaving CEE have often told the department head that difficulties in mathematics and science courses are primary reasons for leaving. In any event, although it is disappointing to the faculty to lose students to other career fields, it is certainly in the students’ best interest for the course to help such students make these choices early in their academic career, and it appears that the course was successful in achieving this.

Has CIVL 102 affected your interest in CEE?	Raised 61%	No change 24%	Lowered 15%
How successful was the course in teaching you about civil engineering?	Very 61%	Moderately 30%	Not very 9%
<b>What I learned in this course</b>			
did not alter my thinking about CEE. 27%	convinced me to stay in CEE. 47%	convinced me to change major. 20%	left me unsure. 6%
I plan to	stay in CEE. 67%	change majors. 27%	Not sure 6%

**Table 4. Student Responses to CEE Topics Survey**

The second set of questions (not included in Table 4) primarily addressed the specific activities or topics utilized during the course of the semester and the impact they may have had on the students. A subset of these questions and the student responses are summarized here. When asked if the mathematics, trigonometry, unit conversion, problem solving, and calculator exercises were beneficial in areas other than CEE, 89 percent of the students responded yes. The students overwhelmingly, 98 percent, preferred hands-



on activities giving them a 4.39 rating on a 0-5 scale. Team-based activities drew some of the most introspective comments from the students while 89 percent felt that team-based activities had helped them in some way during the course. Those comments touched on the problems of individual accountability for team members, management styles and work habits – all of which will be significant challenges they will face in the future. A field trip to a building construction site raised the interest in CEE for 57 percent of the students completing the survey. Students' ratings of the physical models (4.22) and engineering plans (4.15) used during the course were consistent with the expectation that most CEE students tend to be visually oriented.

### **Concluding Comments**

One of the major concerns the faculty had about modifying Introduction to Civil and Environmental Engineering to conform to the Citadel 101 initiative was the potential impact of removing some of the discipline-specific material. In particular, some of the historically well-received hands-on activities were removed to make room for more success strategies in the course. Although only one semester of data has been collected at this point, it appears that the students feel that the newly revised course is very successful in teaching both success strategies and introducing civil and environmental engineering as a profession.

Students were overwhelmingly in favor of taking a course combining success strategies with discipline-specific topics from faculty in their major. Nearly half of the students taking the modified course stated that *this course* convinced them to continue as CEE majors. At the conclusion of the course, two-thirds of the students planned to continue in CEE, while the remainder planned to change majors or were unsure. While these figures are encouraging, it is not possible to extrapolate the data to predict the impact on long-term retention in the department. Therefore, as long as students who have taken this new course are CEE majors, the department will continue to obtain and assess data related to retention.

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