# Evaluation of a First-Year Retention Project: Findings at Halftime

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## Abstract

A decline in the annual retention and graduation rates of the engineering and engineering technology program at a small, private university motivated an internal study (summer 2009) of its underlying causes. Analyses of performance and predictor data, as well as surveys of the literature and of non-retained students, produced several recommended actions based on documented best practices. The resulting 5-year retention project, funded by NSF-STEP, began in August of 2010 and focuses on first-year retention initiatives, namely:

- a faculty mentoring program for first-year students;
- a peer mentoring program for first-year students;
- an industrial contact mentoring program for first-year students;
- exposure to engineering practice through two new freshman courses employing active-learning and multidisciplinary projects aimed at answering the question "What do engineers do?"

During the first half of the project many assessment instruments have been developed and deployed to help determine the effectiveness of the initiatives. These instruments include:

- a pre-and post-engineering survey to determine attitudes toward the engineering profession and program during their first semester;
- a survey of first-year students to determine the effectiveness of first-year interest groups and the mentors;
- both a survey and focus group for the peer mentors;
- a faculty mentor survey;
- industrial mentor survey.

This paper provides details of the retention initiatives employed, and then presents qualitative and quantitative assessment results of the project to date, with the intention of contributing our experiences and findings to the dialogue on retention initiatives. Assessment result details are included to help answer such questions as: "Of the three mentor types, which is the most important?", "Is it important that a peer mentor have the same major as the first-year student?", and "Which student attitudes toward engineering are most easily changed?"



The project, entitled **First-Year Initiatives for Retention Enhancement (FIRE)**, is supported by the National Science Foundation under Grant No. 0969382. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.


## 1.0 Project Activities

### 1.1 Overall Goal

The most specific and immediate goal of this project is to increase the School of Engineering and Engineering Technology (SEET) graduation rate from its 2009 five-year average of 42% to an

improved five-year average of 65%.[1] To achieve this target, 1-year retention of new students must be increased to 85% from its 2009 level of 68%.

### 1.2 Implementation of Best-Practice Activities

The focus of the SEET's retention improvement efforts is upon "first time in any college" (FTIAC) freshmen. The SEET's multifaceted initiatives for increasing retention and graduation rate include several first-year best-practice components, namely:

- the development of a faculty mentoring program for first-year students;
- the development of a peer mentoring program for first-year students;
- the development of an industrial contact mentoring program for first-year students;
- exposure to engineering practice through two new freshman courses employing multidisciplinary projects, presentations by practicing engineers, presentations by students involved in co-op education, and presentations by senior capstone design project students.

Implementing these best practices not only increases first-year retention, but positively impacts retention in subsequent years, as well, since students carry forward their improved study habits, academic support network, and higher level of commitment to pursue engineering. A complete model of the project inputs, activities and outcomes is shown in Figure 1.

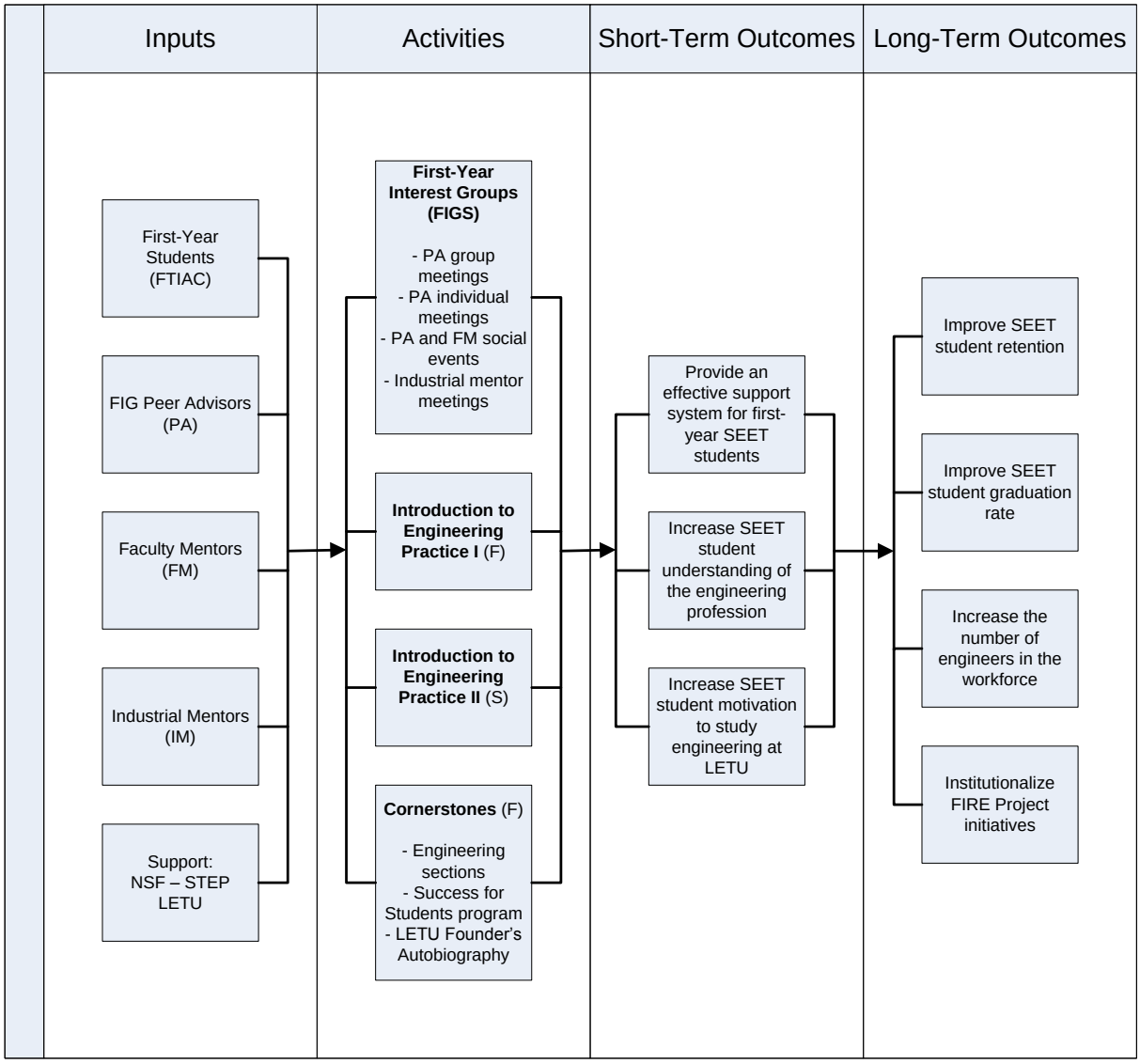


***Figure 1. Project Model***

### 1.2.1 Late Start Disclaimer

Our initial STEP proposal asked for a start date of May 1, 2010, but we were actually given a start date by NSF of August 15th. Given the late start date, we met with our Internal Advisory Committee at the beginning of the 2010-2011 school-year and decided what could and could not be implemented during the pilot year. It was decided that the industrial mentor involvement and the 2nd semester engineering practice course would have to wait until the 2nd year of the project. Fortunately, many people in the SEET and across campus were willing to help launch this effort, so many of the proposed retention initiatives were able to run on a pilot basis already the first year.

