(PART 1) 2004 FIPSE REPORT
PECAP PRE-COLLEGE PROGRAMS:
CARE I & II (Critical and Analytical Reasoning Enrichment)

PROGRESS IN ACCOMPLISHING CARE 1 OBJECTIVES

(1) Increase the achievement of pre-11th grade participants in algebra, trigonometry, functions and graphs, and in general quantitative literacy skills.

All students who attended the 2003 CARE I summer program completed three courses designed to increase their achievement in math and quantitative literacy skills-- College Algebra, Problem Solving and SAT Math Preparation. Pre- and post-tests were administered to measure student growth in algebra over the course of the summer. On the pre-test, the most frequent score was 0% and the highest was 12%. On the post-test, the highest score was 96%; the median was 78 and the mean 69%. The scores indicate that in this class, students made significant progress over the course of the summer session. Figure 1 below summarizes the data for CARE I participants.

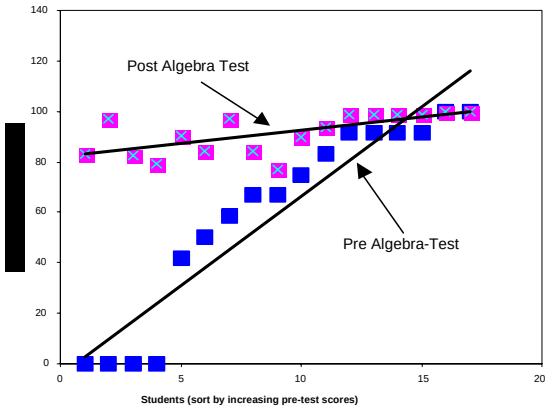

Fig 1: Assessment of quantitative literacy based on performance in College Algebra for pre and post-tests for pre-11th grade CARE students.

Figure 1 shows a comparison of pre-and post-tests to assess the performance of the participants in College Algebra. The pre-test was based on content of the learning objectives while the post-tests tested the same concepts but at the mastery level, including the use of technology. Comparison of the algebra pre- and post-test results (Fig. 1) shows that 11 out of 15 students made significant improvements in mastering the subject matter. There was an 83% difference in scores and with significant improvement among those students who scored lowest on the pre-test. All CARE I students performed at relatively the same level (above 87%) on the post-test.

End-of-program survey results indicate that 89% of the participants believe that participation in the program reinforced their problem solving skills in math and science, 72% reported that through enhancement of their critical thinking skills, program activities improved their math and science problem solving ability and 89% indicated that participation in the program has contributed to their overall educational growth. In addition, 78% of the students reported that classroom assignments exposed them to challenging applications or extensions of the course content. Combined, the survey results suggest that the summer session math-based courses did impact students' math and quantitative literacy skills. For details of survey results, see Tables 1-4 below.

Table 1. Participating in the program has reinforced my problem-solving skills in math and science.

	Pre-11th (CARE I)
N=	18
Strongly Agree	39%
Agree	50%
Not Sure	11%
Disagree	-
Strongly Disagree	-

Table 2. By enhancing my critical thinking, the PECAP program has helped my math and science problem solving ability.

	Pre-11th (CARE I)
N=	18
Strongly Agree	22%
Agree	50%
Not Sure	22%
Disagree	6%
Strongly Disagree	-

Table 3. Participation in the program has contributed to my educational growth.

	Pre-11th (CARE I)
N=	18
Strongly Agree	39%
Agree	50%
Not Sure	6%
Disagree	-
Strongly Disagree	6%

Table 4. Tests, examinations, and other assignments exposed me to challenging applications or extensions of the course content.

	Pre-11th (CARE I)
N=	18
Strongly Agree	28%
Agree	50%
Not Sure	16%
Disagree	6%
Strongly Disagree	-

During the school year, after school tutoring in math was available to CARE students. Tutors were undergraduate students at the University of Pittsburgh pursuing primarily engineering and other math-or science-based majors. Tutoring was offered in all high school math classes. Enrolled students were scheduled for one hour of individual tutoring per week. Any student who had less than a B in a math or science class at the end of the 2002-03 school year was required to enroll in tutoring. High achieving students were encouraged to enroll as well to maintain or improve their grades. Eleven CARE students (33%) took advantage of tutoring services during the 2003-04 school years.

(2) Increase the basic writing/reading and technical communication skills of the pre-11th grade participants.

CARE I students completed a writing class during the 2003 summer session that focused on essay writing. We opted for the focus on essay writing because Pennsylvania and many surrounding states have tests that students must pass to graduate. Most of these tests involve essay writing. In addition, the new SAT will include essay writing and our students will need to write college admissions and scholarship essays.

(3) Increase students' early awareness of engineering careers and provide informal experiences that promote an expectation for excellence and interest in an engineering degree.

The major engineering awareness activity during last year's summer session was the Race Car Project facilitated by the Mechanical Engineering Department. Over the course of the summer session students learned SolidWorks, and designed model race cars on the computer. The cars were built in the prototyping lab, painted by the students and raced as a culminating activity for the project. This hands-on activity exposed students to typical activities of a mechanical engineering professional, enabled them to master a new computer program and challenged them to analyze car features that would contribute to the design of a racecar. For students' feedback on design projects and hands-on learning, please see Tables 5-6 below.

Table 5. Hands-on experience helped my understanding of lecture material.

	Pre-11th (CARE I)
N=	18
Strongly Agree	28%
Agree	44%
Not Sure	22%
Disagree	-
Strongly Disagree	6%
TOTAL	

Table 6. Design projects helped me gain a good experience in research methods.

