Concepts and Methods in Elementary Math

Class 2 - Planning for Instruction

Agenda

Tonight's work and topics:

- Share Notebooks
- Solve Problems
- Discuss Knowledge
- Consider Planning
- Reflect

Sharing Notebooks

Visual Notes

Share your “Life in Numbers” entry with your group.

SET

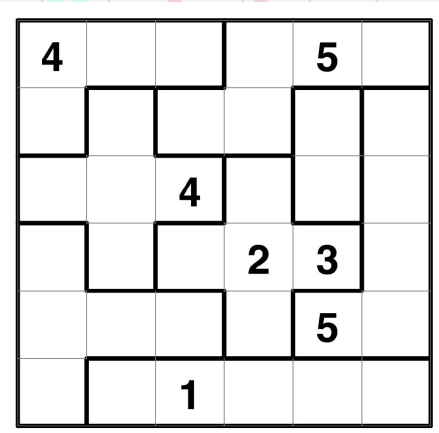
- Share your solution strategies.
- Share challenges you encountered.
- Discuss how this problem/puzzle might be used with students.

Problem Solving Oath

I will:

- make my best effort to solve the problem.
- make sense of patterns and numbers.
- use manipulatives and drawings.
- ask questions.
- listen to the ideas of others.
- stay engaged by trying to find another solution or representation.
- make mistakes and learn from them.

PS Activity 2 - Suguru



How to Play

Suguru is a number puzzle that consists of a grid of squares divided into heavily outlined areas called **cages**.

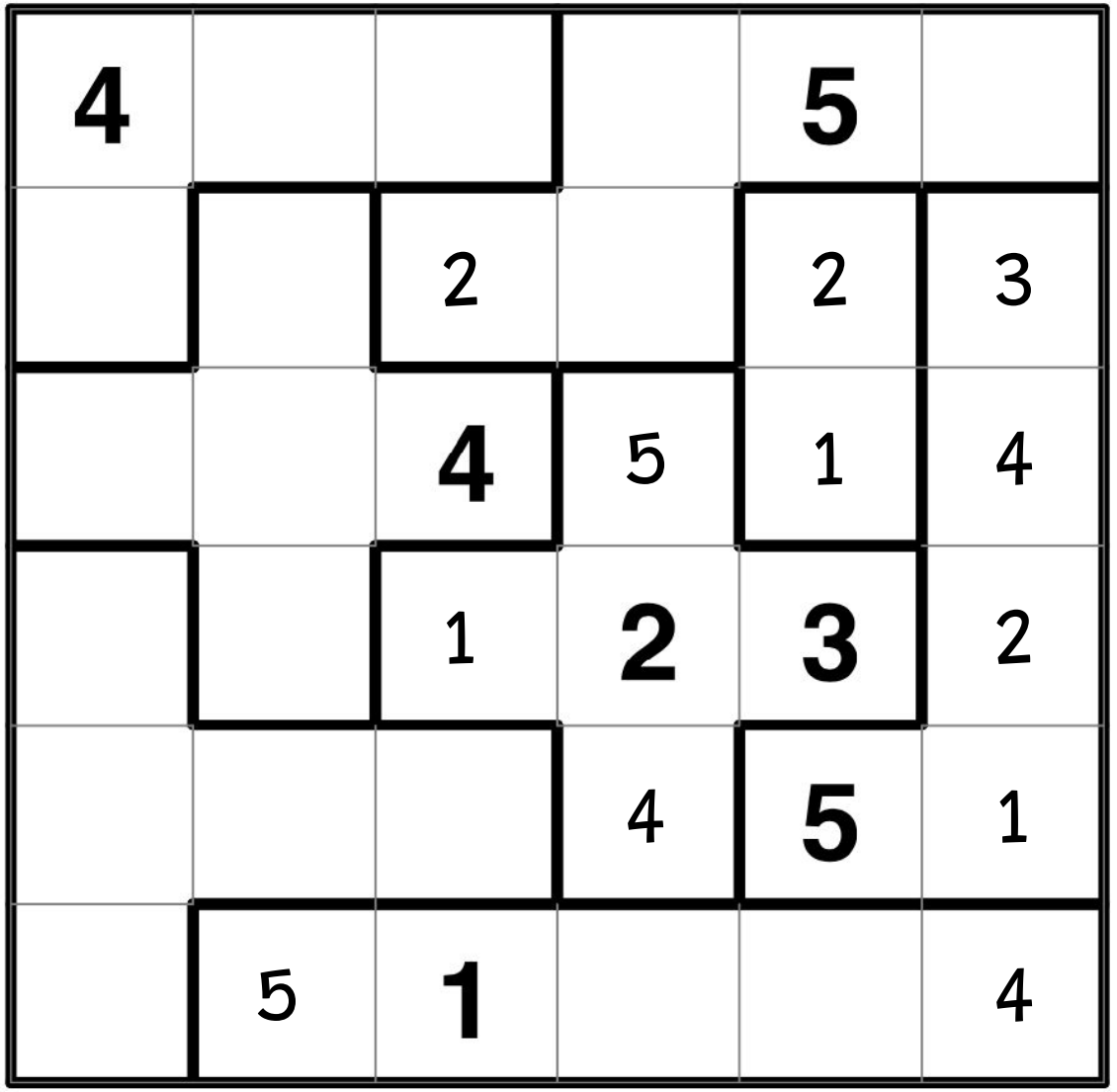
The goal is to fill each square and cage with numbers so that so that adjacent (touching) squares, even ones that touch diagonally, do **not** contain the same numbers.