### 1.2.2 First-Year Interest Groups (FIGs)

The PI assisted the FIG Director in placing all incoming first-year SEET students into first-year interest groups (FIGs) consisting of 6-12 freshmen, a peer mentor, a faculty mentor, and possibly an industrial mentor.[2] The number of participants can be seen in Table 1. Note that the external industry mentor component (i.e., a locally-practicing engineer) was not implemented during the first year. The groups were discipline-specific, with some considerations for gender and ethnicity given during their creation.[3]

***Table 1. FIG Mentoring Participation***

| Entering Year | SEET FTIAC* | | | |
|---|---|---|---|---|
| | Freshman | Peer Mentors | Faculty Mentors | Industrial Mentors |
| 2010 | 112 | 15 | 15 | 0 |
| 2011 | 124 | 17 | 17 | 9 |
| 2012 | 153 | 18 | 17 | 13 |

*First Time In Any College

The purpose of the FIG was threefold. First, it created a support network to help first-year students successfully transition from high school to university life by providing them an opportunity to experience community with others in their own major. Second, it established early mentoring connections between each freshman and his/her faculty advisor (mentor), as well as provided the support of an upperclassman (peer mentor) in the same field of study. Third, it provided a clearer vision of the opportunities in the field of engineering through the input of a practicing engineer (industry mentor).

Activities of the key positions were as follows:

*FIG Director*

- This was Matthew Green, the Co-PI of the project, with course release-time for director duties.
- Reported FIG progress to the FIRE Project Committee on a bi-weekly basis.
- Oversaw the creation of the FIGs.
- Led the Success4Students seminar at the beginning of the fall semester.
- Trained the peer mentors with assistance from the Director of Student Achievement.
- Trained faculty mentors at the fall SEET retreat and subsequent SEET meetings.
- Recruited and trained industrial mentors.
- Met with the peer mentors (which were divided into three groups) biweekly to provide direction, support, and encouragement.
- Assisted the Director of Student Achievement in recruiting the peer mentors.

*Faculty Mentor*

- This was the first-year student's academic advisor. Many SEET faculty members participated in this aspect of the program as seen in Table 1.
- Recommended a peer mentor from his or her upper-classman advisees.

- Hosted the Success4Students seminar (4 hour workshop) with the FIG members during the beginning of the fall semester.
- Met with the FIG group (including the peer mentor) in an informal (preferably off-campus) setting, twice during the semester – once at the very beginning with a get-to-know-each-other focus, and then again during the second half for further relationship building.
- Met with the peer mentor bi-weekly to monitor progress of FIG members and intervened as needed to guide and encourage group members.
- Maintained the role of academic advisor throughout the entire first year and will continue through the academic career of each FIG member in most cases (unless they change major).

*Peer Mentor*

- Peer mentors (locally called peer advisors) were selected by the faculty mentors, FIG Director, and the Director of Student Achievement.
- Each peer mentor was compensated for about 5 hours/week for FIG work.
- Attended the Success4Students seminar with the FIG members.
- Met with the FIG group once a week to facilitate accountability in the areas of class attendance, homework completion and time management. The online Success4Students follow-up package was used during the fall semester for this purpose.
- Provided homework and study group assistance to FIG members at least once during the week.
- Met with the faculty mentor regularly to report progress of FIG members.
- Met with the FIG director and other peer mentors bi-weekly for reporting and encouragement.
- Built community and camaraderie among the FIG freshmen by attending social and professional society events together at least once a month.

*Industrial Mentor (Started in year two)*

- Industrial mentors were recruited from local industry by the FIG director with input from the faculty mentor.
- Met with the FIG approximately two times during the semester.
- Provided a mechanism for exposure of first-year SEET students to "real world" engineering practice either through discussion, presentation, or a plant visit during the first half of the fall semester.
- Offered engineering project opportunities and/or guidance during the second half of the fall semester and during the spring semester.
- Provided a role model to first-year students as an engineering graduate (most are alumni).

*Additional FIG Components*

In the fall, as part of the engineering version of the University's introductory freshman course (Cornerstones), the FIG activities were launched with a DVD seminar entitled Success4Students.[4] The 3+ hour seminar had six segments that addressed the following topics:

- Select your destination (where do you want to be in five years?)
- Determine your path (focusing on goal setting for the semester)

- Planning to succeed (emphasizing the importance of planning your schedule for the week each Sunday and then following it like a compass through the week)
- Maximizing your in-class learning
- Speed Reading and Learning to triple your reading speed with better comprehension
- Creative note taking and memory skills

A fifty-page workbook complemented the video presentation with application activities that were completed at the end of each segment. A 12-week online follow-up was used to enforce the employment of the key concepts. These were monitored by the peer mentor.

Each of the FIG groups were also clustered into the Intro to Engineering Practice I courses.[5] The FIGs were also clustered into the engineering version of the University's introductory freshman course (Cornerstones).

### 1.2.3 New First-Year Courses

The FIRE project developed two new first-year courses which are required for all incoming SEET freshmen, namely Introduction to Engineering Practice I & II (ENGR 1513 and ENGR 1523). These courses comprise a fall-spring sequence totaling six credit hours, the primary aim of which is to maximize students' active participation in the practice of engineering design, fabrication and testing for real-world applications.[6,7] Particular emphasis is placed on the relationships between these three phases of product or process development. The overall goal is to stimulate student interest and engagement.

These courses were offered for the first time in the 2011-12 school-year:

> **ENGR 1513 Introduction to Engineering Practice I**
>
> An introduction to engineering as a career, including problem solving, engineering disciplines, design, teamwork, and communication. An introduction to engineering graphics is included, with an emphasis on solids modeling. Class 2. Lab 3. (Fall)
>
> **ENGR 1523 Introduction to Engineering Practice II**
>
> An introduction to the engineering design process, including teamwork development, ethics, professionalism, and reporting. Class 2. Lab 3. Prerequisite: ENGR 1513. (Spring)

Although these new courses were not offered during year one of the project, a prototype of the first course was provided to the engineering students in their Engineering Graphics course. Lessons learned from that pilot run, and various course modules developed during the subsequent summer has become the basis of the new Introduction to Engineering Practice I course.

#### 1.2.3.1 Introduction to Engineering Practice I

The Introduction the Engineering Practice I course contains the fundamentals of CAD, as well as several engineering practice lecture/lab experiences. The course was team taught by an EE, Graphics, and ME professor.

