

AFT EDUCATIONAL RESEARCH AND DISSEMINATION COURSE OVERVIEW

Course: Thinking Mathematics 2: Multiplicative Structures, Proportional Reasoning

Summary

Participants in Thinking Mathematics 2 study the research on how children learn mathematics, exemplified in Ten Principles to guide instruction, and apply the research to multiplication, division, and beginning proportional reasoning. The course examines how the meaning of numbers differs in additive and multiplicative structures, various representations that help students better understand operations, and multiple strategies for solving problems. The importance of language in developing understanding threads through the course.

Course Content

Overview

Participants learn how to set the stage for a new operation (specifically, multiplication) by prompting students to want a more efficient way to solve a problem. This unit stresses the importance of helping students distinguish equal and unequal groups as preparation for the new operations.

Problem Classification for Multiplication and Division

Here, participants learn about five major categories of word problems: (1) repeated quantities, (2) scalar, (3) combination, (4) geometric, and (5) complex quantities. After discussing the characteristics of each type, they practice classifying some given problems in small groups, and get a chance to create each kind of problem.

Introductory Multiplication/Division

This unit focuses on various strategies and representations that help students anchor their understanding of multiplication and division. Numbers emerge as referents for groups instead of for single objects. Labels are increasingly important. Participants compare and contrast the use of manipulatives to their use with additive structures, examine representation using arrays and t-tables, and explore strategies for helping students learn multiplication tables. This course unit is limited to single-digit multipliers.

Situational Context

In this unit, participants delve into various ways in which context affects problem solution, including variables that make problems more or less difficult, multiple ways that context affects how a solver uses a remainder, and understanding zero in division. The section also examines four levels of mathematical knowledge through which students pass as they learn any new mathematical concept.

Strategies for Multidigit Multiplication

This unit examines the concepts that come together for a “principled understanding of multidigit multiplication.” Participants explore using the distributive property and

area models, as well as proportion tables, as solution strategies. Throughout, this unit reinforces the importance of language and labels.

Long Division

This unit stresses the need for students to show understanding of multiplicative structures and operations before teaching the long division algorithm. Participants examine strategies such as partial quotient algorithms and proportion tables and are shown how to link conceptual methods to the traditional algorithm.

Primes and Factors

Participants focus on how to introduce students to prime and composite numbers using the Sieve of Eratosthenes. Participants see how the concepts of Greatest Common Factor and Least Common Multiple are used in situations and how students can identify them.

A Bridge to Higher Mathematics

In a preview of the next course, participants see how use of situational context can make clear the distinction between adding fractions and adding ratios. They also see how elementary strategies such as using manipulatives and arrays can also be used to illustrate solving linear algebraic equations, how using the distributive property early helps to prepare students for algebra, and how manipulatives can be used to build understanding of signed numbers.

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