

AC 2009-1514: EDGE 2008 PROGRAM – THE FIRST SIGNS OF MATURITY

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EDGE 2008 Program – The First Signs of Maturity

Abstract

This paper presents a brief description and history of the EDGE (Early Development of General Engineering) Summer Bridge Program that was initiated in 2003¹ and focuses on the sixth 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 the EDGE program was intended to serve well-prepared high school students in the 10th and 11th grades who would have participated in the San Antonio Pre-freshman Engineering Program (PREP)². 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 than in the previous year. 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 course³. This prompted us to return to our original course offerings for EDGE III in 2005, and to add 12th graders to our targeted student population. This strategy also failed to produce a sufficient number of applicants who scored high enough on the math placement test to enroll in College Algebra, and the Program 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 was more tightly integrated with the Introduction to Engineering course. The coursework was supplemented by computer assisted Math instruction as before⁴.

For the following year (EDGE IV-2006), the program was more substantially revised to address the inadequate challenge provided by the Computer Literacy course. The replacement course was a lab enhanced version of Conceptual Physics, and the afternoon computer assisted math training was extended and made mandatory. Another new development in EDGE IV was the opportunity for EDGE graduates who met the math benchmark at the end of the Program to enroll in a College Algebra course offered (on Saturdays) during the following fall semester. This course was supported with a study group leader. Twelve students enrolled in the College Algebra course and four of them continued on with a Pre-Calculus course offered during the spring 2007 semester.⁵

The year-round engagement and math progression for qualified students was continued in the 2007 Program (EDGE V)⁶, and two substantial changes were made in the summer curriculum. First, the content of the Conceptual Physics course was augmented to satisfy state standards for high school Physics, making the course acceptable for science credit in local school districts. The second change was the introduction of a in the Introduction to Engineering course. Promotion of the Program was further 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. However, the broadcasting was delayed until the last two weeks of the enrollment period and we did not expect to see a significant impact on recruitment.

This brings us to EDGE VI in 2008. The Program continued with the augmented Conceptual Physics curriculum and the year around math engagement for qualified students. An updated version of the infomercial was broadcast weekly for the entire month of January. Building on the successful robotics project component in the Introduction to Engineering course from the previous year, the project was restructured and expanded to include two different stages of competition with distinct objectives. This provided an increased opportunity for students to diversify their design and programming skills. In the Fall 2008 semester the Math Department again agreed to offer a College Algebra course on Saturdays for our qualifying EDGE students. The course was followed by a tutoring lab that was designed to facilitate student success. This year six students enrolled and one continued on with PreCalculus in the Spring 2009 term. A comprehensive account of EDGE students in the full-term math courses is presented with program results below and summarized in Table 6. For the 2008 Program, there was also a shift in the acceptance process. We did not make the usual compromises on the minimum acceptable math placement scores as in previous years. This resulted in a slightly smaller cohort.

Program Details

As in 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 eight teams of three students each, study groups were composed of two teams, and each pair of teams had a designated Study Leader. Study Leaders were trained in group learning methods 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. One of the Study Leaders was exceptionally talented and acted as an assistant Program Coordinator.

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 thirty minutes every day was reserved for the mandatory PLATO Fastrack Advantage program. There were four field trips conducted to manufacturing facilities in our area showcasing engineering related activities. The popular visit to the San Antonio College planetarium was cancelled in 2008 due to a renovation that was in progress.

Following students' suggestions from 2007, the robotics project component in the Introduction to Engineering course was expanded to include two stages of competition with two different objectives. The first stage involved the design and programming of each team's robot to independently navigate a two level parking garage and park in a designated space without any input from the team members. The ranking was established by the fastest and most precise maneuver. The second stage involved the redesign and reprogramming of the robots for a Robot Sumo Wrestling Competition. This was by far the most popular activity in the entire program, and it attracted extensive media coverage by local newspapers and TV stations.

The same team of two faculty taught the two courses and emphasized connections between course content. 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 and Study Leaders met daily to coordinate assignments and afternoon activities.

Enrollment Analysis

An overview of the application and enrollment history of the EDGE Program since its inception is presented in Table 1.

EDGE COHORT YEAR:	2003	2004	2005	2006	2007	2008
APPLICATIONS RECEIVED						
FEMALE	57%	47%	44%	43%	43%	41%
MALE	43%	53%	56%	57%	57%	59%
Total	35	112	52	98	92	59
COMPLETE APPLICATIONS						
FEMALE	60%	43%	49%	27%	41%	40%
MALE	40%	57%	51%	73%	59%	60%
Total	20	81	39	59	54	52
ACCEPTED APPLICATIONS						
FEMALE	60%	47%	33%	23%	41%	42%
MALE	40%	53%	67%	77%	59%	58%
Total	20	59	27	30	32	33
STUDENTS ENROLLED						
FEMALE	60%	48%	36%	24%	32%	46%
MALE	40%	52%	64%	76%	68%	54%
Total	20	54	25	29	28	24
STUDENTS QUALIFIED FOR COLLEGE ALGEBRA						
FEMALE	29%	28%	29%	20%	30%	0%
MALE	71%	72%	71%	80%	70%	100%
Total	7	18	7	5	10	4