The thrust of the course was to answer the question, "What do engineers really do?" More specific details of the course's content can be found in the course syllabus, but a few highlights include the components listed below.[8]

Lecture Topics:

- Introduction to the Engineering Profession
- Teamwork
- Design Basics
- Creativity
- Industry Standards
- Engineering Components
- Engineering Professionalism

Hands-on Activities:

- Toy Dissection
- Wind Turbine
- Material Properties
- Guitar Amplifier
- Truss Bridge
- 555 Screamer Circuit
- Angry Birds Trebuchet
- CAD Dimensioning

#### 1.2.3.2 Introduction to Engineering Practice II

The second of the new intro to engineering practice courses was offered for the first time during the 2nd year of the project (Spring 2012). This course replaced Fundamentals of Engineering Design and as such kept many of the original course topics, but has additional emphasis on active learning and answering the question "What do engineers do?"

Samples of the course components are listed below.

- Social and global impacts of design
- Academic and professional integrity with applications
- Engineers as entrepreneurs
- Leadership
- Design process
- Teamwork: learning to help each other win
- Effective communication
- Documentation
- Presentation
- LEGO Mindstorms robotics projects
- Arduino microcontroller projects, including designing for customer needs

#### 1.2.3.3 Cornerstones

The University's Cornerstones of Life and Learning (LETU 1101) freshman introduction course is being used to enhance retention. Several sections of this course have been created specifically to accommodate all of the new freshman engineering students. As mentioned earlier, the FIG groups are clustered into the course sections. The sections are taught by engineering faculty mentors who are assisted by the peer mentors of the corresponding FIGs.

Components of this course include:

- R. G. LeTourneau's autobiography "Mover of Men and Mountains"
- Success4Students – time management & study skills
- MBTI – personality inventory used in industry
- Engineering-Focused library search
- "Thriving at College" by Chediak
- How to learn engineering

### 1.3 Assessment Activities

Since we have just completed two and a half years of the project, we were not able to collect any graduation data yet. At this point we have two data points for 1-year retention and one for 2-year retention. We also collect fall-to-spring retention data to allow us to compare two years of data to a pre-project baseline. As indicated below, we conducted both focus groups and surveys with the project participants. The survey instruments were developed and deployed with assistance from the project's external evaluator, Melanie Roudkovski, and the Co-PI. The results of these various assessments are discussed in the "Project Findings" section of this paper.

#### 1.3.1 Focus Groups

Peer mentor focus groups were conducted at the end of both the fall and spring semesters to assess the success of the project's first complete implementation. These focus groups were conducted by the project's Co-PI serving as the FIG Director, who passed the collected data on to the project evaluator for analysis.

#### 1.3.2 Surveys

At the end of each semester, the freshman engineering students completed an online FIG survey, providing feedback about personal experiences in the FIGs. The survey was used to determine the effectiveness of their peer mentor in helping them learn study skills, develop engineering persistence, and form social relationships.

Also, an online Freshman Engineering Survey was designed to assess majors' awareness of their discipline prior to completion of discipline-specific coursework. The survey was administered toward the beginning of the Introduction to Engineering Practice I course and then again at the end.

The peer mentors, faculty mentors, and industrial mentors also completed a survey at the end of each semester. The results of these surveys and of those previously mentioned can be found in the "Project Findings" section of this paper. A list of the assessments which were conducted is provided in Table 2.

***Table 2. FIRE Assessment Instruments***

| # | Description | Timing | Venue/Audience |
|---|---|---|---|
| 1 | Freshman Engineering Survey (Pre-Version) | Fall Semester Activate 1st week | Freshman Engineering Practice I/ All SEET Freshman |
| 2 | Freshman Engineering Survey (Post-Version) | Fall Semester Activate 13th week | Freshman Engineering Practice I/ All SEET Freshman |
| 3 | FIG Student Survey | Fall & Spring Activate 13th Week | All FIG members |
| 4 | FIG Peer Mentor Survey | Fall & Spring Activate 13th Week | Biweekly FIG PA meeting/ All FIG PAs |
| 5 | FIG Peer Mentor Focus Group | Fall & Spring conduct 14th Week | Biweekly FIG PA meeting/ All FIG PAs |
| 6 | FIG Faculty Mentor Survey | Fall & Spring Activate 13th Week | SEET meeting/ All Faculty Mentors |
| 7 | Industrial Mentor Survey | Fall & Spring Activate 14th Week | All Industrial Mentors |

## 2.0 Project Findings

The findings in this section reflect upon quantitative retention numbers, qualitative focus group input, and quantitative descriptive and test statistics.

### 2.1 Project Outcomes Review

Before considering the results of the various project assessments, it is worthwhile to review both the desired long- and short-term project outcomes. As the short-term outcomes are realized within the School of Engineering and Engineering Technology (SEET), the long-term goals will be reached, impacting the University and the profession.

**Short-Term Outcomes:**

1. Provide an effective support system for first-year SEET students.
2. Increase SEET student understanding of the engineering profession.
3. Increase SEET student motivation to study engineering at LETU.

**Long-Term Outcomes:**

1. Improve SEET student retention.

2. Improve SEET student graduation rate.
3. Increase the number of engineers in the workforce.
4. Institutionalize FIRE Project initiatives.

### 2.2 Retention and Graduation Rate

Having completed two and a half years of the project, retention data indicate that the Fall to Spring semester retention has increased for the cohorts affected by the project. Specifically, retention from Fall 2011 to Spring 2012 is at 94.4%. In 2009-2010, this pre-project rate was 85.7%; in 2010-2011, the rate was 88.7% as can be seen in Figure 2. While we cannot link the increase directly to the efforts of this project, there is a strong correlation between the beginning of the project and increase in retention numbers. This increase is plausibly due in part to the curriculum and mentoring initiatives funded in part by this grant.