	Pre-11th (CARE I)
N=	18
Strongly Agree	11%
Agree	50%
Not Sure	33%
Disagree	6%
Strongly Disagree	-
No Answer	-

During the school year, CARE I students attended hands-on engineering activities on Saturday mornings. Like the summer racecar project, these sessions increased students' awareness of what various engineering disciplines involved. Students participated in sessions in electrical and mechanical engineering and materials science.

Figure 2 shows that CARE I students agreed that Logic/Problem-Solving Skills will contribute to their educational growth (100%) and be useful for their college career (94%) while 89% agreed that engineering tools will contribute to their educational growth. Although only 50% of the students agreed that the pace of instruction was appropriate, they agreed that concepts learned in college algebra contributed to their educational growth (83%) and would be useful in their college career (94%). Students also see communication skills to be important in educational growth (61%) and college career (83%).

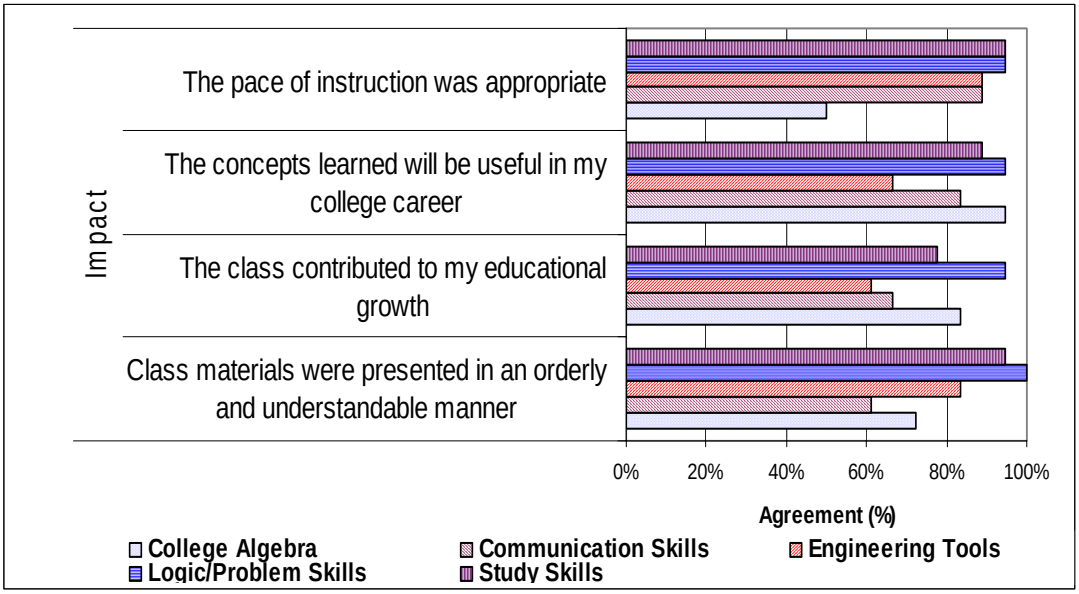

Figure 2. Agreement Percentages for CARE I

In May, students attended a Career Awareness Seminar where professionals from a wide variety of math, science, engineering and other fields discussed their career path, educational background, interests and aptitudes required to be successful in the field, and typical work responsibilities.

PROGRESS IN ACCOMPLISHING CARE 2 OBJECTIVES

(1) Prepare participants for the college level calculus and chemistry that is typical for engineering students.
During the 2003 summer session, CARE II students were enrolled in college level pre-calculus and chemistry classes taught by University of Pittsburgh doctoral students. The median pre-test score for chemistry was 42.9 and the mean score was 46.5. Post-test median was 71.3 and mean 72.3. For Pre-Calculus, the median score was 46.5 for the pre-test and the mean was 43. Post-test median was 69 and mean 83.5. These scores indicate that in both classes students made significant progress over the course of the summer session. Figures (3 and 4) below summarize the data for all CARE II participants.

Figures 3 and 4 (below) show a comparison of pre-and post-tests to assess the performance of the participants in mathematics and chemistry. The pre-test was based on content of the learning objectives while the post-tests tested the same concepts but at the mastery level, including the use of technology. Comparison of the pre calculus pre- and post-test results (Fig. 3) shows that 15 out of 16 students made significant improvements in mastering the subject matter. There was a moderate difference in improvement (11% higher) for students who scored highest in the pre-test compared to the 48% difference in improvement for those that scored lowest in the pre-test. This may be attributed to "over-confidence factor" of this student group at the beginning. In science, 16 out of 16 students made improvements from the pre-test to the post-test. This was also observed in 10th grade college Algebra results which

showed that 16 out of 16 students made improvements from the pre-test to the post-test. The most dramatic change was from a 12% to a 96% (84%) and from a 0% to a 79% score (79%).

