

## **AC 2008-253: THE FIFTH YEAR OF THE EDGE PROGRAM – A NEW BEGINNING**

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# The Fifth Year of the *EDGE* Program – A New Beginning

## Abstract

This paper presents a brief description and history of the EDGE (Early Development of General Engineering) Summer Bridge Program that was initiated in 2003<sup>1</sup> and focuses on the fifth iteration of the program. This project has been supported by grants from the Department of Education (MSEIP P120A050080) and Alamo Community College District Foundation.

## Brief History of the Program

The original version of this summer bridging program was intended to serve well-prepared high school students in the 10<sup>th</sup> and 11<sup>th</sup> grades who would have participated in the San Antonio Pre-freshman Engineering Program (PREP)<sup>2</sup>. EDGE was designed to introduce them to college level course work as a learning community and provide activities to help them develop independent learning and teamwork skills with the goal of increasing their likelihood of earning a college degree in engineering, science, math, or other related field. The learning community courses offered were Introduction to Engineering and College Algebra. Since the total number of applicants, as well as the fraction eligible for College Algebra, was disappointingly low (see Table 5), we implemented two significant changes for the following year. One was our method of promoting the program and the other was to restructure the program to accommodate students who were not ready for College Algebra. For the second year of EDGE, our advertising efforts were more focused on making direct contact with high school principals and school district administrators, and College Algebra was replaced with Computer Literacy as the second learning community course. Supplemental work with computer assisted Math instruction was also added.

The change in marketing strategy was effective, and the number of applications increased considerably from the first year. However, only half of the applicants met college admission requirements, and the math placement scores were even lower. While the results of the EDGE II Program were satisfactory, they were not quite as good as EDGE I, and students were not sufficiently challenged by the Computer Literacy course<sup>3</sup>. This prompted us to return to our original course offerings for EDGE III in 2005, and to add 12<sup>th</sup> graders to our targeted student population. The results of this strategy failed to produce a sufficient number of applicants who scored high enough on the math placement test to enroll in College Algebra, and we reverted to the previous learning community courses, (Introduction to Engineering and Computer Literacy). The Computer Literacy course was modified slightly to provide more advanced assignments and better integration with the Introduction to Engineering course, and the coursework was supplemented by computer assisted Math instruction as before<sup>4</sup>.

For the following year (EDGE IV-2006), the program was more substantially revised to address the inadequate challenge provided by the Computer Literacy course. It was replaced with an enhanced Conceptual Physics course, and the afternoon computer assisted math training was extended and made mandatory. Also added to EDGE IV was an enhanced College Algebra course offered (on Saturdays) during the following fall semester. This course was made available to all qualified EDGE students (current and previous). An option for students to

continue with a Pre-Calculus course offered on Saturdays during the spring 2007 semester provided an opportunity for continued student involvement over the entire school year<sup>5</sup>.

This brings us to EDGE V in 2007. The 2007 program continued the year-round engagement of qualified students and had two major improvements for the summer component. First, the Conceptual Physics course content was augmented to satisfy state mandated curriculum standards for Texas high schools, which made it acceptable for science credit by local school districts. The second major improvement was the introduction of a robotics component in the Introduction to Engineering course. Program marketing was enhanced by the creation of a 30 minute “infomercial” about the EDGE Program that was presented for two weeks on the public access TV channel. Since the broadcasting was delayed until the last two weeks of the enrollment period, we did not expect a significant impact on recruitment. An updated version is ready for broadcasting in January of 2008.

## **Program Details**

As in all previous years, EDGE students were required to meet the same college admission requirements as other entering students, and paid a \$25 entry fee. Students attended the two classes in the morning, Monday through Friday, for the eight week summer session. Afternoon activities consisted of supervised study, student success sessions, and field trips. The number of students enrolled in the program allowed for a single learning community cohort for the two courses. The cohort was split into ten teams and each study group was composed of two teams, each with a designated Study Leader. Study Leaders were 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 supervised study sessions provided a supportive environment for students to work together on homework and group projects while building a sense of community and shared success. The student success sessions were one hour long and involved the entire class, along with the Study Leaders. These sessions included workshops on study techniques, test taking, guest speakers, and special presentations on topics pertaining to the field of engineering. At least one half hour every day was also reserved for the (now mandatory) PLATO Fastrack Advantage program. There were five field trips conducted. Four of these were to manufacturing facilities in our area showcasing engineering activities, and one was to the San Antonio College planetarium.

A team of two faculty members taught the two courses and made connections between subjects to show how they were related. The faculty team approach seemed to help in the development of the learning community, and also aided in the management of the supervised study sessions. The faculty members met daily with Study Leaders to coordinate course assignments with afternoon activities.

