Strategies for Moving Students toward Fact Fluency

Grades K-2

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Fortunately we know quite a bit about helping children develop fact mastery, and it has little to do with the quantity of drill or the drill techniques.

Van de Walle & Lovin, 2006
“The second graders began the year very much "on target" with the first grade facts. I continued the same system this year... By keeping to just a few "new facts" at a time as opposed to sending home the entire set to parents right away in the fall, I, too, have found great success. 94% of my students already have ALL addition and subtraction facts mastered and are ready for multiplication next year.”
Learning Target:

I will understand that when students understand the meaning and properties of addition and subtraction they can develop efficient strategies for reconstructing/recalling basic number combinations efficiently.

I will know that I understand when I can:

- List three precursor understandings that students should master prior to working on fact fluency and give an example of an activity that would help students develop each of those understandings.
- Define “strategy” as it relates to mastery of basic facts.
- Describe what I should look/listen for when teaching and assessing fluency.
What does “mastery” mean?

“A child can give a quick response without resorting to nonefficient means, such as counting.”

Van de Walle & Lovin, 2006, p. 94
Who can “master” the facts?

“All children are able to master the basic facts — including children with learning disabilities.”

Van de Walle & Lovin, 2006, p. 94
What do we know about “mastering” the facts?

- Little to do with QUANTITY of drill
- Develop understanding of number relationships and properties of operations
- Develop efficient STRATEGIES for fact retrieval through practice
- Drill use and SELECTION of strategies

Van de Walle & Lovin, 2006
The Role of Number and Operation Concepts

Composing & Decomposing Single-Digit Numbers

- “Flash” Activities
- Problem Solving Activities

Students must understand that numbers can be decomposed into a variety of different combinations.

Van de Walle & Lovin, 2006, p. 95
Number Activities #1
“Flash” with Five & Ten Frames

How many do you see?
How do you see them?
Number Activities #2
“Flash” with Rekenreks

How many do you see?
How do you see them?
Number Activities #3
“Flash” with Small Objects

If we started with 5, how many are hiding?

(We also use this to “measure” the fact fluency of kindergartners.) 😊
Number Activities #4
Sense-Making Activities

What different ways can you hold 10 pennies?
• How many in your left hand?
• How many in your right hand?

How many ways can you make 5 on the math rack?
The Role of Number and Operation Concepts

Meanings & Properties of Operations

- Story Problems for operation sense
- Read Expressions with Comprehension
- Identifying Patterns & Relationships

Van de Walle & Lovin, 2006, p. 95
# Operations Activities #1: Operation Sense

All problem types: Table 1 CCSS page 88

<table>
<thead>
<tr>
<th>Add to</th>
<th>Take from</th>
<th>Total Unknown</th>
<th>Addend Unknown</th>
<th>Both Addends Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Result Unknown</strong></td>
<td><strong>Change Unknown</strong></td>
<td><strong>Start Unknown</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two bunnies sat on the grass. Three more bunnies hopped there. How many bunnies are on the grass now? 2 + 3 = ?</td>
<td>Two bunnies were sitting on the grass. Some more bunnies hopped there. Then there were five bunnies. How many bunnies hopped over to the first two? 2 + ? = 5</td>
<td>Some bunnies were sitting on the grass. Three more bunnies hopped there. Then there were five bunnies. How many bunnies were on the grass before? ? + 3 = 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Five apples were on the table. I ate two apples. How many apples are on the table now? 5 − 2 = ?</td>
<td>Five apples were on the table. I ate some apples. Then there were three apples. How many apples did I eat? 5 − ? = 3</td>
<td>Some apples were on the table. I ate two apples. Then there were three apples. How many apples were on the table before? ? − 2 = 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Put Together/Take Apart</strong></td>
<td><strong>Difference Unknown</strong></td>
<td><strong>Bigger Unknown</strong></td>
<td><strong>Smaller Unknown</strong></td>
<td></td>
</tr>
<tr>
<td>Three red apples and two green apples are on the table. How many apples are on the table? 3 + 2 = ?</td>
<td>Five apples are on the table. Three are red and the rest are green. How many apples are green? 3 + ? = 5, 5 − 3 = ?</td>
<td>Grandma has five flowers. How many can she put in her red vase and how many in her blue vase? 5 = 0 + 5, 5 = 5 + 0 5 = 1 + 4, 4 + 5 = 9 5 = 2 + 3, 5 = 3 + 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(“How many more?” version): Lucy has two apples. Julie has five apples. How many more apples does Julie have than Lucy? 2 + ? = 5, 5 − 2 = ?</td>
<td>(“Version with “more”): Julie has three more apples than Lucy. Lucy has two apples. How many apples does Julie have? 2 + 3 = ?, 3 + 2 = ?</td>
<td>(“Version with “more”): Julie has three more apples than Lucy. Julie has five apples. How many apples does Lucy have? 5 − 3 = ?, ? + 3 = 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(“How many fewer?” version): Lucy has two apples. Julie has five apples. How many fewer apples does Lucy have than Julie? 2 + ? = 5, 5 − 2 = ?</td>
<td>(“Version with “fewer”): Lucy has 3 fewer apples than Julie. Lucy has two apples. How many apples does Julie have? 2 + 3 = ?, 3 + 2 = ?</td>
<td>(“Version with “fewer”): Lucy has 3 fewer apples than Julie. Julie has five apples. How many apples does Lucy have? 5 − 3 = ?, ? + 3 = 5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Operations Activities #2: Read with Comprehension