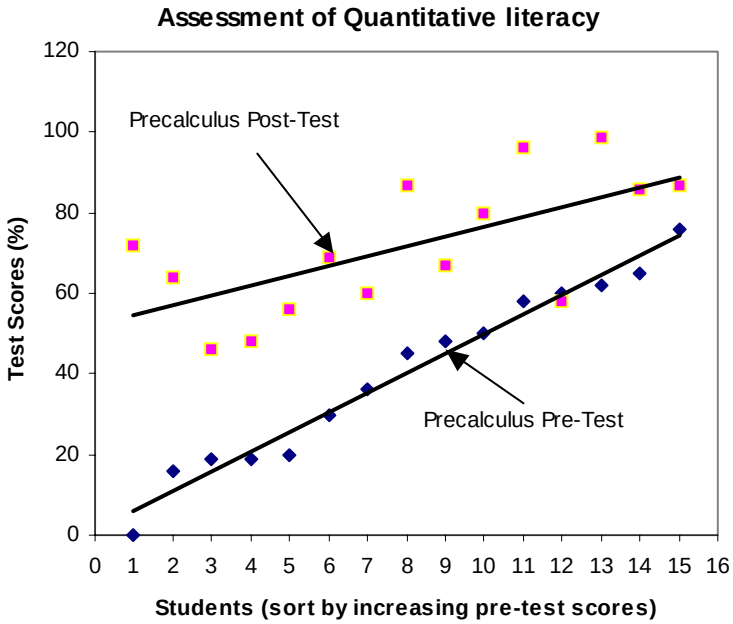

Fig 3: Assessment of quantitative literacy based on performance in pre-calculus for pre-and post-tests for pre-12th grade CARE II students.

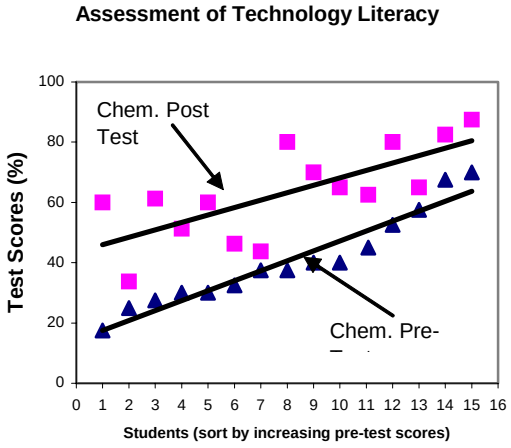

Fig. 4. Assessment of quantitative literacy based on performance in chemistry for pre-and post-tests for pre-12th grade CARE II students.

Survey results reveal that 93% of CARE II students believe that the summer session instruction reinforced their problem-solving skills in math and science. Eighty-five percent of students surveyed reported that the instruction helped math and science problem-solving ability by enhancing critical thinking skills. Ninety-nine percent of students reported that CARE instruction contributed to their overall educational growth with 100% agreeing that

classroom tests and other assignments exposed them to challenging applications or extensions of course content. For details of survey results, tables 7-10 below.

Table 7. Participating in the program has reinforced my problem-solving skills in math and science.

	Pre-12th (CARE II)
N=	14
Strongly Agree	29%
Agree	64%
Not Sure	7%
Disagree	-
Strongly Disagree	-

Table 8. By enhancing my critical thinking, the PECAP program has helped my math and science problem solving ability.

	Pre-12th (CARE II)
N=	14
Strongly Agree	21%
Agree	64%
Not Sure	14%
Disagree	-
Strongly Disagree	-

Table 9. Table 8. By enhancing my critical thinking, the PECAP program has helped my math and science problem solving ability.

	Pre-12th (CARE II)
N=	14
Strongly Agree	71%
Agree	29%
Not Sure	-
Disagree	-
Strongly Disagree	-

Table 10. Tests, examinations, and other assignments exposed me to challenging applications or extensions of the course content.

	Pre-12th (CARE II)
N=	14
Strongly Agree	36%
Agree	64%
Not Sure	-
Disagree	-
Strongly Disagree	-

The CARE II survey results overwhelmingly indicate that we succeeded in preparing students for college level math and chemistry instruction as well as enhancing their ability to excel in their senior year of high school.

(2) Build competence in problem solving and technical communication by the end of 12th grade.
CARE II students participated in SAT Verbal and Math Preparation classes during the summer session. The primary goal of these classes is to enhance students' performance on the SAT, a secondary goal is to hone their problem-solving ability. The engineering project class—the racecar, also provided opportunities for students to enhance their problem-solving ability. In lieu of technical communication, the writing class focused on essay writing. We made this change because we believed that high school seniors' ability to write essays would have immediate impact on their college applications and acceptances as well as on scholarship opportunities.

(3) Motivate high school youth to follow their individual career interests in the fields of engineering and technology.
As CARE I and CARE II students participated in the same career awareness activities during the summer and the school year, please refer to CARE I Objective 3. Hands-on learning and design projects were an overall success. See tables 11-12 for details.

Table 11. Hands-on experience helped my understanding of lecture material.

	Pre-12th (CARE II)
N=	14
Strongly Agree	43%
Agree	50%
Not Sure	7%
Disagree	-
Strongly Disagree	-

Table 12. Design projects helped me gain a good experience in research methods.

	Pre-12th (CARE II)
N=	14
Strongly Agree	14%
Agree	57%
Not Sure	14%
Disagree	14%
Strongly Disagree	-
No Answer	-

CARE II assessed the impact of Chemistry, engineering tools and pre-calculus on quantitative and technology literacy, and study and communication skills in improving learning. Figure 5 shows that most of the participants (93%) agreed that chemistry and the associated lab contributed to their educational growth and will be useful for their college career (100%) while 79% agreed that engineering tools contributed to their educational growth. Although 43% agreed that the pace of instruction in pre-calculus was appropriate (67% indicated the pace was too fast), 86% agreed that the knowledge acquired contributed to their educational growth. Study and communication skills received the highest marks as the critical in sustaining education growth.

