AC 2010-1149: CAMPING THE WAY TO HIGHER RETENTION RATES

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Camping the Way to Higher Retention Rates

Abstract

Freshman retention is a top priority in nearly all engineering schools. Increased retention optimizes new-student recruitment dollars, decreases students' time to graduation, impacts school rankings, and helps to meet industry's increasing demand for engineers. Most researchers and experts in the field agree on a number of basic tenants of retention. Topmost are the tenants of creating community amongst freshmen, bonding freshmen with returning students, creating opportunities for meaningful interaction between freshmen and faculty both in and outside of the classroom, helping freshmen understand and internalize the vision and mission of the school, and fostering students' understanding of how they can apply their academic experience both as undergraduates and after graduation.

In the summer of 2008, the Ira A. Fulton Schools of Engineering at Arizona State University (ASU) made a strategic decision to take deliberate action towards improving the undergraduate student experience by requiring all incoming freshmen to attend a three day/two night camp in the local mountains approximately one hundred miles from campus prior to the start of the fall semester. ASU's Engineering School designed E2 Camp to be the cornerstone of a new engineering freshmen experience. With the bold steps that the Engineering School is taking to impact the success of its undergraduate students through a highly interactive curriculum, more experiential learning opportunities, problem-based learning, and opportunities to conduct high-level and impactful research—E2 Camp is a meaningful and successful way to welcome new freshmen to the engineering family and the dynamic experiences they will have as engineering students.

This paper defines the rational for requiring E2 camp and the objectives of the camp. It also provides details on the logistics and cost of the camp. Finally the paper provides assessment data for the two years that the camp has been held.

Background

Educators and industry alike have well documented their concerns about the future of engineering in the United States due to a decline of engineering graduates.[1] Increasing the number of engineering graduates requires both an increase in the number of students choosing to study engineering as well as an increase in engineering student retention. Engineering programs have struggled with retention issues for decades with many programs reporting that 30-40% of students leave engineering after the freshmen year. Numerous studies indicate the many factors that impact retention [2,3,4].

The Ira A. Fulton Schools of Engineering is investing heavily in strategies for improving freshmen engineering retention. Prior to our E2 Camp, specific freshmen engagement activities have included:

- residential community (students live in a residential community for engineering freshmen with engineering programming)
- student organizations (over 40 engineering student specific organizations are available for new students to participate)
- undergraduate research program (the Engineering School provides funding for students to work with faculty on research projects)
- freshmen engineering success class (all engineering freshmen take a one credit hour engineering success class taught by an engineering faculty member in class sizes limited to 19)
- numerous school and department-level welcoming and orientation activities

Prior to E2 Camp, the Engineering School placed limited focus on student commitment to career goals with most of the focus occurring in our Introduction to Engineering class and limited career coaching.

In the spring of 2008, ASU's Engineering Schools developed a new strategic plan with a significant focus on undergraduate education. One aspect of the undergraduate education component of the strategic plan was to take bold steps to increase undergraduate recruitment and retention. We created E2 Camp to jump start our freshmen retention efforts. Furthermore, we decided to require the camp for all entering full-time freshmen starting in the fall of 2008. The specific goals for E2 Camp are:

1. to create community amongst freshmen
2. to bond freshmen with returning students
3. to create opportunities for meaningful interaction between freshmen and faculty both in and outside of the classroom
4. to help freshmen understand and internalize the vision and mission of the school
5. to foster students' understanding of how they can apply their academic experience both as undergraduates and after graduation.

The remainder of the paper provides a description of the camp and how it differs from other college freshmen camps. The paper also presents the logistical challenges of planning and executing a camp for over 700 freshmen as well as the role of undergraduate student mentors and their recruitment and training. Since the successful camp experience also depends on engineering faculty involvement, the paper will describe the creation and deployment of the Freshmen Teaching Academy.

Finally the paper will describe detailed assessment results from two years of camp experience. The paper will also detail data regarding student retention and the first year experience for the freshmen population as a whole as well as for female and underrepresented minorities.

