



Mentorship Techniques as They Relate to the Retention of First Year Traditional and Non-traditional Engineering Students

Ms. Sydney N Hallman, University of Oklahoma

Sydney Hallman is an electrical engineering senior at the University of Oklahoma. She also participates in the Accelerated Degree Program and will continue her graduate work at the University of Oklahoma in electrical engineering. She has served as the Teaching Assistant for the Transfer Engineering Course and for Engineering Professional Development Course for multiple semesters. She is an active member of the Dean's Leadership Council Mentor Program, the Society for Professional Hispanic Engineers, Eta Kappa Nu, and Tau Beta Pi. With these organizations, she has regularly experienced the challenges and rewards of student involvement first-hand. Her future includes a full-time position for ONEOK in Tulsa, OK after graduation.

Dr. Chad Eric Davis, University of Oklahoma

Chad E. Davis received the B.S. degree in mechanical engineering, M.S. degree in electrical engineering, and Ph.D. degree in engineering from the University of Oklahoma (OU), Norman, in 1994, 2000, and 2007, respectively. Since 2008, he has been a member of the Electrical and Computer Engineering (ECE) faculty, University of Oklahoma. Prior to joining the OU-ECE faculty, he worked in industry at Upronor (Tulsa, OK), McElroy Manufacturing (Tulsa, OK), Lucent (Oklahoma City, OK), Celestica (Oklahoma City, OK), and Boeing (Midwest City, OK). His work experience ranges from electromechanical system design to automation of manufacturing and test processes. His research at OU involves GPS ground-based augmentation systems utilizing feedback control. Dr. Davis holds a professional engineering license in the state of Oklahoma. He currently serves as the faculty advisor for Robotics Club, the Loyal Knights of Old Trusty, and Sooner Competitive Robotics at OU and he serves as the recruitment and outreach coordinator for OU-ECE. He received the Provost's Outstanding Academic Advising Award in 2010 and the Brandon H. Griffin Teaching Award in the COE at OU in both 2012 and 2013.

Mentorship Techniques for First-Year Freshman and Transfer Engineering Students

Abstract:

In the early 2000's, faculty leaders in the College of Engineering at the University of Oklahoma recognized the need to expose first-year engineering students to resources available to them that would improve their probability of success. During the development of an orientation course, the Dean's Leadership Council was created to empower upper-classmen engineering students through mentorship of first-year students. When organizing the curriculum for the engineering orientation courses, it was determined that freshman students might transition to our university differently than first-year transfer students so two separate courses were created. The student mentors served different roles in each course, but had the same overall objective of establishing connections with new students. Based on course evaluations each semester, the need for separate orientation courses is clearly justified. Each semester the courses are adjusted from instructor observations and student feedback so that every effort is made to continually increase the benefits for each of the student groups as they transition into the College of Engineering. A detailed description of each course, the impact of student mentors, and reasons for the chosen curriculum are outlined below.

I. Background

Historically, the College of Engineering (CoE) at the University of Oklahoma (OU) has made it a priority to engage and retain first-year engineering students. In the 2003/04 academic year either the ENGR 1410/1411 Freshman Engineering Orientation Course (FEOC) or the ENGR 3410/3511 Transfer Engineering Orientation Course (TEOC) became a graduation requirement for undergraduate engineering students. A new course structure was introduced for both types of first-year students to aid in the assimilation to OU or from another college within our university. Successful completion of one of the orientation courses is required by all students in the CoE. Since the creation of these orientation courses, evaluations and student surveys have been regularly assessed to continuously improve curriculum and better meet the needs of the different types of incoming students.