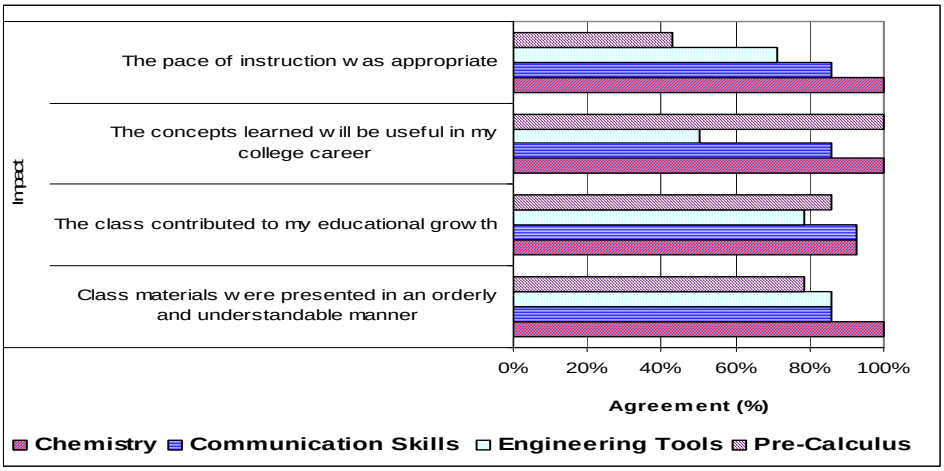

Figure 5. Agreement percentages for CARE II Components.

PECAP PROGRAM CHALLENGES: STRATEGIES TO PERSEVERE

We are pleased with the progress we made this year. We have successfully moved from last year's commuter program for local students to a residential program serving students from the Philadelphia area, New York, and Maryland. One of the challenges we faced in this transition was the decision regarding strategies to recruit out-of-area students. In cooperation with the University of Pittsburgh Office of Admissions and Financial Aid, we developed a list of private, public and parochial high schools and pre-college outreach programs in the target recruitment area. We mailed brochures and applications to these schools and programs as well as repeating our efforts to target students in four local school districts—Pittsburgh, Wilkinsburg, Penn Hills and Woodland Hills and expanding local recruitment to districts within Allegheny and Westmoreland Counties. For non-local schools, we followed up with phone calls asking counselors and program directors if they needed additional information and if they had students who were interested in applying. We also had our program information on our website with an application that could be downloaded. Despite these efforts, we had fewer than 20 out-of-area applicants with a significant number coming from outreach program referrals rather than from our efforts with high school counselors.

While we are pleased with the quality of the candidates, both local and non-local, we need to rethink our strategy for non-local recruitment. At this point, we are considering sending information with admissions counselors as they visit high schools in the fall and possibly attending College Board counselor workshops. We want to broaden our contacts with outreach programs as they were a valuable source of applicants. A new approach is needed if we are to reach our target of having 50 students enrolled in the program.

We are working on ways to keep non-local students connected during the school year. Proposed strategies are online or telephone advising sessions, and providing information on selected school year activities on our website.

EVALUATION AND ASSESSMENT

We solicit feedback from participants in a variety of ways. During the summer session, students complete a Weekly Reflection that provides information on their learning experiences in each class during the week. These forms are read at the end of each week and concerns and questions are shared with instructors as needed. Students also complete a comprehensive survey at the end of the summer that addresses all aspects of the summer program. Survey results are included in Attachment A. During the school year, students complete evaluations at the end of each program activity and complete a survey at the end of the year.

Instructors are asked to complete weekly progress reports during the summer evaluating students' performance as outstanding, satisfactory or unsatisfactory. Instructors also administer pre-and post-tests in all classes and provide a final evaluation for each student that is shared with the student and parents.

We have a consultant who assisted us in the development of the survey and with its modification. He has also helped us to modify our weekly reflections form, making it more user friendly without sacrificing needed data.

(PART 2) 2004 FIPSE REPORT
PECAP COLLEGE PROGRAMS: PITT EXCEL PROGRAM

PROGRESS IN ACCOMPLISHING OBJECTIVES: BRIEF INTRODUCTION

Much has happened over the past academic year in the milieu of the college admissions process. Legislation and campus policies have changed, thus, dramatically affecting the eligibility requirements for students wishing to enter Pitt's Engineering program. This report will outline a year filled with extraordinary successes, as well as difficult challenges. It will detail experiences and rationale in changes to the original plan. Ultimately, this report will establish that Pitt's PECAP team has worked diligently and optimistically in following a pathway that adheres to the originally established FIPSE objectives.

PROGRESS IN ACCOMPLISHING EXCEL OBJECTIVES

(1) Make a solid improvement in the academic performance of the participants in freshman science, mathematics, and engineering problem solving.

As this is the first year in following the first cohort of participants, we have only one year of student performance data and opinion survey feedback. Trends at this time are difficult to predict. Next year's report will provide a better idea regarding solid improvements in academic performance. Activities and outcomes to this date include:

FIPSE Objective #1: *Make a solid improvement in the academic performance of the participants in freshman science, mathematics, and engineering problem solving.*	
Activities	**Outcomes**
Created/Implemented 6-week Summer Engineering Academy.	Participation motivated student cohort to do better in math and science. Thus, indicating an understanding of its relationship to the profile of a successful engineering student. *(Q1 of PECAP Survey results - page A-4)*
	Participation reinforced student's decision to choose Engineering as a college major. *(Q7 of PECAP Survey results - page A-6)*
	All particpants felt by attending SEA, they were better prepared for the upcoming school year. *(Q16 of PECAP Survey results - page A-13)*
Provided weekly tutoring sessions for all SEA participants during the academic school year (Fall 2003 & Spring 2004).	While attendance was taken and strongly encouraged, 23% of the participants chose not to take advantage of the opportunity.
	Consequently, each of those who did not attend regularly, either dropped out of Engineering during the first term (Fall 2003), or failed out of Engineering by the second term (Spring 2004).

