Are the Students Competent Users of Mathematics?

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Outline

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Rose-Hulman at a glance - 1

- private, undergraduate college, 1750 mathematics, science and engineering students
  - biomedical, civil, chemical, computer & electrical, mechanical, optical and software engineering
  - mathematics, chemistry, economics, physics, computer science and applied biology
  - strong humanities department

Rose-Hulman at a glance - 2

- teaching is the primary mission
- small graduate programs
- historical commitment by almost all to a strong presence of computing in the curriculum
- good students, almost all arrive computer literate, and have decent math backgrounds

Math program at a glance

- 19 faculty 50% @ RHIT 7 years or less
- all students take 3 Calc classes 2 DE classes and 1 Stats class (or equivalent)
- 65% of instruction in these classes
- instruction is coordinated
- students:
  - about 45% are SAT 700+, 90% 600+
  - about 50% have some AP placement

Laptop program / infrastructure - 1

- in place since Fall 1995
- all entering students have the same laptop and software programs – same computer four years
- faculty issued the same computer on a three year basis
- laptop and basic software chosen by a faculty/staff committee

Laptop program / infrastructure -2

- Excellent infrastructure
  - network services, email, software distribution, web services
  - repair and support, 2 hour turn around time
  - computing is ubiquitous
- Software recommended by various departments, approved institutionally
- Maple, Matlab, many others available

Laptop program infrastructure - 3

- Majority of classrooms are configured as shown - power and network, network in dorms

Laptop in the Math Curriculum -1

- Maple is used in Calc I,II,III, DE I and II
- Minitab is used Stats I
- using technology appropriately in mathematics is an agreed upon curricular goal
- laptop is used both in class and for homework
- laptop often used for active learning or some tests

Laptop in the Math Curriculum - 2

- a balance of paper & pencil and computer instructional methodologies is a departmental policy
- syllabi specify paper and pencil skills and computer skills to be learned
- syllabus and topics evolution is a collaborative effort
- common department finals have two parts paper/pencil and computer/calculator assisted.

Laptop in the Math Curriculum - 3

- paper and pencil exams focus on elementary computation, concepts and interpretation
- computer assisted exams focus on more difficult problems calling for
  - Numerical computations
  - Graphical reasoning
  - Some harder symbolic computation
  - Multi-step problem solving

Laptop in the Math Curriculum - 4

- areas of agreement in using the computer
  - Graphical reasoning and analysis
  - Numerical computations e.g. solving equations
  - More complex projects

- areas of non-agreement in using the computer
  - Symbolic and elementary computation
  - “Fundamentals”, whatever they are

Are the students competent users of mathematics? - 1

- a basic instructional goal is that

  "Students shall become competent users of mathematics."

- the primary interpretation of this is "are the students prepared for follow on math-based engineering and science courses"
- lunchroom conversation suggests there are issues - Maple is often described as the culprit

Are the students competent users of mathematics? - 2

- a formal feedback process with the client disciplines for this has begun
- no ABET-quality assessment instruments yet.

Are the students competent users of mathematics? - 3

- client discipline expectations are not outrageous, we would want the student to be able to do the same things
- maple is not always used in follow on courses, though Matlab may be
- recent hires (40% of RHIT faculty) both in out of math dept do not have the same history/baggage as faculty who have been here longer

Are the students competent users of mathematics? - 4

- because of advanced placement there may be a long interval between when the math is learned and when the math is used.
- there are no barriers to enrolling in follow-on courses if you have D or D+
- there is still variation in the mathematics instruction

The End

Questions???

Slides at

http:\www.rose-hulman.edu\~brought\Epubs\laptop\Phoenix.html