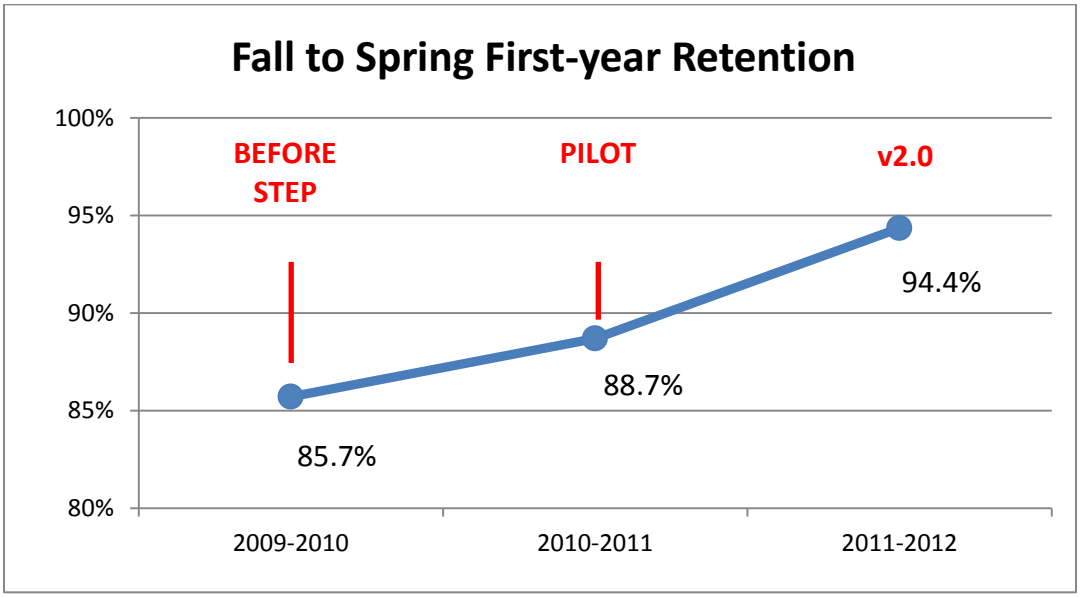


***Figure 2. Fall to Spring Retention in Engineering and Engineering Technology***

The one-year retention rate after the first 2 years of the project was 82.3 % for "first time in any college" (FTIAC) students in the School of Engineering & Engineering Technology. This rate is nearing the 5-year project goal of 85% as seen in Figure 3.

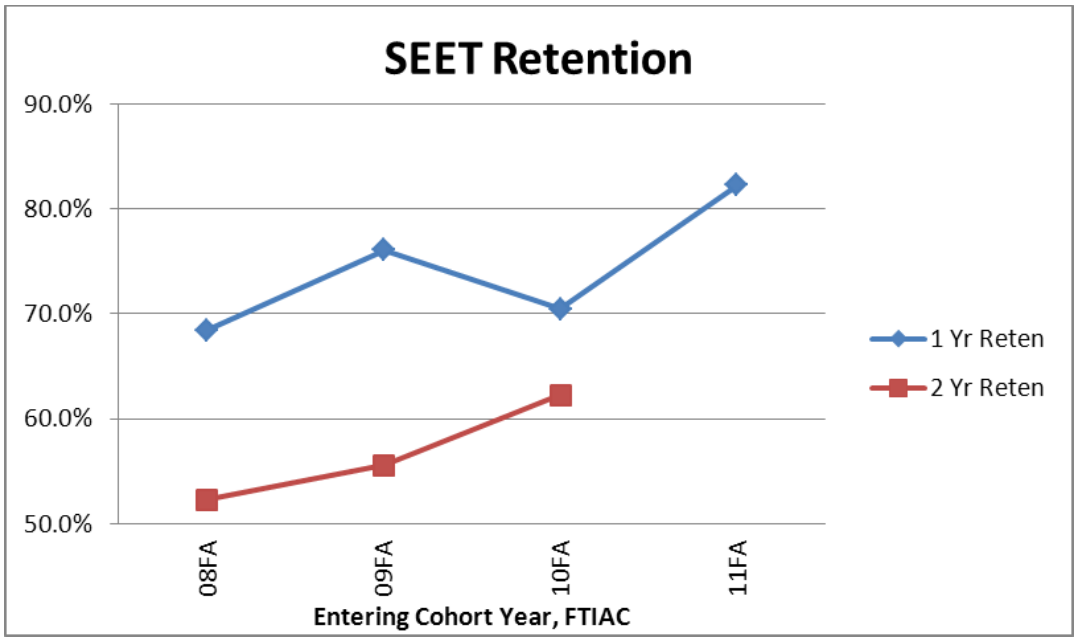


***Figure 3. Retention in Engineering and Engineering Technology***

We do not yet have 6-year graduate rate results, but we anticipate that we will reach our long-term goal of 65%. The project seems to be already having at least an indirect impact in improving graduation rates as seen in Figure 4. At the time of submitting the grant proposal, the project PI and Co-PI presented the 5-year graduation trend for cohorts 98FA – 02FA to the School faculty in a back-to-school retreat setting. It is possible that this awareness of our retention and graduation rate problem, is contributing to the change of course that is shown in the graph since that time. Updates of the School retention and graduation rates, as well as the FIRE project status are provided annually at the fall faculty retreat.

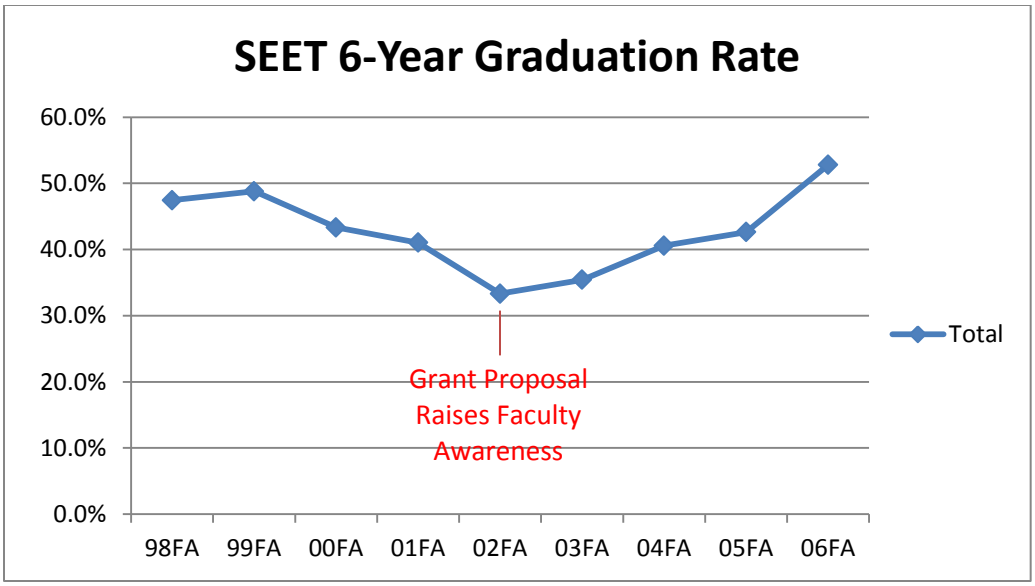


***Figure 4. Graduation Rates in Engineering and Engineering Technology by Cohort Year***

As is evident in the findings that follow, we have identified a number of items that appear to affect the performance and retention of students. However, we recognize the limitations of the initial data and hope to reveal patterns as they emerge in the coming semesters and years. Our feedback from the 2011-2012 academic year suggests that we are on track to make a significant contribution to the retention and success of students.

