

AC 2007-2583: INTRODUCTION TO ENGINEERING PROGRAM: A THREE-WEEK SUMMER CAMP FOR RISING SENIORS IN HIGH SCHOOL

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Introduction to Engineering Program: a Three-Week Summer Camp for Rising Seniors in High School

Abstract

The Introduction to Engineering Program (IEP) is a three-week summer camp for high school students who have just completed their junior year. Students come from all around the country, and in some cases from abroad. IEP's purpose is to provide participants with an overview of all fields in engineering, while giving the students a taste of college life, a look at career opportunities, and a chance to meet professional engineers as well as engineering faculty. Students work on several projects, attend lectures, write reports, code programs, give presentations, do problem solving and design, go on field trips, and interact with a very diverse group of peers.

In this paper we describe the IEP program, and provide an overview of its selection process and its structure and content. We examine how effective the program has been, and describe some of the changes that have been implemented recently. We present, for the very first time, some valuable statistics gathered over eight years. We discuss whether the program is an effective recruiting tool, be it into engineering in general or into our institution in particular. We conclude with some recommendations.

Introduction

There are a number of programs around the country that offer a summer program for high school students interested in engineering. Institutions such as Michigan State University¹, Virginia Tech², University of Virginia^{3,4}, University of Alabama⁵, and others offer a wide variety of such programs.

The University of Notre Dame's IEP program has a number of features that make it stand out. Its cost (\$1,400 for this coming summer, plus transportation and incidental costs) is relatively low, considering the program's length. Furthermore, the people involved in providing lectures and instructions to the students are all faculty at the university's School of Engineering, giving the students a direct contact with university engineering faculty, an experience they all cherish. The length of the program, just shy of three weeks, is ideal, allowing it to cover a very wide range of engineering topics and giving students the time to work on meaningful hands-on projects. A number of scholarships are also available, some full and some partial, and are merit-based as well as need-based. Furthermore, IEP does not only draw from the state, but rather from the whole country, as well as some foreign countries, giving its students a chance to meet peers from all over the world, and providing them with a rich sense of culture and diversity. IEP has seen a very large increase in the number of applications in the past nine years, prompting a forced enrollment cap, and its success is confirmed by the feedback from the students, their survey responses, their comments to their parents and guidance counselors, and by the academic accomplishments of its alumni, as demonstrated by those former IEP students who end up enrolling at Notre Dame.

The information and data presented in this paper are a result of data gathered over eight years, starting in 1998, the year the author became IEP director, until 2005, the year the author was requested to give a presentation to the engineering college council. The paper also provides some updated data for 2006.

Background

The Introduction to Engineering Program⁶ (IEP) at the University of Notre Dame⁷ is a summer program for high school students who have just completed their Junior year. Students come from all over the United States, and, in some instances, even from abroad. There are two sessions each summer, each of which lasts three weeks. The six weeks coincide with the first six weeks of Notre Dame's summer session, usually from the middle of June until the end of July.

Until and including 1997, IEP had consisted of two combined programs: one for women, and one for underrepresented minorities. In 1998, IEP was open to all students who are rising seniors in high school. In 2001, a web site was set up to accept online applications. The program's web page⁶ remains the most effective way to get information out. It maintains all the information about the program, contains a FAQ, and was used very frequently as a means to contact us with questions. It is via the web page that the students apply to the program.

An important aspect of the program is the selection of counselors. They usually number seven to ten, and most are engineering students. The majority are former IEP students themselves. The male/female ratio of counselors is chosen to reflect that of the students, usually in the order 2 to 1, sometimes 3 to 2.

The IEP counselors handle the registration upon the attendants' arrival, organize activities in the evenings and on weekends, take care of enforcing dorm rules, including curfew, and provide very valuable assistance in the Engineering Learning Center. Some of them also come to the field trips.