(2) Make solid improvement in performance in technical research, writing, & analytical problem solving.

Mentoring Program for Excellence in Engineering (MPEE)

On October 1, 2001, Sylvanus Wosu, (Assistant Dean for Diversity and Professor in Mechanical Engineering) started a new program in the School of Engineering, **Mentoring Program for Excellence in Engineering** (*formally known as Minority Engineering Mentoring Program (MEMP*). The focus is on enhancing the engineering education in the School and preparing women and under-represented and/or academically disadvantaged students for a graduate education in engineering. The primary strategy is to identify highly qualified students with strong potential and motivation for graduate school in engineering fields, and to keep them focused and supported to reach that potential. The program will implement a systematic approach of increasing the number of women and under-represented and/or academically disadvantaged students who are better prepared and motivated for a graduate engineering education at Pitt.

The goal of MPEE is to help women and under-represented students develop ambition for an advanced engineering education and to help transform that ambition into reality by using faculty mentors as the "model of identity" and the "brain to pick". The mentors play the role of supporting, pushing, and influencing the desired learning behavior and experience for the dream (ambition) to come true. A measure of the output of such an approach is the increase in the number of well-prepared graduating students aspiring for a graduate engineering education**.** Thus, the proposed mentoring program is a comprehensive educational plan designed to promote advanced academic achievement and consists of three major focus areas: (1) Student Retention and Continuous Performance Evaluation; (2) Undergraduate Research Enhancement; and (3) Transition to Professional Work or Graduate School.

FIPSE Objective #2: *Make solid improvement in performance in technical research, writing, & analytical problem solving.*	
Activities	**Outcomes**
Matching engineering faculty with an under-represented/economically disadvantaged engineering student.	Mentoring of this nature provides participants with "real world" information, encouragement, advice, and access to networks. The School of Engineering heavily encourages its faculty to develop diversity competencies. On November 14, 2003, a new award for Diversity was presented to the Bioengineering program. Such an award will become an annual event and will be presented to the department for significant contributions to enhancing and supporting diversity. *(Press Release attached)*
Students engage in hands-on research relative to their engineering interests, as well as attend professional development workshops.	Experience in lab and workshops activities excite students and provide a direction for their interests and future plans. Many consider graduate school when they originally had not thought it possible. For example, in February 2004, three students attended the PA Conference on Graduate School Opportunities for Black & Hispanic students: ~ Daniel Armanios ; Black/Male, Sophomore, QPA of 3.96 – Mechanical Engineering ~ Monica Higgins ; Black/Female, Sophomore, QPA of 3.67 – Civil Engineering ~ Jessica Mehl ; Hispanic/Female, Junior, QPA of 3.94 – Civil Engineering A group of ten students also attended a motivational and informational session on graduate school sponsored by Dr. Sylvanus Wosu in February
Provide opportunities for participants to professionally present their work to an audience of their peers and faculty.	Participants develop multi-dimensional communications skill-set (writing & presentations) that are essential in both academia and industry. Over the past reporting period, two particpants received national recognition for their newly acquired skills - both recipients began their MEMP experience as pre-freshmen engineers: ~March 2, 2004, Dan Debrah received Honorable Mention in USA Today's 2004 All-USA College Academic Team program. *(Press Release attached)* ~April 23, 2004, Daniel Armanios was awarded a Barry M. Goldwater Scholarship. *(Press Release attached)*

(3) Provide direct access for full participation in quality engineering education at Pitt. Creating an interest in science and math has always been the first hurdle to enrolling more under-represented students into the engineering program at the University of Pittsburgh. That is, until a year ago, when the US Supreme Court determined that universities could consider race when making admissions decisions. This ruling did not end the battle – instead many consider it to have re-shaped the battlefield. Continued threats of litigation have

prompted many schools across the US to eliminate or re-design their programs originally created to attract students of color.

Here at the University of Pittsburgh, the School of Engineering (SOE) began such a process over three years ago when it expanded its definition of under-represented to include:

> "*Diversity refers to those differences (race, religion, gender, national origin, physical ability, sexual orientation, age, geographic origin, socio-economic level, culture, language, ethnic background, intellectual skills, and others) that individuals bring to the School while contributing to the mission of the School of Engineering.*"

Although the definition is inclusive, the tools required for effective recruiting were more difficult to acquire, as a result of a more conservative approach to admissions and financial support for incoming students. Specifically, several items changed the EXCEL programs methods of garnering student interest that potentially jeopardized the matriculation rate of under-represented students. Decisions made university-wide that directly impacted under-represented student recruitment included:

1. Higher admissions standards.
2. Discontinuation of special access programs.
3. Less scholarship money available for all populations.
4. Removal of support grants for continuing special access populations.

In spite of these facts, a concerted effort was made during the spring to personalize interactions with phone calls and emails to parents and students. Invaluable assistance was provided via members of the National Society of Black Engineers (NSBE), the Society for Hispanic Professional Engineers (SHPE), and the Society for Women in Engineering (SWE). All three student groups made themselves readily available when prospective students arrived on campus. The goal was to demonstrate community to our visitors, and the result was strengthening the existing under-represented community here at Pitt.