### 2.3 Focus Group Results

Peer mentor focus groups were conducted at the end of the spring semester to assess the successfulness of the project's second year. Feedback from this group provided valuable insight to the components that were most effective, as well as areas for improvement. Focus groups were conducted in three separate group meetings, and individuals provided feedback regarding the FIG individual meetings, FIG group meetings, and industrial mentor meetings. Each group was reminded that the goal of the FIG is to help students survive and thrive academically, socially, and spiritually. This goal is a restatement of the desired short-term project goal of providing an effective support system for first-year SEET students, and increasing motivation to study (engineering).

#### Individual Meetings

Each semester, students are asked to participate in one-on-one meetings with their assigned peer mentor (known locally as a peer advisor, or PA). Focus groups revealed that, as expected, some students value these meetings more than others. Peer mentors commented on the importance of these meetings at the beginning of the semester, especially the first 6 weeks. Then, meetings may be more beneficial bi-weekly or monthly. Comments made by the peer mentors suggested that

emphasis should be placed on meeting individually with students who are not participating as effectively, and with those who express a need for more direct intervention. Additionally, meetings could become more informal ("Hey, want to grab lunch?").

### Group Meetings

Peer mentors seemed to agree that the group meetings tended to be utilized more for social interaction than for homework. However, some groups worked well as study groups and were very productive with school-related activities. Peer mentors emphasize the importance of discussing academics, but that group meetings "can have academic focus without it being a study session or homework party." One Peer Mentor stated that the group meetings "…need to be fun. They [the students] enjoy food…!" Peer Mentors suggested that having a fun, enjoyable time was more important than structuring the sessions and attempting to force students to do homework. Peer Mentors recommended getting feedback from the freshmen, regarding how they would benefit most from the group meetings.

### Industrial Mentor Meetings

The Peer mentors whose groups participated in the industrial mentor (IM) meetings saw the meetings as beneficial. These meetings appeared to promote good conversations between students and professionals, though attendance was better in the fall semester. One positive outcome was the possible assignment of an internship between one of the freshmen and the IM.

### Focus Group Conclusions

The Peer mentors provided valuable feedback regarding each of the components related to the FIG. We used this information to plan for the 2012-2013 academic year. Getting feedback from the freshmen regarding the use of group time, and encouraging more relational emphasis with the individual meetings will be considered for future semesters. Additionally, all FIG groups have access to an industrial mentor beginning in fall 2012. We expect these partnerships to have even more positive results as we move forward with the project.

## 2.4 Survey Results

Each year, we collect data on several surveys related to this project (summarized in Table 2 earlier in this paper.) Students complete a Freshman Engineering Survey pre- and post- at the beginning and end of each fall semester and they complete the FIG Student Survey at the end of each semester. Additionally, Peer mentors, faculty mentors, and industrial mentors all complete surveys related to their experience with the FIG project at the end of Fall and Spring semesters. Below are the findings related to each survey for the last complete academic year (2011-2012).

### Freshman Engineering Survey

The Freshman Engineering Survey, comprised of 30 statements gauging students' attitudes toward the engineering profession and the LETU program, is administered each fall semester in a

pre-post format. The means and standard deviations for each survey item on the Freshman Engineering Survey are observed in both the first administration at the beginning of the semester (week 1), and in the second administration at the end of the semester (week 14). Responses to this survey were scored from 1 = Strongly Disagree to 5 = Strongly Agree.

Simple descriptive statistics indicated which items improved in the second administration, and vice versa. Additional analyses identified the level of effectiveness of each survey item. Table 3 exhibits the results of paired samples *t*-tests and Cohen's *d*, as well as the level of effect according to Cohen (1992t) for items that were statistically significant ($p < 0.05$), and which had a noteworthy effect size ($|d| > 0.2$). Particularly noteworthy is the **increase in the students' understanding of the engineering profession** (item 21), which is one of the three desired short-term project outcomes. Also the **increase in the students' expectations to find a job** (item 5), to be able **to solve social problems** (item 8), and **to make a lot of money** (item 15) coincide with the short-term project outcome to increase student motivation to study engineering. Since the items in Table 3 are addressed directly in the project's Introduction to Engineering Practice I course, and indirectly through the Industrial Mentoring efforts, the project initiatives appear to be contributing toward the achievement of project outcomes.

***Table 3.***
***Paired Samples Showing a Sizeable Effect from Freshman Engineering Survey (Fall 2011)***

| # | Survey Item | *M* diff[a] | *SD* | Sig (p) | *T* | *df* | Cohen's *d* | Effect Size |
|---|---|---|---|---|---|---|---|---|
| 5 | Upon graduation, I may have difficulty finding a job in the engineering field | -0.32 | 0.82 | .001 | -3.361 | 74 | -0.39 | Small |
| 8 | Engineers do not deal with social problems | -0.27 | 0.63 | .000 | -3.715 | 73 | -0.43 | Small - Medium |
| 11 | I expect to dislike several of my engineering courses | 0.45 | 0.98 | .000 | 3.910 | 73 | 0.45 | Small - Medium |
| 14 | Problems solved by engineers have one correct answer | -0.25 | 0.74 | .004 | -2.977 | 74 | -0.34 | Small |
| 15 | Engineers make a lot of money | 0.27 | 0.56 | .000 | 4.179 | 73 | 0.49 | Small - Medium |
| 21 | I have a good understanding of the engineering profession | 0.33 | 0.81 | .001 | 3.560 | 74 | 0.41 | Small - Medium |

[a] Change in mean score between the pre- and the post-survey.

**Freshman Interest Group (FIG) Student Survey**

At the end of each semester, the freshman engineering students complete an online FIG Student survey comprised of 12 items, providing feedback about personal experiences in the FIG groups. In the fall of 2011, 83 of 124 students completed the survey; 77 completed it in the spring. Responses to the surveys were scored from 1 = Strongly Disagree to 5 = Strongly Agree.

Fall Survey items for which more than 2/3 of respondents agreed or strongly agreed, or items for which more than 1/3 of respondents disagreed or strongly disagreed are shown in Table 4 with supporting student comments provided in Table 5. As expected, several items, namely 7, 11, and 14, decreased by 10% or so from fall to spring as students became less dependent upon the FIG. However, **the expressed benefit of having a peer mentor of the same major remained high**, supporting the literature findings used by the authors.[9] Being informed by this project, the University has likewise adopted the same-major policy for peer mentor assignments across campus.

These results generally support the value of FIG groups, same-major peer advisors, and faculty mentors, but highlight a possible opportunity for enhancing the involvement of faculty mentors (item 14) and provide a reminder that FIG groups are one of many support networks used by students (item 9).

