



ALAMO  
COLLEGES

SAN ANTONIO COLLEGE



# 2016 SAC CCLI Phase 3 8<sup>th</sup> Annual Report

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## Activities and Findings (2009 – 2013)

- ❖ SAC engineering math (EM) course: ENGR 1377
  - *Introductory Math for Engineering Applications*
  - Free, not for credit course
  - Course Materials:
    - WSU course notes with UTSA enhancements
    - Klingbeil/Rattan Textbook (since Fall, 2012)
    - WSU Labs w/Univ. of Toledo Enhancements (Labs 2, 3, 4)
  - Teacher: Klaus Bartels, adjunct engineering/math faculty
    - One student teaching assistant/tutor 2010 - 2012
  - Initial course offering in spring, 2009 semester
    - Offered every fall and spring semester thru spring, 2013



## Activities and Findings (2009 – 2013)

### Enrollment and Course Completion Statistics

Calendar Year	Students Initially Enrolled	Students Completing Course	Students Completing Course (Grades)
2009	9	3	3 (B, C, F)
2010	6	1	1 (C)
2011	4	3	3 (A, B, C)
2012	23	0	-
Spring, 2013	2*	0	-
Totals:	44	7	7 (1-A, 2-B, 3-C, 1-F)

Notes: 4 males and 2 females passed the course

\* Two high school teachers (one math, one science)



## Activities and Findings (2009 – 2013)

### ENGR 1377 Completer Grades in Alamo Colleges Math Courses

Student #	ENGR 1377	Inter. Algebra	Plane Trig	College Algebra	PreCal	Cal I	Cal II
1	B	B					
2	C		B		D		
3	F					B	C
4	C						A
5	A					C	A
6	B					C	B
7	C			A	B	C	C

Totals (excl. ENGR 1377): 4 A's; 7 B's; 8 C's; 1 D; 1 F

Passing Grades: 19 of 21 (90%)





## Activities and Findings – The “Good”

### ❖ Student feedback from course completers

- Universally positive
- Rated course very high overall
- Students strongly agreed the course:
  - was enjoyable, especially labs (difficult for some)
  - improved motivation/success in math/engineering classes
  - taught them a lot about engineering applications
  - was valuable to them and met their expectations
  - is one they would recommend to other engineering majors

### ❖ Textbook praised overall (2012/13 non-completers)

- More & better descriptions of engineering examples desired
  - New 1<sup>st</sup> edition improved on this



## Activities and Findings – The “Bad”

### ❖ Chronic low enrollment & retention

- Average enrollment: 5 students/semester
- 18% (8/44) retention rate
- Techniques used to improve enrollment:
  - Lowered math prerequisite to Intermediate Algebra
  - Increased marketing (flyers, website banner ads)
  - Spring, 2010: Opened to all five Alamo Colleges
  - Fall, 2011: Opened to STEM high school teachers
- Enrollment improved, then dropped; retention down
  - Enrollment: 9 in 2009; 23 in 2012; 2 in spring, 2013
  - Retention: 3 in 2009; 0 in 2012; 0 in spring, 2013



## Activities and Findings – The “Ugly”

- ❖ Reasons for low enrollment & retention
  - Not an approved, for credit course
  - Course not part of 2 or 4-yr engr. curriculum
  - Course not transferable to 4-yr university
  - Not approved as substitute for math prerequisites in physics or engineering courses
  - First course dropped by students when conflicts arise with credited courses or personal issues





## Activities and Findings – The “Lost Hope”

### Conditions for ENGR 1377 success:

- ❖ ENGR 1377 would be a for credit SAC course
- ❖ ENGR 1377 would be transferable to Texas 4-year universities that are part of CCLI Phase 3
  - University of Texas at San Antonio (UTSA)
  - University of Texas at El Paso (UTEP)
  - Texas A&M-Kingsville (TAMUK).
  - SAC received transfer support letters for ENGR 1377 from TAMUK and UTEP in June, 2010 but not as a course leading to a degree.





## Activities and Findings – The “Lost Hope – cont’d”

- ❖ SAC Curriculum Committee did not approve the course for credit
  - Reason: Equivalent course at 4-year institutions is not included as a required course in engineering curriculums
  - SAC requested course be approved/credited as a unique needs course by Academic Council.
    - Request tabled by Curriculum Committee in 2011
      - Lack of sufficient information proving benefits to students.



## Activities and Findings – “New Hopes”

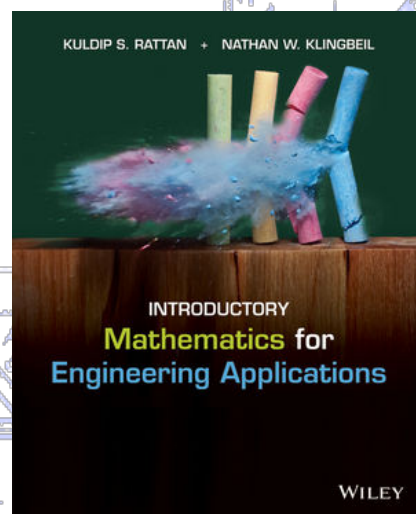
- ❖ Divide and Conquer – Approach #1:
  - Included two EM labs in 6-week summer EDGE program
    - EDGE program for HS students interested in engineering
    - Algebra and System of Equations Circuits Labs
  - Labs well received by most students
  - Used in 2013 and 2014 EDGE programs
  - EDGE grant funding expired in 2015





## Activities and Findings – “New Hopes”

- ❖ Divide and Conquer – Approach #2:
  - Incorporate selected science and engineering applications from EM textbook in math courses at SAC
  - Collaborating with Math Department faculty
  - 2014: Provided textbooks to Math Dept. faculty
  - Results: Some using textbook examples in math classes







## Activities and Findings – “New Hopes”

- ❖ Divide and Conquer – Approach #3:
  - Engineering applications prof. development seminar
  - Provided to MS math/science teachers in March, 2014
  - 6-hour Saturday session doing 9 hands-on activities
    - Structures, geometry, fuel cell car, circuits, rockets, and more
    - Learn how engineers use STEM to creatively solve real-world challenges as well as exploring a variety of ways for students to understand and get excited about engineering
    - Activity handouts included relationship of activities to state math educational standards
  - Highly positive feedback from participants & ESC-20\*

\*Education Service Center, Region 20

## Activities and Findings – “New Hopes”

- ❖ Divide and Conquer – Approach #3 - Photos:
- ❖ Engineering and Math are FUN!!



