

# We have the Tech, but Math is still hard!

Instructional Adventures in  
Aligning Tech with Student Need

# Today's Goals

- 🌐 Consider best practices in technology and mathematics
- 🌐 Ensure that technology serves educational needs
- 🌐 Explore a variety of tools and setting: apps, websites, smart board activities
- 🌐 Challenge ourselves to avoid reducing math instruction to skill practice

# Background

- 🌐 The importance of Number Sense:
  - 🌐 Number Sense is to Math Development what Phonemic Awareness is to Literacy Development (Gersten and Chard, 2001)



# Components of Number Sense

- 🌐 Math is about quantity, not numbers
- 🌐 Numeration: place value and our number system
- 🌐 Equality: equal value, not “the same as”
- 🌐 Understanding Base 10
- 🌐 Form of a Number: tally marks, bar graphs whole numbers, fractions, decimals
- 🌐 Proportional Reasoning: comparing quantities
- 🌐 Algebraic and Geometric Thinking






(Faulkner, 2009)

# Additional Components of Number Sense

- 🌐 Mental flexibility with numbers (Woodward and Gertsen-Chard)
- 🌐 Application in real-world scenarios and word problems (Gertsen-Chard)



# People with Number Sense are able to ...

-  Recognize Math Errors
-  Recognize Benchmark Numbers
-  Recognize Patterns
-  Explain Mathematics Vocabulary
-  Apply Learned Skills in Word Problems

Gersten and Chard, 2001

# Keep in Mind: Define Your Needs

- 🌐 To make the best decisions about technology, keep in mind the educational needs of your students. In my experience, technology works best when the specific need for it is made clear.
- 🌐 For example, at Cotting, we have many students who struggle with both physically accessing and understanding traditional textbooks; we also have two computer labs teachers can reserve and use; Google Classroom is a good fit for our students and our hardware.

# Keep in Mind Part II: Define Your Purpose

What do you need the technology to do?

- 🌐 Give student a platform to demonstrate what you think they can do

OR:

- 🌐 Be an instructional tool for what you want them to be able to learn



# Best Practices in Technology

- 🌐 Alignment: the purpose of the technology
- 🌐 Accessibility: students and staff
- 🌐 Assessment: documenting student work
- 🌐 Reinforcement: supplement, not replicate, teaching

(University of Pittsburgh)



# Best Practices in Mathematics

- standards-based
  - differentiated instruction
  - inquiry/problem-solving
  - use experience and prior knowledge
  - cooperative learning
  - real-world connections
  - providing scaffolding to connect to processes, concepts, and understanding
  - have students justify responses
  - develop computational skills
- (Learning Alliance, 2006)

# Activities and Ideas

- 🌐 Components of Number Sense x (Best Practices in Tech. + Best Practices in Math) = Improved Understanding

# Mental Flexibility and Fluidity

-  10 Frame Fill: Classroom Focused Software
-  My Mental Math: Concept It

81



Level

1

Target

91

Score

0

My Mental Math App: Concept It

9

8

6

5

4

4

+

-

×

÷





63



Level

1

Target

91

Score

0

My Mental Math App: Concept It

72

6

5

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4

+

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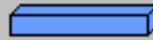
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# Representing Numbers in Different Formats

- 🌐 **Base Ten Math: Tap Fun**
- 🌐 **Math Stretch: SAS Institute Inc**
- 🌐 **Fractions: Braining Camp**
- 🌐 **Native Numbers: Native Brain**
- 🌐 **National Library of Virtual Manipulatives: Base Blocks  
(lots of choices) <http://nlvm.usu.edu>**



Clear

**Use blocks  
to  
represent a  
number**

[http://  
nlvm.usu.edu](http://nlvm.usu.edu)