Pre - IEP

The preparation for the two IEP summer sessions of a given year start as soon as the previous year's sessions end. The first step is to update the program's web site to allow students to start applying online, which is the method most commonly used by most applicants (though some applications are still received via regular mail). The funds for running the program come from the engineering dean's office.

Once applications are in, the selection process begins. Students are accepted into the program based on several factors, including their grades, test scores, number of years of math courses, and a short essay where they describe why they want to be part of IEP. Transcripts and letters of recommendation are also requested for many students.

The selection process is blind once the applications are in. However, strong efforts have been made in the past few years to attract women and under-represented minorities from around the country, and we have been very successful in that regards.

Students who get accepted into the program receive forms to fill out, which include student information, parental consent, and health data. Those forms are imposed on the program by Notre Dame’s Risk Management Office. Those accepted students who confirm that they will attend IEP then send the forms back to us, at which point their information gets entered into the system to prepare for their arrival. The above process usually occurs during January - April. The list of students is then sent to the Registrar and to the Housing Office, as well as to the Office of Information Technologies.

Around a month before students arrive on campus, they receive a packet with all the information they need, including what to bring with them, where to go, whom to contact, and with answers to general questions.

Scholarships

We consider it crucial that an engineering program for high school students be able to provide scholarship money, whether done via donations, funds, or grants.

Several scholarship funds have been very helpful for many IEP students. For several years, a number of students have received full, or nearly full, scholarships from ASCE (American Society of Civil Engineers, out of Chicago, IL) and from IKIC (I Know I Can, out of Columbus, OH). More recently, scholarships have also been received from ACE (Alliance for Catholic Education, out of the University of Notre Dame).

The table below shows the scholarships amounts provided by ACE, ASCE, and IKIC during the last three years of the study, as well as the number of students who benefited from those scholarships:

| | ACE | | ASCE | | IKIC | | <i>Totals</i> | |
|---------------|----------|----|----------|----|----------|---|---------------|----|
| 2003 | \$ 5,400 | 6 | \$ 3,600 | 4 | \$ 650 | 1 | \$ 9,650 | 11 |
| 2004 | \$ 9,016 | 7 | \$ 6,240 | 5 | \$ - | 0 | \$15,256 | 12 |
| 2005 | \$ - | 0 | \$ 3,750 | 3 | \$ 1,625 | 3 | \$ 5,375 | 6 |
| <i>Totals</i> | \$14,416 | 13 | \$13,590 | 12 | \$ 2,275 | 4 | \$30,281 | 29 |

Table 1: Scholarships from long-term sponsors, and number of scholarship recipients

IEP itself also offers scholarship opportunities, mostly partial. The main IEP scholarship is the Martell scholarship, started in 2000 by an endowment from a Notre Dame alumnus. Its intent was to provide partial financial assistance to students interested in Engineering who were in need or who could not afford the full IEP expenses. Students who apply for

the Martell scholarship are required to fill out a separate form, where they need to specify additional information. The forms are then reviewed, and a decision is made as to the amount granted, which is usually between \$100-\$600. In the past five years, 121 students received a scholarship from the Martell funds.

The table below shows the number of recipients of the Martell scholarship and the dollar amount, shown by year, for the years 2000 through 2005:

| <i>Martell Scholarship Recipients</i> | | |
|---------------------------------------|---------------------------|---------------------|
| <i>Year</i> | <i>Number of Students</i> | <i>Total Amount</i> |
| 2000 | 10 | \$2,200 |
| 2001 | 21 | \$6,491 |
| 2002 | 21 | \$6,950 |
| 2003 | 23 | \$6,087 |
| 2004 | 19 | \$5,000 |
| 2005 | 27 | \$6,800 |
| <i>Total:</i> | <i>121</i> | <i>\$33,528</i> |
| | <i>Average:</i> | <i>\$277.09</i> |

Table 2: Martell Scholarship

The sections above described long-term or middle-term scholarships. IEP students have also been able to make use of some one-time scholarships. The past two years, a number of students (19) benefited from various generous full scholarships to IEP. They consisted of grants from Motorola in 2004 and from Northrop-Grumman in 2005. Furthermore, in 2004 several students from Northwest Indiana received full scholarships as a result of an arrangement with Alcoa and with a local congressman from Indiana’s first district.

