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# **AC 2011-1539: BEST PRACTICES OF A TWO YEAR STUDY ON A RECRUITING PROGRAM TO BOOST ECE UNDERGRADUATE ENROLLMENT**

## **James J. Sluss, Jr., University of Oklahoma**

James J. Sluss, Jr., is the Morris R. Pitman Professor and Director of the School of Electrical and Computer Engineering at the University of Oklahoma. He received the B.S. in Physics in 1984 from Marshall University, and the M.S. and Ph.D. in Electrical Engineering in 1986 and 1989, respectively, from the University of Virginia. His current research interests are in the areas of three-dimensional displays, optical communications, photonics, and intelligent transportation systems. He has been awarded 11 U.S. patents, has authored/co-authored over 100 journal and conference publications, and has been principal/co-principal investigator on over \$16 million in sponsored research grants and contracts. He is a member of the SPIE, IEEE, OSA, and ASEE.

## **Chad Eric Davis, University of Oklahoma**

Chad Davis received his PhD from the University of Oklahoma in 2007. Since 2008 he has been a member of the ECE faculty at OU. He teaches courses in circuit analysis, electronics, signal processing, energy conversion, microprocessors, and electromechanical systems. He holds a dual discipline (electrical & mechanical) professional engineering license in the state of Oklahoma. His work experience ranges from electromechanical system design to automation of manufacturing and test processes.

Dr. Davis is a licensed private pilot and performs research primarily in areas related to aviation. His current research at OU involves the design and development of a new GPS Ground Based Augmentation System utilizing feedback control and the design of instrumentation and data acquisition for navigational systems. Additionally, he serves as the ECE recruiting coordinator and one of the primary academic advisers for ECE students.

## **Mark B. Yeary, University of Oklahoma**

Mark B. Yeary (S'95M'00SM'03) received the B.S. (honors), M.S., and Ph.D. degrees from the Department of Electrical Engineering, Texas A&M University (TAMU), College Station, in 1992, 1994, and 1999, respectively. Following his graduation in 1999, he was a member of the DSP group and a Lecturer with the Department of Electrical Engineering, TAMU, where he continued to lead a variety of industrially sponsored projects. Since Fall 2002, he has been with the School of Electrical and Computer Engineering, University of Oklahoma (OU), Norman, where he is now an Associate Professor and member of the Atmospheric Radar Research Center. His research and teaching interests are in the areas of digital signal processing as applied to radars, atmospheric studies, image processing, adaptive filter design, and customized DSP systems. Dr. Yeary is a Member of the Tau Beta Pi honor society and the American Meteorological Society. In the past, he received the 1998 NSF/FIE New Faculty Fellow Award for excellence in teaching. He has received the IEEE Outstanding Young Engineer Award from the I&M Society in 2005 for contributions to radar systems measurements. He has also recently received OU's Teaching Scholars Initiative Award in 2009. In 2010, he received the ASEE Midwest Section Distinguished Teaching award.

## **Results and Best Practices of a Two Year Study on Recruiting Programs to Boost ECE Undergraduate Enrollment**

Abstract:

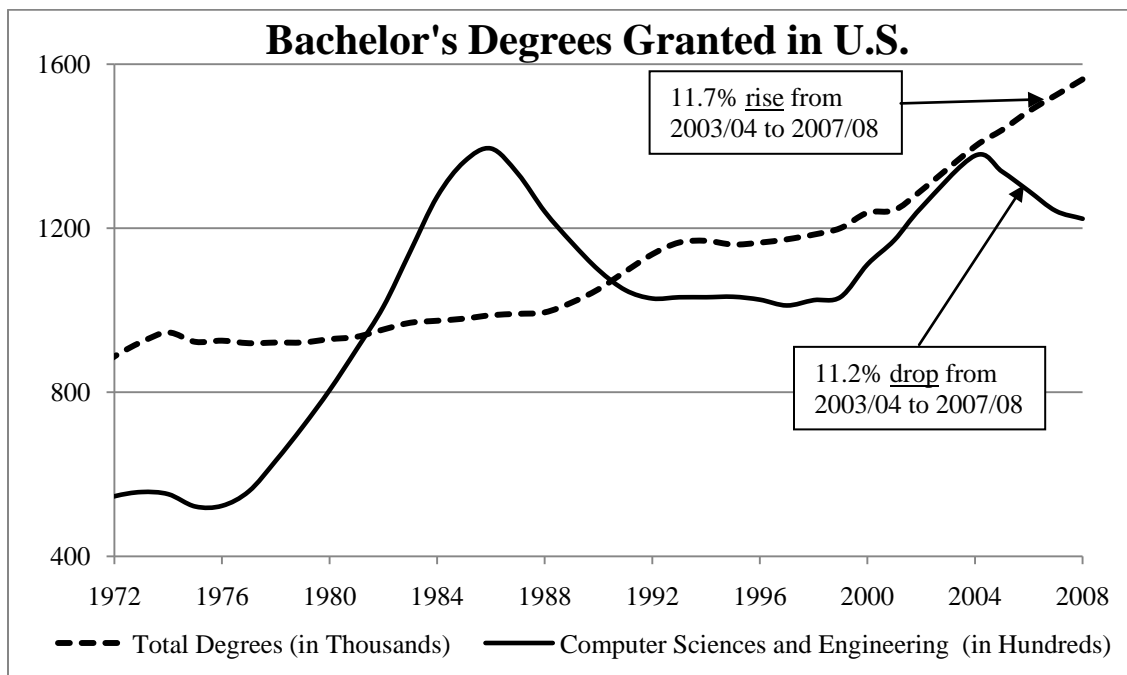
This paper discusses an encompassing approach to increase the number of students in engineering through innovative outreach, recruiting, and retention programs. Prior to these programs, the School of Electrical and Computer Engineering (ECE) at the University of Oklahoma (OU) experienced a trend of reduced enrollment, which is similar to the trend that has occurred across the U.S. in engineering. As a result, the key factors that influence selection of engineering as a career path were investigated and a corrective program to reverse this trend was initiated. The program involves focusing on the present through retention, the immediate future through recruiting, and the distant future through outreach. The focus of all of these programs is to mobilize the OU-ECE faculty and student body to present advanced engineering technologies, innovative demonstrations, and hands-on activities at a level that the individual student can understand and appreciate.

A trend was noticed from the latest “Digest of Education Statistics”, a National Center for Education Statistics publication. It showed that between the 2003/04 to 2007/08 academic cycles the total number of bachelor’s degrees granted had risen by nearly 12%, while the number of Engineering and Computer Science bachelor’s degrees dropped by nearly the same percentage. OU- ECE also showed significant reductions in students during this timeframe. From the fall of 2004 to the fall of 2008 the ECE undergraduate enrollment numbers at our university dropped an average of 9% per year. After the first year of implementing the corrective action program in the fall of 2008, the numbers rose by 18%. Student surveys and interviews are used to qualitatively assess the program and OU-ECE enrollment numbers are used as a quantitative assessment.

### **I. Introduction:**

This paper has resulted from the need to correct the problem of reduced enrollments in Electrical & Computer Engineering (ECE) at the University of Oklahoma (OU). After

studying the situation in more depth it was noticed that our problems are similar to what is occurring across the U.S. in engineering. A trend was noticed from the latest “Digest of Education Statistics”, a National Center for Education Statistics publication. It showed that between the 2003/04 to 2007/08 academic cycles the total number of bachelor’s degrees granted had risen by nearly 12%, while the number of Engineering and Computer Science bachelor’s degrees dropped by nearly the same percentage. Figure 1 shows the data over the last 25 years<sup>1</sup>. The declines over the last few years look very similar to the early to middle stages of the immense declines in engineering during the mid 1980s.



\* Year numbers on the chart corresponding to the end of the academic cycle (i.e. 2007/08 = 2008)

**Figure 1: Chart of Bachelor’s degrees granted from 1971/72 to 2007/08.**

OU-ECE also showed significant reductions in students during this timeframe. From the fall of 2004 to the fall of 2008, OU-ECE undergraduate enrollment numbers dropped an average of 9% per year.