Dec. Places = 0



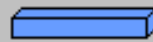
Base = 10



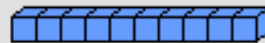
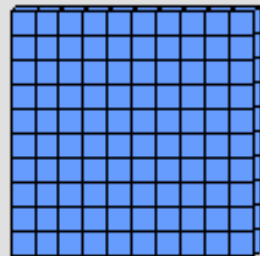
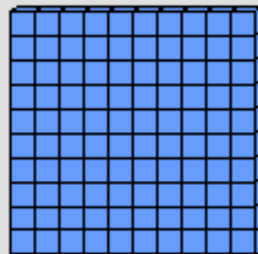
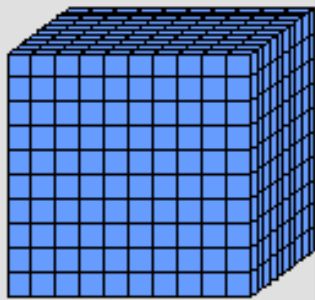
Columns = 4



Show a Problem



Clear



Use blocks  
to  
represent a  
number

1234

Dec. Places = 0



Base = 10



Columns = 4

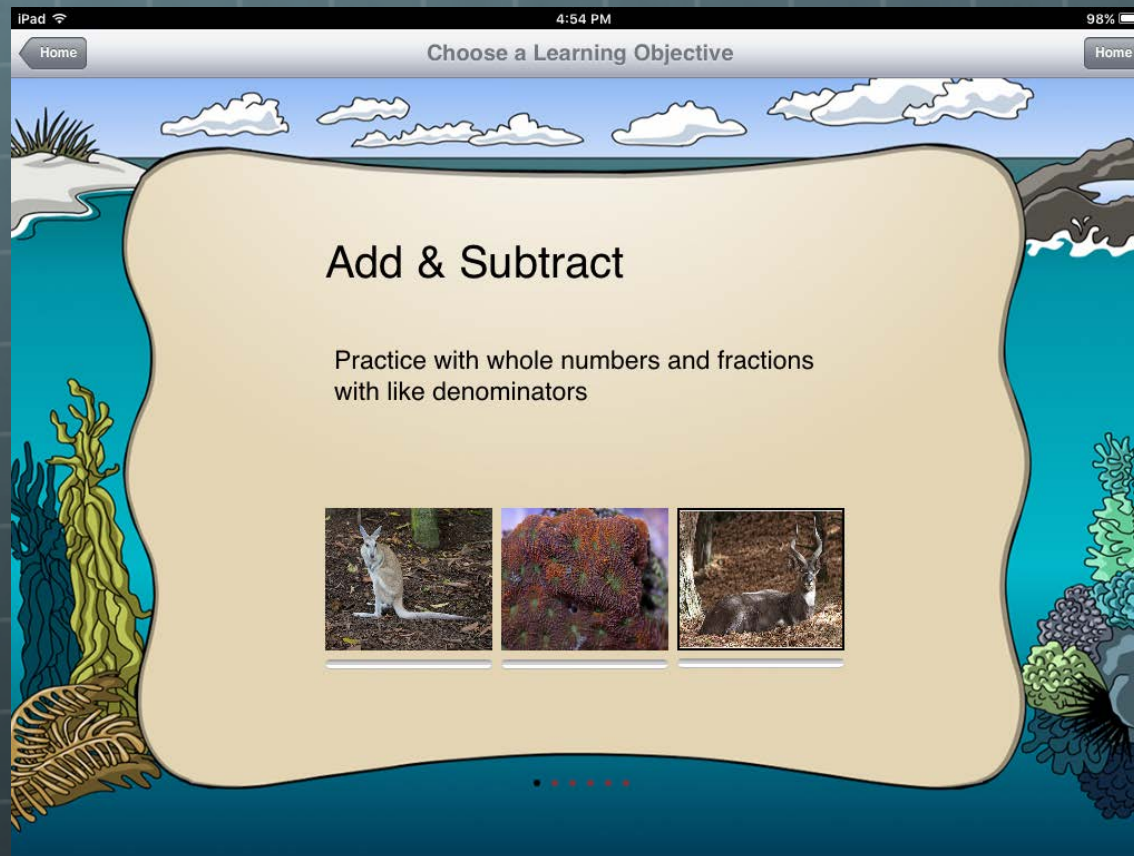


Show a Problem



# Real-World Comparisons

## Animal Watch: University of Arizona



The screenshot shows an iPad app interface. At the top, the status bar displays 'iPad', signal strength, '4:54 PM', and '98%' battery. Below the status bar is a navigation bar with a 'Home' button on the left and a 'Choose a Learning Objective' title in the center, with another 'Home' button on the right. The main content area features a large, light-brown rounded rectangle with a wavy border. Inside this rectangle, the text 'Add & Subtract' is displayed in a large, bold font. Below this, a smaller line of text reads 'Practice with whole numbers and fractions with like denominators'. At the bottom of the rectangle, there are three small square images: a white rabbit, a red coral reef, and a deer. Below the images is a row of five small red dots, with the first dot being larger than the others, indicating the current slide in a sequence. The background of the app is a colorful illustration of a coastal scene with blue water, white clouds, and various marine life like seaweed and coral.



