

Building a Bridge for Pre-Freshman Engineering Majors: The Connecting to Engineering Program

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Abstract

Engineering is a demanding program at The Ohio State University. Students may not be prepared for the academic or social transitions to a college environment. To help students adjust, the College of Engineering in conjunction with the Office of Information Technology (OIT) and Technology Enhanced Learning and Research (TELR) at OSU developed the “Connecting to Engineering” program. This website was designed to reach out to incoming freshman with information about the program, study skills, and campus life. The program was piloted with approximately 1100 students over the summer of 2002. Although participation was not what was expected, the challenges and successes of this program will lead to a renewed program for the summer of 2003.

Introduction

Student retention and achievement is an issue facing universities as a whole, but also individual departments within a university. Students facing new trials may feel overwhelmed and unprepared as to where to seek assistance. In response to this challenge, a supplementary web site was developed to address student attrition factors.

The Engineering Program at OSU

Beginning engineering students are required to take one of two First-Year Program Sequences—either the two-quarter Fundamentals of Engineering (FE) or the three-quarter Fundamentals of Engineering for Honors (FEH) sequence. The programs are designed to give students an introduction to engineering concepts, skills, and areas of interest. First-year students at Ohio State enjoy a relatively unique experience in receiving engineering education during their first year.

Both sequences cover engineering-specific concepts such as engineering graphics, computer-aided design and drafting, and programming, while incorporating teamwork, project management, and presentation skills. Students in both sequences also participate in weekly hands-on labs designed to introduce them to various engineering disciplines, basic measurement, data gathering, and design skills while practicing various aspects of technical writing and project documentation.

The courses in the First-Year Program are taught in state-of-the-art classrooms by college faculty. Class sizes are limited in both sequences in order to foster communication between students and instructors. Students in the course benefit greatly from an instructional team consisting of an instructor, lab instructor, graduate teaching assistants and undergraduate teaching assistants or peer mentors.

Factors that affect retention

Several factors affect retention of students in college programs, and in particular, technical programs. The transition from high school to college life can be lonely and overwhelming to those unprepared for the social and academic changes. One myth for students who target engineering as a major consider is that success in math and sciences is going to lead to success in engineering. Unfortunately, this is not always the case.

One way to combat this faulty assumption is to provide students with a realistic view of what the life of an engineer (and engineering student). This information can help students become mentally prepared for the challenges ahead of them, and make a more informed choice to pursue a particular discipline within engineering, or if to pursue engineering at all. [3].

Other factors that may lead to freshman attrition include the ability of the student to handle stress, and the commitment level of the student [9]. Zhang and RiCharde suggest that for the first three weeks of the freshman experience, the most difficult adjustment is that of the

“psychological adjustment to the college experience,” while the academic demands take precedence once the student becomes entrenched in the university atmosphere [9]. Students who do not remain in the program are more likely to have not developed a coping strategy for dealing with these additional pressures, and may be less likely to seek help when they need it [3, 7].

The commitment level of the student can be related to this psychological adjustment as well. Student involvement and community can help freshman build a commitment to a program. Through the development of a support structure, retention is increased [8]. Students may also build dedication and loyalty to a program through pre-college programs. These programs reach out to students prior to coming to campus to help integrate social and academic aspects of college life, as well as potential address student weaknesses in particular subjects [4, 5].

Lastly, the interaction of other people in the same intellectual community with students is an important retention factor. This can be through faculty interactions, advisors or peer mentors [2, 6].

The Plan

The basis for the proposal was the concern of student retention between the time that they attend their orientation session, and the time that they begin classes at the university. This lapse can be anywhere from two weeks to three months. Students may be initially excited about attending OSU after their orientation visit, but their enthusiasm may diminish over time, thus leading to students transferring to other universities, or other departments within The Ohio State University.

