Fraction Multiplication and Division using Virtual Measurement Models

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Strengthening Tomorrow’s Education in Measurement (STEM) Project

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

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Who is STEM?
Strengthening Tomorrow’s Education in Measurement

Professional Development work with 33 facilitators in 23 regions

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

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

STEM 2015 – NCSM, Boston
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 \(a/b\) is equivalent to a fraction \(n \times a / n \times b\) 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 \((a/b = a ÷ b)\). 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*
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
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: stemproj@msu.edu