

# *Fraction Multiplication and Division using Virtual Measurement Models*

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Say “Hi!” to  
your neighbor  
– we’ll all be  
talking!



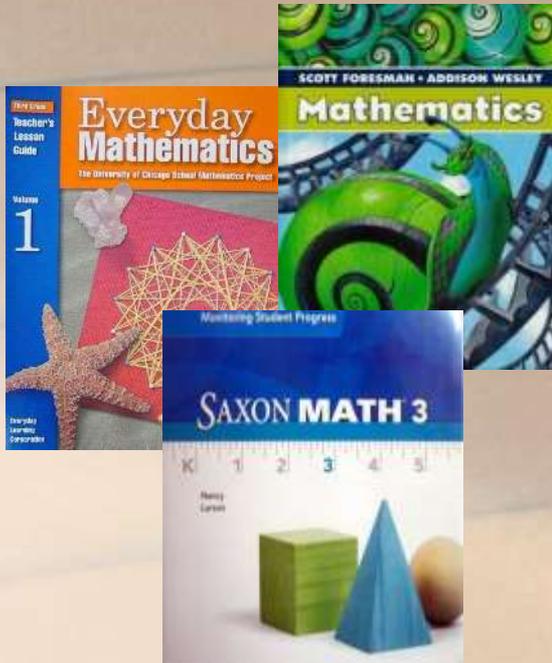
Strengthening Tomorrow’s Education  
in Measurement (STEM) Project



**MICHIGAN STATE  
UNIVERSITY**

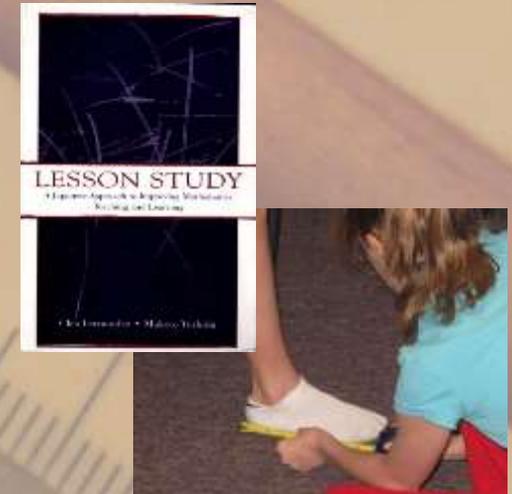
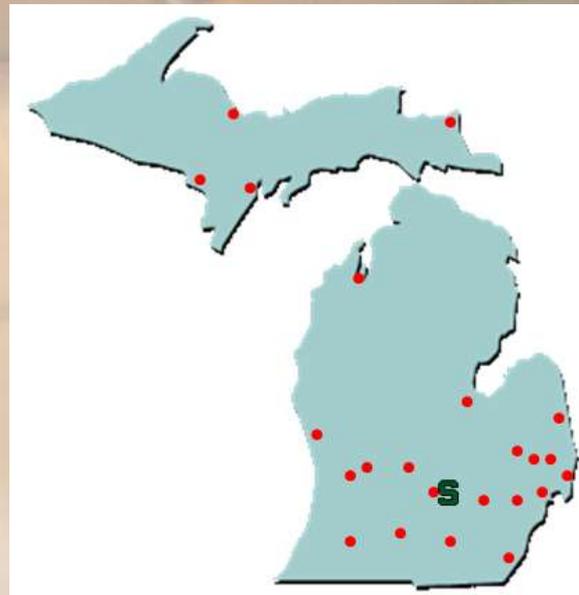
# Who is STEM?

Strengthening Tomorrow's Education in Measurement



Elementary  
Curriculum Analysis of  
Spatial Measurement  
– Length, Area,  
Volume

Professional  
Development work  
with 33 facilitators in  
23 regions



Research &  
Development  
work with Elem.  
Math Methods  
students and  
instructors at  
MSU

# Session Structure:

## Interactive discussion of...

### Students' understanding of mathematical ideas

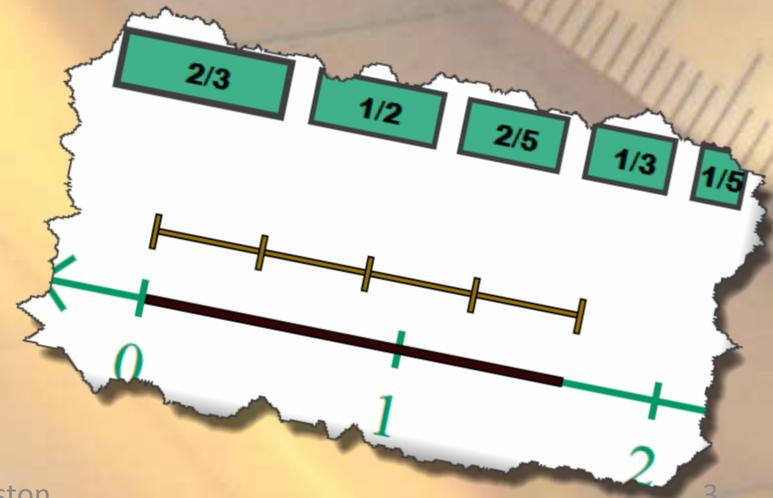
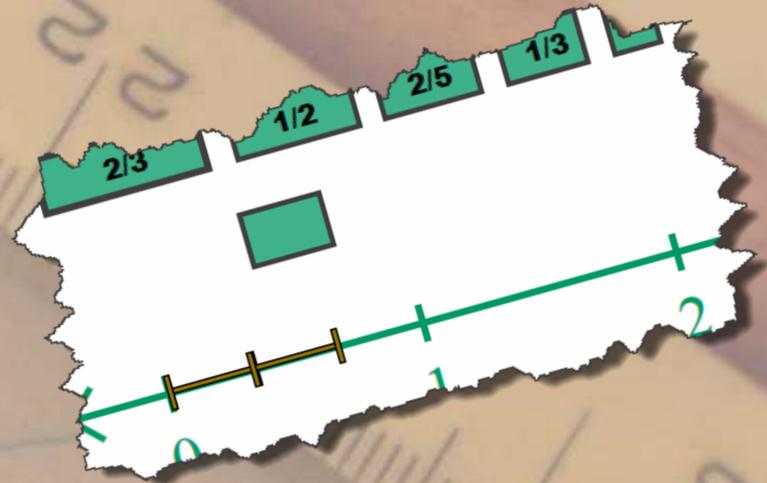
- measurement model
- number line
- fraction operation

