A Technology Toolkit for Secondary Mathematics Methods Students

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Abstract: We will display and discuss technology tools used with secondary mathematics preservice teachers. These tools include calculators available to all secondary students, programs such as The Geometers Sketchpad that are available in many secondary school computer labs, and Mathematica, which we use as a demonstration and personal productivity tool. Technical as well as pedagogical issues will be discussed.

Introduction

Today's preservice teachers face a wide range of options for instructional technology. As we survey technologies defined by national standards (Thomas, Knezek, & Bitter, 2001), we are especially interested in technologies that can be considered "mind tools" (Jonassen, 2000). The Scholarship, Technology, and Educational Practice (S.T.E.P) implementation grant, funded for 2000 - 2002 by the U.S. Department of Education's Preparing Tomorrow's Teachers to Use Technology Program, has enabled us to select technology tools for mathematics teachers based on real teaching experiences. These tools include technology possessed by all students-- for example the TI-83 calculator --and tools used primarily by the teacher -- Mathematica (Wolfram, 2000).

TI-83 Calculator

Graphing: Algebra 1 extensions - use for "challenge" problems and "ugly" graphs. Mostly used for demonstration and exploration when numbers do not turn out even.

Subject: Advanced Algebra. Used as a follow up for graphing parametric equations. Also used to demonstrate various other graphing problems and word problems. Most work in this class is done by hand. Subject: Precalculus - Daily use of the graphing calculator. Begin graphing and solving polynomial functions, and explore logarithmic and exponential functions. An outstanding resource for trig. functions and graphing "fun" problems like y = sin(sin x). Used to explore polar graphs, and parametric equations. Extensively used to complete word problems with vector motion. Examples include the "Ferris Wheel" problem (does the person on the FW catch the ball that is thrown to them?) and the golf / baseball problem. An outstanding visual tool to use in the Precalculus classroom.

Subject: Statistics. Introduce basic programs that can be used to find z-scores and other values found on stat tables. Graph using Plot function. Scatter plot, Box and Whisker, Histograms, Frequency polygons. Find Std. Deviation and other values (var, mean...) using the list function. Data analysis Basic calculations.

Sonic rangefinder. Used as a "subjective manipulative" to let students directly experience concepts of rate and acceleration.
The Geometers Sketchpad

An outstanding program to teach constructions in Geometry. Used to reinforce theorems that are learned throughout the course. Can be used as an introduction to complex concepts to get a "hands on" approach to learning. Used to create accurate drawings for tests and quizzes. A great presentation tool.

Mathematica

Mathematica helps teachers solve challenging problems quickly! Can be used as a word processor, or test writer (with a nice answer key). A tool to be shared occasionally with upper level classes to demonstrate realistic problems.
Example: the sound of a sine wave. Can actually play a waveform.
Example: solving the cubic. Show the entire formula for third degree equations.
Example: graphing 3-D functions in full color. Create beautiful "transparent polygon" 3D visualizations.

References

