


Research Informed Instructional Considerations for Representing Fractions

The teacher should	It allows students to	References
<ul style="list-style-type: none"> introduce learners to fractions through a context of fair sharing, partitioning with a focus on fairness and number of shares. 	<ul style="list-style-type: none"> construct connection between fractions, multiplication, and division through exploration in context of fair sharing. compare fractional amounts using concrete materials. construct unit fractions and common fractions within a context. avoid the misconception about fractional size that a larger denominator means a larger amount. 	<ul style="list-style-type: none"> Fosnot (2007) Fosnot & Dolk (2002) Van de Walle
<ul style="list-style-type: none"> engage students in reasoning with repeated halving before creating <ul style="list-style-type: none"> equal even numbered partitions (e.g., 10) odd numbered partitions (e.g., 7) composition (e.g., 12 can be constructed using a 3x4 array) 	<ul style="list-style-type: none"> develop an understanding of the representation of fractions first as they can more readily model the mathematics using an appropriate model apply their understanding to increasingly complex partitioning situations. use their multiplicative understanding to partition wholes for denominators which can be factored (composition). 	<ul style="list-style-type: none"> Petit, Laird, Marsden Stiff
<ul style="list-style-type: none"> use examples and non examples as representations of fractions. 	<ul style="list-style-type: none"> think about what fractions are NOT. surface misconceptions. 	<ul style="list-style-type: none"> Smith Van de Walle
<ul style="list-style-type: none"> allow students to select their own tools and representations. 	<ul style="list-style-type: none"> share their thinking through the representation, including drawings, and therefore facilitate reasoning. This allows teachers to build upon the students' prior knowledge in meaningful ways. arrive at the conclusion that the parts must be equal in area. Sometimes pre-made partitioned models prevent discovery of such misconceptions. share and refine their understanding of the multiple meanings of fractions, including as parts of a set. think about fraction as part of a whole. Sometimes with pre-partitioned shapes, they rely on counting of partitions instead. construct mental referents which allow them to perform fraction tasks meaningfully. For example, recognize that $\frac{1}{4}$ is less than $\frac{1}{2}$ or that $\frac{4}{3}$ is greater than 1. select manipulatives to model a fraction, which they may find easier to use if they lack the fine motor skills necessary to accurately partition a whole. 	<ul style="list-style-type: none"> Bezuk & Cramer Bruce & Flynn Bruce & Ross Empson & Levi Petit et al Stiff Van de Walle
<ul style="list-style-type: none"> encourage multiple strategies to explain thinking. 	<ul style="list-style-type: none"> explain their thinking using different strategies, deepening their understanding and use of increasingly precise vocabulary. develop a strong conceptual understanding of the connections between and among representations and strategies, aiding in subsequent learning. make connections to other mathematical concepts, including their knowledge of algebraic relationships. 	<ul style="list-style-type: none"> Bruce & Flynn Empson & Levi Meagher
<ul style="list-style-type: none"> make precise decisions about the models used and share the rationale with students. 	<ul style="list-style-type: none"> understand that some representations work better in one context than another. The usefulness of a representation is dependent upon the context. 	<ul style="list-style-type: none"> Bruce Petit et al

Research Informed Instructional Considerations for Representing Fractions (continued)