## Integers Part 2

Multiplication and division with positive and negative integers

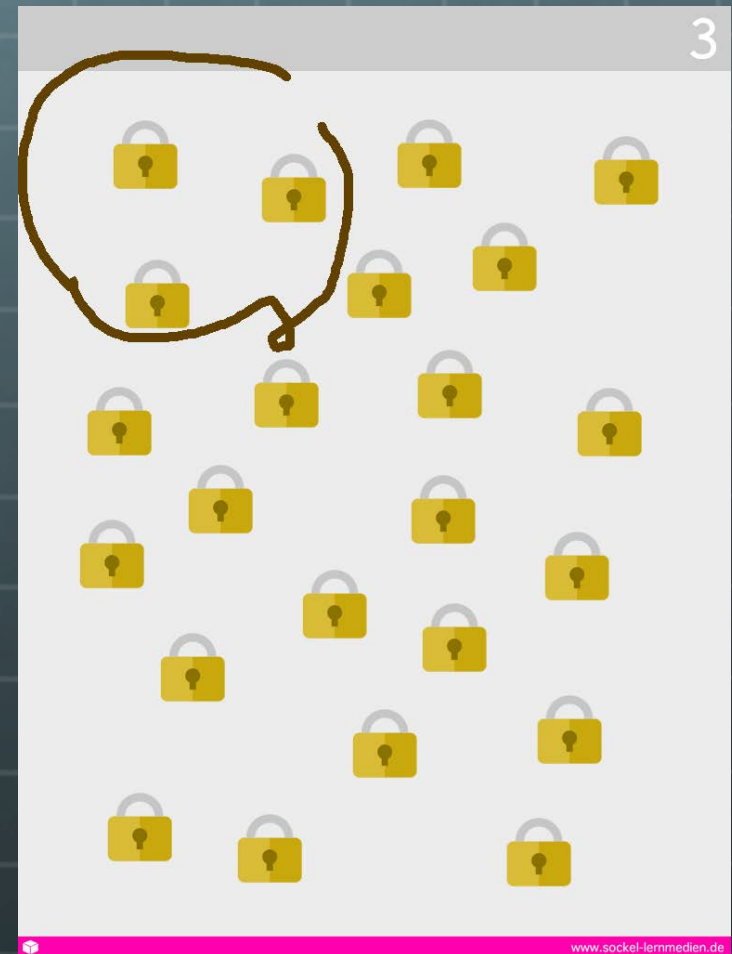


Animal Watch App: University of Arizona



# Math is Quantity, Not Numbers

 Math Base –

Quantity Lasso: Marc Sockel



# Proportional Reasoning

-  Thinking Blocks Ratios: Math Playground
-  Math Stretch by SAS Institute Inc.

**Word Problem:** The ratio of pop tunes to country tunes on Nicole's mp3 player is 3:2. If Nicole has 6 country tunes, how many pop tunes does she have?



Thinking  
Blocks

Build a model that represents the ratio in the story problem.

Thinking Blocks: Math Playground

Label



Label



Check

pop  
tunes

country  
tunes

**Feedback**

You have all the blocks needed to solve this problem.

**Missing Quantity**



**Word Problem:** The ratio of pop tunes to country tunes on Nicole's mp3 player is 3:2. If Nicole has 6 country tunes, how many pop tunes does she have?



Thinking  
Blocks

Build a model that represents the ratio in the story problem.

pop  
tunes



country  
tunes



Check

**Feedback**

You have all the blocks needed to solve this problem.

