# *Fractions as Lengths*

**Eryn Stehr, Nic Gilbertson, D. Lee Clark**

Strengthening Tomorrow's Education in Measurement (STEM) Project

MICHIGAN STATE UNIVERSITY

# Introductions

We are all

**Ph.D. students in mathematics education at Michigan State**

and all work for

**Strengthening Tomorrow's Education in Measurement (STEM) Project:**

**Eryn – 3 yrs. Nic – 4 yrs. Dan – 5 yrs.**

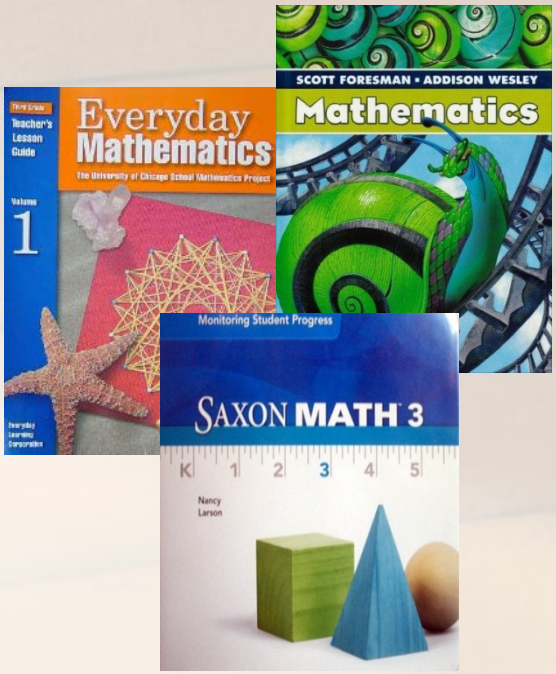
Eryn Stehr – Taught content courses in Mathematics and for Elementary Education majors.

Nic Gilbertson – Taught MS & HS math, and methods courses in Elementary Education.

Dan Clark – Taught psychology, mathematics, mathematics content courses for teachers, and teacher education courses.

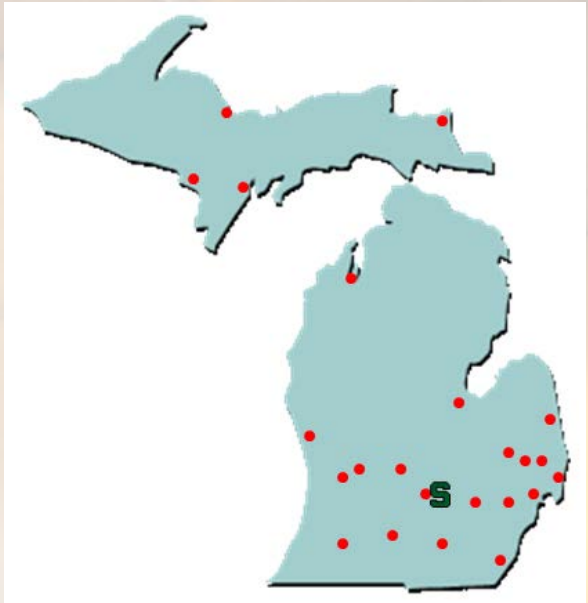
# Who is STEM?

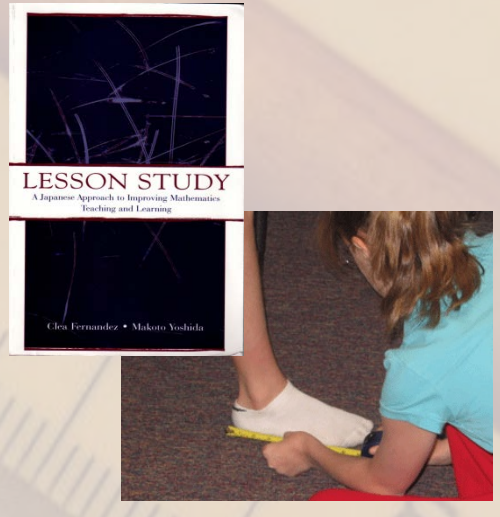
## Strengthening Tomorrow's Education in Measurement




