A Connecticut Model for Mathematics Curriculum

"Mathematical discoveries have come both from the attempt to describe the natural world and from the desire to arrive at a form of inescapable truth from careful reasoning. In the last century mathematics has been successfully applied to many aspects of the human world: voting trends in politics, the dating of ancient artifacts, the analysis of automobile traffic patterns, and long-term strategies for the sustainable harvest of deciduous forests, to mention a few. Today, mathematics as a mode of thought and expression is more valuable than ever before. Learning to think in mathematical terms is an essential part of becoming a liberally educated person."

— Dr. Robert Lewis, Fordham University

"All students must be mathematically literate to make informed decisions about the world around them and ensure success in postsecondary study and in work. An individual who is mathematically literate:

- *has a deep understanding of big ideas within the number, algebra, geometry, probability, and statistics standards;*
- *is able to compute, reason and communicate mathematically when solving problems;*
- *uses a variety of strategies, tools and technology to solve mathematics problems; and*
- *understands the application of mathematics to daily life."*

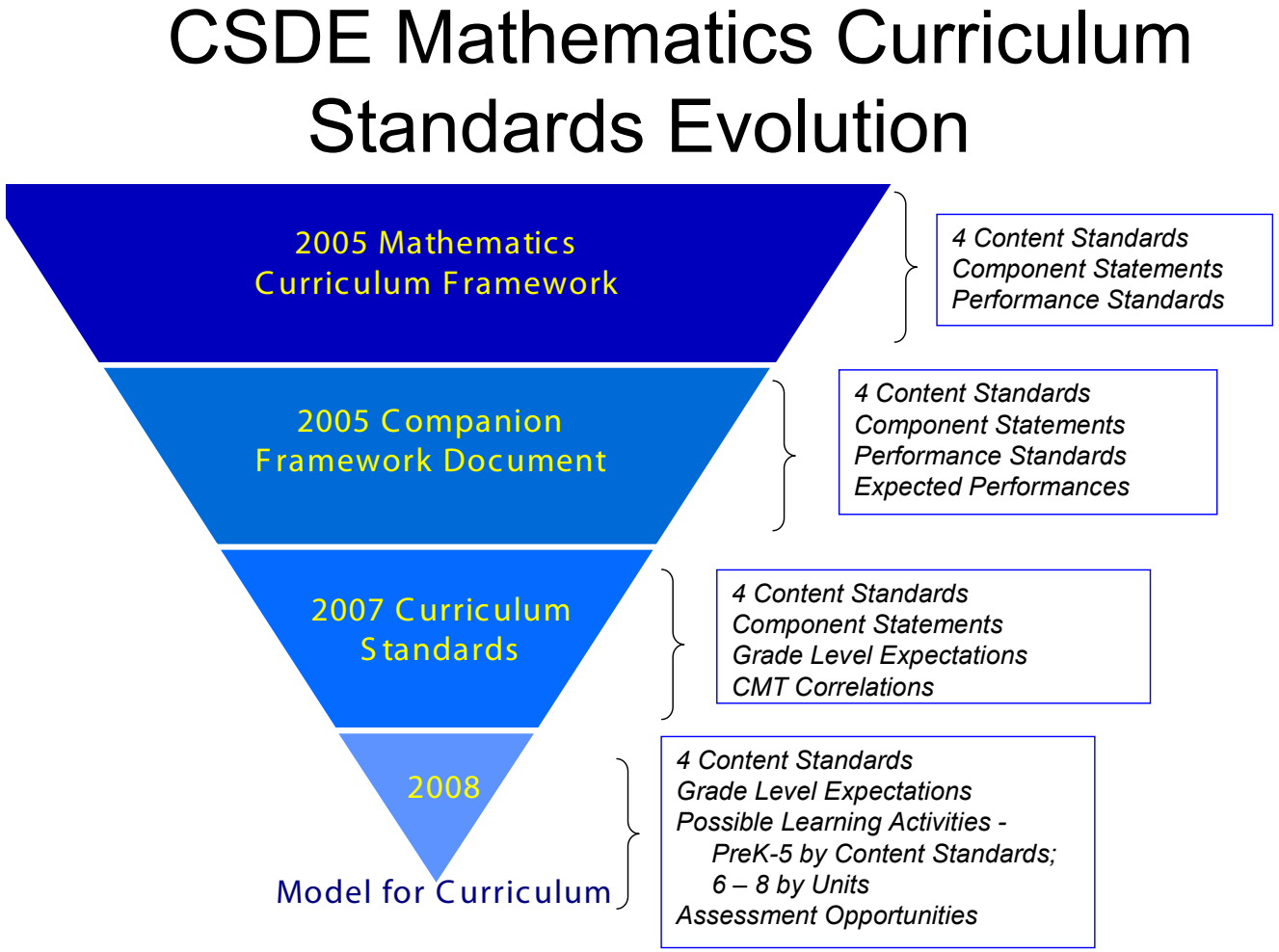
— Connecticut State Board of Education Mathematics Position Statement, 2006