## II. Corrective Action Program Overview:

As a result of the declining ECE enrollments a corrective action program was initiated in the fall of 2008. After explaining the reasons for the specific actions that were taken, the remainder of this paper will concentrate on the details and examples of the program. The program involves focusing on the present through retention, the immediate future through recruiting, and the distant future through outreach. The central focus of all of these programs is to mobilize the faculty and student body to present advanced engineering technologies, innovative demonstrations, and hands-on activities at a level that the individual student can understand and appreciate. The reason for this focus was driven by the interest level from the students in some of the workshops ECE has directed in the past and observing the success of existing programs such as Botball and FIRST. The common theme of both of these programs is that they are focused on the creation of a technologically advanced robot. The merit of this recruiting methodology was reinforced while serving as a mentor in the FIRST Robotics Competition. The level of student enthusiasm at the FIRST Robotics Competition regional competition was surprising and worthy of replicating by other organizations seeking to promote engineering<sup>2</sup>. FIRST is an organization founded by Dean Kamen in 1989 that promotes science and engineering through innovative hands-on competitions for students ranging from 6 to 18 years old. The mission of FIRST is to “inspire young people to be science and technology leaders, by engaging them in exciting mentor-based programs that build science, engineering and technology skills, that inspire innovation, and that foster well-rounded life capabilities including self-confidence, communication, and leadership.”<sup>3</sup> FIRST is driven by over 90,000 volunteers and supported by “a network of more than 3,500 corporations, educational and professional institutions, and individuals”. It is projected to reach over 248,000 students for the fall 2010/11 season. The students are projected to build a total of 20,667 robots<sup>4</sup>.

In 2005 Brandeis University conducted an independent study where students that participated in FIRST were compared to non-FIRST students with similar backgrounds. The study had several positive findings on the effectiveness of their program.<sup>5</sup> FIRST is

even being looked at as an example of what the White House is hoping to achieve in its “Educate to Innovate” initiative<sup>6</sup>. At the press conference to kick-off the initiative, two students were allowed to demonstrate their robot from the 2009 FIRST Robotics Competition to the President and gained national exposure for FIRST<sup>6</sup>.

Botball is another program that is making a significant impact on the promotion of the field of engineering to middle and high school aged students. Botball focuses on smaller scale, autonomous robots that require less mentor support than the FRC robots. At the time of the latest published Botball statistics in 2008, “approximately 93,653 individuals including 40,280 students have been impacted by the Botball Program.”<sup>7</sup> The success of Botball and FIRST is strong evidence that today’s students are interested in advanced engineering technologies, innovative demonstrations, and hands-on activities.

Researching the source of motivation for students to choose engineering was another factor contributing to the corrective action plan. The Center for the Advancement of Engineering Education (CAEE) has published a wealth of information on this subject. A motivator referred to as “*intrinsic behavioral*” was the largest contributor in the research study presented at the keynote address at the Frontiers in Education 2009 Conference by CAEE Director, Cindy Atman. This motivator is explained as “*I like to build stuff*” and is directly related to the focus of our plan. The second and third most contributing motivators are *intrinsic psychological* (explained as “*I think engineering is fun*”) and *social good* (“*engineers improve the welfare of society through creative work*”)<sup>8,9</sup>.

These motivators also contribute greatly to our plan. The goal of all of our activities is to appeal to these three motivators. This is true whether it is a demonstration for a prospective student, a hands-on activity for a group of middle school children, a freshman orientation section, or one of the many other types of student interactions. An example of one of our commonly performed middle school outreach practices is to organize a workshop where students build robots and compete against each other. At each of these different outreach workshops students learn about concepts that can be found in typical ECE curriculums; such as soldering, programmable micro-controllers, sensors, power consumption, energy efficiency, etc. Since results from the outreach efforts are presently difficult to quantify, this paper will focus primarily on the recruiting program that targets

students at or near college age. However, details and results of the outreach and retention aspects of our corrective action plan will be presented in future work.

### III. Faculty and Student Involvement:

With our recruiting model focused on the design, implementation, and presentation of advanced engineering technologies faculty involvement was vital to its success. To quote Dr. James Duderstadt, former board member of the National Science Foundation, “it could well be that faculty members of the twenty-first century college or university will find it necessary to set aside their roles as teachers and instead become designers of learning experiences, processes, and environments.”<sup>10</sup> This is exactly what is occurring with our faculty. In order to demonstrate an exciting learning experience dealing with advanced technologies it requires a considerable amount of effort from the experts in the field to create them.