Undergraduate studies in both the United States and Canada have shown that students with peer- and near-peer mentoring supports are more heavily engaged in their academic curricula and are more socially integrated into engineering-related programs than those students without mentors.¹⁻

⁶ Student evaluations in both the freshman and transfer sections at the University of Oklahoma reflect that the mentorship techniques that are currently in place not only encourage students to get involved with on-campus activities but also provide new students with a resource to ask informal questions that they would not otherwise ask with the traditional professor-student relationship.⁷⁻¹⁰

The Dean's Leadership Council (DLC) was created by the CoE to provide mentor support for the FEOC and TEOC. The objectives of the DLC program are best summarized by the mission statement for the organization: "The Dean's Leadership Council will establish connections

leading to a strong sense of community within the College of Engineering through student-to-student interaction in the form of mentoring, tutoring, and prospective student recruitment. This community will be built through service, dedication, respect, and honesty toward others, engineering as a profession, the College, and the University.” Other universities have established mentorship programs for first-year students and have found the outcomes to be beneficial not only for the students but also for the mentors.²⁻⁵

Using the evaluations to understand the needs of the different types of students the FEOC and TEOC can be refined to better serve the students. It is clear from the evaluations that freshman students are attracted to hands-on activities and the type of personal interactions that are often rare in large lecture sections that may exceed 200 students. Conversely, the transfer students tend to be more interested in university resources like academic advising, professional licensure, and study abroad opportunities. Both groups agree in their expressed need for exposure to career search support and preparation for internship opportunities. Individualized course content is tailored for each orientation course based on these observations from the evaluations. Additionally, activities are chosen by the CoE leadership to meet ABET accreditation requirements, which is another important aspect of the FEOC and TEOC. It is the hope of the College and of the DLC program that resources and networks for students to succeed are established early in a student’s transition to the university. Introducing more relevant content and improving quality of mentorship has become a priority. The following sections describe the latest assessment of course curriculum for the FEOC and TEOC.

II. FEOC and TEOC Overview

Designing the course structure for both the FEOC and TEOC has been a subject of constant discussion. When teaching a course that includes multidisciplinary students with varying levels of professional and academic experience, presenting content that interests and benefits as many of the students as possible is the ultimate target.¹¹⁻¹³ While all aspects of each course may not appeal to every individual, the goal in the curriculum design is for most of the lectures to be informative and useful to the students.

First, since the FEOC and TEOC are orientation courses it is important that they are not designed to be technically difficult or time consuming for the students. Homework assignments are created based on the course objectives and focus on soft-skills that engineering students get minimal exposure to throughout the remainder of their required curricula. Common assignments each semester include a Resume Critique, Graduation Plan, and an Engineering Challenges paper where students detail the motivations for completing their engineering degree and the challenges they anticipate in the coming years. Student comments show that the Engineering Challenges assignment in particular really helped give them a “reality check” and exposed shortcomings in their study habits or their school-work-home balance. Evaluation techniques for the course include attendance grades, outside event grades, and homework grades. The homework assignments are awarded a completion grade, but the grading scale is weighted so that passing scores can not be earned without at least 80% attendance and attending at least two engineering-related outside event activities throughout the semester. While the outside events tend to be the course activity students least prefer, it is the opinion of the CoE faculty and staff that involvement in extra curricular activities is vital for building a strong network of support in the

engineering community and helps foster life-long learning initiatives. Both orientation courses are similar in content, but they strive to be tailored to the needs of the two types of students that are enrolled by having different schedules, structures, and mentorship approaches. The following sections detail the structure and content of the freshman and transfer orientation classes, respectively.

III. FEOC Structure

One of the major objectives when designing the content of the FEOC is to assist first-year students in adapting to college life and become more comfortable with the CoE. For the last few semesters, this has been accomplished through exposure to the different engineering majors offered and some of the post-graduation opportunities available for each degree. Additionally, the freshman course has a supplementary project-based section taught by different professors to give hands-on engineering experience in their first-year of university coursework. Some previous projects include an Egg-Drop Machine, a Pumpkin Launcher and autonomous robots.¹⁶ Details regarding these project sections will not be discussed here since the individual professors, independent of the larger lecture section of FEOC, determine the objectives and design requirements.