The table below shows the scholarships amounts provided by the above-mentioned sources during the last two years, as well as the number of students who benefited from those scholarships (note: the Northrop-Grumman scholarship fund also covered travel expenses, and was given to students from the Mississippi / Alabama area):

| | | | |
|------|---------------------------|-----------|----|
| 2004 | Motorola Fund | \$ 5,000 | 4 |
| 2004 | Alcoa / Rep. Visclosky | \$ 10,000 | 8 |
| 2005 | Northrop-Grumman | \$ 10,000 | 7 |
| | | \$ 25,000 | 19 |

Table 3: Scholarships from one-time sponsors, and number of recipients

IEP in Session

Students coming to IEP arrive on a Sunday, at the start of their three-week session, and register in their assigned residence hall, one for men and one for women. The hall assignment is made by the Office of Residence Life. The students then check in and are helped by the hall staff and by the IEP counselors. They are then given a key to their room as well as their student ID. They are usually placed two students per room. Students are asked to bring their own bed sheets, pillows, and towels.

Monday morning of the first week starts with an orientation session. The program director provides the students with most of the information that they will need, including schedules, details of what is expected of them and what their duties are. Data on their computer user account is also provided. The dean of the School of Engineering is invited to talk to the students on that first day, and gives them a presentation about engineering. In the afternoon of that first full day, a group picture takes place. The group then proceeds to the Engineering Learning Center to get introduced to the facility.

Below is a recent group picture, taken from the first session of IEP 2006.



Each day of the week - other than Thursday, the field trip day - students are given morning talks by faculty members of Notre Dame's School of Engineering. The talk is often in a lecture format, with occasional hands-on activities or group discussions. The topics cover a wide range of engineering fields, and provide the students with an overall understanding of what it means to be an engineer, and what engineers do.

In the afternoons, students go to the Engineering Learning Center. They are divided into groups, and work on their projects. Students also come back to the Learning Center in the evening to do their homework, work on their projects, research their presentation topic, and type their reports. Students' work and expectations are described below.

Two field trips are normally scheduled for each session. While their destinations may vary from year to year, two frequent locations include: the Delphi plant in Kokomo, IN, with a side trip to the Grissom Air Museum in Grissom, IN; and the Museum of Science of Industry in Chicago, IL, followed by a relaxing escapade at the beach at Warren Dunes, MI.

As to room and board, IEP students are well taken care of. They all reside on campus in residence halls during their stay, one for men and one for women. The counselors also live in the dorms (along with a hall manager and two assistant hall managers), enforcing curfew and maintaining general order. They also organize activities on evenings and weekends, and often hold nighttime discussions about what it is like to be an engineering student. IEP students also are also provided with meal plans, which allows them to use the dining hall and Notre Dame's food services facilities.

Daily Work

Each student is required to write a one-page report for each of the morning lectures, as well as for each field trip. The report details the lecture topic, and the student is also asked to provide his/her opinion on the subject. The written reports are grouped into sets, with one set due every few days.

The projects are an important part of the afternoon work in the Learning Center. Students work on those projects in groups. The Lego Mindstorms⁸ kit is used for one of the projects, where the goal is to create a robot that is controlled by a program that the students write. The second project uses the K[^]NEX kit⁹, where the goal is to build a bridge that satisfies given constraints, while at the same time optimizing its cost and load. Each project also involves a competition at the time of the project demonstrations, which is usually the last day of camp. The students enjoy the competitive nature of the project. The incentive of getting awards obviously has a lot to do with that!