About Cages

Cages are generally 1 to 5 squares in size.

Each cage must contain a digit from 1 to n (where n is the number of squares).

A cage with one square contains the digit 1, a cage with two square contains the digits 1 and 2, and so on.

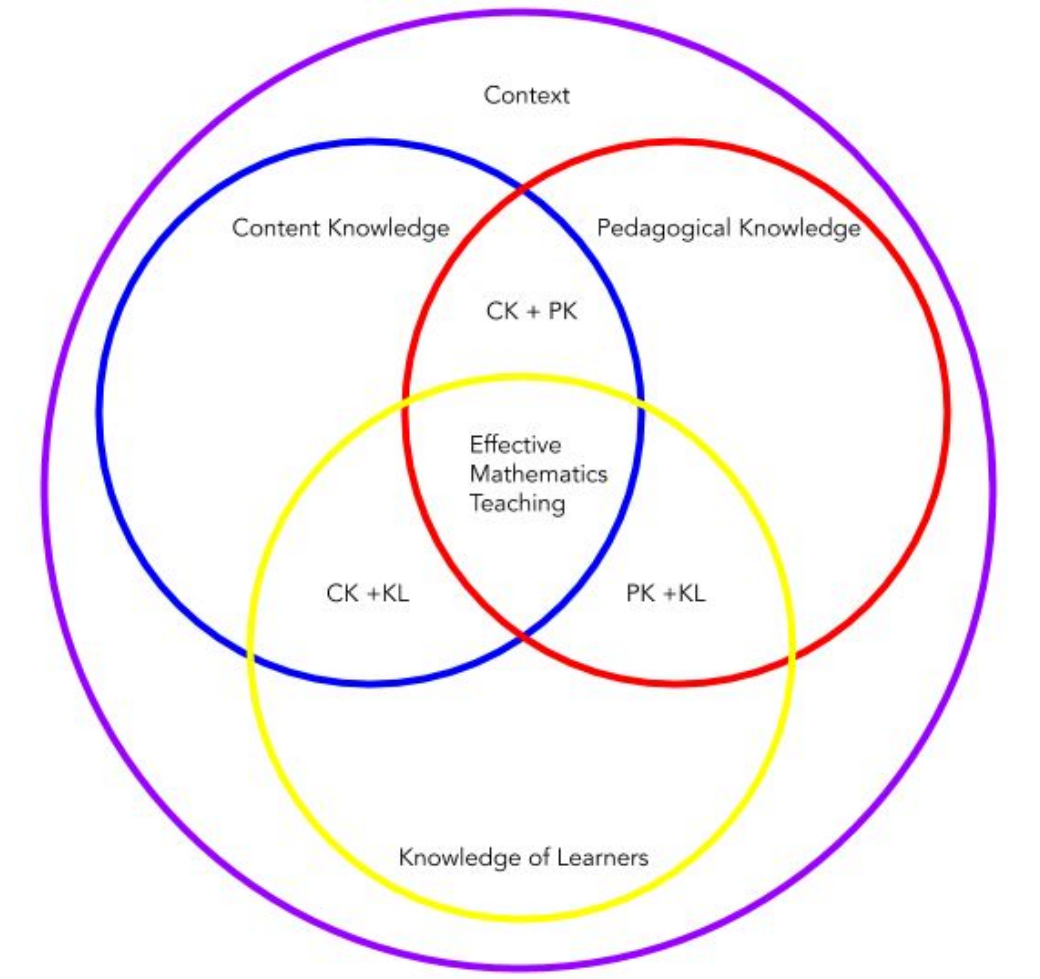


Domains of Knowledge

Consider this:

In elementary math:

- What is content knowledge?
- What is pedagogical knowledge?
- What is knowledge of learners?



Domains of Knowledge

Content

- All the math!
  - Conceptual knowledge (WHY)
