

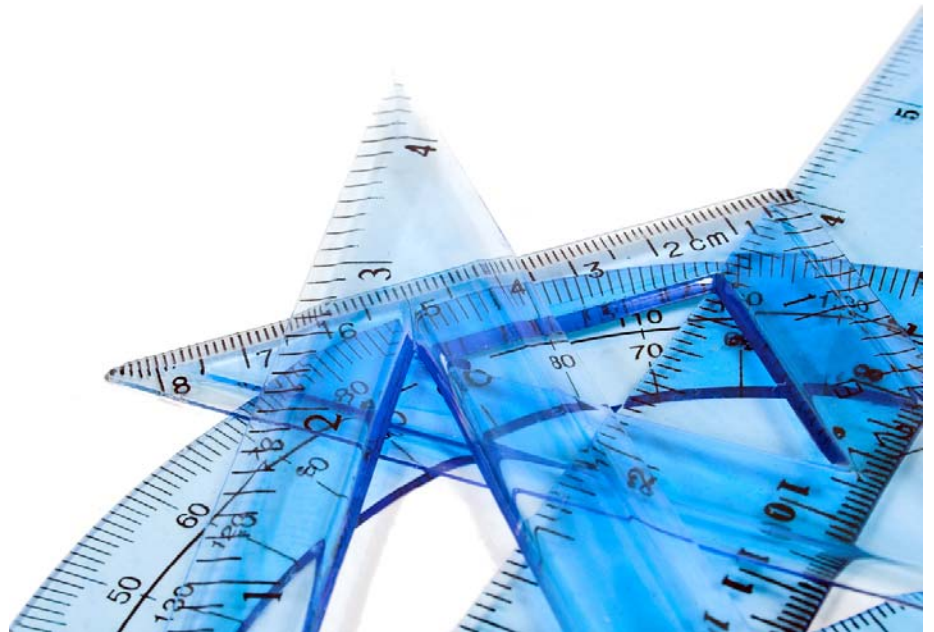
**2009**

# **Mathematics Curriculum Guide**

Catholic Diocese of Salt Lake City, Utah

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## VISION

“As life long learners, we are challenged to use God’s gifts to better understand and improve the world around us. We recognize that we live in a world that is increasingly mathematical and technological and that our students’ futures depend on their mathematical competency. Students should be able to assimilate new information, solve unfamiliar problems in unconventional ways, and work cooperatively as well as independently. They should also be able to interpret issues, think critically and ethically, and act responsibly. Teaching strategies and learning experiences must be varied, meaningful, and engaging to students.”(Diocese of Wilmington, DE)

## CRITICAL ISSUES

Mathematics is learned through an approach that begins with concrete explorations and leads students to an understanding of symbolic representations. All students must have equal access to rigorous, high quality instruction to become mathematically literate. The uniqueness of each student should be nurtured by using differentiated strategies in response to various learning styles. A broad variety of assessments must provide multiple indicators of student achievement.

Communicating mathematically enables students to solve problems by acquiring information through reading, listening, and observing. Students will be able to translate information into mathematical language and symbols, process the information mathematically, and present the results in written, oral, and visual formats to demonstrate their mathematical literacy.

Mastery of computational skills through the employment of age-appropriate materials while also developing higher-level critical thinking skills is critical. In our progressively changing world, students need to know how to properly utilize innovative tools, media, and technology to solve cross-curricular mathematical problems. Technology, however, is not a replacement for the comprehension of mathematical concepts.

## EXPECTATIONS FOR LEARNING

We commit to the following expectations:

1. **That we will teach all the students all the curriculum**
2. That all grade level students:
  - a. Learn to think critically, logically, ethically, and analytically
  - b. Learn to express ideas orally and in writing using correct mathematical terminology
  - c. Learn to apply the techniques of mathematics to real world situations
  - d. Understand that mathematics is important to function in today’s world
  - e. Utilize technology responsibly.
3. That computers, calculators, manipulatives and other tools of learning should be used routinely as an integral part of both instruction and assessment.
4. That mathematics teachers participate in professional development activities on a yearly basis.
5. That the Diocesan mathematics coordinator hold regularly scheduled meetings to facilitate communication and to analyze the strengths and weaknesses within the program.
6. That the teacher utilize the mathematics curriculum guidelines for grade level instruction.
7. That teachers provide differentiated instruction and assessment.
8. That the Diocesan mathematics coordinator provides support for new teachers of mathematics.

## THE SIX PRINCIPLES OF National Council of Teachers of Mathematics

- *Equity.* **Excellence in mathematics education requires equity—high expectations and strong support for all students**

Educational equity is a core element of this vision. All students, regardless of their personal characteristics, backgrounds, or physical challenges, must have opportunities to study—and support to learn—mathematics. Equity does not mean that every student should receive identical instruction; instead, it demands that reasonable and appropriate accommodations be made as needed to promote access and attainment for all students.

- *Curriculum.* **A curriculum is more than a collection of activities: it must be coherent, focused on important mathematics, and well articulated across the grades.**

A school mathematics curriculum is a strong determinant of what students have an opportunity to learn and what they do learn. In a coherent curriculum, mathematical ideas are linked to and build on one another so that students' understanding and knowledge deepens and their ability to apply mathematics expands. An effective mathematics curriculum focuses on important mathematics—mathematics that will prepare students for continued study and for solving problems in a variety of school, home, and work settings. A well-articulated curriculum challenges students to learn increasingly more sophisticated mathematical ideas as they continue their studies.

