

GRADE LEVEL BENCHMARKS

The following were reviewed to identify appropriate benchmarks for Math Fact Fluency. A variety of sources were purposely selected. Benchmarks for Math Fact Fluency remained fairly consistent across these different curriculums and were comparable to the curriculum currently used in Hollis Elementary Schools.

Connecticut PreK-8 Mathematics Curriculum Standards. October 2007.

Elementary Mathematics Benchmarks Grades K-6, Achieve, Inc., December 2007.

Mathematics Grade-Level Expectations, Missouri Department of Elementary and Secondary Education, March 2004.

Mathematics Content Domains – Fourth Grade, Trends in International Mathematics and Science Study (TIMSS), 2007 Assessment.

The California Mathematics Content Standards

Vermont Mathematics Grade Expectations

Automaticity will be defined as the direct retrieval of a math fact without following a procedure. Students may be able to find the answer to a math fact by counting on their fingers, but this would be considered procedural and not considered mastery.

Importance of Math Facts

“Cognitive psychologists have discovered that humans have fixed limits on the attention and memory that can be used to solve problems. One way around these limits is to have certain components of a task become so routine and over-learned that they become automatic.” (Whitehurst 2003).

Without fluent retrieval of math facts, the development of higher order math skills – multi-digit addition, fractions and problem solving – is severely impacted. If a child does not have automatic recall, s/he must shift cognitive attention from the arithmetic task to using strategies to determine the correct answer to a math fact.

It is important to remember that young children have limited short term memory abilities.

We should not return to old instructional strategies where mastering the basic facts was the first thing students were asked to do. To develop *long-term memory* of math facts, students must (1) understand the meaning of the particular arithmetic operation (e.g., multiplication is repeated addition), and (2) Do simple problems involving that operation using alternate methods (such as counting) to get the answer. This provides the student with the framework for memorization.

Four criteria should be used in any method used for mastering basic facts:

- (1) Response time should be under 3 seconds for any fact.
- (2) Questions should be presented randomly because this is how they must be recalled when applying to more complex arithmetic problems
- (3) Immediate feedback should be provided so that incorrect answers can be identified and attention can be paid to learning the correct answer.
- (4) When learning the fact, the question and answer must appear together in some way for optimum learning.

Another note: Students with many different types of learning disabilities have considerable difficulty in developing automaticity with number facts. These students can achieve automaticity through increased practice; however, this may take up to an additional year over the non-LD student.

Some Instructional Strategies

Educational Memory Aides: Flashcards, posters and worksheets.

Use of rhymes and associations

Math facts are introduced one family at a time – just like word families.

Timed tests will be administered at least three times per week.

After the timed tests are graded, they will be returned to the student who will study missed problems for homework.

A letter will be sent to parents outlining the initiative.

Maintenance of math facts is necessary after mastery has been demonstrated.

An Important Consideration

Some students will find the timed tests stressful. Appropriate strategies need to be addressed to reduce the level of anxiety for these students.

Curricular Implications

As we further define mastery in the Number and Operations strand of the mathematics curriculum, it is important to remember that this is one performance indicator of one strand of the mathematics curriculum. We must not reduce the amount of time committed to the other strands: Algebra and Functions, Measurement and Geometry, Data Analysis, Statistics and Probability and Mathematical Reasoning. As indicated by the NECAP scores, Hollis Elementary Schools have shown the efficacy of the current curriculum in helping students to achieve a full spectrum of mathematical knowledge.

BENCHMARKS:

All students should be able to demonstrate proficiency in all number facts by the end of fourth grade. Benchmarks should be as follows:

Grade 1: Develop Addition and Subtraction Facts. (Students will not be tested at this level because mastery is not yet required.)

Grade 2: Students will demonstrate mastery of addition and subtraction facts through 20 by the end of grade 2.

Grade 3: Students will maintain mastery of addition and subtraction facts through 20. Students will begin to develop mastery of multiplication and division facts. Students will demonstrate mastery of multiplication and division facts with 2, 5, and 10 by the end of grade 3.

Grade 4: Students will maintain mastery of addition and subtraction facts through 20. Students will demonstrate mastery of all multiplication and division facts through 12 x 12 by the end of grade 4.

Grade 5: Students will maintain mastery of all math facts.

Grade 6: Students will maintain mastery of all math facts.

Some Resources that will be used:

Greenwal, Susan R. *How to Teach Math Facts.*

Crawford, Donald B. *Mastering Math Facts: Blackline Masters.*

Stuart, Marion W. *10 Days to Multiplication Mastery.*

Christensen, Evelyn B. *Multiplication Mosaics.*

Hein, Marilyn B. *Math Phonics: Multiplication and Division: Quick Tips and Alternative Techniques for Math Mastery.*

Liautaud, Judy and Rodriguez, Dave. *Times Tables the Fun Way.*