

**C**onnected Mathematics is a curriculum developed to provide challenges appropriate for every student including the mathematically gifted child. The curriculum gives all students the opportunity to learn key mathematical concepts in depth and to make valuable connections that will benefit them in future mathematics classes.

## Components of an Effective Program for Gifted Students

The National Council of Teachers of Mathematics made suggestions on how to provide opportunities for the mathematically gifted in the publication *Providing Opportunities for the Mathematically Gifted K-12* (NCTM, 1987). They proposed 16 essential components for programs for the mathematically gifted. A subset of these sixteen components, that directly relate to the mathematics curriculum are listed below. The program should:

- Contain good, high quality mathematics which is challenging, broad, and deep
- Nurture higher-order thinking processes and open-ended investigations
- Prompt students to communicate effectively by reading, writing, listening, speaking, and thinking mathematically
- Have problem solving as a major focus and include applications of mathematics to real situations
- Encourage students to experiment, explore, conjecture, and even guess
- Provide opportunities to use learning resources (texts, calculators and computers, concrete manipulatives)
- Relate mathematics to other content areas.

*Connected Mathematics* possesses all of the components described above, while maintaining a goal of mathematical proficiency for all students.

## Modifications for Gifted Students

In order to provide a curriculum appropriate for gifted students, modifications in both the content and learning environment may be necessary. Maker and Nielson (1995) describe content and process modifications that should be made.

### Modifications in Content:

- Students need a variety of problems to work.
- The content of the curriculum needs to be organized around key concepts or abstract ideas, rather some other organization (as noted by Bruner, 1960).
- Problems should be complex and students should be pushed to abstraction. (Additional opportunities for abstraction are described in Teacher's Guides of *Connected Mathematics*, particular in Going Further features described below.)

### Modifications in Process:

- Promote higher levels of thinking by stressing *use* rather than *acquisition* of information. (Students continue to use information from previous units in the current unit they are studying in the *Connected Mathematics* series.)
- Provide open-ended questions in order to stimulate divergent thinking and to “contribute to the development of an interaction pattern in which learning, not the teacher, is focus” (see page 5).
- Teachers should guide student discovery of content and encourage questions of why and how things work. (*Connected Mathematics* Problems often ask students to think about the questions of why and how.)
- Students must be given opportunities to express their reasoning; (Students are constantly asked to explain or justify their reasoning in *Connected Mathematics*.)
- Group interaction should be a regular part of the curriculum for gifted students to enable them to develop social and leadership skills.

*Connected Mathematics* is designed so that many of the modifications described by Maker and Nielson are embedded in the curriculum. Other simple modifications are possible in order support gifted students and still maintain the integrity of the curriculum.

**Other Modifications** Renzoulli and Reis (2003) discuss the Schoolwide Enrichment Model (SEM), which can be used to promote challenging and high-end learning in schools. The SEM model accommodates the needs of the gifted student and offers suggestions on how to adjust the level, depth, and enrichment opportunities provided by a curriculum.

*Connected Mathematics* offers students rich experiences with a variety of mathematical content. Students are introduced to important areas of mathematics, such as combinatorics, graph theory, probability, statistics, and transformational and Euclidean Geometry early

in their career so that they can see the vast terrain of mathematics. The algebra strand in *Connected Mathematics* is organized around functions, which are the cornerstone of calculus, and the structure of the real numbers, which brings coherence to the exploration of algebraic ideas.

There are particular features of *Connected Mathematics* which support the mathematically gifted child. In the Teacher's Guides, there are questions in the Launch–Explore–Summarize sequence labeled Going Further that teachers can ask students who are ready to go further mathematically. In the homework ACE assignments, Extensions questions often go beyond what was done in class. Extension questions can be used as additional exercises to push students' thinking. These features, in conjunction with the rich, deep problems offered in this curriculum, provide mathematically gifted students challenging problems to explore each day in class.