Question:

What grade level do you teach?

A. K – 12
B. 3 – 5
C. 6 – 8
D. 9 – 12
E. I am an administrator

Developing Mathematical Talent: They Don't Have to Be Bored to Tears

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Myths about Math Talented Students

- Myth 1: Mathematically talented students cannot be identified until high school.
- Myth 2: Only students identified for a gifted program are mathematically talented.
- Myth 3: Mathematically talented students are computation whizzes.

Myths (continued)

- Myth 4: Results from standardized, grade-level testing are sufficient for identifying mathematically talented students.
- Myth 5: Students who are mathematically talented demonstrate mastery of a topic by earning 100% on tests—including pretests.
- Myth 6: The best option for mathematically able elementary school students is enrichment.

Myths (continued)

- Myth 7: Students—even those who are mathematically talented—shouldn't study algebra until eighth or ninth grade.
- Myth 8: The best way to challenge mathematically talented students is to have them skip a grade and study the regular textbook in the regular classroom.
- Myth 9: Students whose pace of instruction is accelerated cannot cover each section of the text and will have gaps in their mathematics background.

Myths (continued)

- Myth 10: If mathematically able students study mathematics at an accelerated pace, they will run out of math curriculum before they reach high school.
- Myth 11: Early ripe, early rot.
- Myth 12: Gifted students respond equally well to the same curriculum.

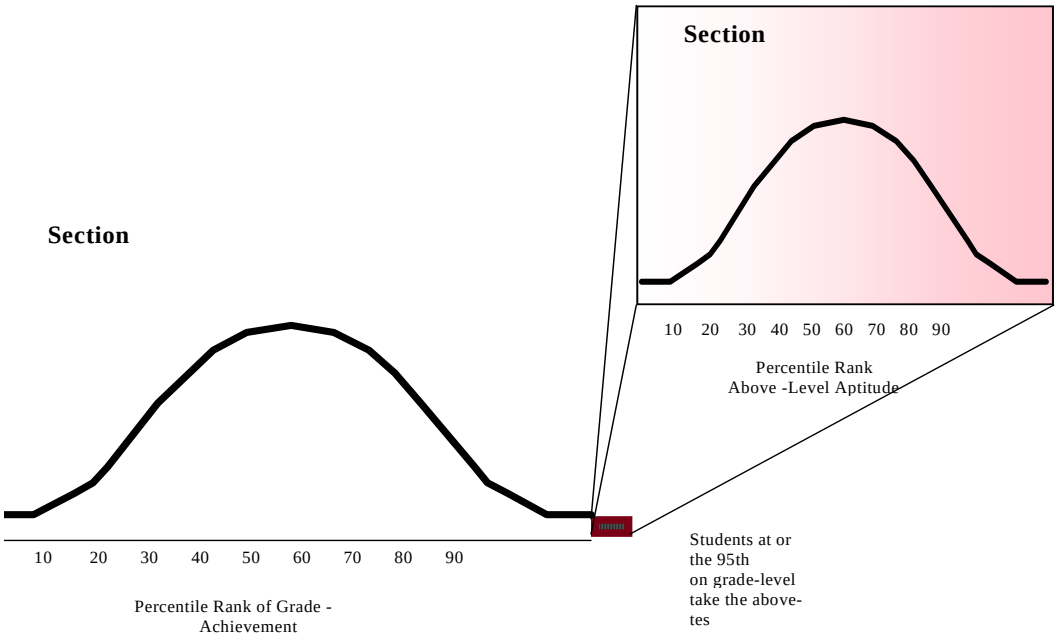
Question:

What kind of programs do you already have available for math-talented students in your school?

Problems with At-Grade-Level Tests

- They are too easy
- The tests give no indication of how different talented students are from each other
- They do not give an accurate estimate of ability if the true level of ability is above the ceiling of the test

Above-Level Score Distribution



Natalie and Maria

- 99th %ile on most sections of ITBS, grade 4

- 5th grade EXPLORE scores (percentile ranking compared to 8th graders):

Natalie		Maria
50th	English	92nd
19th	Math	48th
19th	Reading	64th
48th	Science	93rd
28th	Comp.	81st

What Question Guides the Assessment?

- What is the student's level of mathematical talent, and what is the appropriate level of instruction for him or her?
- Is the student eligible for the gifted program?
- If the student skips 4th grade mathematics, will he or she have gaps in his or her background?
- Is the student ready to take Algebra I in 6th grade?

What Tests Will Yield the Needed Information?

- An IQ test doesn't give enough information about math ability to determine placement in a math class.
- Grade-level achievement tests do not provide enough information about what a student has learned or is ready to learn.

Useful Tests

- Raven's Progressive Matrices (abstract reasoning ability)
- School and College Abilities Test (CTY): verbal & quantitative
- Differential Aptitude Tests (abstract reasoning, mech. reason., space relations)
- Iowa Algebra Aptitude Test
- Orleans-Hanna Algebra Prognosis Test
- Stanford Diagnostic Mathematics Test
- Comprehensive Testing Program III
- PLUS
- EXPLORE
- SAT
- ACT

More Than the Score

- Scores by themselves have little meaning
- Norms: compare scores to a group
- Percentile ranking (50th percentile is average score)
- Use norms above the current grade placement
- Observe test-taking behaviors

Curriculum-Based Assessment

- Mastery
- Chapter tests or unit tests provided by textbook series or teacher
- Gives the instructor a baseline against which progress can be measured
- Instruction is directly linked to the results (no worry about gaps)

Other Comments about CBA

- Might develop items that emphasize lower-order thinking (basic facts rather than math applications or problem solving)
- Best use of CBA is as a complement to the standardized measures that comprise assessment

Question:

Do students in your school participant in either of the Talent Searches offered by the Center for Talented Youth at Johns Hopkins University or by C-MITES at Carnegie Mellon?

