Technology can Transform Traditional Problems into Sense Making Opportunities

NCTM Annual Meeting April 2018, Washington, DC

Victoria Miles, MA
Shephali Chokshi, MA

goo.gl/4nosDB

Welcome and Overview

- Poll the audience
- Technology: an Essential Element
- What is EquatIO?
- Traditional Textbook Problem, adapted using technology
- Desmos Activity Builder ~ choice of 2 activities

Uses of Technology in Teaching

Poll Question: Linoit Board

PLANNING LESSONS	COLLABORATING PROFESSIONALLY
COMMUNICATING WITH FAMILIES	ASSESSING STUDENTS

Uses of Technology in Teaching

Guiding Principles for School Mathematics

Tools and Technology. "An excellent mathematics program integrates the use of **mathematical tools and technology** as essential resources to help students learn and *make sense of mathematical ideas*, *reason mathematically*, and communicate their mathematical thinking."

From NCTM Principles to Action, Progress and Challenge, p. 4

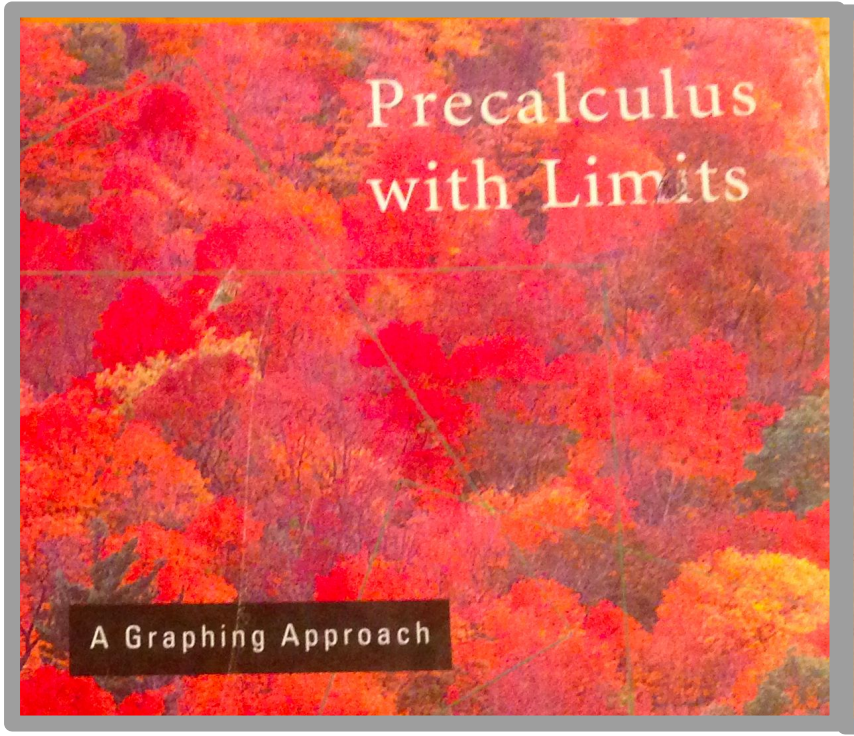
Eight Effective Teaching Practices

1. Establish Mathematical Goals
2. Implement tasks to promote reasoning
3. Use Mathematical Representations
4. Facilitate Meaningful Discourse
5. Pose Purposeful Questions
6. Build Conceptual Understanding, then Fluency
7. Support Productive Struggle
8. Elicit Evidence of Student Thinking

Five Essential Elements of Effective Teaching

1. a commitment to access and equity
2. a powerful curriculum
3. appropriate **tools and technology**
4. meaningful and aligned assessment
5. a culture of professionalism

The Background of this Talk



In Exercises 1–10, sketch the graphs of the three functions *by hand* on the same rectangular coordinate system. Verify your result with a graphing utility.

1. $f(x) = x$
   $g(x) = x - 4$
   $h(x) = 3x$

2. $f(x) = \frac{1}{2}x$
   $g(x) = \frac{1}{2}x + 2$
   $h(x) = \frac{1}{2}(x - 2)$