Mathematically literate children need to be actively engaged in challenging learning experiences that make mathematical sense of the world around them. Dynamic interaction between learners, both children and educators, and the exploration of authentic subject matter develops requisite skills and concepts that facilitate understanding, reasoning and thinking.

A comprehensive curriculum is a major vehicle through which a school district sustains teachers and students and advances mathematical literacy. Districts must align curriculum with state and national standards for mathematics content and skills. District curriculum should reflect the overarching professional communities' expectations for instructional approaches, content knowledge and ongoing assessment.

This model for mathematics curriculum is intended to be an example of instruction that is based on valid research and aligned with standards. The document incorporates a variety of strategies, tools and approaches to engage students in learning meaningful mathematics.

The Prekindergarten–Grade 5 Model for Mathematics Curriculum was designed to be the next step in making the 2007 Mathematics Curriculum Standards clearly understandable and accessible for classroom teachers in Connecticut schools and districts. The evolution of the document is outlined in the diagram below.



PREKINDERGARTEN THROUGH GRADE 5
MODEL FOR CURRICULUM COMPONENTS

Information included for each standard at a grade level:

The Learner at This Level: These are statements specific to the characteristics or development of children at this level. The primary source for statements in this section is *Yardsticks: Children in the Classroom Ages 4-14- A Resource for Parents and Teachers*, by Chip Wood. Information in Yardsticks is organized by age while the model for mathematics curriculum is organized by grade level. The Learner at This Level statements can be referenced using the following crosswalk:

YARDSTICKS (AGE)	MODEL FOR CURRICULUM (GRADE LEVEL)
4	Prekindergarten
5	Kindergarten
6	1
7	2
8	3
9	4
10	5

Central Understanding: At each grade level, a central understanding was developed for each of the standards based on National Council of Teachers of Mathematics (NCTM) Focal Points and other research. These understandings form the foundation upon which the possible learning activities and lessons were built.

CENTRAL UNDERSTANDINGS				
	Algebraic Reasoning	**Numerical and Proportional Reasoning**	**Geometry and Measurement**	**Working with Data**
Prekindergarten	Patterns are found in our environment.	Our environment can be described in a quantitative way using number concepts.	The attributes of objects in the environment can be measured.	Objects in the environment can be organized based on attributes and spatial relationships.
Kindergarten	Patterns can be described, generalized and extended based upon physical attributes or positions.	The relative numerical value of collections can be determined through comparison.	Objects can be described by attributes, properties, measurements, and location.	Objects can be classified and organized based on attributes.
Grade 1	The same pattern can be represented in many different forms.	Relationships between and among numbers can be described in a systematic way.	Attributes can be determined through composing and decomposing shapes and solids.	Information about attributes can be organized to see relationships.
Grade 2	Relationships shown through number patterns extend the understanding of number properties and operations.	In the base-10 numeration system, number relationships can be described and represented in a variety of ways to support conceptual understanding and computation.	Attributes can be compared by applying measurement to an object, situation or event.	The same information can be organized in different ways.