Students are also required to conduct research on a narrow field within the realm of engineering, and to create and deliver a powerpoint presentation to the whole class. They benefit by learning not only how to create a presentation, do research, and work in groups, but also by being forced to develop public speaking skills.

The session ends with a final banquet, which takes place on the Wednesday of the third week. Parents and guests are also welcome to attend at no cost, and many do, making the long trip from their respective hometown and state. The certificates of attendance, signed by the dean of engineering and by the program director, are distributed at the banquet, along with some rewards.

Enrollments

The tables below show the enrollment figures for IEP, showing the attendance per session, as well as by gender. We also show some graphs, depicting the trend over the last eight years.

We would like to remind the reader that the author took over the program in 1998, and opened it to all students, irrespective of gender or ethnicity (the program only targeted women and underrepresented minorities prior to 1998). Another notable milestone is that in 2001, the application process moved online.

We start by showing enrollments, by gender and session, during the summer of 2005, the most recent year of this paper's study (see later in this paper for some updates):

| <i>2005</i> | Male | Female | Total |
|-------------|------|--------|-------|
| Session I | 35 | 15 | 50 |
| Session II | 44 | 21 | 65 |
| Total | 79 | 36 | 115 |

Table 4: 2005 enrollments, by session and gender

We compare the above with enrollments from 2001 until 2004:

| <i>2001</i> | Male | Female | Total | <i>2002</i> | Male | Female | Total |
|-------------|------|--------|-------|-------------|------|--------|-------|
| Session I | 27 | 12 | 39 | Session I | 39 | 11 | 50 |
| Session II | 33 | 17 | 50 | Session II | 37 | 17 | 58 |
| Total | 60 | 29 | 89 | Total | 76 | 32 | 108 |

| <i>2003</i> | Male | Female | Total | <i>2004</i> | Male | Female | Total |
|-------------|------|--------|-------|-------------|------|--------|-------|
| Session I | 34 | 19 | 53 | Session I | 38 | 17 | 55 |
| Session II | 34 | 18 | 52 | Session II | 39 | 12 | 51 |
| Total | 68 | 37 | 105 | Total | 77 | 29 | 106 |

Table 5: 2001-2004 enrollments, by session and gender

Below are enrollments for 2000, 1999, and 1998:

| <i>2000</i> | Male | Female | Total | <i>1999</i> | Male | Female | Total | <i>1998</i> | Male | Female | Total |
|-------------|------|--------|-------|-------------|------|--------|-------|-------------|------|--------|-------|
| I | 11 | 10 | 21 | I | 10 | 9 | 19 | I | 16 | 14 | 30 |
| II | 33 | 17 | 21 | II | 19 | 5 | 24 | II | 25 | 16 | 41 |
| Total | 60 | 28 | 42 | Total | 29 | 14 | 43 | Total | 41 | 30 | 71 |

Table 6: pre-online application enrollments (1998-2001), by session and gender

We provide total enrollments for the period 1992 – 2005:

| | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|-------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| <i>Session I</i> | 52 | 50 | 33 | 40 | 38 | 28 | 30 | 19 | 21 | 39 | 50 | 53 | 55 | 50 |
| <i>Session II</i> | 39 | 59 | 44 | 49 | 33 | 27 | 41 | 24 | 21 | 50 | 58 | 52 | 51 | 65 |
| <i>Total</i> | 91 | 109 | 77 | 89 | 71 | 55 | 71 | 43 | 42 | 89 | 108 | 105 | 106 | 115 |

Table 7: Total enrollments, 1992 – 2005, by session.

