Developing Effective Fractions Instruction for K–8

The *Developing Effective Fractions Instruction for Kindergarten Through 8th Grade* Practice Guide emphasizes that competence with fractions is essential for algebra and other more advanced areas of mathematics. The guide provides recommendations for improving students' learning of fractions and supporting professional development for teachers.

SENSE MAKING

EQUAL SHARING

INITIAL FRACTION CONCEPTS

Build basic fraction concepts from students' informal understandings of sharing and proportionality.

ORDERING EQUIVALENCE

MODELS

OPERATIONS WITH FRACTIONS

Help students understand why computational procedures with fractions make sense.

VISUAL REPRESENTATIONS

FRACTIONS AS NUMBERS

Use number lines to develop student understanding of fractions as numbers.

REAL-LIFE CONTEXTS

RATIO, RATE, PROPORTION

Develop proportional relationship concepts before teaching challenging computational procedures.

LANDMARKS 1, 1/2, 3/4 ...

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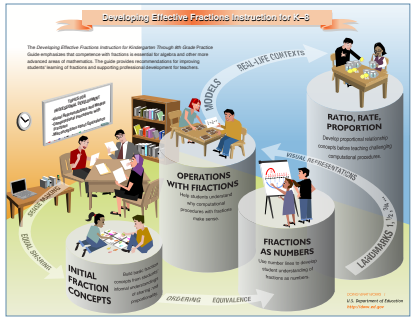

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This diagram depicts the progression of learning about fractions in elementary and middle school with recommended teaching practices from the IES Practice Guide, *Developing Effective Fractions Instruction for Kindergarten Through 8th Grade*. For the purposes of this website, five recommended practices were consolidated into four. The practice related to professional development was incorporated into the other practices.

In the diagram, progressively higher platforms depict the learning trajectory of fractions from the primary grades through middle school. The "ribbon" that connects the platforms identifies important pedagogical concepts (e.g., equivalencies, representations) that are relevant to all stages of learning about fractions. To underscore the importance of improving teachers' mathematics content knowledge and strategies for teaching fractions, the diagram depicts teachers in a professional development setting.

Initial Fraction Concepts

Children have developed an intuitive understanding of basic fraction concepts, such as dividing a whole object into equal pieces or sharing a set of objects among a group of people, by as early as preschool. Teachers can structure activities that create connections between informal knowledge of sharing and formal fraction concepts of ordering and equivalent relationships.

Fractions as Numbers

Understanding that fractions are numbers with magnitudes that can be ordered or considered equivalent is fundamental to grasping operations with fractions. Teachers can develop students' understanding of fractions as numbers by using number lines to illustrate magnitudes, the relationship between whole numbers and fractions, and the relationships among fractions, decimals, and percents.

Operations With Fractions

In order for students to become proficient with operations, they need a strong understanding of how computational procedures work with fractions. Teachers should focus on building conceptual understanding and developing procedural knowledge, emphasizing the connections. Teaching for understanding requires teachers to have deep knowledge of computational procedures.

Ratio, Rate, Proportion

Proportional thinking—understanding multiplicative relationships between quantities—is essential for more advanced work in mathematics. Teachers should develop students' understanding of proportional reasoning before teaching the cross-multiplication algorithm as a procedure for solving proportions. Teachers can make connections among problem contexts involving ratios, rates, and proportions, and discuss which ones can be solved most easily with cross-multiplication.

Professional Development

Professional development programs should place a high priority on improving teachers' understanding of fractions and how to teach them. Teachers benefit from preparation for using pictorial and concrete representations of fractions and fraction operations. It is important that teachers understand students' understandings and misunderstandings of fractions.

The DWW website includes other mathematics topics, some of which include media and materials relevant to teaching fractions. See also these topics: National Math Panel: Critical Foundations for Algebra; National Math Panel: Major Topics of School Algebra; Response to Intervention in Elementary-Middle Math; and Encouraging Girls in Math and Science.