CENTRAL UNDERSTANDINGS				
Grade 3	Relationships can be generalized and represented through rules.	Relationships between numbers and operations are discovered and learned in contextual situations.	Objects and geometric shapes and figures can be described and categorized based upon measurement and classification of specific attributes.	Decisions are made based upon relationships determined from data sets.
Grade 4	Equivalence is a relationship between members of one set and members of another set.	Number relationships and properties of operations provide generalizations for efficient problem solving.	Geometric shapes and solids can be described through estimated and actual measurement. Generalizations can be used foe efficient problem solving.	Predictions can be made by analyzing information gathered from organized data.
Grade 5	Numerical relationships can be represented using symbols.	Numerical relationships are not changed when rational numbers are represented in different ways.	Geometric relationships can be represented spatially and generalized through formulas.	Organized data can be used to summarize what is typical for a specific situation and condition.

Mathematics Background for Teachers: Background statements supply contextual information and research findings for educators. These statements provide overarching information that support student learning at this level. (See the Reference page and Resource sections for specific references and citations).

GRADE-LEVEL MATHEMATICS CURRICULUM STANDARDS CONNECTIONS

Correlated GLEs: This document includes the Mathematics Curriculum Standards, comprised of grade-level expectations with correlations to the Connecticut Mastery Test and an additional column for districts to correlate their curriculum and instructional materials to grade level expectations.

Sequenced GLEs: Grade-level expectations indicate what every learner should know and be able to do by the end of that grade or level. The GLEs are organized by standard and developmentally sequenced by three seasons, fall, winter and spring. Grade-level expectations that are related to concepts and skills assessed on the Connecticut Mastery Test are generally sequenced prior to the scheduled administration of that test. It is important to note that learning not be limited by a suggested sequence of instruction. In order for learners to become mathematically literate, instruction must be fluid so that connections can be made throughout a school year.

Correlated Goals 2000 CRT: Items from the Goals 2000 criterion referenced test have been coded by grade level expectation so that they can be used as pre-and post-assessment of the learner's understanding of the targeted skill or concept.

Possible Learning Activities: Organized by standards and grade level expectations, numerous suggested activities are included to support student understanding of that expectation. Parenthetical cross references to other related grade-level expectations (See also GLE X.X.X) are included where applicable.

SAMPLE INTEGRATED LESSON

These lessons correspond to expected performances from the Mathematics Curriculum Standards. Citations from current Connecticut State Department of Education frameworks for other disciplines are included to illustrate connections between mathematics in this standard and other content areas. A sample lesson template follows.

Context: Sets the stage for this specific lesson. The teacher can scaffold and make connections based upon student experiences.

Objective: What the children should know and be able to do from their participation in the lesson.

Grade-Level Expectations: The GLEs that apply to this lesson are referenced.

Time: The projected amount of time needed to complete the lesson. One instructional period equals about 60 minutes.

Materials: A list of the materials that will be necessary for the implementation of the lesson.

Procedure: Step-by-step instructions on how to implement the lesson. Questioning strategies and suggestions are included to develop learning through guided discovery.

- **Possible Assessment Opportunities**
  - Includes suggestions for interventions and challenges.

The following chart contains citations from the 2006 frameworks of the indicated disciplines that have been integrated into the possible learning activities and integrated lesson.

Interdisciplinary Framework Connections				
Science	**English/Language Arts**	**Social Studies**	**Visual and Performing Arts**	**Physical Education**

Frameworks for each discipline are available here: http://www.sde.ct.gov/sde/cwp/view.asp?a=2618&Q=320954&sdenav_gid=1757.

Vocabulary: A list of applicable vocabulary that is important for development and communication of the mathematics content of the central understanding for this standard.

Resources:

Electronic Resources: A list of electronic resources that support the content learning.

Teacher References: Research, references, and supplementary material to develop background knowledge or lesson structures.

Children's Literature: List of trade books that support the concepts and skills.

Notes: Space for notetaking and reflection