Figure 1 below depicts the numbers by session and by gender, respectively, for the eight-year period of the study (1998 – 2005):

| <i>Year</i> | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|--------------|------|------|------|------|------|------|------|------|
| <i>Total</i> | 71 | 43 | 42 | 89 | 108 | 105 | 106 | 115 |

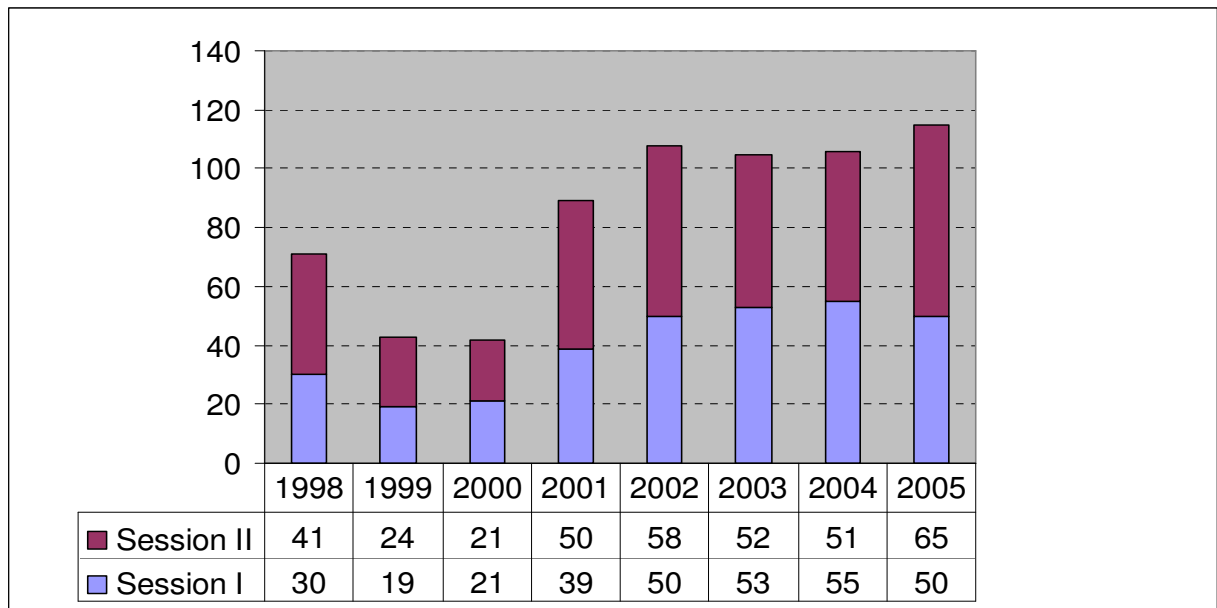


Figure 1: Numbers by session, 1998-2005

The increase in numbers in 2001 and beyond can be attributed to the establishing of the online application, and the increased ease in finding our information on the web. Prior to 2001, our office would send a brochure to guidance counselors at thousands of high schools from around the country, hoping that they would alert their students to our program. The web site, followed by word of mouth resulting our success, has made our program much more visible.

As the numbers have increased, we have been forced to set a cap. While numbers in the mid-50's per session are usually ideal, we have recently been able to properly manage over 60 students per session. We feel though that a cap of mid-60's is necessary, as a higher number would have a negative effect on the quality of the program.

Figure 2 below depicts the numbers by gender, for the same range (1998-2005):

| | | | | | | | | |
|--------------|------|------|------|------|------|------|------|------|
| <i>Year</i> | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
| <i>Total</i> | 71 | 43 | 42 | 89 | 108 | 105 | 106 | 115 |