The next challenge was mobilize the people who could relate best to the students we were recruiting, our ECE student body. With the busy schedules of ECE students, getting them involved with recruiting has always been difficult. Our plan focused primarily on the OU-ECE student organizations that have outreach as an emphasis in their mission. Two student organizations that have been instrumental in the effort are IEEE and HKN. More recently, two other student groups (Robotics Club and Exempli Gratia) became involved and helped create and improve outreach demonstrations. When the corrective action program was initiated in the fall of 2008 there was very little interaction with these organizations. Now one or more of these organizations are involved in almost every activity. In the fall of 2008 there were virtually no students involved in ECE-directed recruiting and outreach efforts. In the last two years, over 30 students have participated. A byproduct of this relationship is that both organizations have grown substantially in numbers and accomplishments over the last two years. As these student organizations grow, there will be more outreach and recruiting activities that follow, resulting in a continuous cycle. An interview with the current president of the IEEE student chapter provides some insight into this dynamic. This student initially declared a non-

engineering major when entering the university. He contributed the high-tech nature of electrical engineering as the reason he first began to think about switching to the field. He stated that by seeing the “finished product” and “applied electrical engineering” he was motivated to change his career plans and major in electrical engineering. As the incoming president of IEEE, he was already actively engaged in planning new recruiting events to attract more students in the same way he was attracted. He coordinated the effort for the first major recruiting event of 2010 that occurs the weekend before the fall semester begins. This is an event that OU-ECE has never been involved in before due to lack of student involvement.

Another motivator to students selecting engineering, discussed in the CAEE research, is mentor influence. This motivator was not as large a factor as the three previously mentioned, but it was much more significant for females than males 8, 9. With this in mind, ECE female students were sought out to help. As a result, eight different female students have volunteered to participate in female outreach and recruiting activities over the last two years. The level of interest in ECE by females appears to have gone up substantially as a result. OU-ECE female enrollment trends will be analyzed in the future in order to measure the effectiveness of this area of our program. Hopefully, it will correlate with other studies that show that actively engaging females, especially peers, to help in the recruitment process is highly effective <sup>11, 12, 13</sup>.

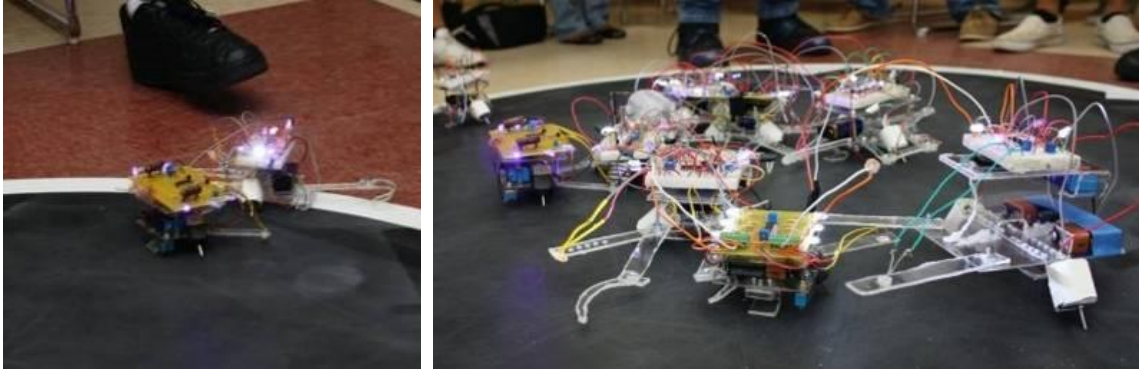
Another mentor influence activity on the rise is OU-ECE students and faculty working with local high school students. For the first time in 2009, IEEE and HKN chapters provided mentor support to a local FIRST robotics team. Over the last two years ECE faculty members have provided mentor support for three FIRST robotics teams, one FIRST Tech challenge team, and numerous other high school competition teams and student groups. Additionally, OU-ECE students have begun providing help for senior design projects at a local pre-engineering high school program. For the first time ever, a college student was selected to be a judge at this program’s final design presentations. This student judge was from OU-ECE and was the active president of HKN. The rapid increase in student involvement was quantified recently at an on campus high school