The results were encouraging and provide an excellent framework to build from in the upcoming year. Facts worthy of noting include: The incoming under-represented freshman class is larger than last year (up 7%); standardized test scores nearly equal that of the majority students (whereas in previous years they consistently lagged far below); an increase in Math SAT's doubled that of the white cohort (minority students increased their total score 48 points, whereas, the majority students increased their total score by 24 points). For details, please refer to the chart below:

	Number of Students			**Average MATH SAT**			**Average Total SAT**		
	04-1	**05-1**	**% Change**	**04-1**	**05-1**	**Score Change**	**04-1**	**05-1**	**Score Change**
American Indian	1	2	50%	630	630	Same	1230	1230	Same
Asian/Pacific Islander	11	14	27%	664	678	+14	1283	1313	+30
Black	28	26	-7%	623	652	+29	1214	1270	+56
Hispanic	1	2	50%	700	635	-65	1290	1260	-30
ALL Minority	41	44	7%	636	660	+24	1235	1283	+48
White	335	379	13%	662	673	+11	1273	1297	+24
All Freshmen	376	423	12%	659	667	+8	1269	1286	+17

Source: University of Pittsburgh Office of Admissions & Financial Aid & the Freshman Engineering Program 2004 database

PECAP/EXCEL PROGRAM CHALLENGES: STRATEGIES to PERSEVERE

Last summers program, PECAP targeted the summer academic enrichment program to all incoming freshmen engineering students; especially all women, under-represented, and economically disadvantaged engineering students. Additionally, invitations were extended to those rising freshmen who were admitted provisionally to the

SOE. This special access program included a wide range of ethnicities and backgrounds. However, the status of special access programs for minority students university-wide fell under tremendous scrutiny in the wake of the Affirmative Action decisions of June 2003.

On February 6, 2004 the School of Engineering officially dropped the PREP admissions category for all engineering admissions for the upcoming recruitment year. This translated into the fact that all admitted students with Math SATs below 600 as well as others that might be considered borderline admits will be informed that they will be asked to take an Algebra and Trig test. Those who do not take the test will be placed in Math 200 (Pre Calc) and not be allowed to take Physics. It was planned the EXCEL program would provide additional support activities to assist students in their persistence efforts during their freshman year. All pre-testing took place on-line, in May of 2004. The timing will allow the Freshman Engineering Program and the Pitt EXCEL program to strongly encourage those who do not test into Calculus to attend the summer program (two weeks prior to Pitt's Freshman Orientation of August), or take an intensive pre-calc course prior to Fall 2004 and be given an opportunity to repeat the Algebra and Trig test.

As a result of such policy changes, students are "tested" into an academic support program to better prepare for fall term academic success. Of great concern was the number of under-represented and economically disadvantaged students who would be admitted directly to the School of Engineering hence impacting the targeted group the PECAP program was designed to serve. At a planning meeting between the School of Engineering's Associate Dean of Academic Affairs, the Freshman Engineering Program Director, and Associate Director of the Pitt EXCEL Program, and the Assistant Dean of Diversity, it was decided that all students who tested into math at a Pre-calculus level should be invited to the PECAP Summer Engineering Academy. Additionally, it was also decided that students who barely passed their placement exams to take Calculus would also have an invitation to participate.

At the time this report is being written, it appears an interesting, and unanticipated result has occurred. While the number of under-represented engineering students (admitted to the SOE) has held consistent with the previous year, the profile of the population who students who could best benefit from the SEA has changed slightly. Specifically, of the 423 engineering freshmen (44 are considered under-represented ethnic minorities) – 26 student's placement exams indicated they should begin their freshman math course at the Pre-Calculus level. Of the 26 students, 12 were under-represented freshmen. Thus indicating that the weak math performers were not comprised primarily of the minority students. Efforts are bring made at this time to ascertain if the group of pre-calculus students are comprised primarily of economically disadvantaged students. Communications with Pennsylvania Higher Education Assistance Agency (PHEAA) have been ongoing, and will verify or disprove this idea. The EXCEL program will report all results of such communications in upcoming reports.

Discuss any significant changes proposed for the coming year. Why are changes necessary?
Two significant factors were carefully considered when evaluating the need for possible changes to the Summer Engineering Academy.

1. 2003 SEA participant opinion indicated that change was necessary.
    a. See: Q17 of attached PECAP Evaluation
2. 2003 SEA participant academic performance during first and second terms demonstrated the need to re-consider program administration and format.
    a. Unsatisfactory performance during Summer Engineering Program appeared to be a strong indicator for poor academics during regular school terms.

The EXCEL staff conducted considerable research regarding other nationally recognized summer bridge programs. Specific criteria used to identify such programs included:

- *Program reputation and varied schedule*: To attract more students by cutting down on program costs and time invested for particpants. It was important to learn from reputable sources.
- *Participants were engineering students who were directly admitted to the university*: Since special access programs at Pitt had been eliminated – it was important to compare similar profiles.
- *Emphasis on Math Skill*: Previous low scores appeared to be a consistent indicator of potential problems, therefore demonstrating the value of focusing the program's efforts in cultivating essential math skills. The chart below illustrates the academic performance comparisons of 2003 SEA participants from the time they were admitted to SOE (see SAT Scores), to their Fall/Spring term academic performance. Such trends demonstrate that a 6-week program cannot make-up for math deficiencies that have occurred over a 12 year

span in schooling. It is anticipated that the newly admitted cohort of freshmen will possess a higher skill level based on the fact they were admitted via the higher admissions standards. Additionally, as the CARE program graduates students into the SOE, math deficiencies will also diminish therefore positively impacting the student persistence/graduation rate.

