

FOSTERING OPPORTUNITIES FOR TOMORROW'S ENGINEERS (FORTE)

PI: John Reisel

Co-PIs: Ethan Munson, Ed Beimborn,
Hossein Hosseini, George Hanson

Project Coordinator: Marissa Jablonski



FORTE Project Goals

- Improve retention rate and graduation rate of students in Engineering and Computer Science.
 - Increase 1-year retention rates from ~58% to 80%.
 - Increase overall graduation rate of new freshmen from ~31% to 58%.
 - Increase overall graduation rate of new transfer students from ~46% to 70%

FORTE Project Goals

- Increase enrollment, retention, and graduation of female, and under-represented minority students.
- Foster partnerships with local high schools
- Contribute research to the effectiveness of specific strategies on improving retention and graduation rates.

FORTE Project Components

- Summer Bridge Program
- Peer Mentoring / Study Groups
- Living-Learning Community
- Student Recruitment
- Faculty Mentoring
- Evaluation

Peer Mentoring

- Beginning in Fall 2009, all incoming freshmen were assigned to study groups (8-10 students, led by an upperclassman). The assignments were done primarily based on Math course, and secondarily by intended major.
- Groups concentrated on Math course topics, with some additional problems from freshmen engineering/CS classes.
- Participation Rate: ~35%

Living-Learning Community

- “Innovation House” began in Fall 2009 with 41 students.
- Students placed into dedicated study groups.
- Guest Speakers and social events
- ~20 students participated in an optional robotics / video production program.



Recruitment

- Targeted Mailings
- High-School visits and college fairs
- Admission to CEAS for some students contingent upon participating in Summer Bridge.

Faculty Mentoring

- Small-scale program being developed with Scholarship program students.

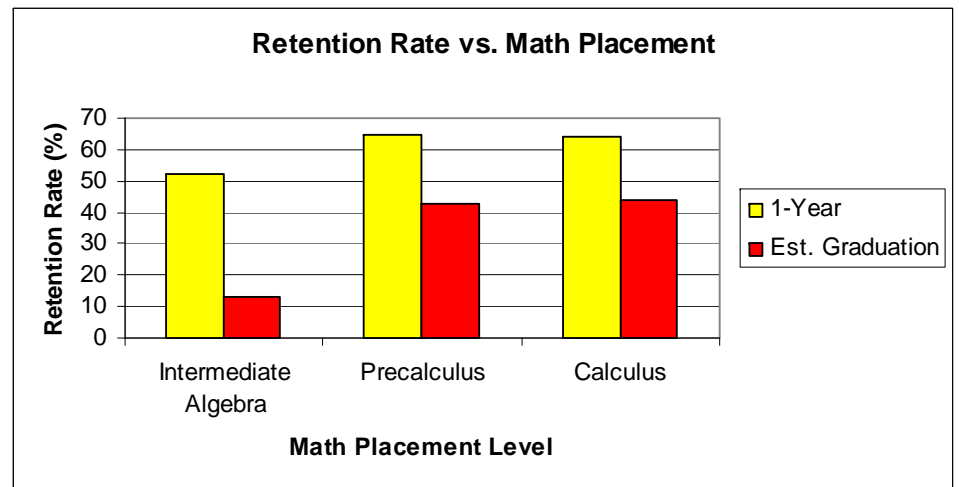
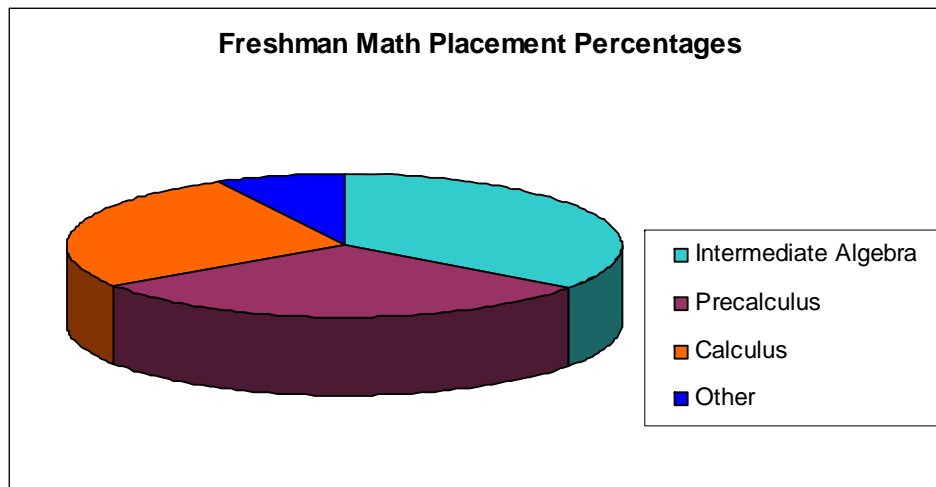
Evaluation