engineering recruiting event. In 2008, the demonstrations at the recruiting table were presented by only one OU-ECE faculty member. In 2009, one faculty member was accompanied by one OU-ECE student at the recruiting table. In 2010, multiple faculty members and over a dozen OU-ECE students were involved in several different areas of the recruiting event. In less than two years, a culture has been created that is influencing an ever increasing number of our students and faculty members to get involved with the outreach and recruiting effort. It is believed that the reason for this is that the recruiting methodologies implemented are not only appealing to the students being recruited, but also are exciting to the students and faculty that are presenting or creating them.

#### IV. The Immediate Future – Recruiting HS Seniors and College Freshman

This section focuses on recruiting high school students that are near graduation and college freshman that are either undecided or in a non-engineering major. As previously mentioned the other two legs of our corrective action program will be presented in future work once the results can be adequately quantified. First, an example of one of the hands-on activities that was performed will be discussed. This annual Multicultural Engineering Program sponsored event, titled Summer Bridge, allows incoming engineering students to go through a two week college preparation program. Part of the program is a hands-on project that is worked on each afternoon. For the first time ever, OU-ECE led the hands-on portion of the program in 2009. The project entailed the students designing and building spider robots that would battle each other. During the course of the project, many of them became proficient in ECE concepts and practices such as bread boarding circuits, soldering, designing printed circuit boards, and operating electronics lab equipment. The program culminated with a final competition to see which team built the best spider robot, which was decided by putting all of the robots in a ring for battle, with the last robot remaining being crowned the victor.





**Figure 9: Summer Bridge Spider Robot Competition.**

The Spider Robot Competition received great reviews from the twenty student participants and from the MEP mentors. Currently, all of the students that initially declared an ECE major are still in the program and at least one other student switched to ECE as a result of the hands-on activity.

Generally, most of the recruiting activities performed can be grouped in three categories: Individual tours for prospective students, demonstrations and mentoring activities with high schools, and university sponsored events. The university sponsored events involve setting up a table display and interacting with students from high school and/or college that are interested in an engineering field of study. The School of ECE joins forces with HKN and IEEE to put on an impressive show of innovative demonstrations of ECE technology. Some of the demonstrations from the display are shown below.



**Figure 10: SumoBot and magnetic levitator (Left), Advanced LED lighting (Right)**

Many of the high school recruiting trips are similar to these university sponsored events except they are off-site. Several high schools have been visited over the last two years. Some visits have been to a particular math or science class and some have involved a table setup where all of the students have a choice of whether or not to engage with us. From our experience, the best method of setting up visits and obtaining an audience that is actively engaged is through the FIRST Robotics mentorship activities that many ECE students and faculty are actively involved. After meeting the teachers and students during the FIRST Robotics Competition, it is natural process to set up a time to visit with their robotics team or club. Having a common bond with FIRST adds a level of credibility that creates a more effective recruiting experience.

The final type of recruiting activity is a variety of tours for prospective students. This is viewed as the most crucial since the student has requested the visit and has the ability and potential to make a commitment to ECE. With this in mind, more focus is spent describing details of OU-ECE rather than the just the specific technologies. Educating prospective students on ECE research programs is a key activity. Some good advice when talking to students about complex subjects like ECE research was recently found in an article by Seelman<sup>14</sup>. It states: *“Don’t Lecture - Engage! Share the personal dimension of your scientific research work. As with any subject, it is important for students to feel a sense of personal involvement with science.”*<sup>14</sup>. Making ECE personal to students at this level in the education pipeline is critical. They need to see themselves having a career that maintains their interest over a long period of time, gives them economic security, and allows them to make a difference in society. OU-ECE’s personal tours have the normal elements of showing the students the labs and the engineering facilities. The added ingredients are demonstrations of student projects and sharing the details of some of the research programs. We found that logistically our process was greatly improved by having a specific faculty member that coordinates the tours. Student tour requests can originate from personal correspondence or from many of the other organizations within the university. When all of these organizations know who to call, more opportunities arise. OU-ECE is getting an increasing number of tour assignments from the CoE for students that didn’t specifically request to speak with someone from