In response to this, a design team of two advisors from Engineering, and two instructional designers developed a plan to reach out to these students. The main points of this plan are outlined below:

- A web site would be developed within OSU's learning management system that would provide secure access to incoming freshman. The decision was made to create this in a learning management system for tracking and privacy purposes.
- A small group of students would be selected as a potential pilot group (70 students in 2-3 separate sessions). Engineering typically has upwards of 1000 students attending orientation sessions autumn quarter.
- Students would be grouped according to their orientation sessions – participants would be across engineering disciplines.
- These students would be required to complete the material, including interacting in discussion boards. Completion of the web site requirements would be tied to credit in ENG 100, potentially as extra credit or as a small point value in the course.
- Advisors, faculty, peer-mentors and technology assistants would be available to students. Faculty may be asked to participate in online chats with the students,

academic advisors and existing students would be able to answer questions about academic planning and the "real world" experience on campus.

- Students would be encouraged to interact with other students through discussion boards on the site both on academic matters, but also in personal matters. If participation began to decrease, section facilitators may try to contact students via email or by phone to encourage participation.
- If students did not have access to technology over the summer, they would be given the option to complete the course after arriving on campus, so they would still be given the ability to receive credit for the material.
- Seven modules would be presented in the web site. See Figure [1] for the original storyboard of the course. Content would include information on study skills, engineering careers and how a major can apply to a particular career, how to find engineering clubs and organizations, and where to find resources at OSU. Content was carefully constructed so to try to not overlap with other freshman orientation information.

The Plan, Part II

As all well-intentioned plans do, the Connecting to Engineering (CTE) site went through a series of changes over the following months. The most substantial changes included the elimination of the small pilot group and the omission of tying the CTE site to course credit. Instead of having a pilot group, all 1100 potential incoming engineering freshmen would have the opportunity to participate in the CTE program. Students would have the option of logging on to the site, and the option of completing those portions that interested them. This led to a substantial change in the presentation and structure of the course [Figure 2 – Final Product].

The modules were re-structured, including the addition of numerous pre and post-tests to judge student participation, including a pre-test [Appendix A] which was configured so that students were not allowed to continue with the site until they had completed the pre-test. Each module had an anonymous survey where students could comment as to whether the material was helpful to them or not. Community-building and some of the more personal intervention, while still important, were not going to be as possible given the number of potential student participants. It was hypothesized that because the course was not longer a requirement, students would be less likely to participate, but in case of overwhelming response, additional academic advisors and faculty were recruited to help manage the discussion boards

Getting the word out

To let students know about the option to participate, the Connecting to Engineering web site was featured in several places during the incoming freshman's orientation. A flyer was created that was included in the student's folder of materials. This flyer provided instructions on how to log on to the site, including their username and password. An undergraduate engineering student was enlisted to speak to the students in small groups about the web site. This undergraduate was

also one of the peer mentors participating in the monitoring of the discussion groups. After the sessions had begun, a note was sent out approximately half-way through the summer to remind students of the resources on the web site, as well as how to log on to the site.

Results

Initial student response was low. Even if a student did initially log in, students did not stay long enough to complete the pre-test. Classes at OSU resumed on September 25, 2002. A week and a half before the start of classes, only 140 students had logged in to the site, with a majority of the logins coming after the reminder was sent out to students.

As autumn quarter began however, student participation increased. The number of student logins increased by 121% by October 25. Total page hits also increased by 27%. [Figure 3]. A total of 94 students took the pretest.

Conclusions, observations and next steps

The majority of the students who logged on to the CTE site were already on campus. Once classes started, students began to take a look at the site. This may be because students use the learning management system for other courses. Seeing the CTE site in their course listing, they may have been intrigued enough to explore the site, accounting for the large number of student logins between September 16th and October 25th. While we are still pursuing the individual page tracking of the course, initial data suggests that the resources on Math and engineering majors are important pieces of information to the students. Also frequently visited were help files on how to use the learning management system's discussion board. This was especially interesting because although the students were not using the tool, they were seeking help on the tool within the course.