## Enrollment Analysis

An overview of the application and enrollment history of the EDGE Program is presented in Table 1. The trend in student participation reflects an evolving focus on the composition of the curriculum and the readiness of our target population. More detailed analysis by gender and ethnicity the 2007 program is given in Table 2. There are no apparent trends in the application data. Gender and ethnicity distributions have remained relatively constant.

EDGE COHORT	YEAR	2003	2004	2005	2006	2007
<b># OF APPLICATIONS RECEIVED</b>						
FEMALE		57%	47%	44%	43%	43%
MALE		43%	53%	56%	57%	57%
	<b>Total</b>	35	112	52	98	92
<b># OF COMPLETE APPLICATIONS</b>						
FEMALE		60%	43%	49%	27%	41%
MALE		40%	57%	51%	73%	59%
	<b>Total</b>	20	81	39	59	54
<b># OF ACCEPTED APPLICATIONS</b>						
FEMALE		60%	47%	33%	23%	41%
MALE		40%	53%	67%	77%	59%
	<b>Total</b>	20	59	27	30	32
<b># OF STUDENTS ENROLLED</b>						
FEMALE		60%	48%	36%	24%	32%
MALE		40%	52%	64%	76%	68%
	<b>Total</b>	20	54	25	29	28
<b># QUALIFIED FOR COLLEGE ALGEBRA</b>						
FEMALE		29%	28%	29%	20%	30%
MALE		71%	72%	71%	80%	70%
	<b>Total</b>	7	18	7	5	10

**Table 1: Enrollment History**

Complete Applications Statistics		Accepted Applications Statistics		Enrollment Statistics	
Female	22	Female	13	Female	9
Male	32	Male	19	Male	19
Hispanic / Latino	41	Hispanic / Latino	27	Hispanic / Latino	23
Asian / Pacific Islander	4	Asian / Pacific Islander	3	Asian / Pacific Islander	3
Non-Hispanic, Black	7	Non-Hispanic, Black	1	Non-Hispanic, Black	1
Non-Hispanic, White	2	Non-Hispanic, White	1	Non-Hispanic, White	1

**Table 2: Gender and Ethnicity analysis (2007)**

## Program Results

The distribution of final grades for 2007 and previous years is presented in Table 3 below.

A	B	C	D	F	W	Productive Grade Rates
<b>ENGR 1201</b>						
5	15	5	0	0	3	89.3%
<b>PHYS 1305</b>						
4	12	10	0	0	2	92.9%

**Table 2: Final Grades posted for 2007 Cohort**

The achievement of desired program outcomes was assessed through three sets of surveys conducted during the eight week session. The first survey was administered the first day of the program to assess students' existing knowledge of engineering and their familiarity with campus life. Field trip evaluation questionnaires were administered after each field trip, and a final questionnaire was administered the day before the closing ceremony to evaluate the entire program and the students' interest in continuing with the EDGE Program in fall of 2007. One student did not participate in the final survey due to a family prior commitment. The survey results are presented in the Appendix and summarized below in association with related program outcomes.

**Outcome 1)** Students will develop a good understanding of student life and the particularities of being an engineering student, the nature of engineering work, and become familiar with the various engineering fields.

**Results:** Initially 14 students thought they had an excellent or very good knowledge of the engineering profession and 14 had a very good knowledge of college life. The final survey shows that 24 students had outstanding or very good knowledge of the engineering profession, and 24 students felt they now had an outstanding or very good knowledge of college life.

**Outcome 2)** The course materials and activities utilized in the program will be well correlated and useful in preparing students for success in mathematics, engineering, technology, and the sciences.

**Results:** In the final survey 24 of the students considered the courses well coordinated and interconnected, and all 27 declared that they would recommend the EDGE Program to other students. A particular mention should be made about the success of the robotics project based on the LEGO Mindstorm kits. All 27 students gave highest scores to the robotics project.

**Outcome 3)** Students will experience academic success and student life in a college environment and begin to accumulate college course credits towards an Associate's degree at San Antonio College.

**Results:** Of the 28 students enrolled in the EDGE 2007 Program, 25 received productive grades in the Introduction to Engineering course and 26 in the Introduction to Physics course, with corresponding college credit.

**Outcome 4)** The EDGE Program will be effective in attracting and retaining high school students into the study of engineering and other technical fields (preferably at San Antonio College).

**Results:** In the final survey 15 students expressed their interest in continuing their studies with College Algebra in the Fall 2007 semester and 17 indicated a definite or highly probable interest in a second level of the EDGE Program, if available.

The number of students returning to San Antonio College or continuing in higher education after attending previous EDGE Summer Programs is being monitored as an indicator of program effectiveness. As of the Spring 2007 semester, 54 of the 162 former EDGE students were enrolled at an institution of higher education and exactly half of them were enrolled at San Antonio College. Of these 54 students, 30 were enrolled in engineering programs.