***Table 4.***
***Strongest Items from Freshman Interest Group (FIG) Student Survey (Fall 2011)***

| # | Survey Item | M | SD | | % SA/A | % N | % D/SD |
|---|---|---|---|---|---|---|---|
| 7 | FIGS helped me develop valuable connections with students in my own major. | 3.79 | 0.99 | | 72% | 17% | 11% |
| 9 | My success as a [SEET] engineering/engineering technology major has been primarily dependent upon my involvement with the FIG. | 2.52 | 1.08 | | 17% | 32% | 51% |
| 11 | My PA has been a source of positive support this semester. | 4.38 | 0.62 | | 93% | 7% | 0% |
| 12 | The fact that my peer advisor is in a similar major to me has been beneficial. | 3.91 | 0.89 | | 76% | 18% | 6% |
| 14 | My faculty mentor has been influential in my success at [this university.] | 3.68 | 0.94 | | 65% | 23% | 10% |

***Table 5. Key Comments from Freshman Interest Group (FIG) Student Surveys (Fall 2011 and Spring 2012)***

7c **FIGs have helped me develop valuable connections with students in my own major.**

- My FIG group has been the easiest way to make those connections …
- I have several close friends in my major because of FIGs.
- The experience … encouraged me to continue the process; I am going to be a FIG [peer advisor] next

year.

9c **My success as a engineering/engineering technology major has been primarily dependent upon my involvement with the First-Year Interest Group (FIG).**

- It was somewhat helpful but my year didn't depend on it.
- My major and my social interactions do not affect each other in a strong way.

11c **My peer advisor (PA) has been a source of positive support this semester.**

- He is always encouraging and he had a lot of good tips on homework and studying.
- Totally! My [peer advisor] is awesome!
- [My peer advisor] helps tremendously by encouraging me to "Do your homework. No more video games."
- [My peer advisor] is a good friend and encourager, she has a good amount of experience to sympathize with what I'm going through.

12c **The fact that my peer advisor is in a similar major to me has been beneficial.**

- All peer advisors should be in the same major so that they understand what their group is going through.
- I really like being able to ask major related questions when I have them.
- It helps to hear what is coming up in my course sequence and what students ahead of me struggled with.

14c **My faculty mentor (academic advisor) has been influential in my success at [this university].**

- [My faculty mentor's] mentoring has been excellent. His thoughts have been a major factor in how and why I do my work.
- Without [my faculty mentor's] advice, I don't think I would have learned so much or adapted so well. He has played a pivotal role in my life here at [the university].
- Heh... What can I say- He was right.

**FIG Peer Mentor Survey**

At the end of each semester, the Peer Mentors complete an online FIG survey comprised of 10 items, providing feedback about personal experiences in the FIG groups. In the fall of 2011, 15 of 17 students completed the survey; 15 completed it in the spring. Responses to the surveys were scored from 1 = Strongly Disagree to 5 = Strongly Agree.

The highest scored fall survey items for which more than 2/3 of respondents agreed or strongly agreed, or items for which more than 1/3 of respondents disagreed or strongly disagreed are shown in Table 6 with supporting comments provided in Table 7. As expected, many items, namely 1, 3, 4, and 7, decreased by 10% or more from fall to spring as students became less dependent upon the FIG and more distant from the Peer Mentors. However, evidence that the students have gained a more accurate understanding of the field of engineering remains high, suggesting that this short-term project outcome is being met.

These results affirm that Peer Mentors are very positive about their experience as mentors and believe FIG groups and peer mentorship both help students understand and study effectively for the engineering profession.

***Table 6. Strongest Items from FIG Peer Mentor Survey (Fall 2011)***

| # | Survey Item | M | SD | | % SA/A | % N | % D/SD |
|---|---|---|---|---|---|---|---|
| 1 | My overall experience as a FIG Peer Adviser has been positive. | 4.27 | 0.59 | | 93% | 7% | 0% |
| 2 | I have seen evidence that the FIG has helped students gain a more accurate understanding of the field of engineering. | 4.13 | 0.83 | | 87% | 7% | 7% |
| 3 | Evidence suggests that the FIG has helped students develop successful life skills and study habits. | 3.93 | 0.70 | | 87% | 7% | 7% |
| 4 | INDIVIDUAL meetings with me benefited my FIG students, and I recommend continuing them in future years. | 4.47 | 0.64 | | 93% | 7% | 0% |
| 6 | The students in my FIG see me as more of a tutor or teacher than as a friend. | 2.60 | 0.63 | | 7% | 47% | 47% |
| 7 | I have developed a good relationship with the FIG faculty member. | 3.93 | 0.70 | | 87% | 7% | 7% |

***Table 7. Key Comments from FIG Peer Mentor Surveys (Fall 2011 and Spring 2012)***

1c **My overall experience as a FIG Peer Adviser has been positive (all questions apply to this semester only.)**

- I feel being a role model made me grow, spiritually and academically. I feel like everything went smoothly.
- I loved getting to know my students and going with them through their experiences. I've discovered a lot about myself also … It helps me to relate to them better and to dig into myself deeper.
- I love being a PA. It allowed me to build relationships and stay connected with the people I was put with. In helping them along with their studies, I also see how far I have come.

2c **I have seen evidence that the FIG has helped students gain a more accurate understanding of the field of engineering.**

- Meetings with the industrial mentor clearly helped some of the guys see what an engineering job is more likely to be, rather than their expectations.
- In the Industrial Mentor meetings that my group had, we learned a lot about what we really need to pay attention to and work on while we're in college.
- It was great to talk with my students about what I had learned about the field of engineering and

to direct them to those professionals who could do so even better.

- It was very obvious that some of the students did not have good understanding of what engineers do, but that they left [the industrial mentor meeting] with a good idea of at least one type of engineering.

3c **Evidence suggests that the FIG has helped students develop successful life skills and study habits.**

- Several students have learned how to study more efficiently and accomplish homework tasks on time when they couldn't do so at the beginning of their freshman year.
- The time tracking and organization skills taught in Cornerstones and through group meetings are invaluable when applied.
- The students said that the time-tracking and even the To-Do lists helped them make better use of their time during the week.

4c **INDIVIDUAL meetings with me benefited my FIG students, and I recommend continuing them in future years.**

- Meeting with the students individually helped me to connect with them on a one-on-one basis, helped me gain insight on areas in which they were struggling, and gave me an opportunity to share my experiences and suggest ways to improve.
- Individual meetings are where I can really help them and foster a relationship with them.
- In the individual groups my students were able to talk to me about more private things and could ask me more personal questions that helped them get along in their school life.

6c **The students in my FIG see me as more of a tutor or a teacher than as a friend.**

- I think that my students were able to relate to me as a student and come to me as an older mentor-type person who has recently been in their shoes.
- I am friends with all of my advisees. They would occasionally come to me as an older student for help with homework, but they always treated our relationship as one of friends.
- I stress that I am willing to help them on homework, but I also have concentrated on building relationships with them.