Table 1: 2008 Enrollment History

There appears to be a small decrease in the degree of female interest in the Program as represented in the number of applications received, but there is no corresponding trend in the number of females accepted and enrolled. The application data show an average female/male gender participation rate close to 40/60. Of the students who qualify for College Algebra by the end of the summer program, an average of only 25% is female. The summer enrollment has stabilized and is expected to remain around 25. More detailed analysis by gender and ethnicity the 2008 program is given in Table 2.

Complete Applications Statistics		Accepted Applications Statistics		Enrollment Statistics	
Female	24	Female	14	Female	11
Male	35	Male	19	Male	13
Hispanic / Latino	44	Hispanic / Latino	25	Hispanic / Latino	18
Asian / Pacific Islander	2	Asian / Pacific Islander	2	Asian / Pacific Islander	2
Non-Hispanic, Black	4	Non-Hispanic, Black	1	Non-Hispanic, Black	0
Non-Hispanic, White	9	Non-Hispanic, White	5	Non-Hispanic, White	4

Table 2: 2008 Gender and Ethnicity analysis

Program Results

The distribution of final grades for the EDGE summer program since the last major curriculum change is presented in Table 3 below. The productive grade rates are much higher than for the traditional college courses.

Grade	A	B	C	D	F	W	Productive Grade Rates
Year	ENGR 1201						
2008	8	13	3	0	0	0	100%
2007	5	15	5	0	0	3	89%
2006	7	16	6	0	0	1	97%
	PHYS 1305						
2008	9	12	3	0	0	0	100%
2007	4	12	10	0	0	2	93%
2006	6	15	8	0	0	1	97%

Table 3: Course Grades for 2006 - 2008

As in previous years, three sets of surveys were conducted during the eight week session to assess achievement of desired program outcomes. The first survey was administered at the beginning of the program to measure students' existing knowledge of engineering and their familiarity with campus life. A field trip evaluation was administered after each field trip, and a final questionnaire was administered to evaluate the entire program and the students' interest in

continuing with the Program in fall. 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 more familiar with the various engineering fields.

Results: The proportion of students who thought they had a very good understanding of college life increased from 63% in the initial survey to 88% in the final survey. The fraction of students who thought they had an excellent or very good knowledge of the engineering profession increased from 29% to 92%.

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 96% of the students considered the courses well coordinated and interconnected, and 96% 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 24 students gave high 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 24 students enrolled in the EDGE 2008 Program, all received productive grades in the Introduction to Engineering and the Introduction to Physics courses, 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 46% of the students expressed their interest in continuing their studies with College Algebra in the Fall 2008 semester and 58% 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 2009 semester, 37% of the 180 former EDGE students were enrolled in higher education programs. Of these, 40% were enrolled at San Antonio College and 37% were enrolled in various Engineering programs. Table 4 presents the enrollment of former EDGE students in higher education that could be located by our office during the spring 2009 semester.

Cohort Year	2003		2004		2005		2006		2007		2008	
	SAC	Other	SAC	Other	SAC	Other	SAC	Other	SAC	Other	SAC	Other
students	2	2	7	8	4	5	4	10	2	8	8	7
Majors	ENGR	Other	ENGR	Other	ENGR	Other	ENGR	Other	ENGR	Other	ENGR	Other
students	1	3	5	10	8	1	6	8	0	10	5	10

Table 4: Survey of Spring 2009 Enrollment of EDGE Students

The improvement in math skills has previously been reported in terms of grade level gains assigned through the PLATO Fastrack Advantage program. The PLATO program has normally provided an assessment of students' math skills at the beginning and again at the end of the eight week session. However, something in the program was changed and not all students were given an initial grade level assessment. For the students who did receive both assessments, these results are reported below. The math progress of all twenty-four participants over the program's duration was determined from a combination of three different criteria listed below and presented in Table 5:

- 1.) PLATO Curriculum Gain
- 2.) Accuplacer Re-Test Scores and
- 3.) College Level Math course grades.

Of the 24 students, 17 (71%) were recorded as a success by one of the three means listed above and 10 students (42%) placed into Math 1314 – College Algebra. Six of them were able to continue their coursework here at SAC during the Fall 2008 semester with College Algebra where 4 earned an A and two earned a B.