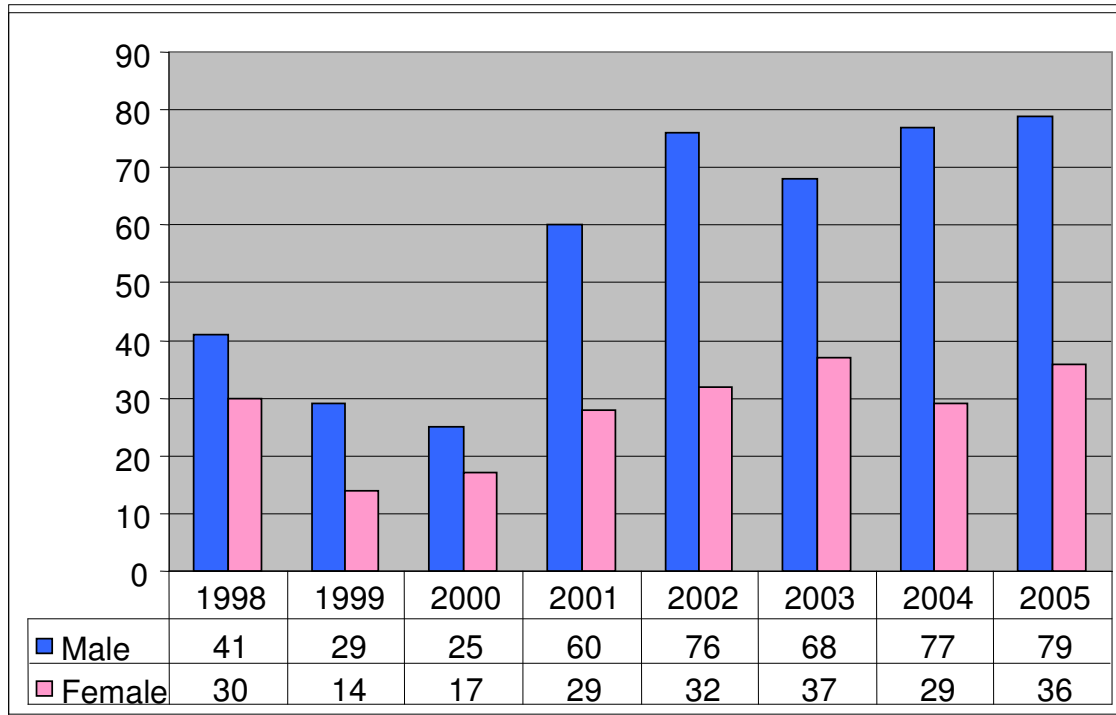


Figure 2: Numbers by gender, 1998-2005

As we see above, IEP's male/female ratio has been relatively good. For the range 1998-2005, it is 2 to 1 (32.9% female). For the range 2001-2005 (four years of high IEP numbers), the ratio is slightly higher (31.0% female). The updated numbers for 2006, shown in the next section, are the best yet, with 76 men and 51 women (40.2% female). We are also currently processing applications for the 2007 sessions, and we anticipate, and even high percentage of women. We are very encouraged by these numbers, and we see it as a testimony to the success of our program.

It should be noted that our male/female ratio is considerably lower than at most college engineering departments, including Notre Dame. We see this as a very positive sign, and are encouraged by it.

Update

Since the study for our report – the source for this paper - was conducted, and its data collected, IEP held two sessions in the summer of 2006, and is currently processing applications for the 2007 sessions.

In 2006, a record 127 students took part in the program. The table below shows the data, by gender and by session:

| <i>2006</i> | Male | Female | Total |
|-------------|------|--------|-------|
| Session I | 35 | 29 | 64 |
| Session II | 41 | 22 | 63 |
| Total | 76 | 51 | 127 |

Table 9: 2006 enrollments, by session and gender

As can be seen above, each session's size was nearly in the mid-60's, near our own acceptable absolute max. We were also very pleased with the improved gender ratio, especially for the first session.

In 2006, the program also provided a record number of students (31) with Martell Scholarships, totaling \$8,400. Updating Table 2, the Martell scholarship fund has now helped over 150 students, with a total of almost \$43,000.

In regards to the upcoming 2007 sessions, with the applications we have already received at the time of the writing of this paper, we anticipate that the numbers will be very similar to those of 2006. We welcome the challenge!

From IEP to Notre Dame

A good number of IEP participants apply to Notre Dame, and many of them end up attending school here, though not all in Engineering. We keep track of those students, and try to assess IEP's impact on their academic choices.

