



A Modeling-Based Approach to Calculus

April 29, 2011

Today's Panelists:



Mariah Birgen
Wartburg College



Laurie Heyer
Davidson College



Joseph Mahaffy
San Diego State
University

Moderator: Danny Kaplan, Macalester College

The Purpose of Project Mosaic

To share ideas and resources to improve teaching and assessment in mathematics, statistics, computation, and modeling.

And to make it easy and rewarding to do so.



My Goals for this Discussion

- ▶ Introduce several innovative faculty who are connecting modeling and computation directly to calculus.
- ▶ See what strategies work at different types of institutions.
- ▶ Explore some of the ways that calculus informs the model process as well as the ways that calculus is used to “solve” models.
- ▶ Discover what conventional calculus topics are strongly related to modeling and which ones are peripheral.
- ▶ Induce other faculty to share their ideas of about teaching modeling and calculus.

San Diego State University

Large Public University with $\approx 35,000$ students.

Calculus for Biology I & II (Math 121, 121)

Enrollment: 200 Students with Labs of 50

“Biological examples are inherently complex, which complicates the understanding of how mathematical modeling relates to the biological problems. Typical courses in the past use grossly simplified examples, which have resulted in students feeling that Calculus is irrelevant to their study of Biology. My web-based course attempts to use more convincing examples and has a significant portion devoted to computer labs, where technology can aid with the more complicated models.”

Davidson College, Davidson, NC

Highly selective independent liberal arts college with 1,920 students, Student-Faculty Ratio 11:1

Calculus I & Modeling + Multivariable Calculus & Modeling

“Students will be guided in the discovery and mastery of mathematical techniques in the context of problems in the life sciences.”

Math 112: “Growth, metabolism, and senescence are examples of changes that occur in every living thing. This course investigates mathematical approaches to describing and understanding change. Topics include single variable differential and integral calculus, difference equations and differential equations.”

Math 140: “A continuation of the study of calculus and other mathematical methods for modeling change. Topics include multivariable calculus, and systems of linear equations and difference equations, ... the study of uncertainty, using probability models such as Bayes’ rule and random walks. ”

Mariah Birgen

Wartburg College, Waverly, Iowa

Selective four-year liberal arts college of the Lutheran Church, 1775 students, nationally recognized for community engagement. Student:Faculty Ratio 12:1

Applied Calculus, MA 250

Topics from algebra, differential and integral calculus. Emphasis on functions, difference equations, derivatives, integrals, applications. Mathematical Reasoning.

Upcoming M-casts for Summer 2011

- May 6 Reading and Writing About Derivatives
- May 13 Using Active Learning to Teach Math Methods
- June 10 Vases and Calculus
- July 15 Using Weebwork for Activities and Homeworks
- July 29 A New Academic Program in Biomathematical Sciences

Other upcoming events:

- ▶ MOSAIC 2-day Workshop on Teaching Statistics with R at the US Conference on Teaching Statistics, May 17-19
- ▶ MOSAIC Roundtable at the Joint Statistics Meetings, Aug. 3