Use meaningful language as you teach expressions / equations with new operation symbols:

- Two bunnies sat on the grass. Three more bunnies hopped there. How many bunnies are on the grass now?

2 + 3 = ?

“2 bunnies joined with 3 bunnies is the same amount as how many bunnies?”
Operations Activities #2: Read with Comprehension

Use meaningful language as you teach expressions / equations with new operation symbols:

• Sheila had 17 rocks in her collection. She gave 9 to her little brother when he cried. How many rocks are in Sheila’s collection now?

\[ 17 - 9 = ? \]

“9 less than 17 is how many rocks?”
Find patterns and make generalizations using contexts:

- $+ 0$ (Additive Identity Property)
- $a + b = b + a$ (Commutative Property of Addition)
- $X 0$
- $X 1$ (Multiplicative Identity Property)
- $a \times b = b \times a$ (Commutative Property of Multiplication)

Students must understand that addition is commutative.
Students must understand the zero (identity) property of addition and subtraction.

Table 3, CCSS p. 90
How do we help students develop efficient strategies?

**What is a Strategy?**

*Computation strategy* - Purposeful manipulations that may be chosen for specific problems, may not have a fixed order, and may be aimed at converting one problem into another.

(CCSS, p. 85)

“A strategy is most useful to students when it is theirs, build on and connected to concepts and relationships they already own.”

(Van de Walle & Lovin, 2006, p. 96)
How do we help students develop efficient strategies?

- **Plan simple story problem lessons**
- **Plan lessons to find structures, relationships, and patterns**
- **Avoid temptation to simply “tell” students about a strategy and then have them practice it.**

Van de Walle & Lovin, 2006, p. 96
Drill vs. Practice

- **Drill** — repetitive non-problem-based activity

- **Practice** — problem-based activities in which students are encouraged to develop flexible and useful strategies that are meaningful

Van de Walle & Lovin, 2006, p. 96
Avoid Premature Drill

• No new information
• No new connections

Practice Strategy Selection

• “Name the strategy”
• Sort by strategy
Overview of Approach

• Make strategies explicit
• Drill established strategies
• Individualize
• Practice strategy selection

• PROVIDE “HOPE”

Van de Walle & Lovin, 2006, p. 97-99
## Dos and Don’ts for Teaching Basic Facts

**Do:**
- Ask children to self-monitor
- Focus on self-improvement
- Drill in short time segments
- Work on facts over time
- Involve families
- Use technology

**Don’t:**
- Use lengthy timed-tests
- Use public comparisons of mastery
- Proceed through the facts in order from 0 – 9
- Work on all the facts at once
- Move to quick-recall activities too soon
- Use facts as a barrier to good mathematics
- Use fact mastery as a prerequisite for calculator use

Van de Walle, Lovin, Karp, & Bay-Williams, 2014, pp. 171-172
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I continued the same system this year where a child has a fluency bag for reviewing the mastered facts daily but also a strategy bag with approximately 2 strategies and around 10 cards. Those are then tested every Friday with known cards being moved to the fluency bag and new fact cards then being moved into the strategy bag from the needs to learn bag.
Resources:

- Rekenrek activies:
  - [http://www.k-5mathteachingresources.com/Rekenrek.html](http://www.k-5mathteachingresources.com/Rekenrek.html)
  - [http://bridges1.mathlearningcenter.org/media/Rekenrek_0308.pdf](http://bridges1.mathlearningcenter.org/media/Rekenrek_0308.pdf)
- Tiny ten frames: [www.ablongman.com/vandewalleseries/](http://www.ablongman.com/vandewalleseries/)
- Contexts for Learning by Catherine Fosnot: [contextsforlearning.com](http://contextsforlearning.com)
- CCSS Progressions documents for math: [http://ime.math.arizona.edu/progressions/](http://ime.math.arizona.edu/progressions/)