As the team goes forward, the new plan is to re-engineer the CTE site. The results seem to suggest that the timing of the CTE roll-out may not have been in our favor. Instead of offering the web site immediately after the orientation session (which could take place as early as late June), we are going to invite all students to begin participation after Labor Day in early September. Ohio State is on a quarterly schedule, so this time period is when students begin to think about their new life within the university system. Their friends may have already left for college, so this could be an ideal time to reach out to them to encourage communication with their soon-to-be classmates. In addition, this later time frame may be enough to remind them that the transition to college is an upcoming event in their lives.

The format of the course is also evolving. Instead of having "modules" as the first CTE site did, students will be encouraged to participate in weeks of content. By providing material on a timely basis rather than a self-paced basis, students may be more likely to log in and examine the materials on a weekly time frame. This more dynamic web-site will still allow students to see material covered in the past, but would reserve additional information for the future. In addition to the material on policies and procedures at the university, the site will include information on how to work in groups and additional interactive resources for students concerned about math

and other sciences.

References

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Figure 3: Results

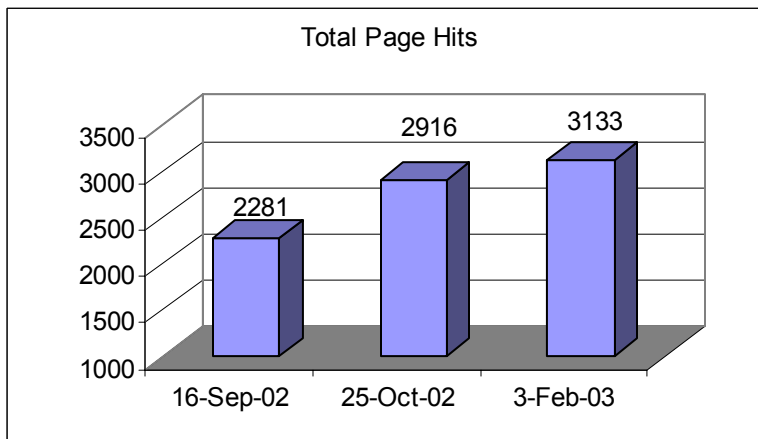
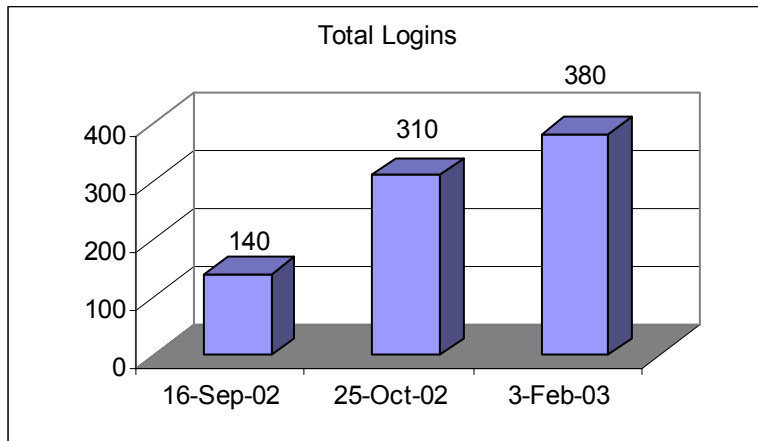