Benchmarking

The notion of a freshmen engineering camp to help new students transition smoothly to the college is certainly not a new one. A 1929 issue of the MIT student newspaper reports that 240 of their freshman class was about to embark on the fourth annual camping experience designed to help new students "get acquainted with their classmates".[5] Rutgers, Rensselaer Polytechnic Institute, and Georgia Tech all boast decades of freshman engineering camps as well.[6,7,8] These camps, however, due to increasing student numbers and the financial burden, have since become on-campus freshman orientation programs.

Currently, Louisiana State University conducts an engineering camp for its freshmen students.[9] As opposed to ASU's E2 Camp which is an intensive, three-day experience designed to take students away from campus to build a common bonding experience for all 900 plus of its engineering freshmen, LSU's program limits its participants to 100 of its entering engineering students and houses its participants on campus. LSU's program, however, does serve as a highly effective orientation and bridge program for its participants. The College of Engineering at the University of Illinois conducts a freshman camp that is quite similar to that of the Engineering Schools at Arizona State University, taking its students to an off-campus camp to engage in similar activities. Illinois' program, however, is limited to its incoming female students only.

The well-noted Texas A&M FISH Camp[10] gives all of its freshman students the opportunity to engage in an off campus camp experience "welcoming the Freshman class to Texas A&M each year with the purpose of giving them an opportunity to have fun, make friends, and learn more about life at Texas A&M." Based loosely on lessons learned through Texas A&M, E2 Camp aspires to the notoriety and impact of FISH Camp while engaging engineering student's in a fun, challenging, and engineering-specific experience.

Camp Staffing and Programming

Designed to support over 900 first-time, fulltime freshmen entering the Engineering Schools at ASU, E2 Camp is a series of five camps that accommodates approximately 180 students each.

The Engineering Schools conduct the camp in a remote location approximately 100 miles from the ASU campus which provides a setting with no distractions for the students. Students at each camp are randomly assigned to 18 cabins in groups of 10. Each of these groups (referred to as cabins) rotates together through as many as 23 activities throughout the three days of camp.

Each camp is staffed by the Camp Director (the Assistant Dean of the Engineering Student Services); two camp leads (professional staff in Student Services); as many as six Engineering faculty (the Associate Dean of Academic and Student Affairs and faculty members of the Engineering Freshman Teaching Academy); two lead Engineering students; and numerous staff including academic advisors, alumni, and industry volunteers. The Camp Sky Y staff at the YMCA facility that hosts E2 Camp facilitates a number of the activities as well. However, the 26 peer mentors—current Engineering students selected for their leadership, communication, and mentoring skills—who spend every hour of the camp with the freshmen students comprise the most impactful staffing of all. The peer mentors, who are nominated for the position, go through a careful screening and selection process and attend hours of training in order to serve in this prestigious volunteer position.

The engineering school designed its programming and staffing at E2 Camp specifically for the purpose of meeting the desired outcomes of creating community amongst freshmen, bonding freshmen with returning students, creating opportunities for meaningful interaction between freshmen and faculty both in and outside of the classroom, helping freshmen understand and internalize the vision and mission of the school, and fostering students' understanding of how they can apply their academic experience both as undergraduates and after graduation. The remainder of this section describes how the programming meets each of the E2 Camp outcomes.

Creating community amongst freshmen

All of the programming and activities during E2 camp have the underlying goal of building community amongst our incoming freshmen. When the students first arrive at camp, they bring their gear to their assigned cabins and engage in what we call cabin time with the mentors. This is the freshmen's first opportunity to meet and start bonding with their cabin mates. During cabin time, the students learn the basic camp rules and engage in an ice breaker activity. From that point on, each cabin engages in a number of small group team challenges, rock wall climbing, and high ropes activities. The Camp Sky Y staff facilitate these challenges encouraging community building through physical and mental challenges which require teamwork, collaboration, trust, and leadership. The freshmen also engage in cabin vs. cabin design and performance competitions, such as water balloon launchers and rubber band cars, which foster camaraderie through team work and fun and spirited competition. Free social time in the evenings provides options like S'mores at the campfire, lighted volleyball courts, ping pong, board games and other directed activities that encourage the freshmen to build community

amongst themselves. Additional activities such as "major lunch" provide opportunities for students to connect with other students in their major.

