

Analyzing Preservice Teachers' Thinking about Proportionality

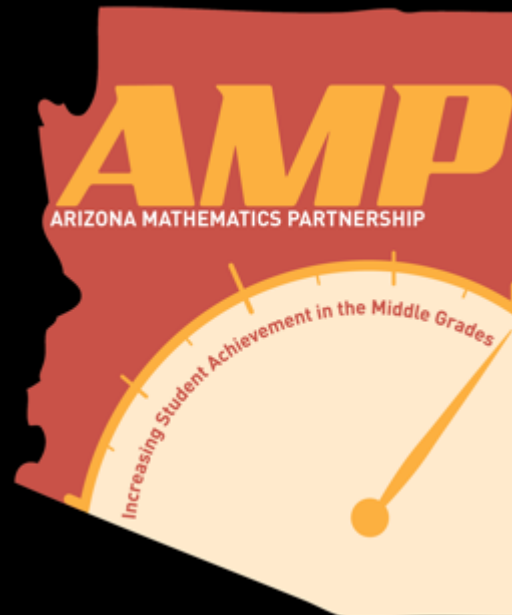
Teacher Preparation Committee Themed Session:
Engaging Future Teachers with Concepts of Rational Numbers

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Theoretical Perspective

- Cognitive constructivism:
 - focus on **describing the mental images of an individual** to learn one's ways of thinking and approaches to problem situations (Piaget, 1970).
 - the philosophical belief that **learning occurs through experiences and action**, rather than through knowledge passed on by others (Steffe & Thompson, 2000).

Task-Based Interviews

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- Comprised of mathematical tasks
- Semi-structured
- Researcher mode, not teacher mode
- Purpose: to probe student thinking!



Proportional Reasoning

Juice Task: Suppose $\frac{3}{5}$ of a cup of juice provides $\frac{4}{3}$ of your daily serving of vitamin C.

- a) Find the amount of vitamin C in one cup of juice.
- b) Find the amount of juice needed to provide one daily serving of vitamin C.

a.

C. amount of juice	$\frac{3}{5}$	$\frac{1}{5}$	$\frac{5}{5}$
daily serving	$\frac{4}{3}$	$\frac{4}{9}$	$\frac{20}{9}$

Handwritten annotations: $\div 3$ above the first column, $\times 5$ above the second column, and $\times 5$ below the third column.

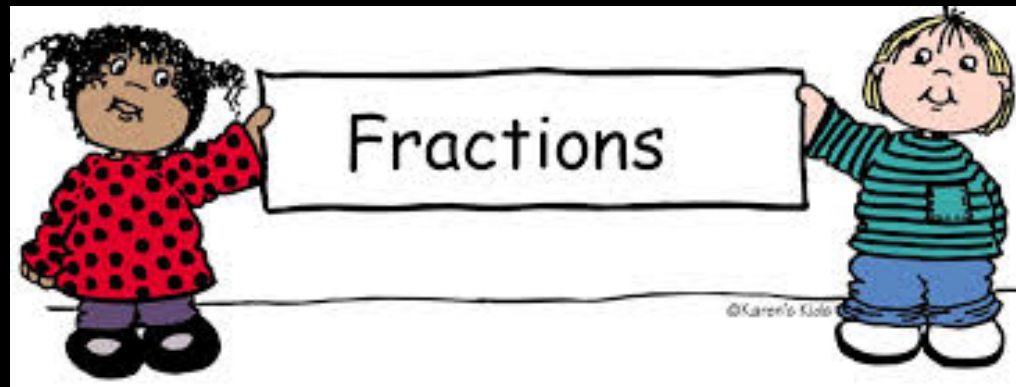
b.

j	$\frac{3}{5}$	$\frac{4}{15}$
d.s.	$\frac{4}{3}$	$\frac{3}{3}$

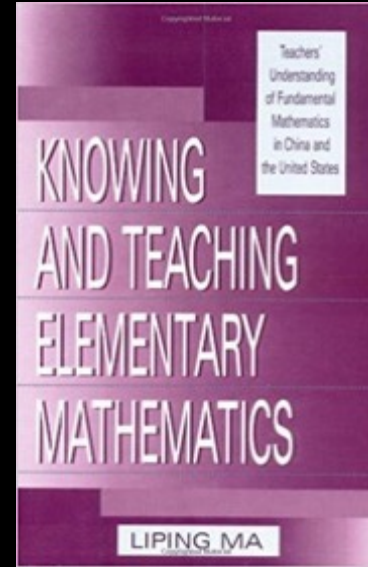
Handwritten annotations: $-\frac{1}{3}$ below the second column, and "1 full d.s." below the third column. The fraction $\frac{4}{15}$ is circled.

Proportional Reasoning

If $\frac{3}{5}$ of one of John's steps has the same length as $\frac{4}{3}$ of one of Lucy's steps, then how many steps must Lucy take to travel one full John-step?



John/Lucy Steps



- Liping Ma (1999)
- U.S. Teachers: “invert and multiply”
- Chinese Teachers: “dividing by a number is equivalent to multiplying by its reciprocal”

$$\frac{4}{3} \div \frac{3}{5} = \frac{20}{15} \div \frac{9}{15} = \frac{20/9}{15/15} = \frac{20/9}{1} = \frac{20}{9}$$

Thank you! Questions?

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