6/30/16

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## Activities and Findings – “New Hopes” – Approach #4

### ❖ Created EGR 1001 - EM Continuing Education (CE) Course

- ‘Introductory Math for Engineering & Science Applications’
- Targeted at High School math and science teachers
- Engineering students encouraged to attend as well

### ❖ Primary benefits:

- Improve teacher’s understanding of how to apply scientific principles and mathematical concepts/methods to analyze/solve practical application problems in science and engineering, which they can pass on to their students
- Improve math skills and motivation for and support of engineering

### ❖ ENGR 1377 vs EGR 1001

- Contact hours reduced from 78 hours to 48 hours (3 hours, once per week)
- Reduced lecture time and topics/examples/labs covered

### ❖ Course offered for Fall, 2013 and Spring & Fall, 2014

- Courses did not make – only a few persons enrolled
- Teachers too busy and couldn’t commit to weekly scheduled class times





## Activities and Findings – “New Hopes” Improved Approach #4 (cont’d)

- ❖ 2015 - Restructured EGR 1001 EM CE course
  - Created flexible, hybrid (blended) EGR 1001 course
  - Better meets teachers’ /students’ availability and needs
  - Students select 4 out of 9 EM topics/chapters from text
  - No lectures – students read textbook at own pace and email completed textbook homework problems for grading
    - Instructor provides assistance one-on-one online or face-to-face
  - Labs and Initial/Final Assessment done in classroom
  - Students coordinate lab dates/times with instructor
    - Lab times offered throughout week including Saturdays
  - Students must successfully complete minimum of 70% of assignments to pass and get completion certificate



## Activities and Findings – “New Hopes” Improved Approach #4 – cont’d

### ❖ New Hybrid EGR 1001 EM CE Course (Spring, 2015 & 2016)

- Results: 56% retention (5 of 9) – substantial improvement

100% of completers passed

Student #	Status	Initial Assessment	Final Assessment	Assessment Improvement	Course Grade
1	HS Math Teacher	77	99	+22	99 (P)
2	HS Math Teacher	68	98	+30	99 (P)
3	HS Math Teacher	70	93	+23	96 (P)
4	SAC Engr Student	19	83	+64	88 (P)
5	SAC Engr Student	73	81	+8	95 (P)
Averages:		61.4	90.8	+29.4	95.4 (P)

- Passing students received 4.8 CEUs, textbook, & tuition stipend
- Student feedback highly positive:
  - “I really enjoyed the opportunity to study the topics that best fit my interests. The open schedule was great...” (HS math teacher)
  - “I need a refresher math class and be able to connect math to engineering problems. This closed the gap.” (college sophomore)
  - “I now have a book full of extra material I can use with my students in project-based labs or inquiry-based activities.” (HS math and physics teacher)
- Offer again 2016/17 school year – hope to increase enrollment



## Activities and Findings – “Additional New Hope”

- ❖ Incorporate elements of EM course in Intro to Engr course
  - Provide student option to complete some EM course topics from EGR 1001
    - Textbook problems and labs
  - Work would be done in place of some individual Intro to Engr course assignments and/or one of 3 team projects
  - Allows students to improve math application problem-solving and motivation to study math and engineering
  - Will test this approach in 2 of 3 Intro to Engineering classes in fall, 2016
- ❖ Use remaining CCLI funds to upgrade EM CE course and purchase additional textbooks and lab equipment





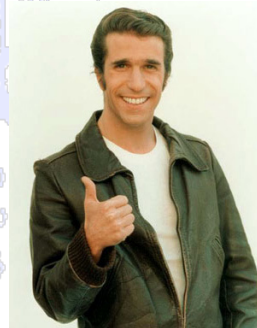
## Activities and Findings – “New Hopes” – Approach #5

- ❖ In the spring of 2015 Texas Higher Education Coordinating Board initiated the Engineering Field Of Study Committee to provide an overview of the engineering, **math**, and science courses required at the lower-division level by universities represented on this committee.
- ❖ The June 19<sup>th</sup> meeting will provide data compiled from the spreadsheets submitted by every participating institution. Additionally, Dr. Rex Peebles, Assistant Commissioner for Academic Quality and Workforce, will discuss Texas Education Code 61.823 with the committee. This statute defines field-of-study curricula and how they transfer. The committee requested further interpretation of the statute at its March meeting.



## Conclusions

- ❖ ENGR 1377 traditional lecture/lab course no longer offered
  - Very low enrollment and completion rate due to hopelessness of resolving crediting/transferability issues
- ❖ EGR 1001, 16-week CE EM course failed
- ❖ Continue flexible, hybrid EGR 1001 CE EM course for teachers/students
  - Holds promise, but need to push hard for higher enrollment.
- ❖ Incorporate elements of EM course in Intro to Engr course
- ❖ SAC remains a strong advocate of CCLI effort
- ❖ Thanks to WSU's support





# *To be continued...*

“Life’s like a movie. Write your own ending.” (Kermit the Frog)

Questions?