- *Teaching.* **Effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well.**

Students learn mathematics through the experiences that teachers provide. Thus, students' understanding of mathematics, their ability to use it to solve problems, and their confidence in, and disposition toward, mathematics are all shaped by the teaching they encounter in school. The improvement of mathematics education for all students requires effective mathematics teaching in all classrooms.

Teaching mathematics well is a complex endeavor, and there are no easy recipes for helping all students learn or for helping all teachers become effective. Nevertheless, much is known about effective mathematics teaching, and this knowledge should guide professional judgment and activity. To be effective, teachers must know and understand deeply the mathematics they are teaching and be able to draw on that knowledge with flexibility in their teaching tasks. They need to understand and be committed to their students as learners of mathematics and as human beings and be skillful in choosing from and using a variety of pedagogical and assessment strategies (National Commission on Teaching and America's Future 1996). In addition, effective teaching requires reflection and continual efforts to seek improvement. Teachers must have frequent and ample opportunities and resources to enhance and refresh their knowledge.

- ***Learning.* Students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge**

A major goal of school mathematics programs is to create autonomous learners, and learning with understanding supports this goal. Students learn more and learn better when they can take control of their learning by defining their goals and monitoring their progress. When challenged with appropriately chosen tasks, students become confident in their ability to tackle difficult problems, eager to figure things out on their own, flexible in exploring mathematical ideas and trying alternative solution paths, and willing to persevere. Effective learners recognize the importance of reflecting on their thinking and learning from their mistakes. Students should view the difficulty of complex mathematical investigations as a worthwhile challenge rather than as an excuse to give up. Even when a mathematical task is difficult, it can be engaging and rewarding. When students work hard to solve a difficult problem or to understand a complex idea, they experience a very special feeling of accomplishment, which in turn leads to a willingness to continue and extend their engagement with mathematics.

- ***Assessment.* Assessment should support the learning of important mathematics and furnish useful information to both teachers and students.**

When assessment is an integral part of mathematics instruction, it contributes significantly to all students' mathematics learning. When assessment is discussed in connection with standards, the focus is sometimes on using tests to certify students' attainment, but there are other important purposes of assessment. Assessment should be more than merely a test at the end of instruction to see how students perform under special conditions; rather, it should be an integral part of instruction that informs and guides teachers as they make instructional decisions. Assessment should not merely be done *to* students; rather, it should also be done *for* students, to guide and enhance their learning

The *Assessment Standards for School Mathematics* (NCTM, 1995) presented six standards about exemplary mathematics assessment. They addressed how assessment should—

- reflect the mathematics that students should know and be able to do;
- enhance mathematics learning;
- promote equity;
- be an open process;
- promote valid inference;
- be a coherent process.

- ***Technology.* Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning.**

Electronic technologies—calculators and computers—are essential tools for teaching, learning, and doing mathematics. They furnish visual images of mathematical ideas, they facilitate organizing and analyzing data, and they compute efficiently and accurately. They can support investigation by students in every area of mathematics, including geometry, statistics, algebra, measurement, and number. When technological tools are available, students can focus on decision making, reflection, reasoning, and problem solving.

The existence, versatility, and power of technology make it possible and necessary to reexamine what mathematics students should learn as well as how they can best learn it. In the mathematics classrooms envisioned in *Principles and Standards*, every student has access to technology to facilitate his or her mathematics learning under the guidance of a skillful teacher.

## STANDARDS: CONTENT AND PROCESS

Ambitious standards are required to achieve a society that has the capability to think and reason mathematically and a useful base of mathematical knowledge and skills.

The ten Standards presented in this chapter describe a connected body of mathematical understandings and competencies—a comprehensive foundation recommended for all students, rather than a menu from which to make curricular choices. Standards are descriptions of what mathematics instruction should enable students to know and do. They specify the understanding, knowledge, and skills that students should acquire from Pre-kindergarten through grade 12.

**The Content Standards**—Number and Operations, Algebra, Geometry, Measurement, and Data Analysis and Probability—explicitly describe the content that students should learn.

**The Process Standards**—Problem Solving, Reasoning and Proof, Communication, Connections, and Representation—highlight ways of acquiring and using content knowledge.

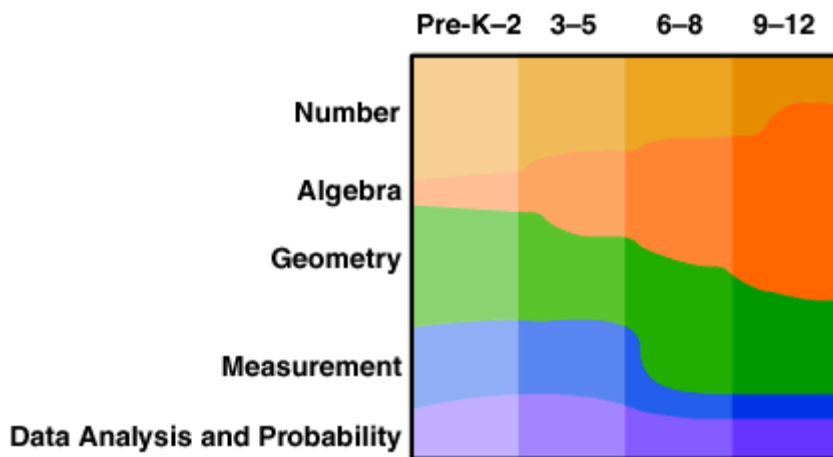


Fig. 3.1. The Content Standards should receive different emphases across the grade bands.