The following table displays data for the past five years, showing the number of students who applied to Notre Dame, numbers who were accepted, and numbers who enrolled.

| | IEP 99 | IEP 00 | IEP 01 | IEP 02 | IEP 03 | IEP 04 | IEP 05 |
|-------------------------|--------|--------|--------|--------|--------|--------|--------|
| <i>total students</i> | 43 | 43 | 89 | 108 | 105 | 106 | 115 |
| <i>applied to ND</i> | 24 | 19 | 53 | 72 | 71 | 78 | 81 |
| <i>accepted into ND</i> | 14 | 8 | 24 | 28 | 25 | 23 | 25 |
| <i>enrolled at ND</i> | 11 | 5 | 22 | 27 | 21 | 21 | 22 |
| <i>in Engineering</i> | 8 | 3 | 14 | 18 | 11 | 12 | - |
| <i>ND class of</i> | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |

Table 8: IEP students who apply to Notre Dame (ND)

Note that student admission at Notre Dame is controlled by the Admissions Office only. Individual departments have no say in who gets admitted to Notre Dame, and do not see the students until their sophomore year.

Challenges and Comments

We now discuss the different characteristics and elements of IEP, how successful they are, and what changes could be made to improve the program, based on observations and feedback.

Morning lectures still play an important part in the program. They allow students to meet and interact with engineering professors, and give the students a taste of what college classes can be like. These are among the selling points of the program. Professors who teach the morning lectures are engaging, interesting, and encourage interaction. While a number of comments suggested that the whole day do away with lectures and consist only of projects, the majority agree that the morning lectures are actually a crucial part of the program, as they give students a good idea of what the different fields of engineering are, and what engineers do.

The program fee (\$1,250 in 2005 and 2006, \$1,400 for 2007, including a meal plan) is still much lower than other summer programs, and should remain in that range. It is a strong selling point. A high program fee would make us too cost-prohibitive, would prevent us from attracting the best students who cannot afford us, and would instead turn us into a program for the social elite. Our scholarships funds have obviously been of great help, but we seek more consistent funding from sponsors in order to be able to provide full scholarships on a regular basis.

The Learning Center in the School of Engineering is an invaluable asset. The students love spending time in there, and the atmosphere is very conducive to a great group working environment. The center was also available in the evenings (provided a counselor was present), which allowed students to work on their homework, report, project, or presentation. During weekdays, we kept the students quite busy.

The field trips are an important part of the program. The trip to the Delphi plant is a constant year after year, and is very valuable. Parents are especially appreciative that their son/daughter had a chance to visit a manufacturing firm. Other trips are being planned for the future, including one to the Whirlpool headquarters, one to the Hummer assembly plant, and one to a nearby prosthetics manufacturing facility.

Both the robot project and the bridge project seem to be ideal for teaching students design and teamwork. A third mini-project was added last summer on a pilot basis, where students designed a simple counter on a small breadboard. The project was quite successful, and it will be used again this coming summer.

Report-writing should still be a requirement for each lecture that the students attend, and group research on a given engineering topic, followed by a powerpoint presentation, should remain a main part of the program. Engineers are often lacking in both writing and presentation skills, and the above will hopefully help the students develop a better sense of how to develop those skills.

The banquet is still a very good way to provide closure to the program, and is open to students as well as parents or relatives. Certificates of attendance are distributed, and awards are given to the group winners of the project competitions.

IEP has a good relationship with Notre Dame's Admissions Office. Each session, they send us an admissions counselor during the second or third week to describe to the students the process of college applications in general, not necessarily to our institution. During the academic year, they also provide our program with invaluable data that help us keep track of which past IEP attendees apply to Notre Dame and which get accepted.

IEP has a FAQ page on its web site, which is frequently updated. At the end of each session, IEP students are asked to look at the FAQ page and indicate what they wish they had known prior to coming which would have made it easier to prepare for their arrival, and that information is fed into the page. The common questions that parents ask via email are also added to the page on a regular basis.

