Idaho State University | Albion Center for Professional Development

Mathematical Reasoning and Thinking

Course Syllabus

Course Description

The purpose of this professional development course is designed to deepen participants' understanding of key mathematical concepts while enhancing their instructional practices. Educators will explore the importance of fostering positive mathematical identities and facilitating meaningful discourse to support student engagement. The course emphasizes conceptual understanding and fluency in operations, guiding participants through strategies and models for addition, subtraction, multiplication, and division. Teachers will also investigate place value, spatial reasoning, and the use of geometry and measurement to build a strong foundation for problem solving. A focus on real-world contexts and visual models will support the development of fraction concepts and operations. By the end of the course, participants will be equipped with research-based tools to build student understanding, reasoning, and confidence in mathematics.

This course enhances classroom teaching effectiveness and supports improved student outcomes by introducing new knowledge in mathematical concepts, instructional strategies, and student-centered practices that promote conceptual understanding, discourse, and engagement in math.

Course Objectives

At the end of this course you should be able to:

1. Explain the role of mathematical identity, the value of mathematical discourse, and the distinction between strategies and models in supporting student learning and engagement in math.
2. Implement research-based strategies to build students' conceptual understanding and fluency with addition.
3. Explain the relationship between addition and subtraction, use models to solve and represent contextual problems, and apply strategies and problem types to deepen understanding of subtraction.
4. Apply strategies like spatial structuring, area models, and ratio tables to support students' conceptual understanding and progression in multiplication.
5. Use your understanding of place value and grouping to solve division problems and explain your thinking using models like equal sharing and repeated subtraction.
6. Apply place value concepts to represent, decompose, and reason about numbers accurately.
7. Use measurement and geometry to solve problems and describe shapes and their relationships.
8. Use models and real-world contexts to understand and explain fractions and their operations.

Modules

- Module 1: Building a Strong Foundation, Quiz 1
- Module 2: Building Reasoning, Numeracy, and Addition Progression, Quiz 2
- Module 3: Subtraction Progression, Quiz 3
- Module 4: Multiplication Progression, Quiz 4
- Module 5: Division Progression, Quiz 5
- Module 6: Place Value, Quiz 6
- Module 7: Measurement and Geometry, Quiz 7
- Module 8: Fractions, Quiz 8

Grading

Each quiz must be passed at an 80% or higher (three attempts allowed).

Format

This is a self-paced, asynchronous (no required live meetings) course. Throughout the PD course, you will find it helpful to take notes along the way to assist with the quizzes. Within each module, you will find reflection assessments that are not graded but will help in your journey through the course. There is an interactive forum in the course to help you connect with peers and instructors, share ideas, and collaborate on best practices throughout your learning journey.