

A STRATEGY FOR SUCCESS: THE *EDGE* PROGRAM IN THE SECOND YEAR

Dan G. Dimitriu, Jerry O'Connor

**Physics, Engineering, and Architecture Department
San Antonio College**

This paper presents the results and the lessons learned from the second iteration of the EDGE Summer Program that was initiated in 2003^[1]. This project was funded by the Alamo Community College District Foundation and the National Science Foundation, with additional support from the ENLACE Foundation. Plans for the next program in Summer 2005 are also outlined.

Recruiting and retaining students is a persistent challenge for engineering educators in almost every engineering program. Many universities and colleges have been using a broad range of outreach programs to introduce high school students to engineering with various degrees of success.^[2-8] There appears to be no certain method that works in all cases to attract students into a profession that lacks media exposure and Hollywood appeal. We started our second year cycle of EDGE with the goals of increasing students' and parents' awareness of our program, increasing the number of students participating in the program (knowing that word of mouth is the best advertising), and providing an engaging, student centered program. One of the key elements that made our program possible was the strong support and encouragement we received from our campus administrators, from the Dean all the way up to the President of the college. Another was the ability to hold open discussions among our team members regarding all aspects of the program.

Our experience from 2003, when the program was completely unknown to the public, prompted us to make some modifications for 2004. Because the small number of students that were able to qualify for College Algebra, we decided to formally create a dual-track program for 2004. The primary track followed the original program concept: College Algebra (MATH 1314) and Introduction to Engineering (ENGR 1201). This track also remained identified as *the* EDGE program, and was the only one advertised. The secondary track included Computer Literacy (COSM 1301) and ENGR 1201. Students not qualifying for College Algebra, but with college level placement scores for English and reading could be enrolled in the secondary track. Successful completion of course work in either track would provide the same number of college credit hours.

The 2003 EDGE Program was advertised through posters, mail-outs, press releases, and visits to local high school classes. Although a great deal of interest had been consistently expressed in the program, that interest was not reflected by the number of applications received. For 2004 we

shifted our marketing emphasis from high school classes, teachers, and counselors to making direct contact with high school principals and district administrators.

Although obtaining appointments was often difficult, Dr. Dimitriu succeeded in meeting with the top administrators in all nineteen independent school districts in our area. These administrators also expressed their interest and support for the program. Some exceeded our expectations by having their districts do a mass mailing to potential students in their district, including our program announcement and application forms. Another change implemented for 2004 was to hold an open house on our college campus to introduce students and their parents to our institution and to the program. This gave us an opportunity to answer questions about the program and provide information about the college and scholarships available for students entering STEM fields. We also tried to convey the idea that college courses were different from those in high school, and distributed a handbook of college and program policies. The event was very well attended, (standing room only).

Program Details

Students were required to meet the same admission requirements as other college-level students, and paid only a \$25 entry fee. As in the previous year, students attended classes in the morning from 9:00 AM to noon, (Monday through Friday for eight weeks). Afternoon activities consisted of supervised study (SS1) and student success (SS2) sessions from 1:00 to 4:00 pm. Each class cohort was to be split into two smaller study groups, each with a Study Leader trained in group learning methods (similar to Supplemental Instruction) prior to the start of the program. The training also emphasized the value of collaborative learning and peer support, and explained the purpose and function of Learning Communities. The SS1 sessions provided a supportive environment for students to work together on homework and group projects while building a sense of community and shared success. Students enrolled in the secondary track were also expected to participate in the PLATO Fastrack Advantage program to improve their math proficiency. The SS2 sessions were one hour long and included the entire class, along with the SS1 Leaders. These sessions included workshops on study techniques, test taking, guest speakers, and special presentations on topics pertaining to the field of engineering. There were also four field trips conducted to introduce students to engineering activities in two privately owned local companies, one quasi-governmental agency, and the San Antonio College planetarium.