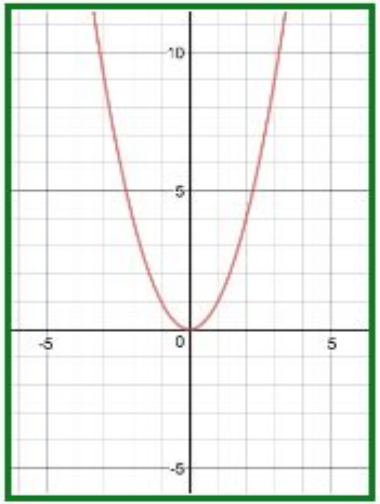
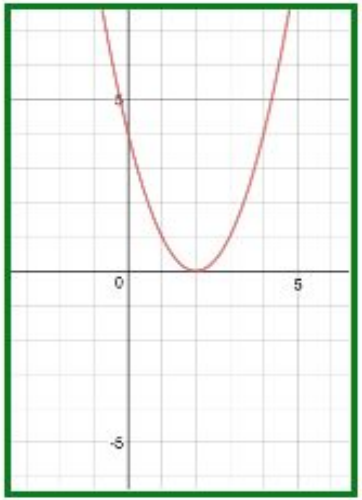
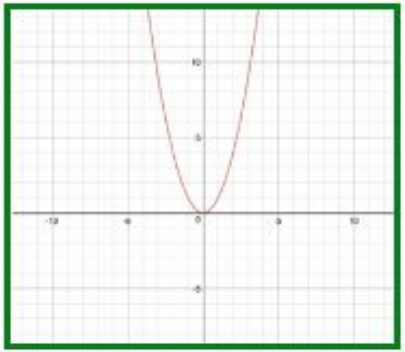
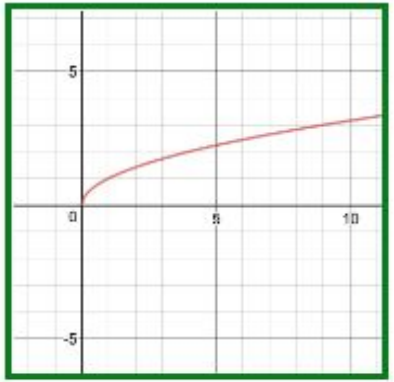
3. $f(x) = x^2$
   $g(x) = x^2 + 2$
   $h(x) = (x - 2)^2$

4. $f(x) = x^2$
   $g(x) = x^2 - 4$
   $h(x) = (x + 2)^2 + 1$

5. $f(x) = -x^2$
   $g(x) = -x^2 + 1$
   $h(x) = -(x - 2)^2$

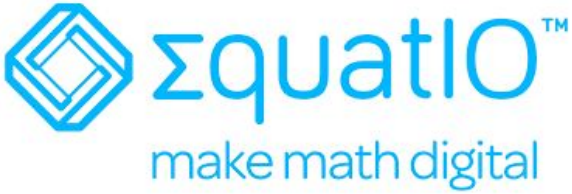
6. $f(x) = (x - 2)^2$
   $g(x) = (x - 2)^2 + 2$
   $h(x) = -(x - 2)^2 + 4$

#4-10 even Sketch the graphs of the three functions by hand on the same rectangular coordinate system. Verify results with a graphing tool. Click on the image to explore transformations of the given function, f(x). The graph of the first function is provided.

#4.	#6.	#8.	#10.
$f(x) = x^2$ $g(x) = x^2 - 4$ $h(x) = (x + 2)^2 + 1$	$f(x) = (x - 2)^2$ $g(x) = (x - 2)^2 + 2$ $h(x) = -(x - 2)^2 + 1$	$f(x) = x^2$ $g(x) = (\frac{1}{4}x)^2 + 2$ $h(x) = -(\frac{1}{4}x)^2$	$f(x) = \sqrt{x}$ $g(x) = \sqrt{(x+1)}$ $h(x) = \sqrt{(x-2)} + 1$
			

Make Your Own Interactive Hyper Docs

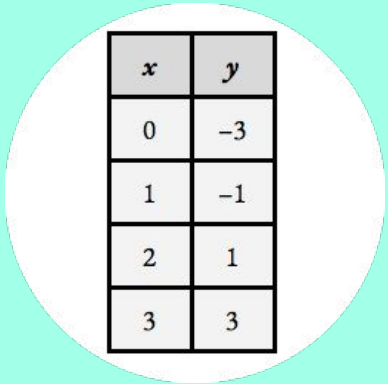
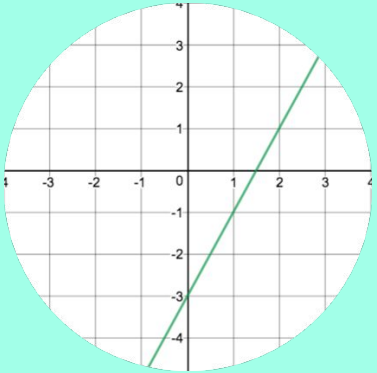
EquatIO™



- gMath, 2nd Generation
- Web-based Chrome extension
- Works with google (docs, sheets, drawings, forms)
- Fully integrated with Desmos
- Free for teachers!
- Make google docs to facilitate deeper understanding
- Screencast tutorial

Introducing EquatIO

The Power of Multiple Representations

Context	Table	Equation	Graph
John borrowed $3 and began saving $2 each day		$y = 2x - 3$	

x	y
0	−3
1	−1
2	1
3	3

New Concepts

The slope-intercept form of a linear equation can be used to graph lines quickly because it gives information about the characteristics of the graph of the equation.

Math Language

The **y-intercept** is the *y*-value where a graph intersects the *y*-axis, and is usually represented by the variable *b*. The coordinate is (0, *b*).

Slope-Intercept Form of an Equation
The **slope-intercept form** is $y = mx + b$, where the value of m is the slope of the line and the value of b is the y-intercept.

Example 1 Determining the Slope and y-Intercept of a Line

Determine the slope and the y-intercept of each equation.

a. $y = 3x - 4$

From Saxon Algebra 1, Lesson 49

Problem Solving using Multiple Representations (desmos link)

Pet Care The table shows a feeding chart on the bag of a certain brand of cat food.

