

Two approaches to teaching Calculus III

Jacqueline Jensen

Sam Houston State University

Huntsville, TX

jensen@shsu.edu

Meeting of the Texas Section of the MAA

Arlington, TX

15 April, 2005

Abstract:

This talk will compare a modified Moore Method approach to Calculus III at SHSU with a traditional lecture-oriented approach. The courses which we will discuss were taught in consecutive years and presented similar information to the students. Students were evaluated in similar ways in both classes, offering a basis for comparison between the two experiences. The similarities and differences in student grades and attitudes between the two sections will be discussed.

Comparison of the Two Sections

Weight of assignments for course grade

Fall 2003 Traditional		Fall 2004 Modified Moore Method	
Presentations	10%	Presentations	30%
Quizzes	15%	Quizzes	10%
Exam 1	15%	Exam 1	15%
Exam 2	15%	Exam 2	15%
Exam 3	15%		
Final Exam	30%	Final Exam	30%

Fall 2003 (Traditional)

Primarily Lecture

Two quizzes per week

Students present challenging HW on Mondays

Fall 2004 (Modified Moore Method)

Primarily student presentations

Supplemented with mini-lectures

Two quizzes per week

Demographics

	Fall 2003 Traditional	Fall 2004 MMM
<i>Gender</i>		
Male	4	6
Female	12	9
<i>Grade Distribution from Calc II</i>		
Retakes	4	3
A	3	1
B	7	7
C	6	6
<i>Class Standing</i>		
Freshman	1	1
Sophomore	5	5
Junior	5	4
Senior	4	3

Difference in Course Grades?

Grade Assigned	Fall 2003	Fall 2004
	Traditional	MMM
A	1	5
B	4	0
C	9	6
D	1	1
F	1	3

No statistically significant differences

Differences by Gender

Males

MMM scored better on Final

No difference in course grades

Females

MMM scored better on presentations

No difference in course grades

Small sample sizes

A comparison of final exam questions

Topic	Average % of pts earned	
	Fall 2003	Fall 2004
Defns	48.75	79.78
	$t = 4.29_s$	
Proj. motion	70.31	72.85
	$t = 0.31$	
Max/Min	69.79	66.43
	$t = -0.62$	
Eqn of plane	64.84	68.57
	$t = 0.45$	
Jacobian	50	42.85
	$t = -0.61$	
Volumes	68.75	72.14
	$t = 0.53$	
Limit	78.125	89.28
	$t = 1.52_s$	

Qualitative Differences on the Final

- Compared each pair of common questions

- Classified mistakes as:
 - All points earned
 - Minor error
 - Did not complete
 - Major error
 - Skipped

- No statistically significant differences

Differences in Evaluations

Fall 2003

All comments about the professor:

“Enjoy your class and like your concern for us as students. Hard material but you explain it well.
Thanks for caring.”

“I really enjoy Dr. Jensen’s class...She is willing to work w/ the students & her teaching style presents the info in a way that is understandable.”

Differences in Evaluations

Fall 2004

All comments about the course format:

“The Moore method was hard to deal with...I think everyone would have appreciated a few more lectures, but I loved this class.”

“The Moore method is very hard to do when you have a full load of classes. I think the class would benefit with having lecture on two days + student presentations on the other two days. I believe she would be a very good prof. if she actually taught.”

“I learn a lot more when you teach us...”

Differences in Evaluations

Fall 2004

“The problem that I have with this class is that so much work is needed outside of class that it is difficult for me to get my work done for other classes. Also, I do not feel that the work I am doing at home on my own is having much, if any, effect on how well I understand the material.

Basically, I love this class, I just do not think that the set-up of the course allows me to have as great of a return for the work that I am doing.”

“I think this course was made harder than it had to be because of the Moore Method. I am learning a lot but don't feel that it is helping me learn more than if I had been lectured to...”

Performance in Future Classes

<i>Traditional Calculus, Intro. to Math Thought Spring 2004</i>			
Grade in Calc III	Grades in Intro. Math. Thought		
	HW Avg	Exam 1	Course Grade
B	69	79	59
C	11	55	17.25
C	73	77	62
C	75	69	57
C	13	52	32
C	7.5	Quit	Quit
C	30	39	37
C	32	39	Quit
F	6	Quit	Quit
Average	35	61	49

<i>MMM Calculus, Intro. to Math Thought Spring 2005</i>			
Grade in Calc III	Grades in Intro. Math. Thought		
	Quiz Avg	Exam 1	Course Grade (to date)
A	100	94	96
A	100	96	97
A	98	91	94
A	98	91	94
C	90	62	74
C	81	65	72
C	100	80	88
C	98	59	76
Average	95	79	86
<i>t</i> -test	9.78	25.77	3.34

Conclusions

- No quantitative differences in Calc. III
- No qualitative differences in Calc III
- Quantitative differences in future mathematics courses

Future Work

- Test students' retention of Calc. III material
- Follow up with comparisons in future mathematics courses