Program Results

The expansion of the original program design as well as the change in marketing strategy had a direct impact on the number of applications received: there were 112 applications in 2004 compared to 32 in 2003. Of the 112, only 58 met college admission requirements, and of these only six scored high enough on the math placement test to qualify for College Algebra. Twelve more students close to the math cut-off were approved to enroll in College Algebra by the Math department Chairperson, who was familiar with the level of student support provided by the program. These eighteen high school students populated the primary track. They were joined by three other regular college students in the math class only. The remaining forty students were

enrolled in two separate sections of the secondary track. Each of these two cohorts was joined by two regular college students in the Introduction to Engineering courses. Four of the forty withdrew early from the program for personal reasons.

The two instructors for the classes in the primary track were encouraged to communicate with each other throughout the semester to reinforce relevant subject matter and facilitate the formation of learning communities. The two different instructors of ENGR 1201 were in daily contact with each other to maintain course equivalence. One of the inherent difficulties with developing a productive learning community is getting the faculty to coordinate their respective curricula. This was especially difficult for the faculty involved with the secondary track. This barrier to establishing productive learning communities has yet to be fully overcome, even for the primary track.

Another problem encountered was in recruiting and retaining a sufficient number of qualified group study leaders. We wanted six, two for each of the three learning community cohorts, but we could find only five to start the program, and one of the five left half-way through the term. This made it impossible to attain uniform progress among the disparate groups during the afternoon study sessions. The larger size of the combined groups in combination with the lower maturity level of the high school students also turned out to be a de-stabilizing factor. A more highly structured environment for the afternoon sessions is needed for students at this level.

Notwithstanding the above considerations, our 2004 EDGE students still performed as well in their course work as college level students, although not quite as well as the 2003 cohort. The distributions of final grades in each of the six courses are presented in the tables below.

A	B	C	D	F	W	Total
						ENGR 1201
4	8	2	0	0	4	18
22%	45%	11%	0%	0%	22%	EDGE/Course rates
						MATH 1314
4	8	1	0	0	5	18
22%	45%	6%	0%	0%	27%	EDGE Rates
4	8	3	0	0	7	21
18%	36%	14%	0%	0%	32%	Course Rates

Table 1: Final Grades posted for the primary track option

A	B	C	D	F	W	Total
						COSC 1301
6	10	3	0	0	0	19
32%	52%	16%	0%	0%	0%	EDGE/Course rates
						ENGR 1201
2	14	3	0	0	0	19
10%	74%	16%	0%	0%	0%	EDGE Rates
0	0	0	1	0	1	21
0%	0%	0%	5%	0%	5%	Course Rates

Table 2: Final Grades posted for the first section of the secondary track

A	B	C	D	F	W	Total
						COSC 1301
8	3	6	0	0	0	17
47%	18%	35%	0%	0%	0%	EDGE/Course rates
						ENGR 1201
0	13	4	0	0	0	17
0%	76%	24%	0%	0%	0%	EDGE Rates
0	14	4	0	0	1	19
0%	74%	21%	0%	0%	5%	Course Rates

Table 3: Final Grades posted for the second section of the secondary track

Of the 18 students enrolled in the primary track, 12 received productive grades in both courses. This success rate is well above the norm for College Algebra, and an improvement over last year. The 36 students remaining in the secondary track received productive grades in both courses. The instructors reported that the interaction between the high school and college students appeared to be positive.

The secondary track students who participated in the PLATO Fastrack Advantage program were assessed in math skills (through the program) at the beginning and at the end of the eight week session. The initial assessment results indicated that 10 students were above the 9th grade Math level and 26 were below. The exit test showed a marked improvement: 29 students were above 9th grade Math level and only 7 were below. The average grade level improvement is shown in Table 4.

Initial grade level	Final grade level	Grade increase	% increase
6.60	9.69	3.09	46.82%

Table 4: Average Basic Math Skills Testing Results

An overview of the application and enrollment history of the EDGE Program is presented in Table 5. The trend in student participation is very encouraging, considering that the increase in enrollment was accomplished with only a slight decline in the fraction of students qualifying for College Algebra.

