Revised Math Standards of Learning:  
A Reason for Math Reasoning  
Kerry Lambert, Director

In February 2009, the Virginia Board of Education adopted revised Mathematics Standards of Learning (SOL). The five goals for students that are addressed by the mathematics standards are: becoming mathematical problem solvers; communicating mathematically; reasoning mathematically; making mathematical connections; and using mathematical representations to model and interpret practical situations. Click on the following link to read more about the five goals and to review the 2009 Mathematics Standards of Learning for Virginia’s Public Schools. [Link to Mathematics Standards of Learning for Virginia’s Public Schools]

To accompany and align with the revised Math SOL, a curriculum framework document has also been recently developed and was adopted by the Virginia Board of Education on October 22, 2009. A version of the adopted Curriculum Framework for the 2009 Mathematics Standards of Learning can be found at: [Link to Curriculum Framework for the 2009 Mathematics Standards of Learning]

School divisions are expected to begin implementation of the 2009 Mathematics Standards of Learning by September 2010 and to fully implement the 2009 Mathematics Standards of Learning in the 2011-2012 academic year. In spring 2012, all items on the Mathematics Standards of Learning assessments will be based on the revised 2009 Mathematics Standards of Learning. Also, beginning in spring 2012, the grade-3 mathematics test will no longer be a cumulative test covering the SOL for grades K-3. Instead, the grade-3 mathematics test will cover the grade-3 SOL only. [Link to implementation timeline]

References


Resources to Support Math Teaching

MathVIDS—an interactive Web site designed to assist teachers in effectively teaching students who have difficulty learning math. [Link to MathVIDS]

Mathematics Vocabulary Resources [Link to Mathematics Vocabulary Resources]

K-5 Mathematics Module: Number and Number Sense [Link to K-5 Mathematics Module: Number and Number Sense]
Effective classroom behavior management involves a host of strategies and supports; including what is done instructionally. Some research suggests that as much as 90% of classroom behavior problems can be eliminated through fully planned and effectively delivered instruction (Engelmann & Colvin, 1983). One such instructional technique is the use of response cards for producing high levels of student responding. Response cards provide a way of actively engaging all students simultaneously during instruction. Using response cards can also provide a convenient way to conduct formative assessment to guide instructional decisions.

Three research articles reported on the positive impacts on disruptive and off-task student behavior when response cards were used during mathematic instruction (Armendariz & Umbreit, 1999; Christle & Schuster, 2003; Lambert, Cartledge, Heward, & Lo, 2006). Lambert, Cartledge, Heward, and Lo (2006), also found a higher rate of correct responses when response cards were used during instruction. Response cards might look like this in the classroom:

- dry-erase boards
- cards with choices to respond to mathematical questions (greater than >, less than <, equal to =)
- Laminated hundreds boards with vis-à-vis markers to circle patterns of 5, 10, 20
- Hand signals (thumbs up, thumbs down)
- Use of technology (Active votes)

More ideas for response cards and other engaging instructional techniques for mathematics can be found below.


Fraction Clothesline (includes downloadable materials, extension activities, and assessment options) [http://illuminations.nctm.org/LessonDetail.aspx?id=L784](http://illuminations.nctm.org/LessonDetail.aspx?id=L784)


References


Making Math FUNctional
*Daniel Biegun, Intellectual Disabilities Specialist*

Many of the Aligned Standards of Learning lend themselves to being combined with functional skills. These ASOLs also have the potential to be taught in fun and exciting ways. Consider the examples below as ways to engage your students and teach multiple skills at the same time.

**Number and Number Sense**

M-NS 14 The student will identify the ordinal positions first through twentieth, using an ordered set of objects.

Activity 1: Help students follow the progress of their favorite sports team. This could also include the teams at your own middle or high school. Use a newspaper or print the team standings from the internet. Ask students to identify which team is in first place, second place, last place, etc. Ask students to identify the placement of their favorite teams.

Activity 2: Pass out an alphabetical list of students in your class. Ask students to identify who is listed first, fifth, tenth, etc.

**Measurement**

M-M 4 The student will compare two objects or events, using direct comparisons or nonstandard units of measure, according to one or more of the following attributes: length, height, weight, temperature.

