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 (2009 Freshmen)
  - Average ACT 28
  - Average SAT 1260

Motivation for Involvement

- Diversity of Participating Universities
  - Comprehensive, small, private university
- Actively modifying and improve current courses
  - Increase number of labs
  - Modernizing current labs
- Understand Retention at TU
  - Retention is relatively high, but there is a desire to do better (62% 2000-2008)
  - 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

Progress

- 3 Semesters of teaching with student surveys
- 2 semesters taught by Co-PI at TU
- Following WSU model within framework of existing introductory analysis/computer course

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
- Preparing to make adoption case to college

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.

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

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

Aside - IRB

- WSU research is likely to be classified as "exempt."
  - No direct IRB oversight required
- Check with each institutional IRB to confirm
  - Each school will be a little different
- IRB approval NOT required for internal use, only for publication or "generalization"

Aside - Getting IRB Approval

- Take an online human research training course
  - Similar to NSF Responsible Conduct of Research Course
- Submit description to IRB officer
  - Includes a plan of research
  - Samples of any surveys/questionnaires
  - Description of privacy measures
  - Samples of consent forms

End Aside.

Survey Responses

- 3 semesters of students
  - 62 possible surveys
  - 55 responses (89% returned)
- 2 students switched majors
  - Chemical Engineering
  - Math and History (law school)

Withdrawal Scale

	Items	***Mean***	***SD***
1	*I am thinking about changing majors*	2.07	1.17
2	*I have looked into the requirements for other majors*	2.87	1.29
3	*I am thinking about leaving the University of Tulsa before graduating*	1.51	.77
4	*I am considering going to graduate school in engineering or a related discipline. (reverse scored)*	2.53	1.05
5	*I am glad that I chose Engineering as a major. (reverse scored)*	1.80	.91
6	*I withdraw from or drop classes when they are too difficult or inconvenient*	2.24	.90
7	*I considered majors other than engineering*	3.53	1.23
8	*I am thinking about attending law school or medical school.*	1.91	1.24
	Average Scores	**2.31**	**.67**

Most student are trending toward staying with ME

Math Confidence Scale

	Items	*Mean*	*SD*
1	*I like math.*	4.35	.73
2	*I can use math to solve problems.*	4.44	.66
3	*I like physics and other science classes.*	4.25	.70
4	*I find it easy to apply what I learn to my interests and activities.*	3.96	.77
	Average Scores	**4.25**	**.49**

Students are generally confident in their math skills

Student Comments

- If you had considered leaving engineering why?
  - Difficulty of Engineering
  - Whether engineering will be a fun career and is right for me.
  - Whether or not what I am learning coincides with my interests.
  - I really don't enjoy engineering. Also, I want to be a lawyer and am afraid I am becoming illiterate

Correlations

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 ACT score														
2 GPA	**0.47**													
3 Class Grade	**0.42**	**0.57**												
4 This course has increased my motivation to study engineering	0.1	0.03	0											
5 This course had increased by chances of success in engineering	-0.12	-0.09	-0.03	**0.51**										
6 This course has increased my motivation to study math	-0.12	-0.04	-0.09	**0.37**	**0.53**									
7 This course has increased my chances at success in future math courses	-0.14	-0.29	0	**0.39**	**0.32**	**0.68**								
8 The recitation sections aided my understanding of the material	0.15	0.1	-0.05	0.24	-0.18	-0.23	-0.07							
9 The lab sections aided my understanding of the material	0.05	-0.22	-0.13	-0.08	-0.03	0.05	-0.15	**0.54**						
10 Application of MATLAB was a valuable component of this course	**-0.41**	-0.11	-0.04	0.11	0.04	0.1	0.06	0.1	0.19					
11 Math and science confidence	**0.42**	0.27	**0.3**	-0.03	-0.08	0.16	-0.02	-0.1	0.22	0.02				
12 Withdrawal	-0.21	-0.2	**-0.35**	**-0.44**	**-0.57**	**-0.46**	-0.3	0.18	0.07	-0.22	-0.05			
13 Liking the class	-0.13	-0.13	-0.17	**0.5**	0.26	**0.59**	**0.43**	0.07	0.21	**0.36**	0.08	-0.23		
14 Willingness to get help	0.01	-0.05	0	0.14	-0.05	0.15	0.21	-0.12	0.09	0.22	0.22	0.04	**0.37**	
15 Intellectual curiosity	-0.13	-0.29	-0.11	0	-0.05	-0.02	0	-0.22	-0.2	-0.04	-0.19	0.11	-0.05	0.17

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Future Plans (year III)

- Complete retention data and report
  - Tying results back to broader student records and grades
- Use this to leverage college wide adoption
- Possible implementation as “block III”
  - Lab-based science gen-ed class
  - TU has no separate Engineering entrance requirements