The teacher should:	It allows students to:	References
<ul style="list-style-type: none"> incorporate a variety of models and contexts into their instruction 	<ul style="list-style-type: none"> make strong connections between physical models and mathematical concepts. move beyond rote, mechanical manipulations of one manipulative. focus on the important components of fractions (i.e., identify the whole, consider what composes ‘equal parts’, establish the meaning of the fraction in the given model/context). make connections between different representations, which may uncover inaccurate generalizations or conceptual misunderstandings. 	<ul style="list-style-type: none"> Petit et al
<ul style="list-style-type: none"> restrict denominators to 12 and less. 	<ul style="list-style-type: none"> work with familiar numbers. easily model the fraction in a variety of ways. 	<ul style="list-style-type: none"> Bezuk & Cramer Van de Walle
<ul style="list-style-type: none"> engage students in counting by unit fractions (e.g., $1/8$, $2/8$, $3/8$,...). 	<ul style="list-style-type: none"> recognize that the top number counts, while the bottom number tells us what is being counted. consider the part to whole relationship. deepen understanding of a fraction as a single number. 	<ul style="list-style-type: none"> Emperson & Levi Petit et al Van de Walle
<ul style="list-style-type: none"> monitor understanding of notation and part-whole relationships separately. 	<ul style="list-style-type: none"> investigate the relationships between the fraction concepts and fraction notation. distinguish their level of understanding of each. 	<ul style="list-style-type: none"> Saxe
<ul style="list-style-type: none"> use models where a region is shaded (without partitions) and ask students to estimate about how much is represented. 	<ul style="list-style-type: none"> develop a sense of what fractions are. think of a fraction as one idea, rather than two numbers. consider the whole region, rather than the individual parts, which minimizes the potential for confusion between whole numbers (the number of parts, the number of shaded parts) and fractions. 	<ul style="list-style-type: none"> Meagher Petit et al Small (2001) Van de Walle
<ul style="list-style-type: none"> require students to partition an area model to represent a specific fractional value. 	<ul style="list-style-type: none"> refine and/or communicate their understanding of the necessity of congruent pieces for fraction representation. strengthen their understanding of the part-to-whole relationship 	<ul style="list-style-type: none"> Anderson & Wong Petit et al
<ul style="list-style-type: none"> sequence shading of models so the number of parts in the model equals: <ul style="list-style-type: none"> the denominator a factor of the denominator a multiple of the denominator of the shaded area 	<ul style="list-style-type: none"> identify the whole unit (and consider how it can change in different contexts). identify the meaning of the equal parts (and consider how they can change in different models). 	<ul style="list-style-type: none"> Petit et al
<ul style="list-style-type: none"> include different orientations, and also separate the shaded areas, when using area models. 	<ul style="list-style-type: none"> generalize part to whole relationships. 	<ul style="list-style-type: none"> Gould & Outhred Small (2010)

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The teacher should:	It allows students to:	References
<ul style="list-style-type: none"> include models with a perceptual distracter (a visual that does not match the task – e.g., Shade one-third of this circle. ) 	<ul style="list-style-type: none"> apply their fraction knowledge. distinguish fractions from whole numbers (i.e., can't just count the correct number of segments). 	<ul style="list-style-type: none"> Case & Moss Petit et al
<ul style="list-style-type: none"> have students break fractions into parts (e.g., $\frac{5}{4} = \frac{1}{4} + \frac{4}{4}$ or $\frac{3}{4} + \frac{1}{2}$, etc) 	<ul style="list-style-type: none"> increase flexibility with number. compose and decompose fractions to make them friendly. view a fraction as a single numeric value. 	<ul style="list-style-type: none"> Empson & Levi Fosnot & Dolk (2002) Petit et al Van de Walle
<ul style="list-style-type: none"> engage students in activities which extend their concept of unit (e.g., if the yellow trapezoidal pattern block is a whole, then what is the value of a green triangle? Also, if this area represents $\frac{3}{5}$, draw the whole.) 	<ul style="list-style-type: none"> develop flexibility of unit. reinforce their concept of unit. deepen understanding of equivalence and relative size. 	<ul style="list-style-type: none"> Bezuk & Cramer Petit et al Van de Walle
<ul style="list-style-type: none"> ask students to represent fractions using a variety of number lines 	<ul style="list-style-type: none"> consolidate their understanding of fraction as number (although they may first revert to whole number reasoning). connect fractions to their understanding of measurement. apply proportional reasoning to the location of fractions on a number line. connect the area representation to the number line by possibly constructing area models underneath and aligned with the number line. 	<ul style="list-style-type: none"> Petit et al