Educating Mathematically Gifted Students: Recommendations from the National Mathematics Advisory Panel

Dr. Camilla Benbow
Vanderbilt University

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Presidential Executive Order
April 2006

- The Panel will advise the President and the Secretary of Education on the best use of scientifically based research to advance the teaching and learning of mathematics, with a specific focus on preparation for and success in algebra.

What Concerns Led to the President's Order?

- National prosperity and safety in international context
  - Role of mathematics in national well-being
  - *Gathering Storm*
  - Workforce of the future

Overview

- Task Groups
  - Conceptual Knowledge and Skills
  - Learning Processes
  - Instructional Practices
  - Teachers
  - Assessment
- Subcommittees
  - Standards of Evidence
  - Survey of Algebra Teachers
  - Instructional Materials
- Reports
  - Final Report
  - 8 Task Group and Subcommittee Reports

Basis of the Panel's work

- Review of 16,000 research studies and related documents.
- Public testimony gathered from 110 individuals.
- Review of written commentary from 160 organizations and individuals
- 12 public meetings held around the country
- Analysis of survey results from 743 Algebra I teachers

Evidence Guidelines

- Executive Order
  - Marshal the “best available scientific evidence.”
  - Review “research relating to proven-effective and evidence-based mathematics instruction.”
- What is the best available scientific evidence?
  - 3 broad categories of quality.
    - Highest quality = high internal and external validity.
    - Promising or suggestive = has limitations.
    - Opinion = values, impressions, or weak evidence.

Good News

- Gifted and Talented students are addressed in the report!

Key Findings for Gifted

- The studies reviewed provided some support for the value of differentiating the mathematics curriculum, especially when acceleration is a component (i.e., pace and level of instruction is adjusted).

Key Findings for Gifted

- Individualized instruction where pace of learning is increased, often managed via computer instruction, show positive benefits, with effect sizes of about .45 or even greater.

Key Findings continued

- Gifted students who are accelerated not only gained time and reached educational milestones earlier (e.g., college entrance) but appear to achieve at levels comparable to or somewhat exceeding (small effect sizes) that of their equally able age-mates on a variety of indicators even though they were younger when demonstrating their performance on the various achievement benchmarks.

Conclusions

- Gifted students in mathematics can learn at a much faster rate than typical students while nevertheless learning well.
- They also appear to become more strongly engaged in science, technology, engineering, or mathematics areas.

Conclusions

- Although it is a frequently expressed opinion as cause for concern, there is no evidence in the research literature, or from our analyses, that gaps and holes in knowledge have occurred as a result of acceleration.

Conclusions

- Support also was found for supplemental enrichment programs.
  - Of the two programs analyzed, one explicitly utilized acceleration as a program component and the other did not. Self-paced instruction supplemented with enrichment yielded the greater benefits.
- This supports the widely held view in the field of gifted education that acceleration and enrichment combined should be the intervention of choice.

Conclusions

- It is important for school policies to support appropriately challenging work in mathematics for gifted and talented students.
- Acceleration, combined with enrichment, is certainly a promising, possibly moderately supported (if the entire literature is considered), practice.

Recommendation

- Underscored by the analysis undertaken by the Task Group on Instructional Practices is the need for more high quality experimental and quasi-experimental research to study effectiveness of interventions designed to meet the learning needs of gifted students.
- Especially missing are evaluations of academically rigorous enrichment programs.

For More Information

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http://www.ed.gov/MathPanel