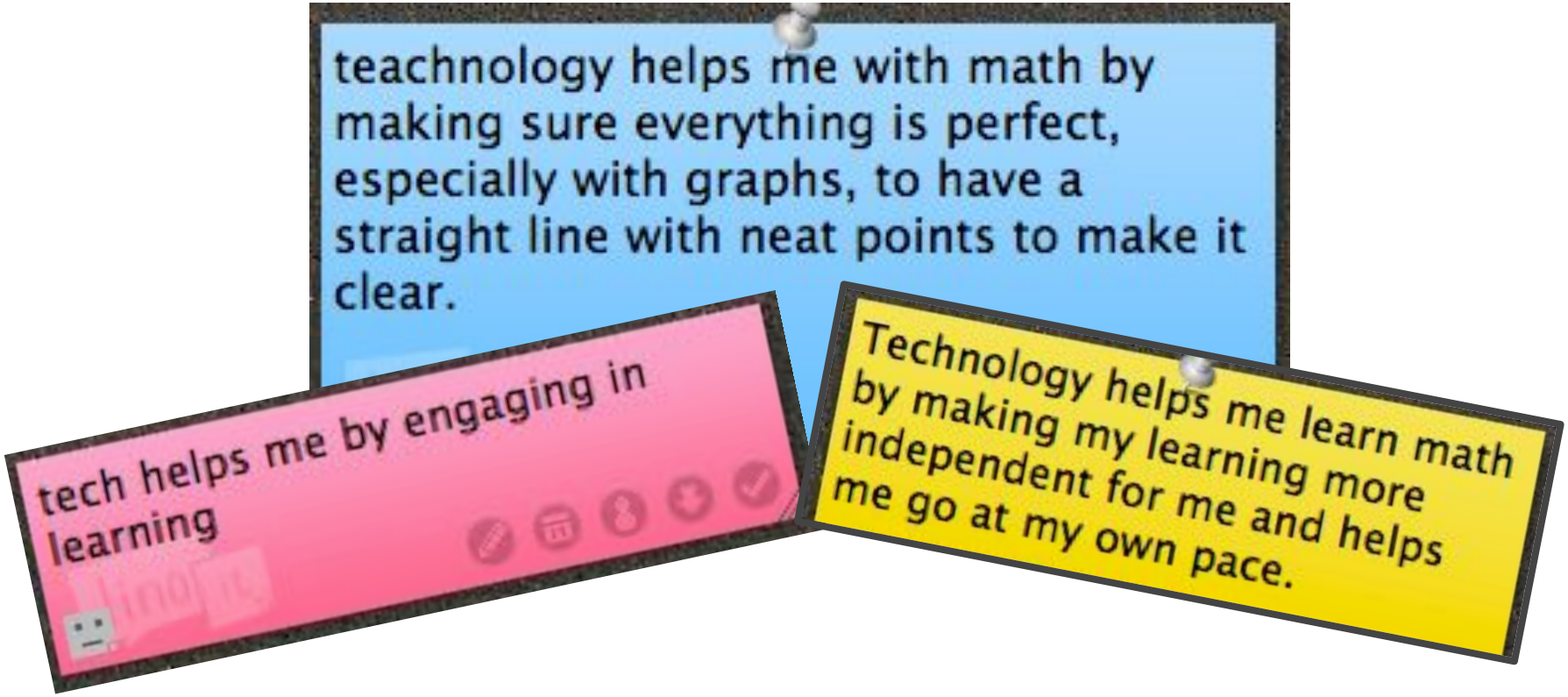
Maximum Weight of Cat	Amount of Food Per Day
6 lb	$\frac{3}{4}$ cup
9 lb	$1\frac{1}{4}$ cups
12 lb	$1\frac{3}{4}$ cups

4 minute Timer

- Write an equation in slope-intercept form.
- A cat that eats 1 cup of food per day would weigh how much?
- How much food per day would a 10-pound cat eat?

Classroom Video Clip of the Cat Food Problem

Student Responses, "Technology Helps Me Learn Math by..."



Desmos Activity Builders

8 minute Timer

Transforming Parabolas

Hey, students!

Go to

student.desmos.com

and type in:

GFMVQ

Compound Inequalities

Hey, students!

Go to

student.desmos.com

and type in:

X94G8N

Create/ Find/ Adapt Free, Sense Making Activities

teacher.desmos.com

- Compound Inequalities
- Systems of Equations
- Marbleslides
- Transformational Geometry
- Parallel Lines & Transversals
- Linear Inequalities

Summary, Using Technology to Facilitate Sense-making

Teachers of mathematics must take the following actions:

- ❏ Implement lessons that make use of technology investigations that precede or accompany the development of pencil and paper skills

- ❏ Plan carefully for the use of classroom technology to ensure that it builds student understanding and reasoning

- ❏ Incorporate mathematical tools and technology as an everyday part of the mathematics classroom

Thank you for attending our session!
Enjoy the conference.

Shephali Chokshi: ShepCMath@gmail.com

Vicki Miles: Victoria.Miles1@gmail.com