We have already established that scholarship funds are a very important aspect of any engineering summer camp. We therefore want to maintain very good contacts with ASCE and IKIC, and any other sponsor. We are most importantly seeking a steady fund with a higher endowment, in order to help a larger number of academically skilled students.

In regards to enrollments, the numbers have increased in the past few years, reaching what appears to be a steady state more recently. That steady state however is a self-imposed one, as we have been forced to cap the size of each session. From a management standpoint, we find that the ideal number of students per session is in the 45-55 range, with a possible maximum of 60. We have been able to maintain that preference, but have most recently (session 2 of 2005) found ourselves with 65 students. Since the end of our study for this paper, our numbers have stayed in that high range (64 and 63 for the two sessions of 2006). We do however have a need for setting an absolute maximum per session, which is 66, the size of our preferred classroom, per fire regulations. With so many applications each year, and with most coming from very good candidates, it is becoming nearly impossible to stay in the "ideal" range, and we anticipate the numbers for 2007 to also be in the mid 60's per session, with over 100 students wait-listed and nearly 40 students rejected. We also feel that if we were to increase the session size to 70 or more (using a different classroom and facilities), we would be shortchanging the students because it would be more difficult to manage the large group, and the overall quality of the program would suffer as a result.

Following up on the enrollment issue, in dealing with all the applications, a method of intentional "over-acceptance" (in numbers) is implemented, by using the assumption that around 80% of accepted students will end up confirming by "accepting the acceptance" and join IEP. The above assumption has been very reliable for the most part, but the recent spike has put it into question, because of a smaller than expected number of students who declined the acceptance. A better method needs to be used to try to anticipate such declines, such as by seeking earlier commitment from students.

As mentioned above, we are pleased with IEP's male/female ratio, and we anticipate an even better ratio for this upcoming summer. As to our percentages of underrepresented minorities however, although it has been good relative to the numbers at Notre Dame, it has not been very steady. Whereas most of the scholarship funds do target minorities (notably ASCE, IKIC, Motorola, and Northrop-Grumman), the general application process, outside of the above scholarship sources, is a blind one. As a result, the study that produced the data for this present paper does not provide us with exact numbers of minorities, but only an anecdotal feel for them. It is only recently that we have recognized the need to track such numbers.

There are other numbers we would also like to track. As we seek additional staff help for our program, we will be able to perform those studies. For one, we would be interested in finding out how many former IEP students end up studying engineering in college, as we only have those numbers for Notre Dame. Other numbers of interest include the number of scholarship recipients who study engineering (at Notre Dame, and elsewhere), a study what would help us assess the effectiveness of the various scholarship funds.

Conclusion

IEP provides a tremendous opportunity for rising high school seniors to explore the world of Engineering. By experiencing all that IEP offers, students develop a very good understanding of what engineers do, and of what would await them if they were to choose to become one. And even if some students decide at the end of the program that engineering is not for them, IEP would still have been a success for them as it helped them narrow down their choices, while understanding what engineering is about.

The success of the program in the past few years has been wonderful. It is such a relief to see so many teenagers interested in engineering, and it is such a joy to see a number of them go to college and major in Engineering. And the fact that some of them do end up matriculating at the University of Notre Dame is an added unintended bonus. The vast majority of IEP alums who end up coming to Notre Dame as engineering majors excel in their studies.

A main challenge is to try to get as many of the top students as possible from around the country. This is where scholarships can be very helpful. From our eight-year study, we see that nearly 170 students have received at least some scholarship in the past six years (out of a total of 565 students, so around 30% of students). That is a good amount, but it could be higher. We again hope to be able to secure permanent funds through an endowment.

There are always challenges of course. All of them can be dealt with and resolved, and each year's experiences help make the following year a better and more efficient one. We have done a good job of improving the program based on our own assessment and from the feedback received each year, and we have turned IEP into one of the premier such programs from around the country.

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