ECE. These students are usually either undecided on which engineering field or there was no one available to meet with them in the discipline they requested. After switching to our new tour process in the fall of 2008, the first 12 tours given were to students that specifically requested to speak with only ECE. Of the next 20 tours we were requested to give, 11 were given to students that requested ECE along with one or more other discipline and 5 were given to students that were classified as undecided. Due to our dedication and organized structure, OU-ECE is also getting the opportunity to give tours for students that can only come on the week end, such as most of the athletic recruits. As previously stated, we believe that quantity and quality are equally important when it comes to recruiting.

The results for the recruiting tours are quantified by the percentage of the students that enter OU as a declared ECE major. Since the students are generally choosing between many schools and different majors, a high percentage is unlikely. To assess the effectiveness of the recruiting tours, the students involved in the tours were tracked during the first two years and a summary of the data is shown below.

**Table 1 – 2008/2009 and 2009/10 Tour Data**

	ECE Tours	Enrolled OU-ECE	Different Major at OU	Not at OU
National Merit	8	5 (63%)	3	0
Other	14	8 (57%)	2	4
<b>2008 - 2009 Total</b>	<b>22</b>	<b>13 (59%)</b>	<b>5</b>	<b>4</b>
National Merit	13	9 (69%)	0	4
Other HS Seniors*	13	6 (47%)	2	5
<b>2009 - 2010 Total</b>	<b>26</b>	<b>15 (58%)</b>	<b>2</b>	<b>9</b>
National Merit	21	14 (67%)	3	4
Other	27	14 (52%)	4	9
<b>2008 - 2010 Total</b>	<b>48</b>	<b>28 (58%)</b>	<b>7</b>	<b>13</b>

\* Four additional tours were given to high school juniors. They will reach college in fall 2011.

With the high percentage of students that came to OU and majored in ECE the tours are considered a success. Since a large percentage of these tours are given to national merit scholars, another evaluation metric will be presented. ECE currently has 31 national merit scholars enrolled in the undergraduate program out of 295 students (11%). First-

year students entering OU prior to the fall 2009 semester were not affected by our new recruiting program. However, only 10 of the 31 national merit scholars entered OU prior to the fall 2009 semester. Therefore, the number of national merit scholars in ECE more than doubled since the inception of our recruiting program.

ECE outreach and recruiting activities can be seen at the following website:

[www.facebook.com/pages/OU-Electrical-and-Computer-Engineering/167607003291905](http://www.facebook.com/pages/OU-Electrical-and-Computer-Engineering/167607003291905).

## V. Survey Results

Another method of evaluating our program was by establishing an ongoing survey in the first ECE course taken by the students. This began in the fall 2009 semester. This ECE course is typically taken in the 3rd semester, so many of the high school recruits have not reached this class yet. However, preliminary results from the surveys show encouraging results that lead us to believe our recruiting practices are on the correct path. 151 total surveys were received out of 167 students enrolled in this course from the fall 2009 semester to the fall 2010 semester. Only students seeking ECE degrees will be included in this analysis. After excluding students that were not in this category, 133 surveys remained. The survey questions related to this paper are shown below. The actual survey provided ample room for responses to each question.