- Comprehensive monitoring system established

Summer Bridge Program

- The “Summer Enrichment Program” began in June, 2009.
- Program Size: 37 students
- Students lived in campus dorms
- Primary Purpose: Improve Math placement for incoming freshmen
- Secondary Purpose: Provide simple engineering experiences for the students to excite them about engineering and computer science.

Summer Bridge: Need



- Data based on 2003-2005 Freshmen
- Large Majority (~70%) place below Calculus Level
- Those placed further below Calculus have lower 1-year retention and graduation rates in CEAS.
- Precalculus placement students tend to leave due to academics more than Calculus placement students

Summer Bridge Program: Math

- 4-week program of intensive math study to improve placement scores for Precalculus (Math 116/117) and Intermediate Algebra (Math 105) students
- Retake placement test at end of program
- Based on ALEKS software, with 3 instructors available for guidance and additional tutoring.
- Students worked formally on math for 2.5 hours each morning, M-F. (Students could work more on their own in the evenings.)

Summer Bridge Program: Results

- 36 students retook the math placement exam at the end of the program (1 student received AP credit during the program.)
- 16 students placed up one class level, and 8 students placed up 2 levels. (65%)
- Time spent on ALEKS program as well as incoming preparation (Math ACT scores) were important in predicting success.

Summer Bridge Program: Results

	Improvement	No Improvement
Number of Students	23*	13
Average Math ACT Score	24.7	23.2
Average time spent on ALEKS (hours)	46.3	39.1

* Does not include student who received AP Credit

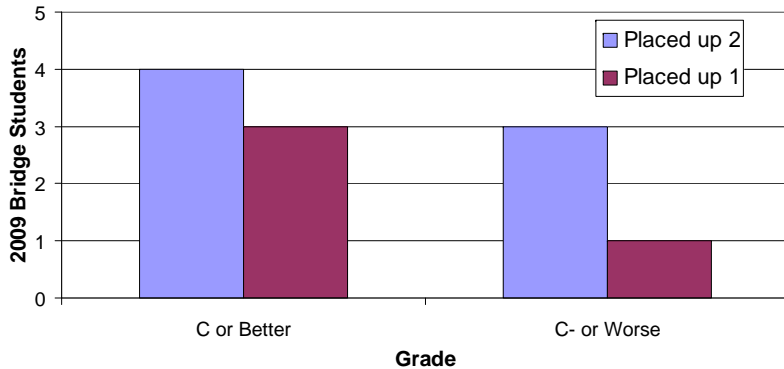
Summer Bridge Program: Results

Math ACT Score	< 21	21	22	23	24	25	26	27	> 27
Improvement	1	3	1	3	2	2	3	5	3
No Improvement	1	2	2	3	1	1	1	2	0

