It's Been Renamed!

- On request of the San Francisco Exploratorium, this program has been renamed "Math Exploration Quilt".
- You can visit its home page at http://www.janrik.net/mathexpl
- The remainder of this presentation uses the old name, as the program was presented at NCCE'96 in Portland.

The Math Exploratorium -- Hands-On Applications of Advanced Mathematics

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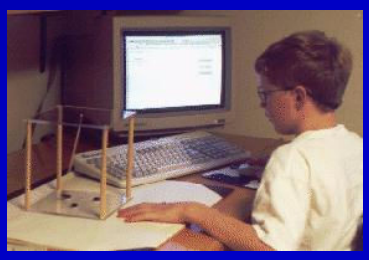
Synopsis

- Work-in-Progress, materials available
- Promising ideas, widely applicable
  - Use general-purpose software
    - » Microsoft Excel
    - » Visual Basic (VBA, embedded in Excel)
    - » Netscape Navigator
  - Modules are "open" to explore and modify
  - Multi-level: GUI, spreadsheet, Visual Basic
- Focus is on applications and effects

Agenda

- Vision
- Goals
- Examples
- Tools
- Infrastructure
- Lessons Learned --
  What Worked, What Didn't
- Review

Vision



- A student learns math, physics, and programming while having fun with <fill in your favorite application>.

Goals

- Help understand how math is applied
  - Hands-on experimental environment
  - Focus on whole applications, not individual techniques
- Help learn to exploit modern software
- Expose advanced students to software development

Key Ideas

- Use general-purpose software tools whose use extends beyond school
- Build modules that can be explored at many levels.
- Make modules "open" so that they can be examined and modified

Examples

- Magnetic Pendulum Simulation
- River-Crossing Problem

Magnetic Pendulum

- Simulates "simple" physics
- Deals with acceleration, velocity, position, mass, linear and nonlinear forces.
- Sequence of small time steps, "rectangle rule" integration.
- Shows "chaotic" behavior

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River-Crossing Problem

- What angle should you point upstream?
- Surprisingly deep problem
  - Trivial to explain what's desired (3rd grade)
  - Easy to solve as spreadsheet (6th grade)
  - Hard to solve simple version analytically (calculus)
  - Impossible to solve general version analytically

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Major Tools

- Microsoft Excel 5.0 or above
  - spreadsheet functionality
  - standard graphics
  - buttons (GUI)
  - Visual Basic -- simulations & dynamic graphics
- Netscape Navigator
  - Text, graphics, hyperlinks

Other Tools

- Presentation graphics
  - Powerpoint
  - screen capture (Lview)
- Text editor (Word, whatever)
- HTML editor (optional)

Infrastructure

- Grants from WSF and Microsoft
- CE Credits for teachers
- Funding for (some) teacher time
- Volunteer expertise from PNL
- Computer lab at school

Lessons Learned: What Worked, What Didn't

- Showstoppers: None!
- Impediments: Many!

Impediments

- Students have to
  - » Learn some Excel (common use, pitfalls)
  - » Learn Netscape
- Developers have to
  - » Learn new medium -- little screen space, not face-to-face with students
  - » Learn lots of Excel
  - » Learn HTML & image tools
- Facilities have to
  - » provide big enough machines
  - » be accessible to students

Review

- Promising ideas, widely applicable
  - Use general-purpose software
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