- 1) Current Major (Circle) Electrical Engineering (EE) Computer Engineering (CpE) Other (List) \_\_\_\_\_
  - 2) When you first came to OU what major did you declare? EE CpE Other (List) \_\_\_\_\_
  - 3) If questions 1) and 2) are different, list the factors or reasons for the switch.
  - 4) Which of the following applies to you?
    - a. Entered OU right after High School.
    - b. Transferred to OU after attending another College. Where? \_\_\_\_\_
    - c. Other. Explain \_\_\_\_\_
  - 7) Do you have a family member who is an Electrical or Computer Engineer? Yes No
  - 8) This question is intended to determine your exposure to ECE recruiting efforts. Circle ALL that apply:
    - a. I received a personal tour of ECE from Dr. Davis or another ECE representative.
    - b. I stopped by a table hosted by ECE at an OU Engineering recruiting event such as the Fall Festival, Sooner Saturday, Engineering Open House, etc. List Event(s) \_\_\_\_\_
    - c. I stopped by a table or witnessed an ECE presentation at a location other than at OU. Where? \_\_\_\_\_
    - d. I received a brochure, promo item, or other information about ECE. List Item(s) \_\_\_\_\_
    - e. Other exposure to ECE recruiting that is not listed \_\_\_\_\_
    - f. I have never been exposed to ECE recruiting.
- For Questions 9 and 10 List as many things as you can think of. Please list them in order of the impact.**
- 9) If you circled a, b, c, d, or e in question 8) what impressed you most about the experience?
  - 10) If you are majoring in EE or CpE what reasons do you attribute for choosing the major?

The following data includes the gender and degree breakdown and the results from question 7.

- 62% (82/133) are EE students and 38% (51/133) are CpE students.
- 14% (18/133) of the ECE student surveys were from females
- 33% (6/18) of the females are EE and 67% (12/18) are CpE majors.
- 66% (76/115) of the males are EE and 34% (39/115) are CpE majors.
- 24% (32/133) had an EE or CpE family member
- 39% (7/18) of the females had an EE or CpE family member
- 22% (25/115) of the males had an EE or CpE family member

It is our assertion and justification for aggressive outreach that most students that enter OU do not have a basic understanding of what ECE is all about. The significant percentage of ECE students that have family members in the field is supporting evidence for this claim. The percentage for females is more than twice as high than males. This is supporting evidence for our belief that females are less informed about ECE than males and is a reason for continued concentration on female outreach.

- 62% (83/133) entered the university right after High School

60% (30/50) of the students who did not enter OU right after high school came from nearby junior colleges. Most of these students have been exposed to ECE concepts through the college courses they have taken. As a result of this survey, we added our first ever recruiting trip to a local junior college in the spring of 2010. It was extremely successful and has resulted in several students either coming to OU-ECE in fall 2010 or indicating they will potentially come in the near future. 8/64 (13%) of the fall 2010 surveys were from students that transferred from this junior college.

When it comes to the major change and recruiting questions, the students who transferred from other colleges and received the survey in their first week upon arriving at OU will be excluded. 25 students were in this category, reducing the total pool of students to 108 for questions 2, 3, 8, and 9.

- 37% (40/108) changed their major to ECE (initially were not EE or CpE)
  - ✓ 16 of these students stated that they were exposed to ECE recruiting.

- 16% (17/108) changed to ECE and initially were non-engineering majors
- ✓ 8 of these students stated that they were exposed to ECE recruiting.

This shows a large percentage of students did not initially major in ECE. It is very encouraging that 17 students that were not majoring in engineering switched to ECE. The next section will focus on the survey responses from the recruiting questions.

- 48% (51/108) responded that they were exposed to ECE recruiting.
- 18 of these students received personal tours from an ECE faculty member.

All of them made comments that suggested they were impressed with the tour. The following are some of the things mentioned:

- The personal nature of the tour and that the information was helpful.
- “The friendliness of the professors”
- “Actually seeing the student projects”

32 of the 51 students said they stopped by a recruiting table at an ECE recruiting event. The following are some of the comments; people that switched majors to ECE are **bold font** and females are marked (F).

- **“The people at the table were very knowledgeable about CpE”**
- **“Just a good set of information”**
- **“Smart Kids, lots of options”(F)**
- **“Number of people there that seemed genuinely interested in engineering & what they were promoting”(F)**
- “The enthusiasm with which the people at the table were presenting”(F)
- “The info displayed to me presented the program in a strong manor”(F)
- “Atmosphere, felt wanted, impressed by all that CpE can do and create”(F)
- “The way everything was organized”
- “Gadgets & things students designed”
- “The ideas implemented”

It is interesting that from this subset 4 out of 5 females versus only 1 out of 5 males made comments specifically about the people at the event. This data supports our focus of getting more female ECE students involved in recruiting.