For the FEOC, DLC mentors are used for the large section lecture as well as the smaller project-based sections mentioned above. Small groups of approximately ten freshman students are assigned a mentor. The mentor is responsible for organizing and leading group activities with their protégés' every other week. The off-weeks are used for Exploring Majors sessions when College Directors are asked to serve as guest speakers in the large lecture section to provide the students a better understanding of the CoE majors. The purpose of the mentor activities is to make a close connection with an involved and academically successful upper-classman. A few of the more experienced mentors serve as paid Teaching Assistants (TAs) for the large-section of the FEOC and act in more of a leadership role over both the students and the mentors. The remaining mentors that interact directly in the protégé groups are expected to organize activities for their group every other week. Since the student groups are multidisciplinary, it gives the freshman students exposure to working in teams of other engineers at the beginning of their academic careers at the university. The mentors assigned to the project-based section of the freshman orientation class have specific roles depending on which professor is teaching the course. Most mentors are asked to act as a "technical teaching assistant" to help students learn new software or master basic engineering concepts needed to successfully implement a project's design.

Table I shows the course schedule for both the FEOC and TEOC and includes additional details under the weeks where specially designed mentor activities are performed. Some of these activities were created to help students focus on the importance of planning a successful academic career, while others emphasized the dedication required to complete the rigorous curriculum demanded by an engineering degree.

TABLE I – FEOC LECTURE SECTION AND TEOC CURRICULUM

Week	<i>FEOC Schedule</i>	<i>TEOC Schedule</i>
1	Course Overview	Course Overview
2	Student Organization Representatives	Student Organization Representatives
3	Alumni Panel of Industry Professionals	Mentoring Day -Resume Assignment
4	Mentor Breakout Group Meeting -Meet your Mentor	Internship Panel Discussion with Mentors
5	Exploring Majors-Engineering Physics Academic Advising and Study Abroad	Academic Advising and Study Abroad
6	Mentor Breakout Group Meeting -Planning Activity	Engineering Ethics Video -Ethics Worksheet
7	Exploring Majors-Electrical and Computer Engineering and Chemical, Biological & Materials Engineering	Undergraduate Research Panel
8	Mentor Breakout Group Meeting -Dedication	Mentoring Day -Graduation Plans
9	Exploring Majors-Computer Science and Civil, Architectural, Environmental Engineering and Sciences	Professional Registration and Licensure
10	Mentor Breakout Group Meeting -Making Good Decisions	Diversity and Inclusion Programs
11	Exploring Majors-Aerospace and Mechanical Engineering and Industrial and Systems Engineering	Mentoring Day -Personality Styles
12	Mentor Breakout Group Meeting -Rewards	Lean and Six Sigma
13	Career Services and Internship Panel Discussion with Mentors	Alumni Panel of Industry Professionals
14	Engineering Ethics Video -Ethics Worksheet	Career Services
15	Class Surveys and Wrap-Up	Class Surveys and Wrap Up

Mentors meet for two hours the week before a scheduled Mentor Activity to brainstorm ideas for their protégés and develop their leadership skills as a group. While mentors are free to choose individual activities independent of the other mentors, it is required that they engage each protégé and have a discussion about that week’s theme. Common meeting activities may include icebreakers, team-building exercises, and round table discussions. In addition to the two-hour meetings every other week, the mentors are required to participate in a daylong leadership workshop at the beginning of each fall semester. A group of professionals leads the mentors in a series of team-building exercises they can use in the future with their protégés. The rest of the workshop is spent discussing the importance of mentorship, the expectations of a mentor, and resources available to assist new mentors. These discussions are typically between a group of experienced mentors and new mentors, which provides yet another leadership opportunity from

peer to peer mentoring.¹⁴⁻¹⁵ Since the mentors from both the FEOC and TEOC are required to participate in this leadership training, the DLC mentor group works as a unit to make mentorship plans for each orientation class even if certain mentors don't participate in the execution of both plans.

The Internship Panel is not a separate breakout group, but instead is an informal presentation to the freshman students. The panel consists of mentors that have had internship experience(s) and are willing to share with the students what they learned. This activity is the only one in the FEOC curriculum that focuses on the job search process and opportunities for employment.