### Relationships between

- quantities and numbers
- actions and operations

### Benefits and limitations of instructional models

- manipulatives
- applets



# Common Core Connections: Fractions, Measurement, Number Line

- **3.NF.2.B:** Represent a fraction  $a/b$  on a number line diagram...
- **4.NF.1:** Explain why a fraction  $\frac{a}{b}$  is equivalent to a fraction  $\frac{n \times a}{n \times b}$  by using visual fraction models...
- **4.NF.B.4.b:** Understand a multiple of  $a/b$  as a multiple of  $1/b$ , and use this understanding to multiply a fraction by a whole number. *For example, use a visual fraction model...*
- **5.NF.B.3:** Interpret a fraction as division of the numerator by the denominator ( $a/b = a \div b$ ). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem.

# We think these are important...

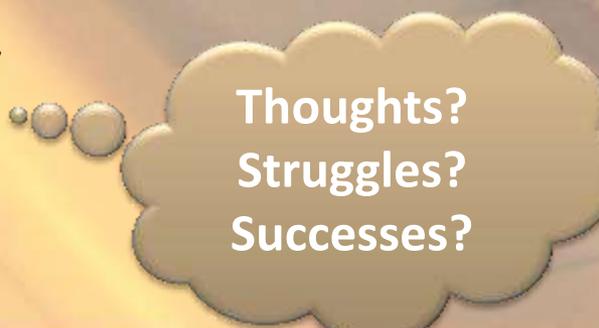
- Interaction of mathematical objects:
  - Lengths, Fractions, and Number Line
- Relationships between quantities & numbers:
  - Discrete vs. Continuous
- Relationships between actions & operations:
  - *Action* of Multiplication vs. Division
- Representations of length measurement
  - Dynamic vs. Static

Initial thoughts?

**Use the manipulatives to solve the problems ...**

## **Focus on:**

- **Interaction of mathematical objects:**
  - Lengths, Fractions, and Number Line
- **Relationships between quantities & numbers:**
  - Discrete vs. Continuous *quantities*
- **Relationships between actions & operations:**
  - *Action* of Multiplication vs. Division
- **Representations of length measurement:**
  - Dynamic vs. Static *representations*



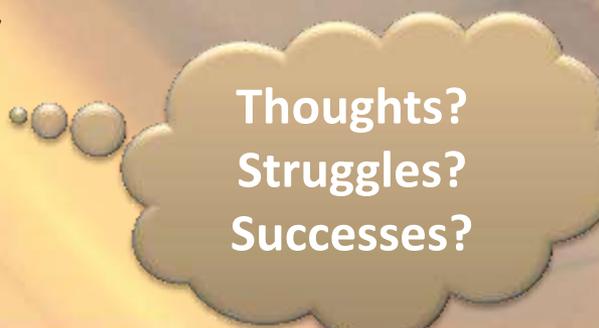
Thoughts?  
Struggles?  
Successes?

# STEM @ MSU Applets

- **Go to:** <http://tinyurl.com/STEM-NCSM2015>
- **These applets *are*:**
  - Our attempt to fill a gap
  - Intended to push *our* thinking about measurement
- **These applets *are not*:**
  - Slick, shiny, perfect
  - “The Answer”

# Play with the Applets & Focus on:

- **Interaction of mathematical objects:**
  - Lengths, Fractions, and Number Line
- **Relationships between quantities & numbers:**
  - Discrete vs. Continuous *quantities*
- **Relationships between actions & operations:**
  - *Action* of Multiplication vs. Division
- **Representations of length measurement:**
  - Dynamic vs. Static *representations*

A thought bubble graphic with three small circles leading to a larger cloud-like shape. The text inside the bubble is white on a dark background.

Thoughts?  
Struggles?  
Successes?

# Final Discussion

- Comparison: Teacher responses to applet interaction
- How can focusing on one or all of the previous support students', teachers', and our own thinking?
- When are virtual manipulatives appropriate?  
When are physical manipulatives appropriate?

We want to thank the National Science  
Foundation for funding this work



**Thank you for coming!**

For more information : <http://www.msu.edu/~stemproj>

If you have any questions please e-mail us at:  
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