**Missing Quantity**

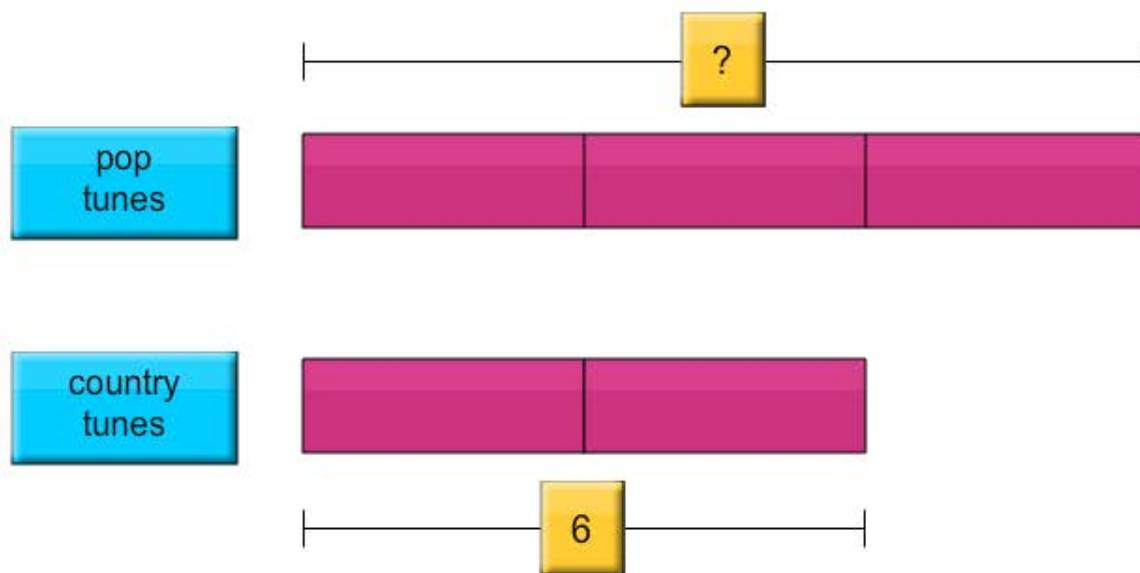




**Word Problem:** The ratio of pop tunes to country tunes on Nicole's mp3 player is 3:2. If Nicole has 6 country tunes, how many pop tunes does she have?



Add numbers to your model. Use a ? to show the missing number.



Check

**Feedback**

Excellent work! Blocks and labels have been placed correctly. Now you can add numbers to the model.

**Missing Quantity**



# Algebraic Thinking

 National Library of Virtual Manipulatives

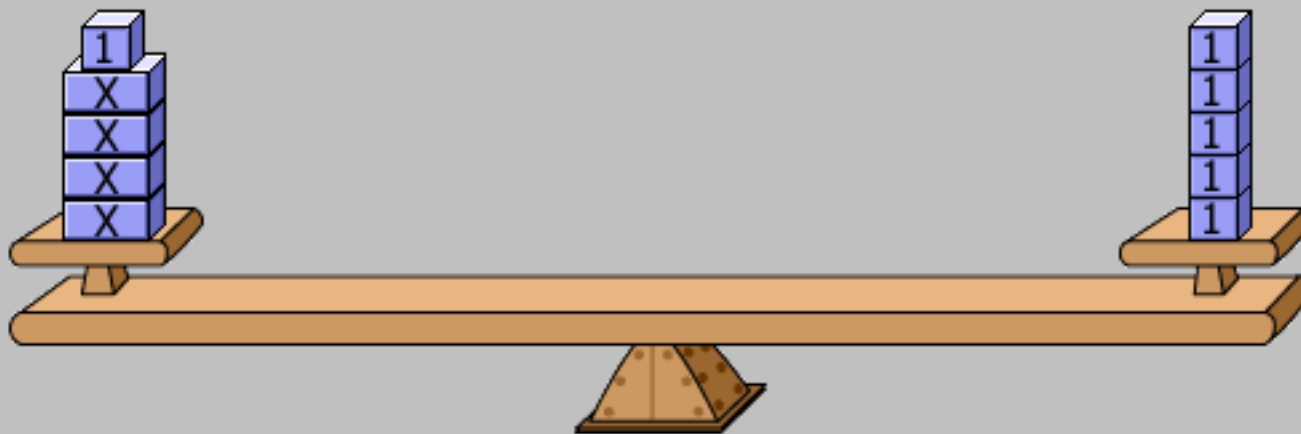
[http://nlvm.usu.edu/en/nav/topic\\_t\\_2.html](http://nlvm.usu.edu/en/nav/topic_t_2.html)