Figure 1: Original Storyboard

Orientation to Engineering - Entire Course

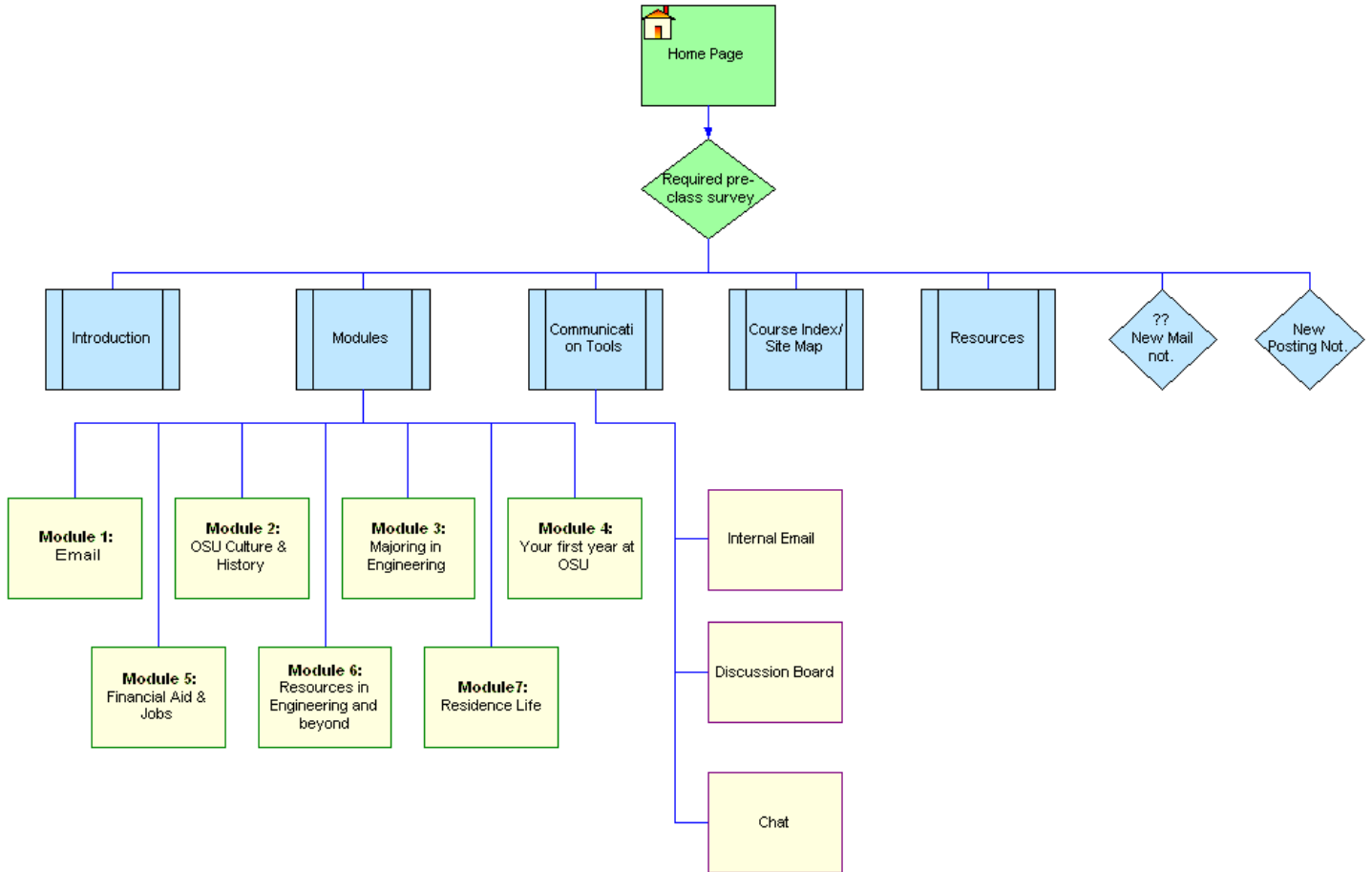
