TU WSU MATH PROGRAM

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The University of Tulsa

- Private, doctoral degree granting, accredited
- Relatively small enrollment
  - 4,187 (3,084 undergraduate, 1,103 graduate and law)
- Selective Admissions (2010 Freshmen All Majors)
  - Average ACT 29
  - Average SAT 1270
- ME Stats
  - Average ACT 30 ± 4 (over survey time)

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Motivation for Involvement

- Diversity of Participating Universities
  - Comprehensive, small, private university
- Actively modifying and improve current courses
- Understand Retention at TU
  - Retention is relatively high, but there is a desire to do better (62% 2000-2008 equates to 38 students/year)
  - Are students leaving because of the structure of the curriculum?
    - Lack of Engineering concepts in Math instruction
    - Lack of Application of Math concepts in Labs

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Progress

- 6 Semesters of teaching with student surveys
- Almost all ME students come through in 1st two semesters
- 2 semesters taught by Co-PI at TU
- Remaining semesters taught by ME faculty member
- Following WSU model within framework of existing introductory analysis/computer course
  - Bottleneck – Physics 1 – pre-req for statics and thermo (begins everything else)
  - Resistance to changing at the moment

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Progress

- Developed course notebook to cover both current course goals and WSU goals
- Developed statistical background for class impact on retention/attitudes
- Developing a framework applicable to TU student population
- Tracking instructor influence on retention using WSU framework
- Made initial adoption case to college Dean

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Course Curriculum

- Lecture/Lab course
  - ME 1312 Computer Applications for Mechanical Engineers
- Labs derived from ERG101 Lab book
- Mostly math-based labs, with some programming only labs
- Covered all topics except sinusoids and 2nd order Deq.

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Assessment/Retention Study

- Attitude survey
  - tracking student perceptions
  - Relating to retention
  - Looking at course effect
- Need data for university-wide adoption
  - "No movement till we have some data!"

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Survey

- 45 of questions
- 1-5 Likert type rating scale
  - *strongly disagree, disagree, neither agree nor disagree, agree,* and *strongly agree*
- Broken into several broad topic areas
  - Demographics
  - Reactions to Major/Class
  - Educational history
  - Learning style assessment

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Sample Questions

- I get discouraged when I fail to see why I need to learn something
- This course has increased my motivation to study math
- I know what mechanical engineers do.
- I like math.
- My parents would be disappointed if I decided not to be an engineer

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Survey Responses

- 5 semesters of students
  - 118 possible surveys
  - 98 responses (83% returned)
- 2 students switched majors (At the moment)
  - Chemical Engineering
  - Math and History (law school)

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Instructor-Dependent Results

- Three separate instructors have taught course
- Significant differences in "Teacher Personality"
  - Mike – Fast-paced (occasionally unorganized)
  - Brenton – Ultra-organized and paced
  - Henry – New Teacher
- Little statistically significant difference between instructors
- Slight difference in student attitudes
  - Likely just pre-existing student biases

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Attitude for Withdrawal

- Results of questions indicating tendency to withdraw from ME
- Variance among instructor not significant

Professor	Subset for p<0.05
Brenton	2.276
Michael	2.329
Henry	2.406

Tukey HSD results

1 – Not withdrawing
5 – Strongly Considering withdrawal

Engineering Motivation

- "This course has increased my motivation to study engineering"
- No statistical difference between instructors

Professor	Subset for p < 0.05
Brenton	3.542
Michael	3.357
Henry	3.634

Tukey HSD results

1 – Strongly Disagree
5 – Strongly Agree

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Withdrawal Group Correlations

	ACT	GPA	Course Grade	This course has increased my motivation to study engineering	This course had increased by chances of success in engineering	This course has increased my motivation to study math	This course has increased my chances at success in future math courses	The recitation sections aided my understanding of the material	The lab sections aided my understanding of the material	Application of MATLAB was a valuable component of this course	Confidence in Math Skills (group)	Enjoyed Class (group)	Willingness to Get Help (group)	Intellectual Curiosity (group)
Withdrawal	-0.21	**-0.26**	**-0.37**	**-0.25**	**-0.46**	**-0.42**	**-0.25**	0.07	0.05	-0.21	-0.14	-0.24	-0.11	**0.22**

Bolded are significant at $p < 0.05$

Class Grade Correlations

	ACT	GPA	Withdrawal	This course has increased my motivation to study engineering	This course had increased by chances of success in engineering	This course has increased my motivation to study math	This course has increased my chances at success in future math courses	The recitation sections aided my understanding of the material	The lab sections aided my understanding of the material	Application of MATLAB was a valuable component of this course	Confidence in Math Skills (group)	Enjoyed Class (group)	Willingness to Get Help (group)	Intellectual Curiosity (group)
Course Grade	**0.45**	**0.52**	**-0.37**	0.01	0.04	-0.08	-0.01	-0.01	0.05	-0.11	**0.28**	-0.07	0.12	-0.08

Bolded are significant at $p < 0.05$

Future Plans (beyond year 3)

- Complete retention data and report
  - Tying results back to broader student records and grades
- Dean needs retention data to back adoption
- ABET visit in 2012 - ME and Engineering Physics
  - ME is planning post-accreditation curriculum changes
  - Good time to make formal changes to pre-requisites

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