

Improving Teacher Quality Program

Mathematics Within: Algebraic Processes and Its Connections to Geometry

Kelly Barkve, Sandy Kriz-Herbert, & Sandy Harthan

Context of the lesson:

1. Explain where this lesson occurs within a unit or series of lessons. Describe what led up to this lesson and what will follow.

This lesson is taken from the first book in the Investigations curriculum (see references below). In White Bear Lake we have a daily "15-minute math" requirement to focus on computation (as this was an area our students scored lower on tests.) Leading up to this lesson is skip counting, factor pairs, and rectangles showing factor pairs up to 1,000. Division follows building up to factors of 10,000.

2. What is the purpose of this lesson?

The purpose of this lesson is to show multiple strategies of multiplication (including clustering, area model, breaking apart/decomposing, and other strategies that students construct).

3. What do you anticipate taking place?

Over the year, students will develop several strategies for solving multiplication problems.

4. What strategies or techniques will you use to monitor learning?

We will monitor learning through:

- discussions with students sharing strategies up front
- small group discussions
- written work
- formal assessments/tests

5. How will you know if students have achieved the objectives?

We intend to look for progress in developmental steps to move towards efficiency, accuracy, and fluency. 5th graders should master 2-3 digit multiplication using at least 2 strategies to demonstrate their thinking by the end of the year.

6. As this was our first year of focusing on computation, we have not yet been able to see if there is any improvement on the Iowa Test of Basic Skills. We were able to see improvement on the Computational Assessment itself. All students in grades 1-5 took the fall, winter, and spring assessments. There was significant improvement in all grades from the first test to the last.

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Broad Topic: Multiplication Strategies **Subtopic:** 2-Digit by 2-Digit Multiplication

Grade Level: 5

Time Frame: 30 minutes

Aim: Learn to approach multiplication problems using different strategies.

Specific Objectives:

- Learn to approach multiplication using area model, breaking apart, and clustering strategies.
- Learn to construct one's own strategies to approach multiplication problems.

Materials/Supplies:

- Overhead Projector
- Multiplication Problems
- Chart Paper

References:

- "Investigations" Mathematical Thinking at Grade 5

Introduction

Background information: As a class we've been working on factor pairs and arrays.

Body

Give students the problem 25×13 to solve. Ask students to "Solve this problem in any way you know. Explain your reasoning using words, pictures, and numbers."

- Have volunteers share strategies.
- Explain that we will focus on one strategy and practice for about a week.
- As students share, pull out any vocabulary (break apart, clustering, area model) and post on chart. Also post examples of strategies.

Example:

- clustering

$$25 \times 13 =$$

$$25 \times 10 = 250$$

$$25 \times 3 = 75$$

$$250 + 75 = 325$$

- break apart/decomposing

$$25 \times 13 =$$

$$25 \times 10 = 250$$

$$20 \times 3 = 60$$

$$5 \times 10 = 50$$

$$5 \times 3 = 15$$

$$200 + 60 + 50 + 15 = 325$$

- area model

	10	3
20	200	60
5	50	15

Close

This is an on-going discussion that is revisited every few weeks.

Observations

Kelly saw much mathematical growth throughout the year. Besides seeing students get more confident in their computation, she was then able to explain their thinking. They became each others' teachers. She was students move "along" in their number sense and understanding (children at a basic level were gradually able to understand more advanced strategies).

Sandy gave the 4th grade Computation test, consisting of 24 questions, in fall, winter, and spring. Of the 17 students, 5 of the scores stayed the same or decreased and 12 increased. One student's score increased by one point; and eleven students' scores increased by 3 or more points. Five students (almost one-third) increased their computation scores by 6 or more points (25%). I would consider this a great success!

Another thing I discovered this year during my 15 minute computation time was the power of class discussions. When students shared their strategies on a regular basis, they began to use those strategies more often. The class discussions also really managed to stretch the thinking of even my top students, and gave strategies to those who needed them. I did a study of 6 of my students this spring, and all six improved their ability to solve multi-digit multiplication problems. Computation time should not be just "practicing facts." It needs to help students understand why and help improve their number sense.

Assessment

Daily work, tests, and district tests (Computational Assessment)

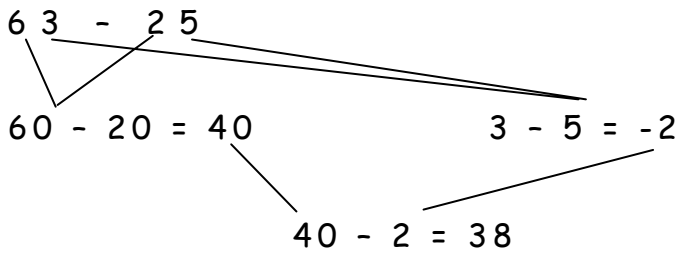
Modifications

Other operations (addition, subtraction, division, fractions) are discussed and worked on in class.

Example

- Subtraction
63-25=

$$\begin{array}{r} \overset{5}{6} \overset{1}{3} \\ - 25 \\ \hline 38 \end{array}$$



$$\begin{array}{r} 25 + \boxed{5} = 30 \\ 30 + 30 = 60 \\ 60 + \boxed{3} = 63 \\ \downarrow \\ 38 \end{array}$$