7c **I have developed a good relationship with the FIG faculty mentor.**

- We both cared about our students and wanted to help them succeed and we worked well together to help them.
- I have gotten to know my [faculty mentor] well this semester. This opportunity has been a great one, and I have learned much from him, and look forward to continuing that relationship even after this semester.
- My faculty mentor is really cool. Whenever we had talks things not only went around the students, but he also helped me out with a lot of the things that I needed.

**FIG Faculty Mentor Survey**

At the end of each semester, the Faculty Mentors complete an online survey comprised of 6 items, providing feedback about personal experiences with the FIG groups, Peer Mentors, and Industrial Mentors. In the fall of 2011, 16 of 17 faculty mentors completed the survey; 15 completed it in the spring. Responses to the surveys were scored from 1 = Strongly Disagree to 5 = Strongly Agree.

Key survey item results for fall 2011 are shown in Table 8, with supporting statements provided in Table 9. All items, with one exception, decreased by 15% or more from fall to spring as students and Peer Mentors became more distant from the Faculty Mentors. Only item 3, "the overall faculty mentoring experience" did not decline.

These results generally affirm that faculty perceive the FIG groups and faculty involvement as valuable, but also highlights an opportunity to work towards improving the connection between faculty and peer mentors and therefore faculty to first-year students.

***Table 8. Strongest Items from FIG Faculty Mentor Survey (Fall 2011)***

| # | Survey Item | M | SD | | % SA/A | % N | % D/SD |
|---|---|---|---|---|---|---|---|
| 3 | My overall experience as a FIG Faculty Mentor has been positive. | 4.06 | 0.68 | | 81% | 19% | 0% |
| 4 | I have seen evidence that the FIG has helped students gain a more accurate understanding of the field of engineering. | 3.75 | 0.45 | | 75% | 25% | 0% |
| 5 | Evidence suggests that the FIG has helped students develop successful life skills and study habits. | 3.93 | 0.62 | | 69% | 19% | 0% |
| 6 | I have developed good relationships with the students in my FIG. | 3.79 | 0.58 | | 63% | 25% | 0% |
| 7 | I have developed a good relationship with the FIG peer adviser. | 4.13 | 0.62 | | 88% | 13% | 0% |
| 8 | I believe my meetings with the FIG Peer Advisor will help me provide better advising to my FIG students (academic advisees). | 4.31 | 0.60 | | 94% | 6% | 0% |

***Table 9. Key Comments from FIG Faculty Mentor Surveys (Fall 2011 and Spring 2012)***

3c **My overall experience as a FIG Faculty Mentor has been positive.**

- It's been good to connect personally with the new freshman early.
- Allowed me to get to know my advisees a little bit better than not having a FIG group.
- I think this is a good program and could have a positive impact on students as they get adjusted to the campus and the engineering program. We should be careful in selection of Peer Mentors …

4c **I have seen evidence that the FIG has helped students gain a more accurate understanding of the field of engineering.**

- [Hearing] my own engineering experiences which should increase their understanding.
- [T]hrough encouragement to succeed in IEP II which increases their exposure to the engineering field.
- [Students] level of discussion and involvement suggests a much better understanding.

5c **Evidence suggests that the FIG has helped students develop successful life skills and study habits.**

- Some have testified to the benefit of implementing the time management techniques followed up on in FIGs. Others acknowledge that their lack of success is related to their lack of implementation of time management.
- I think the S4S program really helps the [peer advisors], because their courses are hard enough that they see the value in it. With the freshmen, they need it, but they don't realize that...
- Students are certainly exposed to some good study habits. Many keep them after fall semester, but some don't pick them up again until the following year.

6c **I have developed good relationships with the students in my FIG.**

- I've had good interaction with them at the social events and advising sessions.
- Some I don't know as well as others since most of my time was spent with the entire [first year experience] class.
- Yes, with all but one, who doesn't show up.

7c **I have developed a good relationship with the FIG peer adviser.**

- Our meetings are good and I am impressed with [my peer advisor's] persistence with the students.
- Excellent PA [peer advisor], and will be returning next year.
- On a personal level, we have what I consider to be a very good relationship.

8c **I believe my meetings with the FIG Peer Adviser will help me provide better advising to my FIG students (academic advisees.)**

- [T]he [peer advisor] gave me insight … to get more involved with a struggling advisee.
- [The peer advisor] provides insight into the non-academic side of [my advisees] lives.
- The information on [academic] interventions performed by my [peer advisor] was helpful for advising.

### FIG Industrial Mentor Survey

At the end of each semester, the Industrial Mentors complete an online survey comprised of 9 items, providing feedback about personal experiences with the FIG groups, and Peer Mentors. In the fall of 2011, 6 of 9 industrial mentors completed the survey; 6 also completed it in the spring. Responses to the surveys were scored from 1 = Strongly Disagree to 5 = Strongly Agree.

The Industrial Mentors were the most positive group surveyed as can be seen in the results for Fall 2011 provided in Table 10 with supporting statements in Table 11. The results from the

spring survey are the same or higher, but it should be noted that the small sample size doesn't warrant useful comparison. Of the mentors who participated in the survey, 100% agreed or strongly agreed that the mentoring program should continue, and they wanted to continue serving as mentors in the future. One other interesting statistic was that 100% of mentors agreed or strongly agreed that in the long run, both the individual and their company would benefit from them serving as an industrial mentor. Overwhelmingly, industrial mentors indicated that the experience was positive in terms of benefits to both the students and the industrial mentors. One mentor even reflected upon personal experience and the significance of meeting with a professional as motivation for continuing the major and gaining confidence as a student. Mentors did comment that the challenge of meeting together is an issue of timing and availability. Industrial mentors commented on the positive and respectful attitudes of the students with whom they interacted. One recommendation for improvement revolved around the limited attempts made by peer advisors to contact the industrial mentors.

***Table 10. Strongest Items from FIG Industrial Mentor Survey (Fall 2011)***

| # | Survey Item | M | SD | | % SA/A | % N | % D/SD |
|---|---|---|---|---|---|---|---|
| 4 | My overall experience as an IM has been positive. | 3.83 | 0.75 | | 67% | 33% | 0% |
| 5 | I believe students benefited from meeting with me. | 3.83 | 0.75 | | 67% | 33% | 0% |
| 6 | I believe meeting with me helped students gain a more accurate understanding of the field of engineering. | 4.00 | 0.63 | | 83% | 17% | 0% |
| 7 | I recommend [continuing] the industrial mentor program in future years. | 4.33 | 0.52 | | 100% | 0% | 0% |
| 8 | I would like to continue to serve as an industrial mentor in the future. | 4.17 | 0.41 | | 100% | 0% | 0% |
| 9 | In the long run, my company and I are likely to benefit from me serving as an IM. | 4.17 | 0.41 | | 100% | 0% | 0% |
| 10 | Serving as an IM has been a good investment of my time. | 4.17 | 0.41 | | 100% | 0% | 0% |
| 11 | The faculty and the PA who scheduled meeting times with me were respectful and courteous. | 4.50 | 0.84 | | 83% | 17% | 0% |
| 12 | I would recommend serving as an industrial mentor to other practicing engineers. | 4.33 | 0.52 | | 100% | 0% | 0% |

*Table 11. Key Comments from FIG Industrial Mentor Surveys (Fall 2011 and Spring 2012)*

4c **My overall experience as an industrial mentor has been positive.**

- I enjoyed the student interaction.
- I would have enjoyed more contact.