IV. TEOC Structure

Similar to the freshman course, the TEOC aims to provide new CoE students at the University of Oklahoma with the resources to be successful and become assimilated into our network of engineering students and faculty. The biggest difference to the FEOC is that the TEOC does not have the additional project-based course. It is replaced with increased focus on preparation for the OU career fair, professional licensure, the importance of on-campus involvement, and discussions on the ethical expectations for a professional in the engineering field. Activities, assignments, and guest speakers are chosen in an effort to benefit as many students as possible.

There are usually only a few mentors assigned to the TEOC and these are commonly transfer students who took the TEOC previously. One mentor serves as the paid Teaching Assistant and is very involved in the organization of guest speakers and teaching of general information. Having this "senior" mentor in both the FEOC and TEOC allows the protégés to hear testimonies from students who have been in their shoes. For example, when Career Services does the presentation of resources available to engineering students, they list dozens of programs and seminars offered each semester. The senior mentor often speaks afterwards regarding their personal experiences with career services and describes the benefit of a few of the services they've utilized throughout their time at the university. This typically encourages students to try out the services more so than if only the instructor advocates for it. Mentors in the transfer orientation section take on a significantly different role than in the freshman course. There are scheduled "mentor-days" where the assigned mentor(s) for the class give organized presentations over selected topics not covered by the other speakers. These mentor-days are typically more informal than the other lectures and give new students an opportunity to ask important questions about transfer credit equivalencies, student life, class assignments, and successfully balancing academics with other commitments. The mentors for the TEOC are chosen with the goal of creating a diverse mentor group. Some mentors may have experience with study abroad or transferring from another college at the university, while other mentors may have internship experience and be out-of-state students.

The University of Oklahoma's Engineering Career Fair typically occurs within the first five weeks of school so the first part of the semester is spent trying to prepare new students so they will be successful in the job search. Many transfer students have limited engineering experience outside of the classroom and are unsure of the proper way to document their other skills. Assignments are given during these weeks that require students to submit a critiqued resume and

to document research about three different companies that will appear at the career fair. This assignment aims to help prepare students for the research they will be expected to do prior to an interview. Course evaluations reflect that students really value the Mentor Resume Workshop and the Internship Panel where other mentors can give advice regarding the job search and share their personal experiences. On the Resume Workshop day, the course TA, who also serves in the mentorship program, discusses recommended practices for a successful career fair and answers questions about the career search process.

For the next mentor activity, a faculty liaison from the Graduate College speaks about the benefits of research as an undergraduate and answers questions the students may have about funding, course credits, and the demands of the research positions. A panel of student mentors is invited to share their experiences with research and discuss how they obtained the position and what they gained from the experience. Many new students view research as something only possible for graduate students so it is beneficial for them to hear about the research opportunities afforded to their peers.

A few weeks before advising sessions are scheduled, a mentor session is organized to walk students through mapping out their degree programs to graduation. Campus resources for degree audits, transfer equivalency checks, and prerequisite flow-charts are provided to simplify the process. The students turn in a copy of their graduation plan and are encouraged to take a copy to their advising session.

The Personality Styles activity is more interactive than the other mentor sessions in the transfer class. A veteran mentor is invited to lead a self-evaluated “personality survey”. Students are instructed to rate characteristics in each row from 1-4 (“4 being most like the student and, 1 being least like the student”). Each column is added up to determine the personality type each person most closely relates to. Most individuals score relatively equal across each category with one category a few points higher than the others. There are always a few students however that score very high in one column and very low in the others. Students with a high number in any one column are encouraged to volunteer for the activity. This creates a collective sample of individuals that strongly represent each category.