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

Professional Development work with 33 facilitators in 23 regions





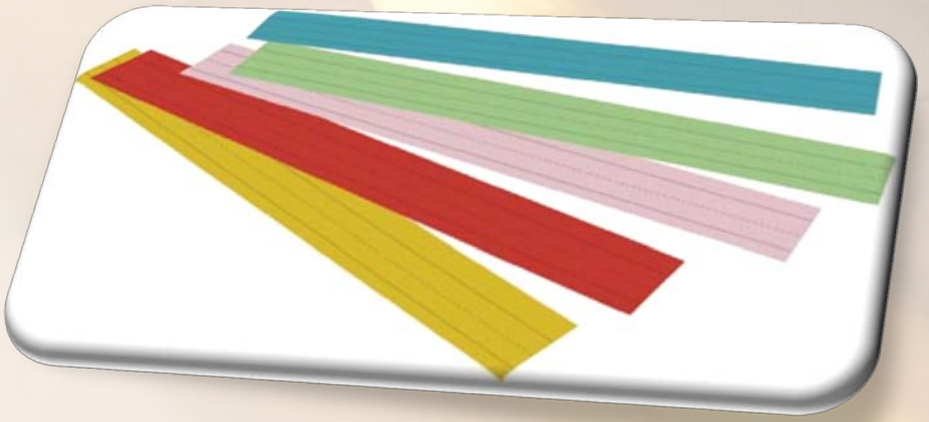

Research & Development work with Elem. Math Methods students and instructors at MSU

# What this session is about…

**If students are going to understand the number line in rich and meaningful ways, they should understand how numbers represent accumulated quantities of lengths.**

# What we are going to be doing…

**Explore connections between fraction operations and representations using a length model.**



# Our goal for this session…

**Walk out with a better understanding of one (possibly new) way of thinking about connecting fractions and measurement.**

# Fraction in CCSSM

- **Grades 1&2**: Intuitive understanding of fraction
- **Grade 3:** Meaning & representation of fraction
- **Grade 4:** Fraction operations (+, -, x)
- **Grade 5:** Fraction operations (+, -, x, $\div$)
- **Grade 6:** Fraction operation ($\div$)

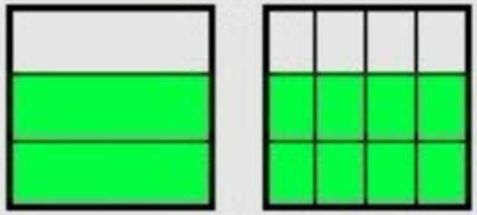
**For more details on CCSSM fraction standards, check out:

- http://msu.edu/~stemproj
- http://commoncoretools.me/tools/
- http://turnonccmath.net/

# Using measurement to learn fractions

• Using measurement model to make sense of certain fraction procedures:

Using an area model to show that $\frac{2}{3} = \frac{4\times2}{4\times3}$



•Using measurement as a context to make sense of the fraction operation:

Jim has 3/4 of a yard of string which he wishes to divide into pieces, each 1/8 of a yard long. How many pieces will he have?

$3/4 \div 1/8$

# Representing Fractions as Numbers

- Break into groups of 3
- Using a length unit (sentence strip), represent the following quantities:
  - **Group member 1:** $^{2}/_{3}$, $^{4}/_{3}$, and $1\ ^{2}/_{3}$
  - **Group member 2:** $^{3}/_{4}$, $^{5}/_{4}$, and $1\ ^{3}/_{4}$
  - **Group member 3:** $^{4}/_{5}$, $^{6}/_{5}$, and $1\ ^{4}/_{5}$
- Choose one representation to share out

# Fraction Operations (**Addition**)

Using your length unit, represent the following **sums** as lengths:

A. $^1/_3 + {}^1/_4$

B. $^1/_4 + {}^1/_5$

C. $^1/_5 + {}^1/_3$

D. $^1/_5 + {}^1/_4 + {}^1/_3$

Choose **one** and determine the length measurement.

# Fraction Operations (**Multiplication**)

Using your length unit, represent the following **products** as lengths based on the unit:

A. $6 \bullet {}^{1}/_{3}$

B. $1{}^{1}/_{2} \bullet {}^{2}/_{3}$

# Fraction Operations (**Multiplication**)

Using your length unit, represent the following **products** as lengths based on the unit:

A. $6 \bullet {}^{1}/_{3}$

B. $1{}^{1}/_{2} \bullet {}^{2}/_{3}$

**Challenge Questions:**

C. ${}^{3}/_{4} \bullet 2{}^{1}/_{3}$

D. ${}^{2}/_{3} \bullet {}^{9}/_{10}$

# Fraction Operations (**Division**)

Using your length unit, represent the following **quotients** as lengths based on the unit:

A. $^{6}/_{5} \div {}^{2}/_{5}$ B. $^{6}/_{4} \div {}^{2}/_{4}$

What changes if we replace 6 by 7 in both questions?

# Fraction Operations (**Division**)

Using your length unit, represent the following **quotients** as lengths based on the unit:

A. $^{6}/_{5} \div {}^{2}/_{5}$

B. $^{7}/_{5} \div {}^{2}/_{5}$

**Challenge Questions:**

C. $^{7}/_{5} \div {}^{1}/_{10}$

D. $^{7}/_{10} \div {}^{1}/_{20}$

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: stemproj@msu.edu