Bonding freshmen with returning students

Key to the goal of bonding the new students with current, returning engineering students is the corps of peer mentors who staff each of the camps. One peer mentor leads each cabin of students and functions not only as a mentor but as a group member as well. Participating in all of the activities with their cabin throughout the three days of camp, each mentor builds a strong rapport with the students. After each activity the mentor debriefs with the students how that activity's process and outcome apply to the students as they transition from high school to the university. During down times, the mentors have the opportunity to talk with their group about their experiences as undergraduate engineering students and convey to the students the things that have been most impactful to their own academic and personal success. The freshmen also see how the group of mentors themselves form a community bonded by the common experience in the school of engineering. Although not a specific part of our programming, many of our mentors have maintained communication with their freshmen via email, Facebook, and meeting over lunch. The interaction with the mentors helps build student commitment to engineering.

Creating opportunities for meaningful interaction between freshmen and faculty

Through the Global Workshop and the Grand Challenges Curriculum, students interact closely with faculty members of the Engineering Freshman Teaching Academy during E2. The Global Workshop, an activity facilitated by both peer mentors and faculty, presents the freshmen students with scenarios that pertain to global engineering challenges. One such challenge addresses the technical as well as the cultural and ethical concerns of building a bridge in a village in an under-developed country. Through the direction and collaboration of the faculty, students derive solutions to the scenarios and develop poster boards that demonstrate those solutions. The Grand Challenges Curriculum, likewise, is facilitated by faculty and uses an interactive approach for students to think about what challenges our society faces, contemplate their role as engineers in finding solutions to those challenges, and learning how their notions align with those of current engineers. Students also have the opportunity to engage with faculty members during meals and other down times and get to know them as people, breaking down some of the fears and other barriers that often keep freshmen students reluctant to approach faculty members. The faculty interaction plays a key role in strengthening student commitment to career goals.

Helping freshmen understand and internalize the vision and mission of the school

Because the vision and mission of the Ira A. Fulton Schools of Engineering State University are predicated on solutions to global issues and are aligned with the Grand Challenges, the two activities above are instrumental in setting the tone for the freshmen in understanding and

internalizing that mission and vision as they transition to the culture, mindset, and ethic of the school. In addition to these activities, the school's Dean, Executive Dean, and Associate Dean engage with the students at each camp in formal and informal discussions related to mission and vision. Through these interactions and the students' interactions with peer mentors, faculty, staff, and alumni—the freshman learn that the mission and vision is simply a way of life incorporated into the experience of being an engineering student at ASU.

Fostering students' understanding of how they can apply their academic experience

Built into the core of the E2 camp experience is the notion that engineers make a difference and that the freshman students can start making that difference now. Throughout the camp, the students hear from faculty, alumni, and industry partners how professional engineers are grappling with and solving today's and tomorrow's issues. They hear how they, as future engineers will make an impact in the same way. This helps solidify their commitment to an engineering career. But key to the message throughout all camp activities, from the Global Workshop and Grand Challenge Curriculum to the informal time with their peer mentors, is the notion that they can make that difference now as well. They learn that—through such activities as undergraduate research, applied projects, engineering service learning, and service-oriented engineering student organizations—the carrot isn't four years away. In fact, it's in their hands.

Logistics and costs

As can be imagined, the logistics and costs for a program of this magnitude are daunting. Planning for E2 camp is on a thirteen month calendar starting with finalizing the facility booking for the subsequent year's camp.