  - Procedural knowledge (HOW)
- Real world connections
- Curriculum and vertical alignment

Pedagogy

- General teaching strategies
- Strategies for differentiation
- Classroom management
- How to motivate and encourage
- How to assess and give feedback
- Best resources for instruction

Learners

- Developmental stages
- How kids learn math
- Learner profile
- Background and experience
- Typical mistakes kids make in math

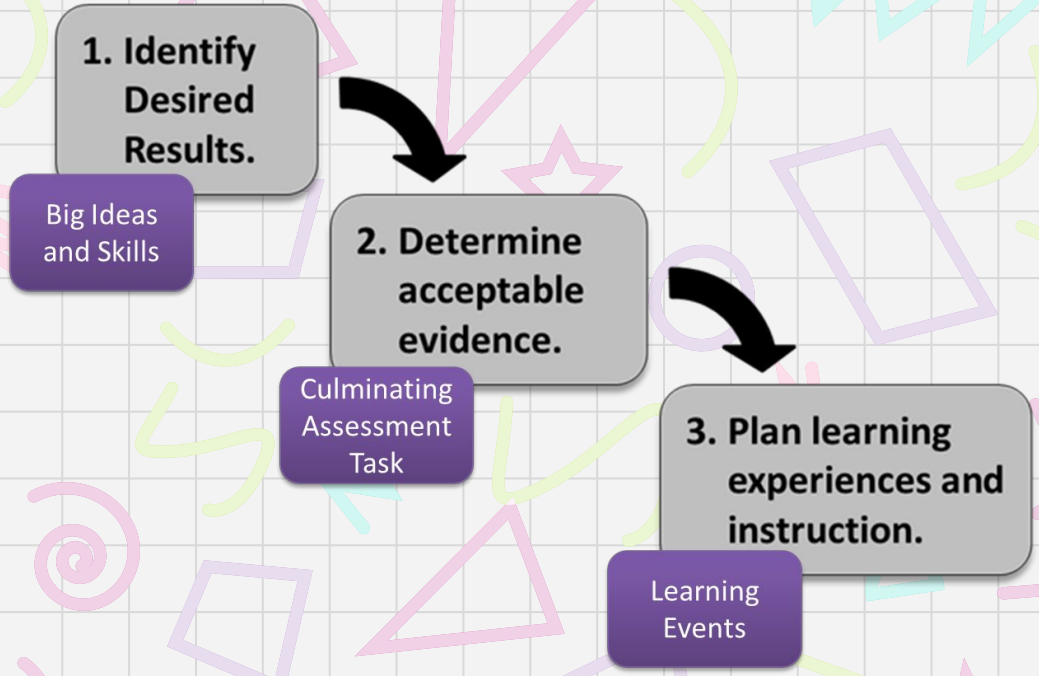
Planning in Math

Backwards Design

"Begin with the end in mind."