Activity: Let students get hands-on and have fun with this activity. Select two or more students (or adults) for each and ask students to determine who: is tallest, has the longest shoe, has the heaviest backpack, has the cleanest desk, wears the thickest coat, has the deepest voice, etc. Turn this into a game and watch students have a great time as they learn.

A common question asked by teachers is, “How am I supposed to find time to teach functional skills and the ASOLs?”

Consider the following equation:

\[
\text{Academics} + \text{Functional Skills} + \text{High Interest Subject Matter} = \text{AWESOME LESSON!}
\]

**Probability and Statistics**

M-PS 4 The student will investigate, identify, and describe various forms of data collection in his/her world (e.g., recording daily temperature, lunch count, attendance, and favorite ice cream), using tables, picture graphs, and object graphs.

Activity: Assist students in surveying others (classmates, teachers, parents, school peers). At school, students may survey peers about their favorite cafeteria food or favorite school subject. Set up a table in the school or allow students to approach peers during lunch, recess, etc. There are wonderful social opportunities here! After the survey is completed, help students interpret the results.

**Additional Activities**

T/TAC Online has many additional suggested activities for Math (and other content area) ASOLs. The activities are not only aligned with the ASOLs, but have been created by teachers who have used them successfully in their classes.
Creating Meaning in Mathematics for ALL Learners
Laura Beller, Curriculum and Instruction Specialist

The Concrete-Representational-Abstract sequence of mathematics instruction allows students to move meaningfully through less complex math concepts and procedures to more abstract, complex ones. Research indicates that the CRA sequence has been effective for students with and without disabilities. Teachers provide explicit teacher modeling and scaffolding, and also conduct ongoing assessment to determine what level of instruction is needed by various students.

<table>
<thead>
<tr>
<th>Concrete</th>
<th>Representational</th>
<th>Abstract</th>
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</thead>
<tbody>
<tr>
<td>The “Concrete” level is the most basic and crucial. Using concrete objects, students can have a sensory experience of mathematical concepts. They can see, touch, and feel math! Teachers can facilitate learning at this level by getting students to think about and verbalize how the objects reflect the mathematics.</td>
<td>When students are able to “see” concepts and are proficient with the concrete, the concept can be modeled at the “Representational” level using drawings that represent the concrete items. When students begin to draw, their understanding of the concept can become apparent. Teachers can facilitate learning by explicitly relating the drawings to the concrete materials that were used earlier. Replicating the movements used while using the concrete items can assist struggling learners.</td>
<td>When students are proficient at drawing representations of math solutions, they are ready for the “Abstract” level. By connecting what students did at the earlier “representational” and “concrete” levels of learning, teachers can promote conceptual understanding and allow students to internalize their learning. Linking the abstract symbols to the concrete items and drawings that students used to progress through earlier stages, can assist in this process.</td>
</tr>
<tr>
<td>Use chips, straws, interlocking cubes, base-10 blocks, beans and bean sticks, pattern blocks, geometric prisms, paper plates, fraction bars.</td>
<td>Use tallies, dots, circles, stamps, number lines, graphs, pictograms, etc.</td>
<td>Use number sentences and algorithms.</td>
</tr>
<tr>
<td>Mastery to move to Representational Level: Performs skill correctly 3/3 times, 3 consecutive days.</td>
<td>Mastery to move to Abstract Level: Performs skill correctly 5/5 times, 3 consecutive days.</td>
<td>Mastery of Skill at Abstract Level: Performs skill correctly 10/10 times, 3 consecutive days.</td>
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</tbody>
</table>

Concrete Level Math VIDS Lesson Plan: Comparing Fractions with Like and Unlike Denominators (SOL 2.4)  

Representational Level Math VIDS Lesson Plan: Identify and Represent Equivalent Fractions (SOL 4.2)  

Abstract Level Math VIDS Lesson Plan: Adding and Subtracting Fractions with Mixed Numbers (SOL 5.7)  
http://www.coedu.usf.edu/main/departments/sped/mathvids/plans/asfmn/A_intro.html


To get more information about Teaching Math with Meaning, plan to attend upcoming workshops for elementary or middle school math teachers.
Algebra in Preschool?
Linda Ingleson, Early Childhood Special Education Specialist

The National Council of Teachers of Mathematics (NCTM) algebra standard specifies the understanding, knowledge, and skills that students should acquire. Beginning as early as preschool and continuing through grade 12 students should learn to:

- Understand patterns, relations, and functions;
- Represent and analyze mathematical situations and structures using algebraic symbols;
- Use mathematical models to represent and understand quantitative relationships;
- Analyze change in various contexts (NCTM, 2000, para.1).