TABLE II – PERSONALITY STYLES SURVEY

A	B	C	D
1. ___ Competitive	___ Persuasive	___ Protective	___ Cautious
2. ___ Self-Assured	___ Enthusiastic	___ Patient	___ Analytical
3. ___ Decisive	___ Open	___ Relaxed	___ Methodical
4. ___ Assertive	___ Talkative	___ Modest	___ Organized
5. ___ Adventurous	___ Optimistic	___ Predictable	___ Logical
6. ___ Dominating	___ Outgoing	___ Easy-Going	___ Consistent
7. ___ Directing	___ Spontaneous	___ Accepting	___ Detailed
8. ___ Persistent	___ Sensitive	___ Sincere	___ Perfectionist
9. ___ Daring	___ Impulsive	___ Stabilizing	___ Reserved
10. ___ Results-Oriented	___ People-Oriented	___ Loyal	___ Quality-Oriented
___ Total	___ Total	___ Total	___ Total

The “A” student volunteers are grouped together, then the “B” group, and so on. Each group is told to plan a party and sent to separate private areas for ten minutes. During this time, the presenting mentor explains to the class the different characteristics represented by each column and predicts the type of behavior expected from each party-planning group. After ten minutes, the four groups were brought back in front of the class and asked to present their party ideas. The mentor predictions are always very accurate each semester and teach the students the importance of recognizing different personality types within project groups both in an academic and professional setting. Emphasis is placed on organizing projects to best fit the dynamics of the team. This activity has historically received the lowest scores on course evaluations so it will likely be redesigned for future semesters. Based on student comments, the objective of the activity is overshadowed by the party-planning presentations, resulting in little perceived overall value for the activity.

The final lecture is an opportunity for the class mentors and the course TA to speak on an informal level to the students about the importance of their time at the university. Encouraging thoughts and stories are shared with the goal of inspiring students and reminding them that they have the support and resources to finish their degree. The mentors provide their personal contact information to the students at this time in so they can continue to be a resource for the remainder of the students’ academic and professional careers.

V. Motivations for Degree Completion

Additional questions were placed on the course evaluations for both the FEOC and TEOC last semester. The first of these questions addressed students’ motivations for choosing and completing an undergraduate degree in engineering or related field. The freshman student responses included discussions on ideas such as excitement to create unique design solutions, apply math and science skills to problems, and develop their technical and analytical abilities. A common theme of the transfer students was the monetary value of a degree. They were more focused on getting internships and/or full-time careers after graduation. Many of these students mentioned the need to provide for their families and become financially stable while paying off student loans. A number of students in both courses mentioned that they were first generation college students. Some of these individuals commented that they were completing their degree to make their parents proud and to set an example for future generations in their family. Select quotes from TEOC students are shown below to give some of their perceptions of the course.

- This class is a very useful class. I wish I would have taken this class my first semester at OU and not my fourth as it would have helped greatly when I was new to campus.
- I have been at OU for four years and for the first time in four years I actually was able to engage in outside activities because of this class. The class helped me understand what I need to do not only throughout the rest of my time at OU but once I get out into the real world.
- I found the requirement of outside events invasive to my personal life, time I could have spent with my family.
- This was a helpful class which made the transition for transfer students into life at a new university much more easier!
- They (Course TA and DLC Mentors) did a great job in their presentations. The information and experiences they shared I could easily grasp and relate too.

The differences in perspectives of the TEOC and FEOC students discussed above contribute to the varying content in each course. It is the belief of the faculty and staff that non-traditional students in the TEOC have different academic perspectives, long-term goals, and academic needs than their younger counterparts in FEOC. Lectures and activities for each class are designed for each audience and tailored in an attempt to increase retention in the College of Engineering.

VI. Assessment

In the fall of 2014 semester, the University of Oklahoma taught two lecture sections of the ENGR 1410/1411 FEOC with a total of 726 students and one section of the ENGR 3410/3511 TEOC with 170 students. Of these, 323 students (44.4%) in the FEOC and 105 students (61.7%) in the TEOC completed the course evaluations at the conclusion of the semester. Table IV below shows the percentage of students in each class that responded with “Agree” or “Strongly Agree” to the corresponding evaluation statements using a standard five-point Likert Scale.

