Maple Labs for Calculus at USC

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The Past – Origins

- **Old Format**
  - Lecture: 3 hrs/wk
  - Recitation: 2 hrs/wk

- **Objectives**
  - Active Learning
    - Calculus is not a spectator sport
  - Improved Conceptual Understanding
  - Introduction to Modern Mathematical Software

- **New Format**
  - Lecture: 3 hr/wk
  - Recitation: 1 hr/wk
  - Lab: 1 hr/wk
## The Past – Evolution

<table>
<thead>
<tr>
<th>Year</th>
<th>Trans Functs</th>
<th># students per semester</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>02-03</td>
<td>Late (VPR)</td>
<td>60 (1 section)</td>
<td>Overly optimistic; too much syntax; too much typing</td>
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<tr>
<td></td>
<td></td>
<td>![141] ![142]</td>
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<tr>
<td>03-04</td>
<td>Late (VPR)</td>
<td>170 (3 sections)</td>
<td>More reasonable; less typing/syntax; each week like a project</td>
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<td>![141] ![142]</td>
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<tr>
<td>04-05</td>
<td>Early (ABD)</td>
<td>1000+ (all sections)</td>
<td>Begin to utilize M4C; labs are more “useful”</td>
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<tr>
<td></td>
<td></td>
<td>![141] ![142]</td>
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<tr>
<td>05-06</td>
<td>Early (ABD)</td>
<td>1000+ (all sections)</td>
<td>Fewer quizzes; extensive use of M4C</td>
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<td>![141] ![142]</td>
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The Present – Organization

- Weekly lab session in computer lab
- Integral part of the first-year Calculus courses
- Content designed to follow lecture topics
- ~10 lessons with weekly HW/Mastery Quiz
- 2 in-lab quizzes
- 2 projects

- Access: site license / Maple Adoption Program
The Present – Improvement

- Keep good communication between lab coordinators, course instructors, teaching/lab assistants, and students
- End-of-course student surveys
- Improve as we go

- Website: http://www.math.sc.edu/calclab/
The Present – Projects & Project Reports

- **Roller Coaster Design**
  Lab: [http://www.math.sc.edu/calclab/141L-S06/labs/RollerCoaster.pdf](http://www.math.sc.edu/calclab/141L-S06/labs/RollerCoaster.pdf)
  Project: [http://www.math.sc.edu/calclab/141L-S06/labs/Project1.pdf](http://www.math.sc.edu/calclab/141L-S06/labs/Project1.pdf)

- **Designer Goblets**
  Lab / Project:
  [http://www.math.sc.edu/calclab/142L-S06/labs/GobletProj106s.pdf](http://www.math.sc.edu/calclab/142L-S06/labs/GobletProj106s.pdf)
  Sample Student Solution

- **Koch Snowflake**
  Lab / Project:
  [http://www.math.sc.edu/calclab/142L-S06/labs/SnowFlakeProj206s.pdf](http://www.math.sc.edu/calclab/142L-S06/labs/SnowFlakeProj206s.pdf)
  Original, Student Samples: 3-, 4-, 4+

- **Project Report Guidelines**
The Future – ???

- Utilize Maple 10 GUI
  - 2D input / document
  - more user-friendly / less syntax.
- Investigate use of Maple TA
- Increase use of M4C; suggest additions
- Continue to convince all instructors and students to see Maple as a very useful tool
  - today – for learning Calculus
  - tomorrow – general Science/Engineering/Math
Collection of more than 50 maplets
... utilizing Maple’s *symbolic, numeric, and graphic* capabilities
... to create *student-(and instructor-) friendly* environments
... for learning and teaching fundamental calculus *concepts, manipulations, theory, and applications*.

- Maplet
  ✦ Applet created in the Maple programming language
- Co-Authors
  ✦ Phil Yasskin (TAMU) and Doug Meade (USC)
Problem Solution / Checking

- Step-by-step approach closely follows standard methods and terminology found in textbooks
- Hints are available
- Solution is checked symbolically step-by-step
- Correct solution can be displayed
Maple Conference 2006
- Wednesday, July 26, 1:45 – 2:15, BA 113
- Phil Yasskin & Doug Meade
- Demonstration of Maplets for Calculus, and a discussion with the authors.

MathFest (Knoxville, TN)
- Saturday, August 12, 3:35 – 3:50
- Phil Yasskin & Doug Meade

Conference on Mathematics in the Digital Era (Aveiro, Portugal)
- August 15 – 17, time TBA
- Phil Yasskin & Doug Meade