Creating Interactive Excel Templates for Concept Demonstration

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Capabilities of Spreadsheet Technology
With the spreadsheet, the teacher is able to
• Illustrate, ____________ concepts
• Facilitate discovery
• Enable ____________
• Ease homework "pain"

Discovery and Demonstration
• Manipulate ____________

\[ R = A \cdot \cos (B \cdot \theta + C) \]

• Make predictions
• ____________ with spreadsheet

Problem Solving and Homework
• Find simultaneous solution

\[ y = 3x - 2 \]
\[ y = -\frac{4}{5} + 6 \]

• Use the spreadsheet
  – Enter the ____________
  – Note the results

Some History
• 1978 Harvard MBA student ____________
• Collaborated with Bob Frankston
• Ran on an ____________
• Mainframe implementation in early 60's
• 1981 –Grace Murray Hopper Award
• Sold millions of Apple ][ computers.

"Without the invention of this software category, spreadsheets, the impact of the personal computer might have been delayed for years." (R.S. Houghton)

Advantages of Electronic Spreadsheets
• Introduce ____________
  – Teach details afterwards

• Allows multiple representations
  – Formula
  – Graph
  – Table of values
Advantages of Electronic Spreadsheets

- Experiment with values
  - View results
  - Study "__________________________"
  - Foster higher-order thinking
- Easily __________ software
  - Use in school labs
  - Available for home computers
  - ________________ short

Disadvantages of Spreadsheets

- Must have computer
  - ______________ issues
- No home computer ?
- On tests
  - Need a lab full
  - ______________ on "high stakes" tests

Interactive Excel Spreadsheets

- "________________"
- Change value in one cell
- Changes spreadsheet display
  - numerical
  - ______________
  - symbolic
- Done without …
  - ______________
  - macros
  - Visual Basic

Interactive Spreadsheets

Template Methods

- Enter a value
  - Evaluate the expression
- ______________ manipulate value(s)
- This example classic min/max problems
- Note multiple ________________

Template Methods

- Example which shows values of several related quantities – Rectilinear motion
  - Time
  - ______________
  - Velocity
- Slider used to advance time, $t$
  - Linear visual for time, distance
  - ______________ visual for velocity
  - Note how distance "catches up" as velocity increases
Style Issues

- Create a ________________
  - Sets the scene,
  - describes the problem
- Give instructions
- Use appropriate ________________
- Nice sometimes to eliminate grid
- Decide whether to ________________ which provide points for graph

Resources

- "A Developer's Guide to Excel".
  - Examples, links, tutorials.
- "Interactive MS Excel Workbooks".
  - Includes PDF tutorial on creating an interactive tangent line graphing tool.
- "Chemistry Excel".
  - Over 20 interactive chem spreadsheets.
- "Microsoft Excel Modules".
  - Lots of info, tutorials
- "Hacking Excel"
- Speedometer charts, another source

Demonstration

- We will create a spreadsheet which illustrates the concept of a tangent to a curve

\[ m = \lim_{\Delta x \to 0} \frac{f(x_0 + \Delta x) - f(x_0)}{\Delta x} \]

Tasks for Showing Tangent

- Generate ____________ in 1st column
- Generate y values using \( f(x) = x^2 \)
- Plot points, adjust axes, scale
- Specify two points \((A, f(A)), (B, f(B))\)
  - draw ________________
- Determine line through points

\[ m = \frac{f(A) - f(B)}{A - B} \quad b = F(A) - m \cdot A \]
Tasks for Showing Tangent

- Include y = mx + b in graph
- Manipulate A, B values – entering manually
  - They change → line changes
  - Deal with situation A = B
- Create slider(s) control A, B, values
- Clean things up
- Display slope as value

Brainstorm Additional Ideas

What ideas do you have about things to add or alter? What other kinds of interactive spreadsheets occur to you after seeing these? Questions? Comments?

- area under the curve
- left/right sums
- }

URLs for Previous Links

- http://academic.pgcc.edu/~ssinex/excelets/
- http://www.framingham.edu/faculty/smabrouk/Interactive/index.htm
- http://academic.pgcc.edu/~ssinex/excelets/chemexcelets.htm
- http://aitt.acadiau.ca/nstpd/excel00.htm

URLs for Previous Links

- http://guava.cites.uiuc.edu/l-arvan/ExceletsWeb/Modules.htm
- http://www.forsyth.k12.ga.us/kadkins/abc.htm
- http://www.windowsdevcenter.com/pub/a/windows/excerpt/excelhacks_chap05
- http://www.andypope.info/charts/gauge.htm