2003 SUMMER ENGINEERING ACADEMY: PARTICIPANT PERFORMANCE

	STANDARDIZED TESTING		**MATHEMATICS**					**GRADE POINT AVERGE**		
	SAT		**Summer ENGR Academy**	**Fall 2003**		**Spring 2004**		**Summer ENGR Academy**	**Fall 2003**	**Spring 2004**
	Math	*Total*	*Foundational ENGR Math*	*Pre-Calc*	*Calculus*	*Pre-Calc*	*Calculus*	*QPA*	*Term QPA*	*Cum. QPA*
St.1 (BB)	550	1150	F	F		No grade. Left School		1.44	0.3	0.3
St.2 (CB)	550	1150	D	F		B-		1.19	0	0.96
St.3 (MB)	610	1070	F+	D			C	1.00	1.25	1.5
St.4 (KD)	570	1120	B+		A		A	3.13	2.44	2.48
St.5 (ME)	680	1400	---		C+		B+	3.75	2.81	3.07
St.6 (TE)	610	1160	B		F		B-	1.94	1.04	1.42
St.7 (DG)	630	1240	C+		C+		---	2.31	1.32	1.72
St.8 (TI)	570	1080	B		F		B-	3.50	1.59	1.42
St.9 (NJ)	570	1060	B	B			B-	3.00	2.31	2.13
St.10 (AP)	650	1330	---		F		---	3.25	0.45	1.62
St.11 (KT)	560	1120	F	F		No grade. Left School		0.19	0.23	0.23
St.12 (WW)	660	1310	A-		B+		A-	3.63	2.54	2.83
St.13 (JY)	620	1260	A		C-		---	4.00	2.52	2.4

Source: University of Pittsburgh Office of Admissions & Financial Aid & the Freshman Engineering Program 2004 database

SUMMER ENGINEERING ACADEMY: THE NEW PARADIGM

Significant time was invested in discussing options to provide new approaches in re-designing the Summer Engineering Academy to better fit the needs of the participants. Research of comparative nationally recognized programs indicated that the following universities met the above mentioned criteria, as well as represented similar institutional profiles:

1. Arizona State University ~ Minority Summer Bridge program
2. Mississippi State University ~ Summer Bridge Program
3. North Carolina AT&T State University ~ Summer Bridge Program
4. Purdue University ~ Mathematics Bridge Program
5. University of California Los Angeles (UCLA) ~ PREP Summer Bridge Program
6. University of Tennessee ~ ENGAGE Program
7. University of Southern California (USC) ~ Summer Bridge

Each of the above listed programs has similarities, yet, none precisely matched with Pitt's School of Engineering under-represented freshmen and mission of the PECAP program. As a result, the EXCEL staff worked with members of the University of Pittsburgh community to re-engineer a summer experience that would offer tangible

benefits to potential participants. The goal this year is to double participation, as well as have a 75% pass rate on the final placement exam to be given the final day of the program. A general outline of SEA's changes is indicated in the chart below.

2004 SUMMER ENGINEERING ACADEMY: PROGRAM OUTLINE

	Last Year (2003)	**This Year (2004)**	**Specific Change to Program**	**Rationale for Change**
Target Population	All under-represented, economically disadvantaged, and female first-year engineering students.	All engineering students who tested into pre-calculus &/or those students who barely placed into Calculus 1. However, all of the previous year's designated target population would also be invited to participate.	Opened up program participation to a broader audience.	Focus continues to be preparation for success in Calculus 1 & academic enhancement. Change illustrates institutional desire to be more inclusive to all student populations.
Selection	Same as previous year. Students must apply after receiving placement test scores.			
Dates of Program	June 23 - August 1, 2003	August 11- 22, 2004	More intensive / shorter program following the same technical content as the previous year's program.	Convenience for students and linkage with Fall registration programs for engineers as well as availability of on-campus housing for participants.
Content	Courses included: Foundational Engineering Mathematics, Intro. To Engineering Science, Writing for Engineers, Engineering Software Tools, Research Seminar	This years courses: Foundational Engineering Mathematics, Engineering Software Tools, Research Seminar	No Introduction to Engineering Science and no Writing for Engineers will be offered. Such skills are sufficiently covered during Freshmen coursework in Chemistry, Physics, and Engineering Analysis. Focus will be on Math proficiency.	Since Calculus skill has proven to be the factor most critical in engineering student persistence, the focus for the Summer program has been concentrated to include a more intensive Pre-Calculus experience. Engineering problem solving with math applications will also continue to be offered, as well as academic enrichment sessions.
Assessment	Same as previous year. Continue with original assessment plan.			
Cost per participant	Maximum of $1200. Participants pay according to what Pitt's Financial Aid office reports as their estimated family contributions as well as unmet financial need.	Maximum of $500. Participants pay according to what Pitt's Financial Aid office reports as their estimated family contributions as well as unmet financial need.	Lower cost for students to participate.	Entice students who ordinarily may have to work full-time jobs over the summer and may not be able to take time off to participate.

Have you experienced delays?
Delays in the College component of PECAP have not occurred.

The summer program has been planned to take place later in the summer for the following reasons:

- Since SEA will take place precisely two-weeks prior to the start of the Fall term, students will be able to move into their permanent on-campus housing. Thus, providing the participants the benefit of settling into dorm life earlier, establishing relationships with peers, and providing an environment for SEA and its participants) that will nearly replicate that of the regular college term.
- Shorter time commitment for all participants. Previously, the cost of taking time from work, and the added burden of travel prevented students from participating.
- The completion of SEA will coincide precisely with the final registration session for engineering students. This will enable all SEA participants who place out of Pre-Calculus to change their fall schedule to include both Calculus and Physics.