In planning for the initial E2 camp for the summer of 2008, one of the more challenging tasks was developing the daily schedule of activities. Many of the activities facilitated by the Sky Y staff can accommodate no more than 15 people at a time due to their very nature and the limitations of the facilities. Each activity requires approximately one hour. Other activities, such as the balloon launcher design and build, are not limited by a maximum number of participants but do require a significantly longer period of concerted time to accomplish. The challenge was to create a matrix that accounts for numerous activities of different student capacities and lengths of time and that rotates18 groups of students through all activities. Fortunately, this type of challenge is the expertise of one of our engineering staff who developed the activity matrix currently utilized for E2 Camp.

The list of tasks is virtually unending, and the level of required detail is quite challenging. Many, if not most, of these tasks have numerous subtasks. For instance, the April task of identifying and training peer mentors has a page of tasks to be accomplished before it can be checked off the list. Likewise, the March task of setting the curriculum for the Grand Challenges

workshop requires the collaboration an interdisciplinary team of four experts from across the campus to accomplish.

As previously alluded to, E2 Camp also requires a great number of people (staff and volunteers alike) to make it happen. Key to the planning of the camp is the Camp Coordinator for whom E2 Camp is approximately 75% of her FTE. The Camp Coordinator has established a core planning committee comprised primarily of Engineering Student Services staff with several staff members from the engineering academic units. Each of the committee members oversees a number of tasks which often require soliciting the assistance of volunteers to accomplish.

The following list indicates the number of individuals required throughout the actual functioning of the five 2009 E2 Camps. These are composite numbers; not all individuals served at all camps.

Dean's Administration	6	(approx. 4 per camp)
Faculty	19	(approx. 5 per camp)
Engineering Staff	54	(approx. 5 at each camp and 5 on campus per camp)
Peer Mentors	58	(approx. 26 per camp)
Alumni	4	(approx. 2 per camp)
Sky Y Staff	6	(6 at each camp)

The costs for running E2 Camp are significant, with the largest expenditures being those of the camp facility (which includes staff, room, and board) and the bus rentals. In 2009, the gross expenses came to approximately $175,000.00 or about $215 per student. Faculty, staff , and mentors volunteer at the camp and are not included in this figure. To subsidize some of these expenses, the engineering school assesses a $50 fee charged to students whether or not they attend the camp. After adjusting for the $50 student fee and some alumni sponsorship, the net cost to the Engineering School came to approximately $128,000.00. Having accommodated an actual number of 774 students (82% of the engineering freshman class), the 2009 E2 Camp cost the Engineering School approximately $165.00 per student.

Assessment

After two years of conducting E2 Camp, we see that the camp is having a very positive influence on our incoming freshmen. With only one year of retention data, there is no trend, but the single-year data supports that E2 Camp had a positive impact on the retention of the 2008 participants.

Retention Activity	Participant N	Non-Participant N	Fall 2009 Retained University					Fall 2009 Retained College				
			Participants		Non-Participants		Percent Difference	Participants		Non-Participants		Percent Difference
			N	%	N	%		N	%	N	%	
E2 Camp	599	226	534	89.1%	181	80.1%	**9.1%**	436	72.8%	149	65.9%	**6.9%**
Female (N-172)	*132*	*40*	*125*	*94.7%*	*37*	*92.5%*	*2.2%*	*96*	*72.7%*	*29*	*72.5%*	*0.2%*
URM (N-211)	*143*	*68*	*127*	*88.8%*	*54*	*79.4%*	*9.4%*	*95*	*66.4%*	*45*	*66.2%*	*0.3%*

With 73% of the 825 engineering freshmen attending E2 Camp in 2008, 89.1% of the participants were retained at the university (compared to the 80.1% of the non-participants), and 72.8% of the participants retained in engineering while only 65.9% of the non-participants were retained in engineering. The camp has a much smaller impact on the retention of our female students, though the female retention percentages are significantly higher than those of the male students. Of the 172 female students entering as engineering freshmen in 2008, 132 participated in E2 Camp. 94.7% of those participants retained at the university while 92.5% of the non-participants retained, and 72.7% retained in the school of engineering compared to the 72.5% of the non-participants who were retained. The impact on underrepresented minorities is particularly impressive, with 88.8% of participants being retained at the university, compared to 79.4% of the URM non-participants. E2 Camp, however, is much less impactful in retaining URM in the engineering school itself, with 66.4% retained in engineering, compared to the 66.2% of non-participant underrepresented minorities.

