Course Follow-up Activities

Developing Computational Fluency in Addition and Subtraction (K-4)

ACTIVITY 1: UNDERSTANDING COMPUTATIONAL FLUENCY

During this workshop, you solved the following addition and subtraction problems:

1+2+3+4+5+6+7+8+9
3000-298
13+24+17+36
48+27
39+54
100-67

Some of the alternative strategies you used to solve these problems included:

***Using combinations of ten to make the problem easier**

***Changing one or more numbers to a friendly number and compensating**

***Decomposing (splitting) numbers, and operating separately on the tens and ones**

***Making different jumps (ones, fives, multiples of ten) and going in different directions on the Hundred Chart and Open Number Line**

1. Reflect on the following:

a. **How do these strategies compare to the ways you were taught as a young mathematics student?**

b. **Describe a problem or strategy that stood out for you. How did it deepen your thinking about addition or subtraction?**

2. Review the handout on Susan Jo Russell's definition of computational fluency.

a. **What is computational fluency? Define accuracy, efficiency, and flexibility.**

b. **In what ways does computational fluency demand more of learners than memorization of procedures?**

Developing Computational Fluency in Addition and Subtraction

ACTIVITY 2: ASSESSING WHAT CHILDREN KNOW AND UNDERSTAND

Conduct a student assessment on one of the two following topics:

Activity 2a: Addition Strategies and Fluency with Basic Addition Facts

Activity 2b: Unitizing

ACTIVITY 2a: Assessing Addition Strategies and Fluency with Basic Addition Facts

1. Review the handout "Build on What Children Know and Understand". How can knowing doubles or sums of ten help children solve other addition facts efficiently and accurately?

2. Assess a child's fluency with basic addition facts using the "Assessment of Addition Strategies" checklist and a deck of playing cards. Follow these guidelines for conducting the assessment:

a. Decide which deck of cards is most appropriate for the child to use. A 1-10 deck? A double deck of 1-5 cards?

b. Engage the child in a game of Double Peace with you or another child (with older children, you can use flash cards instead of playing this game). Double Peace is another name for Double War, which follows the same rules as War, except that each child puts out two cards. Children take turns calculating each player's sum.

c. When the child computes a sum of two numbers, ask, "How did you get that?" or "Show me how you got that."

d. Record each number fact on the checklist next to the strategy applied by the child.

3. Meet with a colleague to share your observations and assessment data. Discuss, analyze, and plan next steps:

a. What strategies does the child typically use? Counting all? Adding on to the smaller number? The larger number?

b. What number facts does the child compute with fluency? difficulty?

c. How can you build on what the child knows to help them more efficiently, flexibly, and accurately solve the number facts they don't know? (For example, if a child struggles to calculate 5+4, you can ask, "What *double* can help you solve this?")

d. Checklists are effective assessment tools only if they work for the teacher who is using them. How might you modify Kathy Ernst's assessment checklist to make it work better for *you*?

ACTIVITY 2b: Assessing a Child's Understanding of Unitizing

1. Unitizing is a big idea essential to a child's understanding of place value. What *is* unitizing? (Review the handout "Big Ideas Underlying Quantity, Addition, and Subtraction".)

2. Assess a child's understanding of unitizing by following the following protocol demonstrated in the workshop:

a. Place a collection of 17 cubes or other objects on a table. Ask, "How many cubes are there?" Observe how the child counts.

b. If the child accurately counts 17, ask, "Could you write the number seventeen for me?"

c. If the child accurately writes "17", underline and point to the 7, asking, "Can you show me what part of the cubes *this* stands for? Observe what the child says and does.

d. If the child accurately separates 7 cubes, underline and point to the 1, asking, "Can you show me what part of the cubes *this* stands for?

e. Observe what the child says and does. Do they select one cube? Ten? Do they seem confused or are they confident about their response?

3. Reflect, analyze, and plan next steps.

a. What does the child know and understand about unitizing? What misconceptions, if any, do they have?

b. In the workshop we discussed purposeful contexts, such as bundling books or school newsletters into groups of ten, as a way to support children's understanding of unitizing. What can you do to support and extend the child's understanding of unitizing and place value?

ACTIVITY 3: IMPROVING TEACHING TO IMPROVE CHILDREN'S COMPUTATIONAL FLUENCY IN ADDITION AND SUBTRACTION

1. With your colleagues, reflect on your mathematics teaching and discuss the following:

a. What aspects of computational fluency do your students need to develop? Accuracy? Efficiency? Flexibility? What evidence of student thinking and work supports your view?

b. We discussed models (cubes, hundred chart, open number lines, etc.), contexts (real problems, games, elevator problems to introduce open number lines, etc.), and teaching strategies (building on what children know to solve what they don't know, posing problems

and questions to support and extend thinking, asking children to share their strategies, guiding children through an analysis of their different solution paths, etc.). What models, contexts, and teaching strategies do you currently use to develop computational fluency in your students? Be specific.

c. What modifications will you make in your teaching to improve your student's development of number sense and computational fluency?