6c **I believe meeting with me helped students gain a more accurate understanding of the field of engineering.**

- I shared personal experiences and gave recommendations for their schooling and career

8c **I would like to continue to serve as an industrial mentor in future years.**

- I have a strong desire to help students find their place during the educational process, particularly in the engineering program.

9c **In the long run, my company and I are likely to benefit from me serving as an industrial mentor.**

- The more realistic a student's expectations are of industry, the better.
- My boss was very interested in getting students familiar with companies that are in Longview, especially hers.

10c **Serving as an industrial mentor has been a good investment of my time.**

- I only had one opportunity to meet with the students. More time to meet and answer questions would have been nice.
- I regret that we only had a single meeting, and that all of the students did not attend. I had intended to arrange additional meetings … but never got around to it.
- Just wish I could have invested more time in it.

11c **The faculty and Peer Advisor who scheduled meetings with me were respectful and courteous.**

- My Peer Advisor and the two young men that I met with were great. I really enjoyed our visit.

First-year students indicated 53% or greater agreement that industrial mentors helped them understand engineering duties and personal career fit, and 59% agreed the mentorship increased motivation to succeed in engineering. 7 out of 8 peer advisors linked to a mentor agreed or strongly agreed the industrial mentor meetings were beneficial to first-year students. The industrial mentors themselves unanimously (100%) agreed that the mentoring program should continue, and that they wanted to continue serving as mentors in the future (they also indicated both they and their company would benefit.) These early indicators from industrial mentors, peer advisors, and the first-year students themselves are extremely encouraging regarding the value and future of the industrial mentoring program.

The industrial mentor program assessments yielded numerous insights for improvement in the 2012-13 academic year, including primarily:

- Introduce peer mentors and industrial mentors at a kick-off meeting, and make arrangements for all industrial mentors to attend faculty dessert night with their students.

- Work with peer mentors very early in the semester to put 2 mentor meetings on the calendar so students and mentors can all plan ahead. This will reduced missed opportunities such as invitations to dinner in the mentors home and workplace tours.
- Provide peer mentors more detailed guidance in advance regarding scheduling and conducting meetings between industrial mentors and the first-year students
- Share motivational success stories of mentor relationships to enhance the motivation of both students and mentors to invest in these relationships.

**Survey Conclusions**

The results of the five surveys, each administered twice during the academic year, provide a wealth of both quantitative and qualitative data which in general affirms the perceived effectiveness of the current grant initiatives, and highlights some areas with opportunity for improvements such as enhancing faculty-student interaction and more thorough administration of the industrial mentoring program.

**2.5 Overall Project Satisfaction**

One of the overall objectives of the FIRE project is to achieve an 80% satisfaction rating by the students and their Peer Mentors. The survey items shown in Table 12, extracted from the FIG Student and Peer Mentor surveys, indicate satisfaction level with the various mentor aspects of the project. In all cases, the level of dissatisfaction as indicated by the Disagree/Strongly Disagree column, is no more than 13%. A response of Neutral is considered satisfactory. From the perspective of the first-year students, **being mentored by a peer is the most positive aspect of the project** (93% SA/A, Fall 2011). Likewise, the peer mentors view their mentoring role as a positive experience (93% SA/A, Fall 2011).

***Table 12. Satisfaction Indicators from the FIG Student and Peer Advisor Surveys (Fall 2011 and Spring 2012)***

| | **Indicator** | **Fall 2011** | | | **Spring 2012** | | |
|---|---|---|---|---|---|---|---|
| **#** | **FIG Student Survey** | **%SA/A** | **%N** | **%D/SD** | **%SA/A** | **%N** | **%D/SD** |
| 11 | My PA has been a source of positive support this semester. | 93% | 7% | 0% | 81% | 12% | 7% |
| 14 | My faculty mentor has been influential in my success at [this university.] | 71% | 23% | 6% | 60% | 29% | 10% |
| 17 | My industrial mentor has increased my motivation to succeed in engineering/engineering technology. | 59% | 34% | 6% | 50% | 37% | 13% |
| | | | | | | | |

| | Peer Mentor Survey | %SA/A | %N | %D/SD | %SA/A | %N | %D/SD |
|---|---|---|---|---|---|---|---|
| 1 | My overall experience as a FIG Peer Adviser has been positive. | 93% | 7% | 0% | 80% | 20% | 0% |
| 10 | FACULTY MENTOR (academic advisor) meetings benefited my FIG. | 73% | 20% | 7% | 47% | 40% | 7% |
| 13 | *INDUSTRIAL MENTOR (practicing engineer) meetings benefited my FIG. | NA* | NA | NA | NA | NA | NA |

**NA: Half of the FIG groups had an industrial mentor in the pilot year*

The course evaluations given at the end of the semester in the two new Introduction to Engineering Practice courses reveal:

- F11, ENGR1513 – overall course rating = 4.4 of 5.0, indicating 88% satisfaction
- S12, ENGR1523 – overall course rating = 4.2 of 5.0, indicating 84% satisfaction

According to these results, both the mentoring and first-year course initiatives of the project are providing meaningful and satisfactory experiences for the first-year students.

### 2.6 External Evaluator Conclusions

Based on the findings thus far, it appears that the project is impacting involved students, both first-year students and peer mentors. Significant findings indicate that students are receiving clarification concerning the profession of engineering. Examples can be identified in Table 3, which shows the effect of the project on items such as the likelihood of finding a job following graduation, and whether or not **engineers are able to make a positive impact upon society**. Results also indicate that **peer mentors are a positive source of support** for the first-year students, and that consistent interaction **with peer mentors in a similar major** helps some students to be more successful in their engineering courses. One other finding suggests that the social interaction promoted among students seems to be building community and increasing the likelihood of enjoyment of the college experience and, perhaps, in the degree program.

Based upon the findings reported above, I (the external evaluator) recommend the continuation of survey administration for each of the assessments designed for data collection. We may need to watch closely the impact of the faculty mentors and determine if a more effective use of the faculty-student relationship can be identified. I expect that the increase of industrial mentors in the Fall of 2012 will positively impact the project, and that as students develop relationships with practicing professionals they will gain clarity in terms of career path. I also expect that we will see a stronger correlation between retention rates and the implementation of the project as additional cohorts of students take part. As is evident from current retention data, the School of Engineering & Engineering Technology will set the trend for retention across campus and similar efforts will be seen across campus.

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