Talent Search Tests

- Eligibility: 95th or 97th percentile on grade-level achievement test taken in school
- Take an above-level test:
  - SCAT: 2nd-4th
  - EXPLORE: 3rd-6th
  - PLUS: 5th-6th
  - SAT: 7th-8th
  - ACT: 7th-8th

Advantages of Participating in a Talent Search

- Educational diagnosis (above-level test is a more accurate measure of ability)
- Educational recommendations tailored to the abilities of the student
- Educational opportunities provided by the talent searches

Advantages of Participating in a Talent Search

- Appropriate educational information
- Honors, awards, and scholarships
- Peer group

Program Options: Less Appropriate

- Tutor other children: Help others who are having difficulty in math. This is NOT a good substitute for learning new material.
- Isolated, self-paced instruction: Student works ahead in the textbook at his/her own pace. May result in feelings of isolation; student may not learn material well

Program Options: More Appropriate

- Differentiation in the regular classroom:
  - Enrichment Topics: Extend or enrich the regular curriculum
  - Math-related independent study projects
  - Curriculum Compacting: Eliminate some curriculum to allow more time for other activities
  - Breadth/Depth Approach: The same curriculum, greater depth
- Move up a grade for mathematics (subject-matter acceleration)
- Ability Grouping: Special class with other math-talented students
- DT->PI model: individualized, accelerated program

Types of Classroom Enrichment

- 1. Busywork: More of the same, but in greater quantity than required of most students in the class.
- 2. Irrelevant academic enrichment: A special subject or activity meant to challenge the academic experiences of the student; however, the subject has very little to do with the talent area, i.e., the mathematically talented student spends "enrichment time" working on a class newspaper.
- 3. Cultural enrichment: While not relevant to the specific talent area, the activity has cultural merit, e.g., attending a theatrical or musical performance.

“Good” Enrichment

- Relevant academic enrichment: There is exposure to special topics in the specific talent area, such as a unit on tessellations, which may or may not be related to the topics being covered in the class.

DT->PI Model (The SMPY Model)

- Diagnostic Testing followed by Prescriptive Instruction

- Step 1: Aptitude test
- Step 2: Achievement pre-test
- Step 3: Re-administer missed items
- Step 4: Prescriptive instruction
- Step 5: Post-test

- Re-enter the process at Step 2

Step 1: Determine Aptitude

- Goal is to discover mathematically talented students
- Select the level of a standardized test that is at least 2 grade levels above the student's current grade
- For example: above-level ITBS, Stanford Achievement Test, or Metropolitan Achievement Test

Step 2: Diagnostic Pre-Test

- Measure talented students' achievements and determine where to begin instruction
- Example: Stanford Diagnostic Math test
- Also consider end-of-year tests from textbook publisher

Step 3: Re-administer and evaluate missed items

- Purpose is to gain a more complete understanding of topics the student does and doesn't know
- No time limits
- Show all work

Step 4: Prescriptive Instruction

- Thorough analysis of testing results
- Mentor works with student
- Work on concepts the student doesn't understand
- Goal is mastery

Step 5: Post-Testing

- Determine if the student has mastered the content
- Administer a parallel form of the pretest

Who Makes the Best Mentors?

- High school math teachers
- Engineers
- College professors
- Undergrad math major
- Certified teacher
- 1:1 ratio up to 4:1

How are the sessions conducted?

- Two hours per week (one or two sessions)
- School time or outside of school
- Work on principles student doesn't understand
- Time for enrichment, extension
- Highly individualized
- Homework between meetings

How Effective Is the DT->PI Model?

- Students have mastered one or more years of math in 75 hours of instruction
- Perform well in the next course in school
- Long-term retention of subject matter
- High student satisfaction

Advantages of Subject-Matter Acceleration in Math

- Regular classroom teacher does not have to search for materials for the advanced student, because that student is removed during math class
- It is more likely that the student will be grouped with intellectual peers
- Student receives credit for work completed
- Student is appropriately challenged and therefore remains interested in mathematics

Disadvantages of Subject-Matter Acceleration in Math

- The pace may still be too slow
- If only one year of acceleration, there may be little new content
- Long-term planning is essential, so the student does not “run out” of mathematics before graduating from high school.
- Student may not receive credit for high school math done before enrolling in high school.

Issues in Planning Programs for Mathematically Talented Students

- A “One Size Fits All” Program Doesn’t Fit All
- Students May be Gifted in Math but not in Other Subjects
- The Gifted Program Might Not Address the Needs of the Math Talented Student
- “Acceleration Vs. Enrichment” Is a False Dichotomy

Issues in Planning Programs for Mathematically Talented Students

- Acceleration Doesn't Necessarily Produce Gaps
- Students Extremely Talented in Mathematics May Make Computation Mistakes
- Special Programs Need to Be Integrated into District-Wide Objectives So the Program Can Survive Changes in Personnel

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