Questions 3 and 10 give some insight on things that motivate people to select ECE. The survey results follow many of the CAEE research findings in regards to the different things that motivate people to select engineering as a major. Table 2 shows the number of people who mentioned a specific type of topic or subject and table 3 shows how many mentioned standard motivator categories. To avoid bias in the data, the survey allows students to write anything they want in response to these questions. Some students listed multiple motivators while others only listed one. We will primarily use this data in a comparative manner. When recruiting strategies are implemented the motivators with higher percentages will given more focus. For the 133 ECE student surveys there are 187 total responses that fit into one of the categories in table 2 or 3. This data provides some insight, but will be much more reliable when we have several years of survey data. The terms “computers” and “interesting” were by far the two most common words that appeared. The “interesting” term fits perfectly into our recruiting strategy of demonstrating ECE projects. However, computers are not a specific focus in our strategy. A new recruiting demonstration that deals with the inner workings of a computer would likely be well received. A surprising result was that only four people, all males, listed something that can be classified as the “social good” motivator. This is a motivator that the students might not have thought of as they provided their reasons for choosing ECE.

**Table 2 – Motivators for selecting ECE (related to topics or subjects)**

	Computers, Video Games, Programming	Circuits, Electronics	Math, Science, Physics	Technology, Robots	Specific Advanced ECE Areas
All (133)	28 (21 %)	28 (21 %)	16 (12 %)	13 (10 %)	11 (8 %)
EE (82)	9 (11 %)	19 (23 %)	12 (15 %)	9 (11 %)	7 (9 %)
CpE (51)	19 (37 %)	9 (18 %)	4 (8 %)	4 (8 %)	4 (8 %)
Males (115)	24 (21 %)	24 (21 %)	15 (13 %)	12 (10 %)	8 (7 %)
Females (18)	4 (22 %)	4 (22 %)	1 (6 %)	1 (6 %)	3 (17 %)

**Table 3 – Motivators for selecting ECE**

	ECE is Exciting Fun, or Interesting	Job Market	Financial Benefits	Family Influence	Past Work Experience	ECE Faculty, Students	High School Exposure	Social Good
All (133)	27 (20 %)	17 (13 %)	11 (8 %)	10 (7 %)	10 (7 %)	8 (6 %)	5 (4 %)	4 (3 %)
EE (82)	19 (23 %)	10 (12 %)	8 (10 %)	5 (6 %)	6 (7 %)	6 (7 %)	4 (5 %)	3 (4 %)
CpE (51)	8 (16 %)	7 (14 %)	3 (6 %)	5 (10 %)	4 (8 %)	2 (4 %)	1 (2 %)	1 (2 %)
Males (115)	25 (22 %)	13 (11 %)	8 (7 %)	5 (4 %)	10 (9 %)	8 (7 %)	4 (3 %)	4 (3 %)
Females (18)	2 (11 %)	4 (22 %)	3 (17 %)	5 (28 %)	0 (0 %)	0 (0 %)	1 (6 %)	0 (0 %)

## VI. Conclusions

This paper shows that the corrective action plan implemented at our university to boost ECE enrollment has shown initial signs of success. The verbal indications and survey responses show that presenting advanced engineering technologies, innovative demonstrations, and hands-on activities is an effective methodology. From the fall of 2004 to the fall of 2008 the ECE undergraduate enrollment numbers at our university dropped an average of 9% per year. However, after the first year of implementing the corrective action program in the fall of 2008, the numbers rose by 18%. The probability of continued rises is strong once more of the students impacted by our outreach and recruiting practices reach college. OU-ECE students and faculty have embraced this program giving it the ability to be sustained. By continuing the practice of surveying ECE students, more data will be acquired that will allow us to make adjustments to the program in the future.

On the surface this paper focuses on our particular ECE department, but of greater importance is the blueprint that is provided for other engineering schools, departments,



and disciplines. We have already noticed other engineering disciplines at our university modeling some of our practices. The ultimate goal is for all of engineering to be lifted up, and it is our hope that this work will inspire others to do the same in their area of influence. If the engineering decline is taken seriously and action is taken by engineering departments all over the U.S., then we truly can reverse the trend. By doing our part to shine a light on the benefits and excitement of engineering, we can make a difference.

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