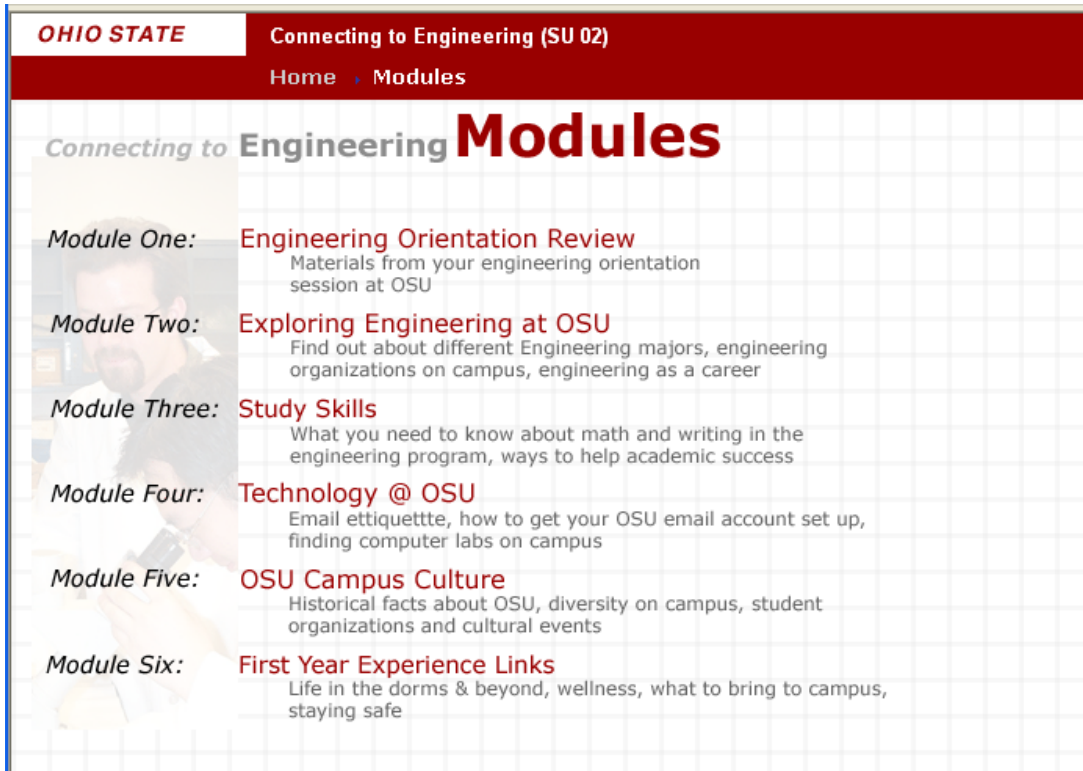
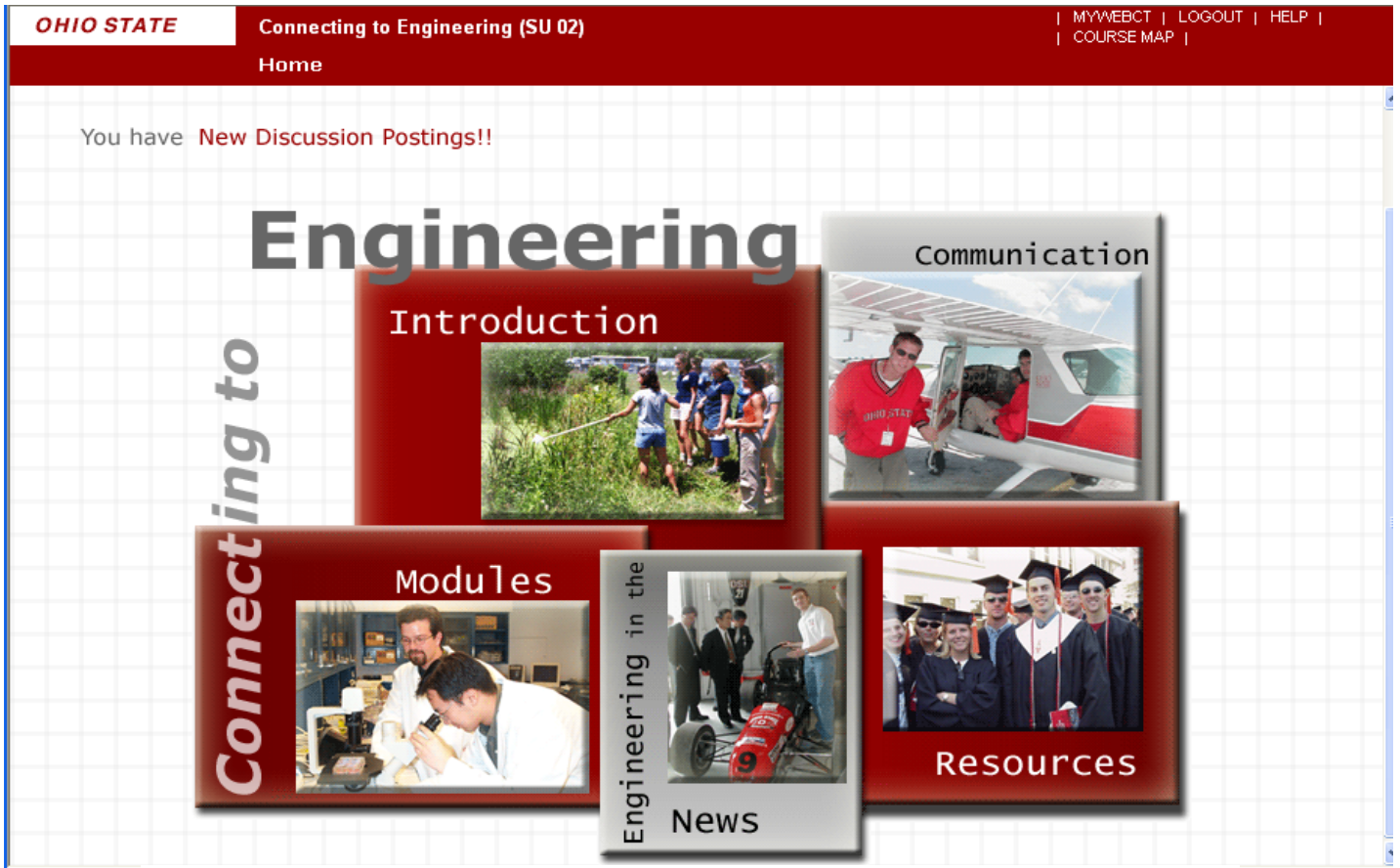