TABLE III – COURSE EVALUATION STATISTICS

Evaluation Question	% FEOC Students	% TEOC Students
Homework and other assignments contributed to my INDIVIDUAL learning of the course material.	38.2	74.3
Class time was well used and contributed to my learning of the material.	52.8	84.8
The way in which the course was taught helped me develop analysis and design abilities.	40.9	58.1
You liked the guest speaker lecture format of the large section class.	23.8	83.7
Overall, the assignments for the course were beneficial to you as a freshman (for FEOC) or non-traditional student (for TEOC).	54.4	72.4
This course increased your interest in pursuing a degree in the College of Engineering.	70.2	71.4

While the majority of students in both courses expressed an increased interest in pursuing a degree in our university’s College of Engineering, the freshman students did not seem to get as much benefit from the course in every other area compared to the transfer students. One thing to note is that the freshmen hands-on project section is considered a separate course and has its own evaluations. Even if the data points to freshman students not seeing value in some of the necessary aspects of the orientation course, their needs are still being met in the hands-on project section. The free-response sections of the evaluations uncovered some of the dissatisfaction of the freshman students. They revealed that they did not enjoy the guest speakers and found their mentor breakout sessions lacked organization and clear objectives. One student even commented that it was “a waste of time”. On the other hand, the transfer students expressed the positive influence the DLC mentors had during Mentoring Day activities and any time after class

when they had questions. TEOC students expressed an extreme dislike for the outside events that are required for the course because as one student stated they “were useless and interfered with family and work”. There were a few students in the freshman class that really enjoyed their mentors and stated that the mentor sessions were the aspect of the class they looked forward to the most. There were also a few transfer students who stated that they had already built a strong network of friends through extra-curricular activities they discovered while completing the outside event assignments. Overall, the evaluations provided solid evidence that the TEOC is meeting the needs of the transfer students, but the FEOC appears to not be as effective for the freshman students. In general, many comments from both courses involve statements similar to “I didn’t like [this] aspect of the class, but I understand why it’s included and I don’t know a better way to approach it.” This statement very simply states the challenge of designing engineering orientation courses. While the small hands-on project sections are typically very well received by the freshman students, the evaluation data in Table IV indicated that modifications should be made to the large lecture section of the FEOC in order to better serve the students. Some of the following negative FEOC student quotes show insights into their perceptions of the course.

- Unless they (the speakers) were talking about your major it was uninteresting, I guess it could be useful if people were undecided... but it was very boring.
- The only things that contributed to my learning were lectures from outside sources (i.e., engineering professors and career services).
- Many class periods seemed to be lacking in helpful resources and engineering information that is necessary for engineering students.
- I have known what type of engineering I have wanted to do for a long time now and nothing would change that.
- The course was more like an information session than an actual class. It felt like it had almost no structure, and I feel that if there was a particular organization to the class and I knew what to expect for the weekly meetings I would be more invested.

Future semesters of the FEOC large section will likely be condensed to five weeks rather than the current 15-week schedule. Since many students expressed they are certain they will stay with their selected major, exposure to each degree program within CoE will no longer be part of the curriculum. The five weeks of the large section will be changed to focus on only the following items:

- Exposing the students to the career services resources
- Showing them opportunities for study abroad
- Teaching the students how to get involved in undergraduate research
- Conveying to them the importance of engineering ethics

The mentor breakout sessions will be eliminated for the FEOC and the mentors will instead play a more active role in the project-based sections, which are very well received by the freshmen students. This new design should continue to allow the students to benefit from the mentorship of upper-classmen without spending time going over less beneficial topics in the large-lecture section. Instead of completely eliminating the FEOC large lecture section and only having the hands-on project sections, the large lecture section will be redesigned to include only the critically important topics in the FEOC that were identified. Keeping the FEOC large section will also allow the condensed information to be covered without interfering with the structure and plans of the individual professors project-based sections. While the overall goals and services

provided to the students have always been good, these new methods by which they are delivered should better meet their needs based on the student feedback that was received.