New lesson plan format!

- Guidelines
- Template



Wiggins, G. P., & McTighe, J. (2005). *Understanding by design*. Association for Supervision & Curriculum Development.

Identify Desired Results

Start with the Standards

- Use the 2023 Math SOL.
- Chunk the content (into manageable units or topics).
- Write objectives and learning targets.

- Check out these tips for writing objectives.
- When you write objectives, use Bloom's Revised Taxonomy as a guide for selecting verbs.

Write Objectives & Learning Targets

Use this SOL:

K.NS.1 The student will utilize flexible counting strategies to determine and describe quantities up to 100. Students will demonstrate the following Knowledge and Skills:

a. Use one-to-one correspondence to determine how many are in a given set containing 30 or fewer concrete objects (e.g., cubes, pennies, balls), and describe the last number named as the total number of objects counted.

Determine Acceptable Evidence

How will you monitor and assess student progress?

- What evidence will you collect?
- What will you look and listen for?
- How will you know each individual student is making progress towards meeting/mastering the objectives?

More on this next class!

Plan Learning Experiences & Instruction

How do you know what to choose?

- Choose activities and manipulatives with **high leverage practices** in mind.
- Keep in mind what we know about **HOW** students learn.
- Think about SEL in Math. (You can dig deeper into this in the Ontario Math Curriculum.
- Three additional resources you will find helpful are:
  - Principles of Effective Instruction
  - Eight Effective Teaching Practices
  - Asking Effective Questions

High Leverage Practices

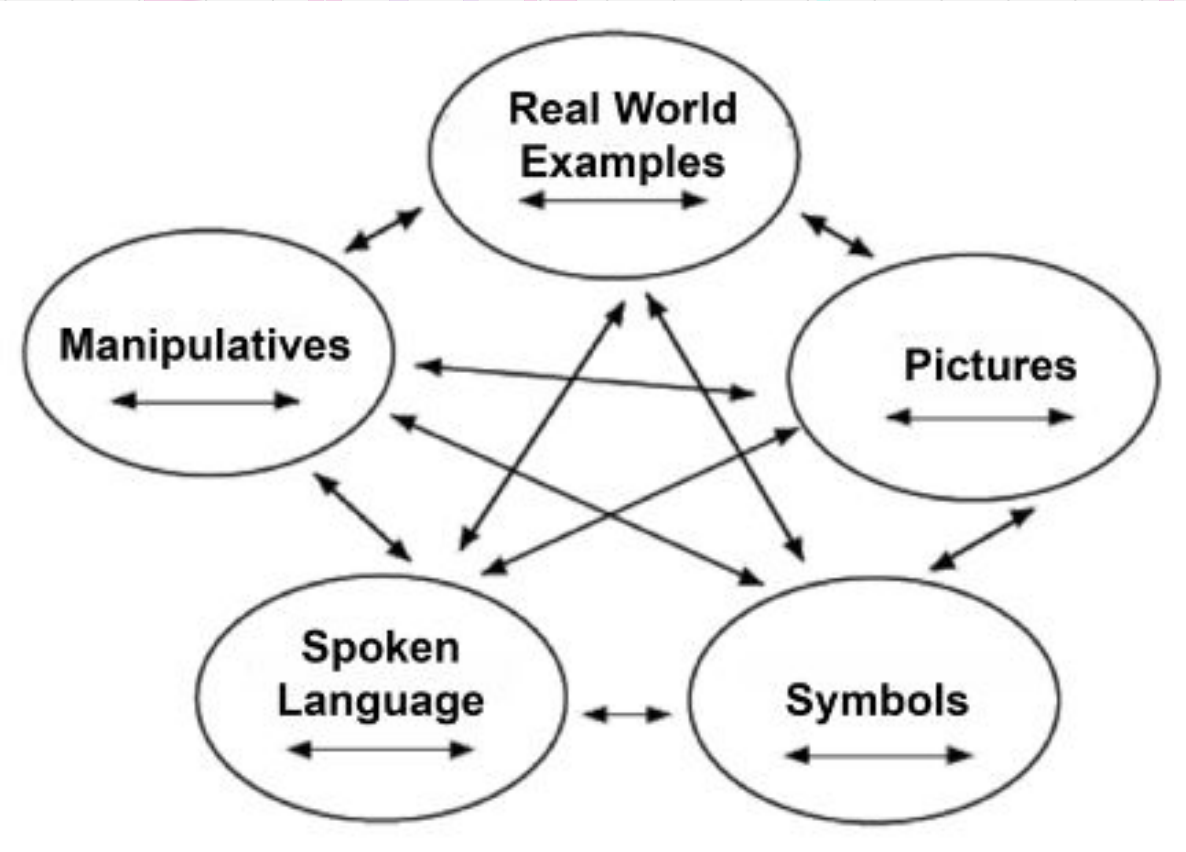
Practices that promote deep learning of mathematics:

- Establish mathematics goals to focus learning.
- Implement tasks that promote reasoning and problem solving.
- Use and connect mathematical representations.
- Facilitate meaningful mathematical discourse.
- Pose purposeful questions.
- Build procedural fluency from conceptual understanding.
- Support productive struggle in learning mathematics.
- Elicit and use evidence of student thinking.

Mathematical Representations

C-R-A Approach

- **Concrete** representations use objects (manipulatives) to make concepts meaningful.
- **Representational** learning uses pictures to illustrate concepts.
- **Abstract** representations use symbols to represent concepts.



All About Manipulatives

You can access manipulative lists here.

- Manipulatives are physical objects that are used as teaching tools to engage students in the **hands-on learning** of mathematics.
- Manipulatives help make abstract ideas concrete.
- Manipulatives allow children to test and confirm their reasoning, building confidence in their mathematical ideas.

Hands-On Definition

In Science

Students purposefully manipulating real science materials when safe and appropriate in a way similar to a scientist.

In Math

Students “doing” math by experimenting first-hand with physical objects in the environment and having concrete experiences before learning abstract mathematical concepts.

Why Hands-on Instruction?

Hands-on instruction in math is important because it:

- helps students build deeper understanding of concepts and procedures
- helps students make sense of mathematical ideas
- allows students to create physical evidence of thinking and reasoning
- increases student engagement

Chinese Proverb

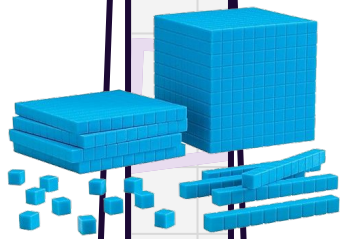
I hear and I forget.
I see and I remember.
I do and I understand.

—Confucius (551–479 BCE)

Manipulative Definitions

Relating to **Number**

- Number values in **discrete materials** are constructed from individual units that can be joined together and pulled apart.
- Number values in **continuous materials** are represented by separate objects that cannot be divided physically into individual units.



Relating to **Grouping**

- **Proportional materials** show a direct relationship between the size and value of materials in a set.
- **Non-proportional materials** do not show consistent size changes. There is no direct relationship between the size and corresponding value of the materials.

Closure

Reflection

Respond to ONE of the following prompts.

- What is one thing you learned today that:
  - surprised you?
  - confirmed something you already know or believed to be true?
  - conflicts with something you thought you knew or believed?
  - made you wonder? What new question do you have?

Housekeeping

Work to complete before the next class

- Read Chapter 1, Chapter 2, and Chapter 4 to top of p. 77 (Stop when you reach Managing Differentiation)
- Complete visual notes on reading and ideas from class (p. 8-9)
- Complete **Suguru** problem (p. 10) and reflection (p. 11)