Figure 2: The Final Product



Appendix A: Pre-Test Questions

1. My email address at OSU is _____@osu.edu
2. I know how to forward my OSU email address to another personal account.
 - a) Yes
 - b) No
3. What exactly is a buckeye anyway?
4. The Code of Student Conduct includes ramifications for inappropriate student behavior both on and off campus.
 - a) True
 - b) False
5. I would rate my current study habits as:
 - a) Excellent
 - b) Good
 - c) Fair
 - d) Poor
6. There are ___ different majors for undergraduates in engineering at The Ohio State University.
 - a) 6
 - b) 12
 - c) 18
 - d) 23
7. I would rate my computer skills as:
 - a) Excellent
 - b) Good
 - c) Fair
 - d) Poor
8. I am currently familiar with or currently use on a frequent basis:
 - a) Email
 - b) Chat Room(s)
 - c) Instant Messaging
 - d) Discussion Boards
 - e) Newsgroups
 - f) Using the World Wide Web

9. How will you connect to this website?

- a) Dial-up Modem (56K or above)
- b) Dial-up Modem (below 56K)
- c) Cable Modem or DSL
- d) From a public access point (like a library or school)
- e) From work
- f) Don't know

10. I am ___ sure of engineering as my major

- a) 100%
- b) 75%
- c) 50%
- d) 25%
- e) 0%

11. I was involved with _____ activities my senior year in high school.

- a) Many
- b) Some
- c) Few
- d) None

12. Some activities I might be interested in participating in here at OSU are:

13. I would rate my confidence level in the following subjects as:
(Extremely Confident, Somewhat Confident, Not at all Confident)

- 1) Chemistry
- 2) Engineering
- 3) Math
- 4) Physics

14. I think knowing what resources are available in _____ would be helpful to me.

- a) Chemistry
- b) Engineering
- c) English
- d) Math
- e) Physics

15. This question is optional - for demographic purposes only:
My gender is:

- a) Male
- b) Female
- c) I choose not to answer