Children are learning to understand patterns in their preschool years. For example, when shown a model such as a row of blocks with alternating colors they will imitate the model by following the pattern of red block, blue block, red block, blue block. As noted by Taylor-Cox (2003), "patterns serve as the cornerstone of algebraic thinking" (p.15). Using patterns as a component of the foundation for algebraic thinking and reasoning is a logical fit for young children, who "are not only capable of noticing patterns but often use this skill naturally to make sense of their world" (Moses, 2000, p.5). Young children are also developing beginning concepts related to patterns, functions and other algebraic topics when they learn repetitive songs, rhythmic chants, and poems that are based on repeating and growing patterns (NCTM, 2000).

The National Council of Teachers of Mathematics (2000) identifies the following expectations for the understanding of patterns within the algebra standard in Pre-Kindergarten through Grade 2.

All students should:
- Sort, classify, and order objects by size, number, and other properties.
- Recognize, describe, and extend patterns such as sequences of sounds and shapes from one representation to another.
- Analyze how both repeating and growing patterns are generated (NCTM, 2000).

Web sites about math in the early years can be found at:

http://math.about.com/od/reference/a/preschool.htm
http://www.naeyc.org/positionstatements/mathematics
http://www.readyforlearning.net/html/math.shtml

References


Computers and software programs afford students with disabilities opportunities to participate in math activities and manipulate objects for counting, sorting, combining, and completing math problems. Such assistive technology options create access to classroom math materials for students with sensory, cognitive and/or physical disabilities who may need alternate strategies to hands-on manipulation and hand-written calculations.

Many free Web sites are available that are filled with multiple math and numeracy games as well as instructional videos. One safe-for-kids site to explore, that has been used successfully with a wide range of students including those with intellectual disabilities, is called the Math Playground (http://www.mathplayground.com). Skills for elementary and middle school math are included in games like Making Change and Alien Angles. There is a section on word problems that is organized by grade level and includes self-checking problems. There are instructional math videos for many skills that include visual aids with auditory assistance. There is, also, a section for manipulatives that can be used online.

National Library of Virtual Manipulatives is a site that provides online tools and manipulative activities to help students understand abstract math concepts.

T-TAC ODU offers a CD version of the for loan. The CD utilizes the features of the online version while allowing more options without the use of the internet. Students can save work for review and assessment purposes. A print feature is available for all manipulatives and on-screen help instructions. (Instructions also can be customized.) There are 115 virtual math manipulatives spanning grades K-12 and covering topics such as Number & Operations, Algebra, Geometry, Measurement, and Data Analysis & Probability. T-TAC library material #200117.

Math Missions- The activities in this software program use math skills to solve real-world problems and earn money to play fun arcade games. Travel around Spectacle City by bus, subway, or ferry and complete 12 math activities like counting candy, sorting toys, or constructing a skyscraper. (Grades K-2). T-TAC library material #4437.

Clipitz Number Set- Students use clips along with an assortment of sturdy picture cards to learn more about numbers and number words, or even to create a train of cards to form math equations. The set, from ETA Cuisenaire, includes 104 cards featuring numerals, dots, objects, and written-out numbers, and 52 plastic clips in a storage box. Grades PreK–1. T-TAC library material #200127.

IntelliMathics- A problem solving tool with on-screen manipulatives the can be used to help students master a variety of math applications. T-TAC library material #2440.

T-TAC ODU Conferences

Visual Tasks: Make It / Take It
February 16, 2010
This workshop will explore the principles for developing visual tasks with children with autism spectrum disorder. Participants will determine the type of task to make and will have time to put it together.