EDGE Cohort Year:	2003	2004
Applications received	32	112
Students accepted into the program	20	62
Students enrolled in the program	20	58
Students qualified for College Algebra	7	18

Table 5: EDGE Program Participation History

Conclusions

Once again, a number of problems arose that we consider to have inhibited the development of model learning communities, but these were of a somewhat different nature than last year. And also once again, the EDGE students as a group achieved as well as, or better than (College Algebra), their college level peers. The group in the secondary track also showed substantial gains in math proficiency: an increase of 16% in the average math test score and 62% of the students progressed by at least one skill level. It is of interest that although 10 of the students applying to the 2004 program had a productive high school grade in Pre-Calculus, only 6 qualified for College Algebra on the Accuplacer test. A survey administered at the end of the eight week period revealed that 80% of the primary track students and 90.4% of the secondary track students liked the program and felt that they had learned a lot.

One of the new problems encountered in 2004 was that we found an appreciable number of students who were not as excited about the program as were their parents. This suggests we should adopt more stringent screening procedures, which we may now have the luxury of doing with the increasing popularity of the program.

With awareness of the program increasing, we propose to return exclusively to the original program concept with MATH 1314 and ENGR 1201 as the only option, and open the program to 12th grade students in addition to those originally targeted (10th and 11th graders). This larger pool of potential candidates is expected to have a higher qualifying rate for College Algebra. A homogeneous program will also make it easier to maintain program integrity and develop a pool

of qualified students for the anticipated debut of EDGE-Phase II. If the trend in program demand continues, we will receive even more applications than last year, and with the more stringent entry requirement of MATH 1314 in place, we plan to accept no more than fifty students into the 2005 program. This will allow for two learning communities with 25 students each enrolled in MATH 1314 and ENGR 1201. We will be interested to find out how many of the 12th graders from the 2005 program enroll at SAC for the Fall 2005 semester. Eight of the 2003 program participants were found to be enrolled at SAC for the Fall 2004 term, four with declared majors in engineering or engineering technology.

One of the greatest challenges we face in conducting this program is in securing a sufficient number of competent group study leaders. Each year we expand our recruiting efforts, but we remain restricted in who we can hire and how much we can pay them by the policies and procedures of our Human Resources department. Other goals for the 2005 EDGE program are to provide better structure and alignment for the afternoon activities, and more communication between the group study leaders and program faculty.

We would like to thank our EDGE Team members, the program faculty, and our college administration, for their participation and support in enabling us to continue and improve this program, which was developed to increase the number of students entering college with the intention and capability of achieving a degree in Engineering, Science, or Mathematics.

References:

1. Getting an EDGE in Engineering Education, by Jerry O'Connor and Dan G. Dimitriu, ASEE Conference, Salt Lake City, UT, June 2004
2. < www.prep-usa.org/portal/texprep/ >
3. < www.msoe.edu/admiss/summer/index.shtml >
4. < <http://studentservices.engr.wisc.edu/diversity/esp/> >
5. < www.engr.ncsu.edu/summerprograms/index2.html >
6. < www.seas.virginia.edu/minority/ite.htm >
7. < www.engineering.cornell.edu/diversity/office-diversity-programs/summer-programs/index.cfm >
8. Bringing "Engineering Forward" To The High Schools: One University's Experience In Starting An Engineering Summer Camp Program, by Bryen E. Lorenz, Frontiers in Education Conference, Savannah, GA, October 2004.

Biographical Information:

DAN G. DIMITRIU has been practicing engineering since 1970 and taught engineering courses concurrently for over 20 years. He has been involved with several engineering societies, most recently as vice-president of the SPE-Central Texas Section. He has been the coordinator of the Engineering Program at San Antonio College since 2001. His research interests are: alternative fuels, fuel cells, plastics, and engineering education.

JERRY O'CONNOR has been teaching physics (and occasionally engineering and math) courses since 1980. He was the Campus Coordinator for the Texas Alliance for Minority Participation program from 1993 to 2002, and is currently the Department Chairperson for Physics, Engineering, & Architecture. He has been involved in numerous initiatives to integrate the findings of physics and engineering education research with education practice.