EVALUATION & ASSESSMENT of EXCEL PROGRAM

(Note: A detailed analysis of the PECAP programs evaluation plan can be found in Appendix A: PECAP Final Report, prepared by PECAP's external evaluator, Mr. Robert Goldbach.)

How is your evaluation proceeding?
The evaluation plan for the PECAP program is proceeding precisely as planned in PECAP's original FIPSE grant submission.

What specific measurements are you developing and using to determine the progress of your project?
Planning for the evaluation of program outcomes began well before the onset of the summer program. Meetings between the evaluator and the staff focused on the construction of survey instruments, the development of an evaluation plan and discussions about the use of appropriate outcome measures.

The external evaluator administered the results of two survey instruments on the final day of class:

- The PECAP survey instrument, the shorter of the two, was designed to elicit student reactions to the program as a whole. It posed the same set of questions to participants of all programs. While the survey items asked about certain specific program details, such as tests, learning strategies and instructional techniques, it also was designed to uncover information about more intangible elements such as motivation, educational growth, and overcoming obstacles.

  The evaluator designed a data entry system and provided the PECAP staff with instruction for entering the survey results. After the staff completed the data entry, the database was given to the evaluator, who analyzed the results using a statistical software package. The findings from this survey are presented in the first section of the report.

- The Program Summary instrument asked more detailed questions about each of the program components. The survey items encouraged students to evaluate such aspects as instructors, class materials, length of the class day, and pace of instruction. Open-ended items were included to give students the opportunity to explain answers, suggest improvements, and indicate what aspects of the program were helpful or not helpful.

Program staff took responsibility for summarizing the responses to these surveys. The summarized results were then given to the evaluator for analysis and interpretation. The findings from the analysis of closed-ended questions are included in the second section of the *Evaluation of the PECAP Summer Program (prepared by external evaluator),* in the Program Summary Results. Additionally, thematic analyses of the open-ended responses are found in the third section (Student Feedback Summary) of the report.

Additionally, the program staff continually monitors student academic performance through both mid-term and final grade reports.

How often do you collect evaluation data on your project?
Evaluations are collected in two ways at two distinctly different time periods:

1. Upon completion of Summer Engineering Academy and the Minority Engineering Mentoring Program, student opinion surveys are administered.
2. Throughout the Fall and Spring academic terms, participant academic performance is carefully tracked. Such results provide directly observable evidence to student performance that is relative to their science, mathematics, and engineering problem-solving abilities.

Are you experiencing any difficulties gathering data on your objectives?
No, there has been no difficulty in gathering data on the stated objectives.

Are than any changes or delays from your original evaluation plan?
In terms of the original evaluation plan, there have been no changes of delays for the PECAP program.

PECAP'S IMPACT ON SCHOOL OF ENGINEERING PEDAGOGY

To improve the quality of teaching and learning within the University of Pittsburgh and the local high schools, the PECAP project is completing the development of three supplemental instruction manuals in a series of Modules (Modular Pre-Calculus -College Algebra, Modular Pre-Calculus –Trigonometry and Functions, and Modular Calculus I) as part of PECAP's proposed Foundational Mathematics. The Modular Pre-Calculus -College Algebra covers college algebra and Algebraic manipulations of complex equations with some technical examples and emphasis on problem solving. The Pre-Calculus- Trigonometry, Functions and Graphs Module covers trigonometry, functions, linear equations, and an introduction to limits and calculus. Each module breaks the course content into sub-modules and self-programmed exercises with integrative critical, analytical and engineering inquiries to increase mastery and retention of concepts learned. The Modules will give the students added practices that will lead to mastery and knowledge extension of the subject matter. The Pre-Calculus modules will be used by CARE students in the summer to enhance teaching and learning of the entering High School Seniors. The SEA (entering college freshman) students will use the Pre-Calculus –Trigonometry module. It is hoped that the supplementary instruction will improve the students' performance and preparation for Calculus in the Fall. The Modular Calculus I also follow the same strategy, breaking the regular Calculus I course into Modules, introducing engineering calculations and MATHLAB in problem solving. Engineering freshman students who placed into Calculus will use this Module. By integrating these Modules into the engineering freshman curriculum, the PECAP program will be improving engineering pedagogy and empowering students to take personal initiative in their own learning and educational growth.

PECAP'S IMPACT ON NATIONAL EDUCATIONAL PRACTICE

The first year results of PECAP were presented during the 2004 ASEE conference attended by educators from several national and international universities and published in the conference proceedings. The PECAP project is making an impact on educational practices in local public schools as evidenced by the responses and support of school officials. Other evidence of the impact is an invitation by the University Puerto Rico to present PECAP strategies for adoption in Hispanic high schools and universities.

Growth of the original PECAP project has remained stable with no significant increase in scale. However, the program strategies and vision have been broadened in terms of diversity of the students' population and strategic links to the engineering curriculum.

Materials and practices developed in the PECAP project are being disseminated to others through the internet conference proceedings, press releases, mailings, and newsletters.

PREDICTIONING SUSTAINABILITY OF THE PECAP PROGRAM

PECAP has been institutionalized as a unit of the Engineering Office of Diversity with oversight over all recruitment, retention, mentoring, and graduation of all students that contribute to diversity in the school of engineering. The unit has enjoyed full endorsement from the Dean of Engineering, the Provost's Office, the

Chancellor's Office, and local industries with appropriate level of funding that will continue beyond the FIPSE years. The unit is also the recipient of 2004 Chancellor's Award for Affirmative Action for its contribution to diversity at the University of Pittsburgh.

Other plans to sustain the Project including charging a minimal fee (following the model of other such national programs) after FIPSE funding to cover summer activities.