The Fragile Brain
March 10, 2010
This workshop links brain research with special education methods and will review the capacity of the brain to change. Brain differences and how classroom environments can facilitate rapid change in these unique brains will be discussed. http://ttac.odu.edu/_public/file/fragile%20brain.pdf

ASOL’s Everyday: Planning Your Math Instruction
March 12, 2010
This workshop is appropriate for teachers of students with intellectual disabilities who are assessed through the VAAP. Elementary, middle and high school teachers are invited to attend.
http://ttac.odu.edu/_public/file/Math%20ASOLs%20031210.pdf

The Power of Reading Instruction for Struggling Readers (K-5)
March 16, 2010
This workshop will focus on a variety of research-based methods that reading researchers have found to be effective for elementary school students who are struggling with reading.

Using the SMARTBoard to Enhance Early Childhood Instruction
March 16, 2010
Learn in depth methods of creating pages and manipulation of objects and pictures on the SMARTBoard, plus much more.

M3+Making Math Meaningful - Evidenced Based Practices for Teaching Mathematics to Struggling Students
March 24-25, 2010
When you register for a workshop, you will be able to choose from a variety of sessions that will provide strategies for teaching math meaningfully to students.

Elementary Workshop Registration
Middle School Workshop Registration

Save the Dates!
Shining Stars: Charting the Future for Today’s Children
July 14 - 16, 2010
Virginia’s Seventh Annual Early Childhood conference. For more information and to register for the event, log on to: http://www.ttaconline.org. Call for proposals, due by March 5, 2010. Submission form available at: https://acrobat.com/?d=xYf90vFNRbl2ARCY0RnEQ

Opening Doors - Unlocking Potential
August 3 - 4, 2010
4th annual conference for professionals who work with students who are deaf or hard of hearing. Registration will be available soon at: http://www.vcu.edu/partnership
From Indifference to Empowerment: Preparing Students to Lead Self-Determined Lives
February 17, 2010
IDEIA requires that Individualized Education Program (IEP) teams address functional, as well as academic skill development. This institute prepares educators and parents to help students learn and practice the component skills of self-determination, a cluster of functional skills that support successful transition to adult life.
http://education.wm.edu/centers/ttac/profdev/index.php

Learning Disabilities Association of America (LDA) 47th Annual International Conference
February 17-20, 2010
The largest learning disabilities Conference in the nation, with the most current information and technology available for parents and professionals, the 47th Annual International LDA Conference! This upcoming conference is full of powerful speakers with vital information on learning disabilities and related subjects.
http://www.ldanatl.org/conference/index.asp

2010 conference on Visual Impairments and Blindness
March 3-5, 2010
Virginia Department of Education and The Virginia Chapter of the Association for Education and Rehabilitation of the Blind and Visually Impaired present nationally renowned keynote speakers that will provide information and insight for professionals in the field of Blindness and Visual Impairment.

Autism in Virginia - It’s a New Day!
March 10-11, 2010
This two-day conference will include a full-day workshop on Day One featuring Dr. Brenda Smith Myles, an international figure in our field. On Day 2 many local and statewide experts in the field of autism will share their knowledge and experiences in breakout sessions.
http://www.autismva.org/documents/201012-21-09CASAnnualConferenceRegistrationBrochure_000.pdf

The Virginia Transition Forum
March 15-17, 2010
The theme of this conference is “Virginia: The State of Transition - 25th Anniversary”. It will be held at the Hotel Roanoke & Conference Center in Roanoke, VA.
http://virginiatransitionforum.org

2010 Annual SHAV Conference
March 25-27, 2010
This years’ topic will be: Thinking Outside the Box: How to Do More with Less. Renaissance Portsmouth Hotel, Portsmouth, VA.
http://www.shav.org

CEC 2010 Convention & Expo (Nashville, Tenn.)
April 21 - 24, 2010
This event offers you an unparalleled learning experience with more than 800 educational hours to help you learn the latest in evidence-based practices; explore innovative technologies, products, and services; and network with others working with children with exceptionalities and their families. It will be held at the Gaylord Opryland Hotel and Convention Center in Nashville, TN.
http://www.cec.sped.org/Content/NavigationMenu/ProfessionalDevelopment/ConventionExpo/default.htm