Excerpt From: Discovering Mathematical Talent

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What Should Parents and Teachers Know to Help Them Better Recognize Mathematical Talent?

Mathematical talent refers to an unusually high ability to understand mathematical ideas and to reason mathematically, rather than just a high ability to do arithmetic computations or get top grades in mathematics. When considering mathematical talent, many people place too much emphasis on computational skill or high ability in replicating taught mathematical procedures.   Some characteristics and behaviors that may yield important clues in discovering high mathematical talent are the following:

- An unusually keen awareness of and intense curiosity about numeric information.
- An unusual quickness in learning, understanding, and applying mathematical ideas.
- A high ability to think and work abstractly and the ability to see mathematical patterns and relationships.
- An unusual ability to think and work with mathematical problems in flexible, creative ways rather than in a stereotypic fashion.
- An unusual ability to transfer learning to new, untaught mathematical situations.

How Can Standardized Test Results Help In Recognizing Mathematical Talent?

Intelligence Tests. IQ test results often yield valuable information and may provide clues to the existence of mathematical talent. Used alone, however, these tests are not sufficient to identify high ability in mathematics. Mathematical talent is a specific aptitude, while an IQ score is a summary of many different aptitudes and abilities.

Mathematics Achievement Tests. Mathematics achievement tests also can provide valuable clues in identifying high ability in mathematics, but the results of these tests have to be interpreted carefully. Mathematics achievement tests are often computation-oriented and give little information about how a student actually reasons mathematically. Also, the tests seldom have enough difficult problems to appropriately assess the upper limits of a talented student's ability or show that this ability is qualitatively different from that of other very good, but not truly mathematically talented, students.

Mathematics Aptitude Tests.   Aptitude tests have some of the same limitations as achievement tests except that, because they are designed to place more emphasis on mathematical reasoning skills, the results from these tests are often more useful in identifying mathematically talented students.

***Out-of-Grade-Level Mathematics Aptitude Tests*. Many of the limitations associated with mathematics aptitude tests can be reduced by administering out-of-grade-level versions of the tests. This process should be used only with students who already have demonstrated strong mathematics abilities on regular-grade-level instruments or those who show definite signs of high mathematics ability.**

What Instructional Approaches Benefit Mathematically Talented Students?

Students identified as mathematically talented vary greatly in degree of talent and motivation. No single approach is best for all of these students. For example, students with extremely high ability and motivation may profit more from a program that promotes rapid and relatively independent movement through instructional content. Students with less ability or lower motivation may do better in a program that is not paced so quickly and is more deliberate in developing the mathematical concepts being taught. There are some common features, however, that seem to be important ingredients in the mathematics programs of mathematically talented students.

The program should bring mathematically talented students together to work with one another in the area of mathematics. Students will benefit greatly, both academically and emotionally, from this type of experience. They will learn from each other, reinforce each other, and help each other over difficulties.

The program should stress mathematical reasoning and develop independent exploratory behavior. This type of program is exemplified by discovery learning, looking for underlying principles, engaging in special projects in mathematics, problem solving, discovering formulas, looking for patterns, and organizing data to find relationships.

The mathematics program should deemphasize repetitious drill work and cyclical review. This type of work should be minimal for all mathematically talented students. As ability in mathematics increases, the benefits to be gained from this type of activity decrease.

The scope of the mathematics curriculum should be extensive so that it will provide an adequate foundation for students who may become mathematicians in the future. In many programs the mathematics curriculum will have to be greatly expanded to meet this need.

The mathematics program should be flexibly paced. Flexibly paced means that students are placed at an appropriate instructional level on the basis of an assessment of their knowledge and skill:

- **Continuous progress. Students receive appropriate instruction daily and move ahead as they master content and skill.**
- **Compacted course. Students complete two or more courses in an abbreviated time.**
- **Advanced-level course. Students are presented with course content normally taught at a higher grade.**

- **Grade skipping. Students move ahead 1 or more years beyond the next level of promotion.**
- **Early entrance. Students enter elementary school, middle school, high school, or college earlier than the usual age.**
- **Concurrent or dual enrollment. Students at one school level take classes at another school level. For example, an elementary school student may take classes at the middle school.**
- **Credit by examination. Students receive credit for a course upon satisfactory completion of an examination or upon certification of mastery.**

Conclusion

The fate of mathematically talented students will be determined largely by the ability of their parents and educators to discover and nurture their special ability. The notion that these students will achieve their potential anyway is constantly refuted. For too many students, lack of appropriate mathematical nourishment seems to be the rule rather than the exception. At risk are the benefits that these children might gain from early advancement and the attitudes that these children will have toward mathematics, school, learning in general, and themselves.

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