Table 4 presents the higher education enrollment of former EDGE students that could be located by our office during the spring 2007 semester.

2003		2004		2005		2006		2007		EDGE Year
SAC	Other	SAC	Other	SAC	Other	SAC	Other	SAC	Other	School
4	3	10	12	5	6	3	6	5	0	# of students
Engr.	Other	Engr.	Other	Engr.	Other	Engr.	Other	Engr.	Other	Majors
3	4	9	13	10	1	3	6	5	0	# of students

**Table 4: Survey of Spring 2007 Enrollment of EDGE Students**

The PLATO Fastrack Advantage program normally provides an assessment of students' math skills at the beginning and again at the end of the eight week session. Due to a computer malfunction during the 2007 program we were unable to collect data comparable with previous years. We did however have pre- and post-program Accuplacer scores for twelve students that attempted to qualify for enrollment in the College Algebra course. The scores indicate a substantial gain in math skills. The average score level improvement is shown in Table 5.

Initial assessment	Final assessment	Percentage increase
81.29	95.34	17.28

**Table 5: PLATO's Effect on Accuplacer Scores**

A brief review of other recruitment and retention programs for engineering around the country report that, in general, similar results have been achieved <sup>6, 7, 8, 9, 10, 11</sup>. This gives us confidence and reasons to continue refining our program model in order to improve our ability to attract and retain more students in math, engineering, science, and technology.

Because of the continuing difficulties encountered with College Algebra, one of the original program goals that has remained out of reach is the development of a second phase EDGE Program that would allow students to complete the bridge between their high school and college studies. Instead we have increased the time dedicated to PLATO training with the intent to enroll more students in the Fall and Spring follow-up math courses.

For Fall 2007 the Math Department again agreed to offer a College Algebra course on Saturdays for our EDGE students. The course was followed by a tutoring lab and the students met with a study leader every Friday to receive course assistance and to monitor their progress. A total of 10 students answered this call, five from the 2006 cohort and seven from the previous year. Out of the five students who successfully completed the College Algebra course four enrolled in Pre-Calculus with the same structure as before during the Spring Semester and none of them was able to obtain a working grade. Two of them tried again during the summer of 2007 and this time they both succeeded. Only one of them continued at SAC in the fall of 2007 while the other one transferred to a four-year institution pursuing an engineering program. The reduced number of students able and willing to continue with a second level of the EDGE Summer Program forces us to postpone it until the number of students increases to appropriate levels. The final grades distribution for the follow-up courses is presented in Table 6.

Semester	Course	EDGE Students Enrollment	Grades					
			A	B	C	D	F	W
Fall 2006	College Algebra	12	1	3	1	0	1	6
Spring 2007	Pre-Calculus	4	0	0	0	0	1	3
Summer 2007	Pre-Calculus	2	1	1	0	0	0	0
Fall 2007	Calculus I	1	0	0	0	0	0	1
	College Algebra	10	2	0	1	1	1	5

**Table 6:** Final Grades in Math Courses for Year-Around EDGE Students

Another ongoing challenge we continue to face in conducting this program is in recruiting and retaining competent group study leaders. For 2007 we were not able to hire enough to effectively manage the student groups. Most notably lacking was having a study group leader to act as a general coordinator. It was extremely helpful in past years to have a leader serving as a general coordinator to supervise the teams' rotation in the PLATO labs and act as a liaison between students, study leaders, and faculty. With the fall 2007 opening of the first MESA Study Center in Texas at our college we hope to have a better pool of qualified study leaders available. The MESA student members will make excellent candidates for these positions.

## **Program Promotion**

As in past years, a very strong positive response continues to be received after presentations at local high schools, yet the number of applications received and the academic preparation of students has remained below expectations. The pressure to extend application deadlines in order to obtain a better pool of qualified students and to compensate for disparities in the timely reception of program information at some high schools was ever present as usual and this time we had to extend the deadline twice.

For 2007 we added a new advertising tool that increased the exposure of our program within the community. With the help of the college PR Department we prepared a half hour “infomercial” that was run on the public access channel for two weeks. Although we could not determine if this affected the number of applications received, we did observe that the number of students at the College Algebra readiness level was at an all time high.

Another enhancement of the program was to augment the content of the Physics course to meet state standards requirements for high school physics. This was intended to allow high school students the opportunity to simultaneously earn credits for college and high school physics and hopefully boost the enrollment in the EDGE Program. Three students received dual credit for their efforts in 2007.