Click and drag quantities from bins to balance beam pans to represent the equation.

$$4x + 1 = 5$$



[http://nlvm.usu.edu/en/nav/frames\\_asid\\_201\\_g\\_3\\_t\\_2.html?open=instructions&from=topic\\_t\\_2.html](http://nlvm.usu.edu/en/nav/frames_asid_201_g_3_t_2.html?open=instructions&from=topic_t_2.html)



Continue

Clear

Create Problem

New Problem



# Students with Number Sense are able to ...

- 🌐 Recognize mistakes:
  - 🌐 <http://mathmistakes.org/>
  - 🌐 <http://www.basic-mathematics.com/common-mistakes-in-math.html>

- Recognize benchmark numbers and patterns:
  - [https://www.mangahigh.com/en-us/math\\_games/algebra/algebra\\_and\\_sequences/recognize\\_number\\_patterns\\_and\\_relationships](https://www.mangahigh.com/en-us/math_games/algebra/algebra_and_sequences/recognize_number_patterns_and_relationships) (timed)

The screenshot shows a game interface with a top navigation bar. On the left, there are icons for a keyboard, home, and fullscreen. The text "FOR FULLSCREEN" is visible. In the center, it says "Question 2 of 10" and "EASY" with a green hexagon icon. To the right, it says "2 more correct to go up!" with a green arrow icon. Further right, it says "Score: 144" and has a speaker icon and a close button. The main area contains the instruction: "Sort the numbers into two groups, odds and evens, by dragging them into the boxes below." Below the instruction are two dashed blue boxes labeled "Odd" and "Even". To the right of these boxes is a vertical list of numbers: 8, 48, 6, 5, and 16. Below the numbers is a "SUBMIT ANSWER" button. At the bottom of the interface, there are two buttons: "2 FREE HINTS" with a lightbulb icon and "1 FREE SOLVE" with a calculator icon.



🌐 Explain Vocabulary:

- 🌐 [www.broward.k12.fl.us/studentsupport/ese/PDF/MathWordWall.pdf](http://www.broward.k12.fl.us/studentsupport/ese/PDF/MathWordWall.pdf)

Data Analysis and Probability Word Wall






median

*Regional Center II, August 2006*

m + e + a + n

*Regional Center II, August 2006*

## Apply Learned Skills in Word Problems:

-  Drill Math Word Problems - Banana Math: Power Math Apps
-  Math 4 Adults - Word Problems Every Grown Up Should Know
-  Thinking Blocks Addition, Multiplication, Fractions: Math Playground
-  Math Shake: Top Storey
-  Math Word Problems Step by Step app (Janine Tool)

## References

1. Faulkner, V. (2009). The Components of Number Sense. *Teaching Exceptional Children*, Vol. 41, No. 5, 24-30.
2. Gertsen, R. & Chard, D. (2001). Number Sense: Rethinking Arithmetic Instruction for Students with Mathematical Difficulties. Retrieved from <http://www.ldonline.org/article/5838/>
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4. Halberda, J., Mazocco, M, & Feigensen, L. (2008). Individual Differences in Non-Verbal Acuity Correlate with Maths Achievement. Retrieved from [http://www.jhu.edu/news/home08/sep08/number\\_sense.html](http://www.jhu.edu/news/home08/sep08/number_sense.html)
5. Woodward, J. (2006). Making Reformed Based Mathematics Work for Academically Low Achieving Middle School Students. In Montague, M., & Jitendra, A. (in press). *Middle School Students with Mathematics Difficulties*. New York: Guildford Publications.

# Contact Info

- 🌐 Michael Teuber, Upper School Teacher, Cotting School
- 🌐 [michael.teuber5@gmail.com](mailto:michael.teuber5@gmail.com)
- 🌐 [mteuber@cotting.org](mailto:mteuber@cotting.org)
- 🌐 Twitter: @mteuber5
- 🌐 Linked In