# of Students Enrolled	Average Time on PLATO	# of Students evaluated by PLATO	Average PLATO Grade Gain	# of Students with Accuplacer Gain of 1 Math Level	# of Students Enrolled in College Algebra
24	25.6 hours	11	1.97	7	6

Table 5: PLATO's Effect on Math Performance

Semester	Course	EDGE Student 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
Spring 2008	Pre-Calculus	1	0	1	0	0	0	0
Summer 2008	Calculus I	1	0	1	0	0	0	0
Fall 2008	College Algebra	6	4	2	0	0	0	0

Table 6: Final Grades in Math Courses for full-term EDGE Students

Program Promotion

As in past years, a 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 well below our 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 schools has also persisted. We have made progress in our ability to maintain deadlines however, and only provided one extension in 2008.

We continued using an updated half hour “infomercial” to advertise the Program on the public access channel. The broadcasts went on for over a month in advance of the 2008 Program. Another feature of the Program that enhances its appeal is the augmentation of the Physics course content to meet state standards for high school physics. This provides high school students the opportunity to simultaneously earn credits for college and high school physics. Approximately half of the EDGE students in 2008 qualified to receive dual credit due to this arrangement with their ISD.

Conclusions

One of the ongoing challenges faced in past years was recruiting and retaining a competent group of Study Leaders to properly conduct the program. For 2008 we were fortunate enough to find a sufficient number to effectively manage the student groups. This may be due, at least in part, to the fall 2007 opening of the first MESA Study Center in Texas at our college. For 2008 we had the best pool of study leader candidates ever. We hope that MESA student members will continue to apply for these positions and at the same time help serve as role models and guides to engineering and higher education.

This year again the difficulties encountered with Math readiness for College Algebra prevented us from developing a second phase EDGE Program that would have allowed students to complete the bridge between their high school and college studies. That is the only original program goal that continues to remain out of reach.

A brief review of other recruitment and retention programs for engineering around the country report that, in general, similar results have been achieved ^{7, 8, 9, 10, 11, 12}. This gives us confidence that at this stage our program model reached a mature stage showing consistency attracting and retaining students in math, engineering, science, and technology. The same consistency is shown in the numbers of productive scores and numbers of students interested to continue being involved with the EDGE program.

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. 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 already enhancing 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 “on time” from a four-year engineering program ¹³.

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
	INITIAL SURVEY - # OF STUDENTS - 24							
1	Knowledge Of The EDGE Program	6	11	5	2			
2	Knowledge Of College Life	1	14	8		1		
3	Knowledge Of The Engineering Profession	2	5	14	3			
4	Engineering Career Interest	10	5	5	3	1		
5	Math Performance	10	10	3		1		
6	Physics Performance	5	7	11	1			
7	Participant In Similar Programs						11	13

		OUTSTANDING	VERY GOOD	AVERAGE	MARGINAL	NONE	YES	NO
	FINAL SURVEY - # OF STUDENTS - 24							
1	Rating Of The EDGE Program	16	7	1				
2	Knowledge Of College Life	7	14	3				
3	Knowledge Of The Engineering Profession	5	17	2				
4	Engineering Career Interest	8	6	7	3			
5	Math Performance	11	10	3				
6	Physics Performance	3	11	9	1			
7	EDGE Program Recommendation						23	1
8	Courses Were Well Coordinated & Interconnected						23	1
9	Gained From This Program						23	1

		DEFINITELY	HIGHLY PROBABLE	MAYBE	NOT LIKELY	NO		
	FINAL SURVEY - # OF STUDENTS - 24							
10	Interested In The Fall 2007 EDGE Program	4	7	9	4			
11	Interested In A Second Level EDGE Program	3	11	8	2			

Field Trip Survey Results:

CHALLENGER LEARNING CENTER						
	# OF STUDENTS - 24	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE
1	Trip Was Informative			5	11	8
2	Site Staff Were Helpful			2	12	10
3	Trip Supported The EDGE Program Objectives			5	15	4
4	Trip Supported Pursuing A College Education		1	6	10	7
5	Trip Was Satisfactory			1	11	12
KELLY AVIATION CENTER / LOCKHEED MARTIN AFFILIATE						
	# OF STUDENTS - 16					
1	Trip Was Informative		1	1	6	8
2	Site Staff Were Helpful		1		8	7
3	Trip Supported The EDGE Program Objectives			3	5	8
4	Trip Supported Pursuing A College Education			3	6	7
5	Trip Was Satisfactory		2		10	4
KINETIC CONCEPTS, INCORPORATED						
	# OF STUDENTS - 21					
1	Trip Was Informative			3	10	8
2	Site Staff Were Helpful			2	10	9
3	Trip Supported The EDGE Program Objectives			4	9	8
4	Trip Supported Pursuing A College Education		1	5	11	4
5	Trip Was Satisfactory		1	3	9	8
PRECISION MOLD & TOOL, INCORPORATED						
	# OF STUDENTS - 23					
1	Trip Was Informative	1			14	8
2	Site Staff Were Helpful	1		2	10	10
3	Trip Supported The EDGE Program Objectives	1		5	11	6
4	Trip Supported Pursuing A College Education		1	8	7	7
5	Trip Was Satisfactory	1		3	14	5