VII. Conclusion

When it was acknowledged that first-year engineering students were not being exposed to many of the resources offered to help them succeed, the CoE at the University of Oklahoma created the mandatory FEOC and TEOC for freshman and transfer engineering students, respectively. Since the first-year of its implementation, course evaluations clearly reflect the differences between the needs and motivations of freshman versus transfer students. For this reason, the courses have not been combined into a single orientation course. The comments in the evaluations showed that there are very few areas in which both groups of students wish to receive the same information. The project-based section of the freshman course allows the students to get hands-on engineering experience not found in most other first-year general education courses. Information from the evaluations reflects the need to make adjustments in the large section of the FEOC for future semesters. The majority of freshman students who responded to the evaluation do not feel the course structure is currently serving their needs. Innovative changes to the DLC program and the delivery method for course information will likely take effect in the Fall 2015 semester. Based on the feedback from the transfer students, the course structure for the TEOC is effective at serving the needs of the students. Small adjustments to the mentor activities in TEOC will be made based on student comments, but the overall structure and content will remain the same. Based on these observations, the curriculum and activities are tailored for each group of students and DLC mentors are used to network, encourage, and assist the new students in their transition to our university. By making new students aware of the support and resources available to them while creating peer-to-peer mentor networks, the engineering students at our university are given every opportunity to succeed.

VIII. References

1. J. Wallace and V. Haines, "The benefits of mentoring for engineering students", *Journal of women and minorities in science and engineering*, vol 10, issue 4, pp. 377-391, 2004.
2. D. Budny, C. Paul and L. Bon, "The impact peer mentoring can have on freshman students", *Frontiers in Education Conference*, pp. 1,6, Oct. 2006.
3. F. Tobajas, V. De Armas and A. Morales, "Effectiveness of a peer mentoring program in engineering education", *Education Engineering (EDUCON), 2010 IEEE*, pp. 14-16. Apr. 2010.
4. E. Hansen, E. Stein and V. May, "Work in progress-building community among first year engineering students", *Frontiers in Education Conference*, Oct. 2008.
5. F. Leung, E. Ko and T. Chow, "Helping first-year engineering students in transition: Promoting transformative learning in student and faculty development", *Teaching, Assessment and Learning for Engineering (TALE), IEEE International Conference*, Aug. 2012
6. M. Marszalek, A. Snauffer, S. Good, G. Hein and A. Monte, "Mentors improve the college experience of engineering undergraduates", *Frontiers in Education Conference*, Oct. 2005.
7. N. Walters and J. Whittaker, "Mentoring in engineering careers: a case study", *Engineering Management Conference*, pp. 348, 355, Oct. 1994.
8. B. Block and A. Georgiadis, "Project-Mentoring in Engineering Education-A competence-oriented teaching and learning approach", *Global Engineering Education Conference*, pp. 1,8, Apr. 2012.
9. J. Banerjee, "Mentoring undergraduate students in engineering", *Frontiers in Education Conference*, Nov. 2003.

10. A. John and A. Segal, "A place for mentoring in engineering education", *Engineering Education*, pp. 30, Jan. 2002.
11. G. Hein and A. Monte, "A student mentoring and development program for underrepresented groups in engineering", *Frontiers in Education Conference*, Oct. 2004.
12. D. Kilgore, C. Atman, K. Yasuhara, T. Barker, and A. Morozov, "Considering Context: A Study of First-Year Engineering Students", *Journal of Engineering Education*, pp. 321-334, Oct. 2007.
13. B. Jones, M. Paretti, S. Hein, and T. Knott, "An analysis of motivation constructs with first-year engineering students: relationships among expectancies, values, achievement, and career plants", *Journal of Engineering Education*, pp. 319-336, Oct. 2010.
14. M. Hutchison, D. Follman, M. Sumpter, and G. Bodner, "Factors influencing the self-efficacy beliefs of first-year engineering students", *Journal of Engineering Education*, pp. 39-47, Jan. 2006.
15. N. Pendergrass, R. Kowalczyk, J. Dowd, R. Laoulache, W. Nelles, J. Golen, and E. Fowler, "Improving first-year engineering education", *Journal of Engineering Education*, pp. 33-41, Jan. 2001.
16. C. Davis, M. Yeary, and J. Sluss, "Reversing the trend of engineering enrollment declines with innovative outreach, recruiting, and retention programs," *IEEE Transactions on Education*, vol 55, issue 2, pp. 157-163, May 2012.