

Engineering Math Development at CBU Utilizing the WSU Model (Current Year One Results*)

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Overall Context for this work is somewhat unique

- CBU is a Private University (4000+ students in Riverside California – 32% minority, semester based)
- School of Engineering Started in 2006 (first classes Fall 2007)
 - 4 Degrees offered: CE, ECE, ME and Engineering (pre law, pre med, business and global applications)
 - Incoming class size (55, 67, 70+ (est))
 - 35% ethnic minority,
 - 20% female
 - 22% international
 - 30+% of incoming students involved in athletics
 - Cohorts of students on presidential scholarship from Rwanda (11/12, 16/19)
 - Full time Faculty (1,2,5,8,11?) Currently 2 of 8 faculty are women

Our NSF team has diverse and complimentary backgrounds

- Dr. Alex Chediak – PhD Material science Cal Berkeley – responsible for teaching and implementing a new inquiry based physics curriculum for our engineering program (joint appointment SOE and College of NMS)
- Dr. Elizabeth Morris – PhD Mathematics Education (School of Education)
- Dr. Xuping Xu -Masters in Applied Math and PhD in EE from Notre Dame (School of Engineering)
- Dr. Anthony Donaldson – PhD in EE, innovative curriculum work at TTU, SPU and CBU (School of Engineering)
- Three new F 2009 engineering faculty involved in teaching, and lab development for this effort (including 2 women)

Outstanding undergraduate curriculum is a focus and thus a fit for this model

- One of four articulated areas of focus for the school's activities
- One of ten distinctives desired for our programs
- Faithfulness in using vocational gifts for service is seen as a primary way we worship God and thus curriculum development is seen as directly tied to our school of engineering mission statement and its guiding verse (Ephesians 2:10)

Course structure was changed to fully implement Wright State model

- 2007-2008 – algebra, precal or calculus entry points (WSU 100 1.0 introduced in fall, WSU 101 1.0 introduced for first two groups in spring 2008.)
- 2008-2009 – WSU 100 2.0 (labs added), WSU 101 2.0
- 2009-2010 – WSU 100 3.0 (EGR faculty and vertical integration “VI”) WSU 101 3.0 (required course, VI and customized text)

Vertical and horizontal integration has begun

- 5 new labs developed for '100' and '101', more planned for this summer for fall required 101 rollout.
- Input begun from Physics (mechanics), circuits, statics, strength of materials
- This fall 1 section of 100 and 2 sections of 101 will all be taught by engineering faculty with integrated (VI and HI) labs.

Algebra-Concepts in Physics

- Velocity as a function of time for a constant acceleration scenario (such as a glider sliding down a frictionless incline plane):

$$v(t) = at + v_0$$

- Again, the function is an example of:

$$y(x) = mx + b$$



Incline plane with glider.
Photogate will measure the
velocity.

Initial results are very encouraging!

- 44% of 'at risk' students entering 100 in Fall of 2008 still in program after 1 year (WSU went from 24 to 48 %)
- Student perception of benefit was highest for courses where we have begun to vertically integrate. 4.67 out of 5.
- Overall student perception of benefit was quite good. (see details on next slide)

Overall student perception of 101 was very positive! – preliminary details

- **“EGR 101” increased motivation to study engineering 4.29***
- **“EGR 101” contributed to success in subsequent EGR courses 4.43**
- **“EGR 101” increased motivation to study math 3.86**
- **“EGR 101” contributed to success in subsequent MATH courses 4.43**

*on a 5 point scale 5:strongly agree,
3:neutral, 1: strongly disagree

Additional assessment is being implemented

- Math anxiety (pre and post 100 and 101)
- Correlation with a customized math placement exam
- Correlation for student performance in Calculus (w and w/o 101) is planned
- Correlation for student performance on National FCI for Physics is planned

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