## **Conclusions**

The EDGE Program seems to have reached a stable level of maturity, and changes are more likely to be implemented in the area of follow-up course support than summer program structure. The greatest challenge we continue to face in conducting this program is obtaining a sufficient number of suitable program personnel to act as study group leaders. This restriction limits the program to about 30 students per year, which is half of the student population expected when we started the program. We persevere in the hope that the number of enrolled will continue to grow and that we will eventually be able to offer a two-step EDGE Summer Program with Math courses during the school year. The inception of the MESA Program at our college is expected to enhance the learning communities established through the EDGE program by providing more peer mentors and role models for new students, as well as a new pool of potential student group leaders. If we can prepare students to pass the Calculus hurdle by the time they finish high school, we will have maximized their chances to graduate in time from a four-year engineering program<sup>12</sup>.

As in previous years, we remain indebted to all other members of our EDGE Executive Team, the program faculty and staff, and our college administration. Their participation and support has enabled us to continue offering this program, and to make continuing improvements to help increase the number of high school students entering college with the intention and capability of achieving a degree in Engineering, Science, or Mathematics. We are also deeply grateful to the Department of Education and in particular to MSEIP grant officers who through their advice and supervision provided us with continuous support and encouragement.



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## APPENDIX

### Survey Results:

		OUTSTANDING	VERY GOOD	AVERAGE	MARGINAL	NONE	YES	NO
<b>INITIAL SURVEY - # OF STUDENTS - 28</b>								
1	Knowledge Of The EDGE Program	7	12	8		1		
2	Knowledge Of College Life	4	10	9	4	1		
3	Knowledge Of The Engineering Profession	3	11	8	4	2		
4	Engineering Career Interest	8	7	11	2			
5	Math Performance	12	12	4				
6	Physics Performance	3	11	11	3			
7	Participant In Similar Programs						13	15

		OUTSTANDING	VERY GOOD	AVERAGE	MARGINAL	NONE	YES	NO
<b>FINAL SURVEY - # OF STUDENTS - 27</b>								
1	Rating Of The EDGE Program	20	6	1				
2	Knowledge Of College Life	9	14	4				
3	Knowledge Of The Engineering Profession	11	13	3				
4	Engineering Career Interest	13	5	5	3	1		
5	Math Performance	11	12	4				
6	Physics Performance	3	13	7	4			
7	EDGE Program Recommendation						27	
8	Courses Were Well Coordinated & Interconnected						24	3
9	Gained From This Program						24	3
<b>FINAL SURVEY - # OF STUDENTS - 29</b>		DEFINITELY	HIGHLY PROBABLE	MAYBE	NOT LIKELY	NO		
10	Interested In The Fall 2007 EDGE Program	11	4	6	6			
11	Interested In A Second Level EDGE Program	12	5	8	2			

**Field Trip Survey Results:**

<b>CHALLENGER LEARNING CENTER</b>						
		STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE
	<b># OF STUDENTS - 28</b>					
1	Trip Was Informative			4	10	14
2	Site Staff Were Helpful			5	10	13
3	Trip Supported The EDGE Program Objectives			5	10	13
4	Trip Supported Pursuing A College Education		2	8	9	9
5	Trip Was Satisfactory			3	9	16
<b>KELLY AVIATION CENTER / LOCKHEED MARTIN AFFILIATE</b>						
	<b># OF STUDENTS - 26</b>					
1	Trip Was Informative		1	2	6	17
2	Site Staff Were Helpful		1	3	5	17
3	Trip Supported The EDGE Program Objectives			1	6	19
4	Trip Supported Pursuing A College Education			3	5	18
5	Trip Was Satisfactory			1	10	15
<b>KINETIC CONCEPTS, INCORPORATED</b>						
	<b># OF STUDENTS - 26</b>					
1	Trip Was Informative		1	4	10	11
2	Site Staff Were Helpful		1	5	6	14
3	Trip Supported The EDGE Program Objectives			2	8	16
4	Trip Supported Pursuing A College Education			8	11	7
5	Trip Was Satisfactory			4	11	11
<b>PRECISION MOLD &amp; TOOL, INCORPORATED</b>						
	<b># OF STUDENTS - 28</b>					
1	Trip Was Informative	1	1	3	10	13
2	Site Staff Were Helpful			4	7	17
3	Trip Supported The EDGE Program Objectives			3	13	12
4	Trip Supported Pursuing A College Education	2	3	6	9	8
5	Trip Was Satisfactory	1	1	5	13	8
<b>SCOBEE PLANETARIUM</b>						
	<b># OF STUDENTS - 28</b>					
1	Trip Was Informative		2	1	12	13
2	Site Staff Were Helpful		1	3	9	15
3	Trip Supported The EDGE Program Objectives	1		6	16	5
4	Trip Supported Pursuing A College Education	2	1	9	13	3
5	Trip Was Satisfactory	1	1	2	14	10