Center for Innovation in Education
Math a Way of Thinking® Workshop
Daily Summary of Lessons

Course Philosophy

Theme — Mathematics is a way of thinking and not just a collection of ideas. Patterns form the basis of understanding and transferring knowledge. Patterns and the search for them tie the seemingly disjointed elements of math together. Mathematics is the science of pattern and order.

Usual Daily Lesson Plan

Core, Parallel core, Science (applications). Workshop lessons are not every step in a sequence. The sequence is in the book. Workshop lessons are aimed at the process of thinking — to present math as a way of thinking and to provide a (one) model of classroom teaching. All lessons are placed within the framework of the NCTM Standards.

Day One — Overview

Ctaite Mathe Teakst Buk

Purpose: To provide participants with "child-like" learning experience that will produce insights into what goes wrong for the "non-learner".

To ask participants to envision the difficulties a student may have — one they know. To evaluate the experience in terms of the math learned and in terms of the instructor's behavior.

Tangrams - I

Purpose: To provide practice in informal geometry and logical thinking. To provide a framework for dealing with situations that arise when someone thinks a problem can't be solved.

Beans and Cups (core) +1 and -1

Purpose: To use beans and cups to learn how to add and subtract comfortably in another base so we, as teachers, can see how our students can learn to add and subtract comfortably in base ten.

To look for patterns in numbers that help us (and our students) make better sense out of all numbers, regardless of base.

Patterns with Unifix Cubes — AAAB-AAAB-AAAB

Purpose: To examine a material for patterns as practice in exploring patterns. Using visual patterns to predict patterns not yet seen. To look for relationships between "materials" patterns and "number" patterns.

Understanding Fractional Values

Purpose: To attribute fractional values to people and Power Blocks or pattern blocks.

Day Two — Overview

Beans and Cups (Core) — Race up and Back <, >, +,-

Purpose: To continue the process of learning how to add and subtract in different bases.

To observe and experience the process of allowing the answer to flow from the material.

Measurement I

Purpose: To establish a clear understanding of the need for standardized units of measure.

To measure.

To develop an understanding of the concept of error of measurement.

Measurement II

Purpose: To learn considerations important in communication, measurement, and giving directions.

To measure.

To practice drawing and reading maps.

Geoboard — Area

Purpose: To provide necessary skill to find the surface area of geometric shapes. On a later day, this skill is used in pattern searches which lead to predicting areas in advance of working them out.

Sort and Classifying

Purpose: To provide background information on the downfall of "sets" as it relates to the elementary school curriculum, and the remaining value of "sorting and classifying".

To show that it is the foundation of much of science, particularly the natural sciences.

To demonstrate the key to the process is logical thinking.

Surrounding Patterns

Purpose: To examine a material for patterns as practice in exploring patterns. Using visual patterns to predict patterns not yet seen. To look for relationships between "materials" patterns and "number" patterns.

Tangrams II

Purpose: To provide practice in informal geometry and logical thinking. To provide a framework for dealing with situations that arise when someone thinks a problem can't be solved.

Day Three Overview

Beans and Cups — Multiplication

Purpose: To provide participants with an understanding of the process of multiplication through assembling multiplication matrices in a variety of bases.

To explore the matrices for possible patterns.

To build an understanding of two place multiplication.

Structures I — 3-D Construction

Purpose: To learn some geometric and engineering concepts concretely that have traditionally been presented abstractly.

To provide participants with the background necessary to be successful in Structures II.

To provide experience at kite building.

Geoboard Formulas

Purpose: To use knowledge of computing areas gained in an earlier lesson to generate data to examine for patterns.

To learn where a good deal of what we were taught as "given" formulas came from in the first place.

Probability

Purpose: To learn a skill useful in drawing increased meaning from graphs.

To gain a better understanding of the nature of "chance"

Sort and Classifying — People sorting — Descriptions

Purpose: To practice sorting skills learned in previous lesson.

Palindromes

Purpose: To demonstrate addition practice motivated by the search for patterns.

Coordinate Graphing — Coordinate Geometry

Purpose: To learn a new form of graphing for organizing specific kinds of data into displays more useful for making predictions.

To learn a little about what algebra is all about.

Day Four Overview

Beans and Cups — Division

Purpose: To provide participants with an understanding of the process of division by creating and solving division problems in other bases.

To examine the relationships between multiplication and division, which accounts for why the "answer is on the top and why division might be recorded the way it is".

Tiles + , - , x, ÷

Purpose: To use pattern searches as motivation for working simple addition, subtraction and multiplication

To provide a look at some number patterns that will occur again and again.

Pool Hall Math

Purpose: To explore a simple activity for the variety of patterns that emerge.

To demonstrate that patterns are everywhere and that many patterns reoccur in seemingly unrelated situations

Graphing — Pictorial Representations

Purpose: To graph data so that relationships may be observed visually.

To learn how to ask questions about graphs.

Structures II

Purpose: To use the principles learned in the previous Structures lesson to build stable structures.

Pendulums — Science

Purpose: To apply a wide variety of problem-solving techniques and mathematical knowledge to a science activity.

To study a little physics

Day Five — Overview

Chip Trading + , - , x , ÷

Purpose: To learn how to use "chips" for addition, subtraction, multiplication and division.

To see why chips come after beans and cups and not before.

Shell Game — Science

Purpose: To apply problem-solving techniques and mathematical knowledge to a science activity.

To set up experiments to find answers.

To practice living with not knowing **all** the answers.

To know what it feels like to a "scientist".

Cube Stick Fractions

Purpose: To examine fractions generated with cube sticks for patterns

Geoboard — Multiplication of fractions

Purpose: To examine numbers for patterns that lead to developing a rule for the multiplication of fractions.

1 - 2 - 4 - 8 - 16 - 32

Purpose: To look for patterns.

To see the power of materials to show thinking, and their power to show what numbers represent.

Building Behind a Shield

Purpose: To demonstrate three models for teaching.

SUMMARY

The Center for Innovation in Education is a nonprofit educational organization which provides support to teachers who use the Math a Way of Thinking philosophy of teaching. This support takes the following forms:

1. Holding 30 hour workshops on the teaching of Math a Way of Thinking across the U.S. and Canada throughout the year.
2. Holding follow-up classes for participants during the school year to assist teachers with implementation of the program.
3. Providing math kits and materials at reasonable prices to teachers.

For additional information, please contact us.

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