Fact Fluency
Grades K-5

HENRY COUNTY SCHOOLS

Big Ideas

- Number relationships provide the foundation for strategies that help students remember basic facts. For example, knowing how numbers are related to 5 and 10 helps students master facts such as 3+5 (think of a ten frame) and 8+6 (since 8 is 2 away from 10, take 2 from 6 to make 10+4=14).

- “Think addition” is the most powerful way to think of subtraction facts. Rather than 13 “take away” 6, which requires counting backward while simultaneously keeping track of the number of counts, students can think 6 and what makes 13. They might add up to 10 or they may think double 6 is 12, so it must be 7.

- All of the facts are conceptually related. You can figure out new or unknown facts from those you already know. For example, 6x8 can be thought of as five 8’s (40) and one more 8. It might also be three 8’s doubled.

Basic Facts

- Basic facts for addition and multiplication refer to combinations where both addends or both factors are less than 10.
- Mastery of a basic fact means that a child can give a quick response (in about 3 seconds) without resorting to non-efficient means, such as counting.
- All children are able to master the basic facts-including children with learning disabilities. Children simply need to construct efficient mental tools that will help them.

Steps Towards Fact Mastery

- If appropriate development is undertaken in the primary grades, there is no reason that all children cannot master their facts by the end of grade 3.
- Three components or steps to this end can be identified.

Step One-Part One

- Help children develop a strong understanding of **number relationships**
  - Spatial relationships: recognize sets of objects in patterned arrangements and tell how many without counting
  - One and two more, One and two less: more than just the ability to count on and count back—students should know for instance that 7 is 1 more than 6 and also 2 less than 9
  - Anchors or “benchmarks” of 5 and 10: 10 plays a large role in our number system and because two 5’s make up to 10, it is very useful to develop relationships for the numbers 1 through 10 to anchors of 5 and 10
  - Part-part-whole relationships: to conceptualize a number as being made up of two or more parts is the most important relationship-for example, 7 can be thought of as a set of 3 and a set of 4 or a set of 2 and a set of 5 or a set of 3, 3, and 1.

Step One-Part Two

- Help children develop a strong understanding of the **operations**
  - Meanings of operations play a role in the construction of efficient strategies. The ability to relate 6x7 to “5 times 7 and 7 more” is based on an understanding of the meanings of the first and second factors. To relate 13-7 to “7 and what makes 13” requires an understanding of how addition and subtraction are related.
  - The commutative or “turnaround” properties for addition and multiplication reduce the number of addition and multiplication facts from 100 to 55 each.

Step Two

- Develop efficient strategies for fact retrieval through practice
  - Many children have learned basic facts without being taught efficient strategies. They develop or learn many of these methods in spite of the drill they may have endured. The trouble is that far too many students do not develop strategies without instruction and far too many students in middle school continue to count on their fingers.
  - A strategy is most useful to students when it is theirs, built on and connected to concepts and relationships they already own.
  - As long as the strategy is completely mental and does not rely on a model, picture, or tedious counting, repeated use of the strategy will almost certainly render it automatic.

Two Approaches to Fact Strategies

- Use simple story problems 5- to 10- minutes to start each day that are designed in such a manner that students are likely to develop a strategy as they solve it. Focus attention on the methods that are most useful.

2. Create a lesson revolving around a special collection of facts for which a particular type of strategy is appropriate. Students can discuss how these facts are alike or you may suggest an approach and see if students are able to use it on similar facts.

Step Three

- Provide drill in the use and selection of those strategies once they have been developed
- **Drill versus Practice**: Practice refers to problem-based activities in which students are encouraged to develop (invent, consider, use-not master) flexible and useful strategies that are meaningful. Drill refers to repetitive non-problem-based activity. Drill with an in-place strategy focuses students' attention on that strategy and helps to make it more automatic.
- It is critical that you do not introduce drill too soon. Premature drill introduces no new information and encourages no new connections. It is both a waste of time and a frustration to the child.

Practice Strategy Selection or Strategy Retrieval

- Strategy selection or strategy retrieval is the process of deciding what strategy is appropriate for a particular fact. If you don't think to use a strategy, you probably won't. When facts are all mixed up or the child is not in "fact practice" mode, old counting habits return.
- A simple activity that is useful is to prepare a list of facts selected from two or more strategies and then, one fact at a time, ask children to name a strategy that would work for that fact. They should explain why they picked the strategy and demonstrate its use. This type of activity turns the attention to the features of a fact that lend it to this or that strategy.
- Make strategies explicit in the classroom-when a student suggests a new strategy, make sure that all students understand and practice how it is used.

- Don’t expect to have a strategy introduced and understood with one word problem or exposure. Children need lots of opportunities to make a strategy their own. Many children will simply not be ready to use an idea the first few days, and then all of a sudden something will click and a useful idea will be theirs.

- No student should be forced to adopt someone else’s strategy, but every student should be expected to understand strategies that are brought to the discussion.

- When you are comfortable that children are able to use a strategy without recourse to physical models and that they are beginning to use it mentally, it is time to drill it. Flash cards are among the most useful approaches to fact strategy practice. For each strategy, make several sets of flash cards using all of the facts that fit that strategy. On the cards, you can label the strategy or use drawings or cues to remind the children of the strategy.

Strategies for Addition Facts

- One-More-Than & Two-More-Than Facts (36)
- Facts with Zero (19)
- Doubles (10)
- Near-Doubles (18)
- Make Ten Facts (30)
- The Last Six

Strategies for Subtraction Facts

- Think-Addition for Facts with Sums to 10: What goes with this part to make the total? (64)
- The 36 “Hard” Facts
  - Build up through 10 (with an 8 or 9)
  - Back down through 10

Strategies for Multiplication Facts

- Doubles (19)
- Fives Facts (19)
- Zeros and Ones (36)
- Nifty Nines (19)
- Helping Facts (25-really only 15 w/ the turnarounds)

Effective Drill

- There is little doubt that strategy development and general number sense are the best contributors to fact mastery. Drill in the absence of these factors has repeatedly been demonstrated as ineffective. However the positive value of drill should not be completely ignored. Drill of nearly any mental activity strengthens memory and retrieval capabilities.

- Far too much time is devoted to inefficient drill of basic facts and leads to a negative impact on students' attitudes towards mathematics and beliefs about their abilities.

Adopt This Simple Rule…

- Adopt this simple rule and stick with it: **Do *not subject any student to fact drills unless the student has developed an efficient strategy for the facts included in the drill.***
- Counting on fingers and making marks on paper can never result in automatic fact recall regardless of the amount of drill. Drill without an efficient strategy present offers no assistance.

Timed Tests…

- Cannot promote reasoned approaches to fact mastery
- Will produce few long-lasting results
- Reward few
- Punish many
- Should generally be avoided

Consider This…

Teachers who use timed tests believe that the tests help children learn basic facts. This makes no instructional sense. Children who perform well under time pressure display their skills. Children who have difficulty with skills, or who work more slowly, run the risk of reinforcing wrong learning under pressure. In addition, children can become fearful and negative toward their math learning. (Burns, 2000, p. 157)