In 2009, we were much more successful at encouraging students to attend camp, having yielded 82% of the 2009 freshman class compared to the 73% in 2008. Although we indicate that all engineering freshmen are required to attend, there is very little holding the students to that obligation. All incoming engineering freshmen are assessed a $50.00 E2 Camp fee. If a student doesn't attend E2 camp, she or he loses that fee. Also, during the second iteration of E2, we assigned a grade to the Grand Challenges portion of the Camp, and that grade figured into the final grade of a common entry-level engineering course for the fall semester. This may account for a portion of the increase in yield. Our hope is that, as the tradition and reputation of E2 Camp increases and as the general excitement about the camp funnels down to newly admitted freshmen, the yield will move ever-closer to 100%.

The post-camp student surveys also indicate that the student satisfaction with E2 Camp is quite high. The participant surveys show that the students were overwhelmingly positive about their interactions with the peer mentors with no less than 95% of the students indicating favorably in all categories and 99% agreeing or strongly agreeing that the mentors were both knowledgeable and approachable. One of the greatest testaments to the students' view of the peer mentors is the number of freshmen who inquired, immediately after camp, into how they can become mentors in subsequent years. The surveys also show that the students feel that E2 Camp helped them learn more about engineering in general and more, specifically, about the school of engineering

at ASU. 92% of the participants indicated that they enjoyed their interaction with other engineering freshmen, with their comments indicating that E2 Camp was impactful in helping them build friendships with their peers. In addition, 86% indicated that the camp connected them in meaningful ways to current engineering students, faculty, and staff.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
My Peer Mentor helped me to connect with my group members	60%	35%	5%	1%	0%
My Peer Mentor was approachable	79%	19.5%	1.5%	0%	0%
My Peer Mentor helped make this an enjoyable experience	70%	25%	5%	0%	0%
My Peer Mentor was knowledgeable about the Fulton School of Engineering and ASU	69%	26%	5%	0%	0%
I have enjoyed interacting with other students during E2 Camp	49%	43%	4%	1%	0%
After E2 camp, I am more knowledgeable about the School of Engineering	28%	45%	22%	4%	.3%
Activities connected me to current engineering students, faculty and staff	41%	45%	11%	1%	0%

The anecdotal evidence indicates that the incoming freshmen engineering students are not the only ones who are positively impacted by E2 camp. Faculty who worked with the students at camp comment on a different energy level amongst the freshmen in the classroom in the fall. Staff, especially those who don't typically work closely with students, indicate the pleasure they get when a student they met at camp calls them by name when passing on campus. Interest and participation in engineering student organizations has also swelled, and peer mentors discuss not only the fun they have had at camp, but also their sense of accomplishment and the increased sense of camaraderie they feel amongst the undergraduate engineering students.

Conclusion

With the bold steps that the Ira A. Fulton Schools of Engineering at Arizona State University is taking to impact the success of its undergraduate students through a highly interactive curriculum, more experiential learning opportunities, problem-based learning, and opportunities to conduct high-level and impactful research—E2 Camp is a meaningful and successful way to

welcome our new freshmen to the engineering family and the dynamic experiences they will have as engineering students.

Each year we learn more about what we can do better. In learning the impact that the peer mentors have on the freshmen students, we would like to see many more facets of the Camp being designed and implemented by our current students, especially since over 1,400 of them have either participated in the camp, served as peer mentors, or have experienced E2 Camp from both perspectives. We believe that the most and best changes to E2 Camp will occur when our undergraduates lead that change.

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