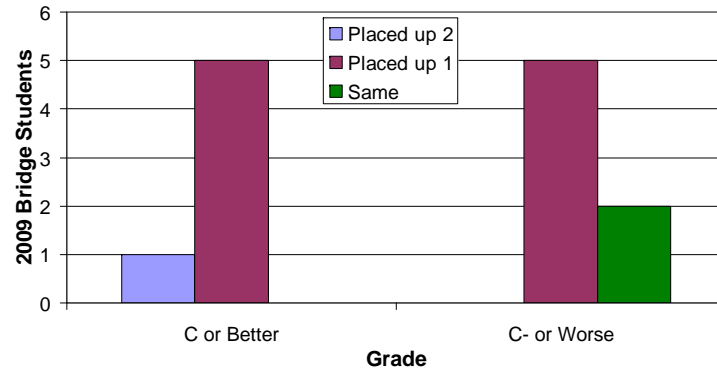
Students who had an **ACT Math score of 24** or higher placed higher at a **75% rate**, while students who had a **score below 23** placed higher at only a **50%** rate. Often, this brought the students with a Math score of 24 to a level of math placement expected of their Math score (placement into at least College Algebra and Trigonometry).

Bridge Students – Fall 2009 Math Results

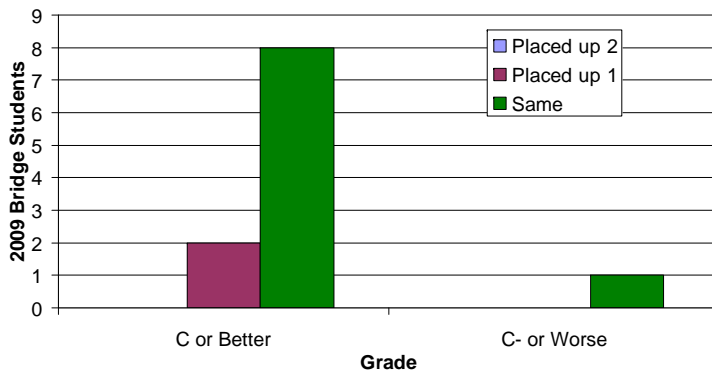
Math 231 - Fall 2009



Math 116/117 - Fall 2009



Math 105 - Fall 2009



Bridge Program students benefited the most in Calculus (Math 231) and Intermediate Algebra (Math 105).

Advancing 2 courses might not be a benefit for all students.

3 students who did not get through both College Algebra (116) and Trig (117) did get a C or better in one of the two.

Overall in Math 116: 40% of all students received a C- or worse.

Summer Bridge Program: Engineering Activities

- Students participated, in groups, in four weekly activities. Each group made a presentation on their project at the end of the week.
- Guest speakers were brought in to talk more about the topic, and one field trip was conducted.
- Six student mentors were employed, with 4 being the project “leader” for one project.

Weekly Topics

Week 1: Traffic Intersection Design



Week 2: Construction of a Motor



Weekly Topics

Week 3: Bridge Design / Testing



Week 4: Building a Generator / Repeat Presentations for Families



Bridge Program Challenges

Increase Math Course Placement Improvement Rate

- ALEKS was a useful tool, but students who received more direct interaction with instructors succeeded at a higher rate (73% vs. 54%...style of instructor in class.)
- Student survey desired more hands-on instruction/tutoring
- Student mentors desired greater involvement.

Planned Solution: Have student mentors go to the dorms during the evenings to tutor students needing additional math instruction

Bridge Program Challenges

Improve Math Course Passing Rates in Subsequent Semesters

- The pass rates of students in College Algebra/Trig and Calculus in the Fall 2009 semester were similar to the whole course rates...more benefits could be seen from students with the additional math prep. (as seen in Intermediate Algebra).

Planned Solution: Additional math tutoring over the summer by the mentors should help this. In addition, more use of the Fall Study Groups needs to be stressed during the summer program.

Bridge Program Challenges

Weekly engineering projects were unrelated, and didn't involve computer science

- CS students expressed a desire for a computer science project, and other students would have liked a pure Mechanical Engineering project.

Planned Solution: Revise one or two of the projects, and have all built around the same theme. For example, have a 4-week project on building a drawbridge, with one week devoted to the bridge design, one to building a motor, one to designing the mechanical system for raising the bridge, and one for programming the operation of the system.