

Preliminary Report

National Mathematics Advisory Panel

January 2007

I. THE PRESIDENT'S CHARGE

The National Mathematics Advisory Panel (Panel) was established within the Department of Education as part of the President's *American Competitiveness Initiative* through Executive Order 13398, April 18, 2006 (Appendix A). Included in the Executive Order is a requirement for the Panel to issue a Preliminary Report no later than January 31, 2007. This document fulfills that obligation.

There is a growing national concern about the mathematical proficiency of young people who are now emerging from our schools or will graduate in the next decades. This is a world of ideas, a world of innovation, where national well-being rests largely on economic competitiveness, which inevitably and increasingly depends on broad respect for and command of mathematics in the workforce. Present evidence strongly suggests that the United States is not renewing its workforce with adequate rigor and foresight:

- In the 2003 Programme for International Student Assessment (PISA), U.S. 15-year-olds ranked 24th among 29 developed nations in math literacy and problem-solving (Organisation for Economic Cooperation and Development, 2004).
- In the Trends in Math and Science Study (TIMSS), only 7 percent of U.S. fourth and eighth graders achieved the advanced level on the 2003 test. In Singapore, a world leader, 38 percent of fourth graders and 44 percent of eighth graders reached that level (Gonzales, P. et al., 2004).
- One study has claimed that an applicant for a production associate's job at a modern automobile plant must have the math skills equivalent to the most basic achievement level on the National Assessment of Educational Progress (NAEP) math test (Levy, F. and Murnane, R., 1996). This threshold is not met by almost half of America's 17-year-olds (Perie, M. et al., 2005).
- A 2006 Hart/Winston Poll found that more than three-quarters (76%) of people in the United States believe that if the next generation does not work to improve its skills in math, science and engineering, it risks becoming the first generation of Americans who are worse off economically than their parents (Peter D. Hart Research Associates and The Winston Group, 2006).
- The recent widely discussed report from the National Academies, *Rising Above the Gathering Storm*, questions the future of American competitiveness in scientific and technological areas. Its first emphasis is on increasing the U.S. talent pool, both in terms of workforce issues and the potential for innovation, by vastly improving K-12 mathematics and science education (National Academies, 2006).

The discussion about math skills has persisted for many decades. One aspect of the debate is over how explicitly children must be taught skills based on formulas or algorithms (fixed,

step-by-step procedures for solving math problems) versus a more inquiry-based approach in which students are exposed to real-world problems that help them develop fluency in number sense, reasoning, and problem-solving skills. In this latter approach, computational skills and correct answers are not the primary goals of instruction.

Those who disagree with the inquiry-based philosophy maintain that students must first develop computational skills before they can understand concepts of mathematics. These skills should be memorized and practiced until they become automatic. In this view, estimating answers is insufficient and, in fact, is considered to be dependent on strong foundational skills. Learning abstract concepts of mathematics is perceived to depend on a solid base of knowledge of the tools of the subject. Of course, teaching in very few classrooms would be characterized by the extremes of these philosophies. In reality, there is a mixing of approaches to instruction in the classroom, perhaps with one predominating.

Currently, the math education conversation has expanded to include the significance of acquiring a certain level of math skills by the end of 8th grade (or earlier for many able students). This critical year in mathematics education is the point at which students, if they have been exposed to the necessary skills and have an appropriate level of understanding in math, have prepared themselves for the rigorous high school mathematics courses that are necessary for college and the current workforce. Unfortunately, many 8th graders have not been exposed to all of this necessary content and continue to lag behind, leaving them unprepared to take algebra, the gateway course to higher mathematics.

Teachers play a vital role in education, and their preparation also has been an area of interest among those working to improve math education. Great attention is being paid to the role of the nation's universities in adequately preparing teachers for the teaching of mathematics in schools. While secondary school mathematics teachers typically have more extensive coursework in this subject area, there are questions about whether elementary school teachers take a sufficient number of math courses to prepare them for math instruction. Once in the classroom, sustained professional development and training also are necessary to continue to equip teachers with the skills they need. Between a focus on subject area expertise and knowledge of the proper pedagogy, there is uncertainty about the balance necessary to best prepare teachers for the unique task of teaching math and for their continuing professional development.

The Panel's precise charge, set forth in the Executive Order, is to advise the President and the U.S. Secretary of Education on means "...to foster greater knowledge of and improved performance in mathematics among American students...with respect to the conduct, evaluation, and effective use of the results of research relating to proven-effective and evidence-based mathematics instruction." The Executive Order further calls for recommendations "...based on the best available scientific evidence..." a phrase that has been particularly noted by the Panel as guidance for its work. Moreover, the Executive Order also defines a particular set of topics for the Panel to examine:

- a) the critical skills and skill progressions for students to acquire competence in algebra and readiness for higher levels of mathematics;
- b) the role and appropriate design of standards and assessment in promoting mathematical competence;
- c) the processes by which students of various abilities and backgrounds learn mathematics;
- d) instructional practices, programs, and materials that are effective for improving mathematics learning;
- e) the training, selection, placement, and professional development of teachers of mathematics in order to enhance students' learning of mathematics;
- f) the role and appropriate design of systems for delivering instruction in mathematics that combine the different elements of learning processes, curricula, instruction, teacher training and support, and standards, assessments, and accountability;
- g) needs for research in support of mathematics education;
- h) ideas for strengthening capabilities to teach children and youth basic mathematics, geometry, algebra, and calculus and other mathematical disciplines;
- i) such other matters relating to mathematics education as the Panel deems appropriate; and
- j) such other matters relating to mathematics education as the Secretary may require.

Item (a) in the President's list clearly indicates that the Panel's focus should be on the preparation of students for entry into and success in algebra, which itself is a foundation for higher mathematics. Thus, the Panel sees its role as addressing all aspects of teaching and learning in mathematics from pre-kindergarten (Pre-K) through grade 8 or so, but not so fully with teaching and learning in algebra *per se*. While readiness for algebra is the central concern, the Panel also will address, with lesser intensity, elements of early-grade mathematics that may be needed in preparation for higher mathematics distinct from algebra, such as geometry or statistics.

II. COMPOSITION OF THE PANEL AND PROCESS OF WORK

The National Mathematics Advisory Panel (often called the "National Math Panel," NMP, or Panel) comprises 22 members designated by the Secretary of Education. Seventeen of the members are experts not employed by the Federal Government and five are *ex officio* designees from Federal agencies. The members were sworn into service and the Panel began its work on May 22, 2006.

Members from outside the Federal Government:

Larry R. Faulkner, Chair
 President, Houston Endowment
 President Emeritus, The University of Texas at Austin

Camilla Persson Benbow, Vice Chair
Dean of Education and Human Development,
Peabody College, Vanderbilt University

Deborah Loewenberg Ball
Dean, School of Education and William H. Payne Professor,
University of Michigan

A. Wade Boykin
Professor and Director of the Graduate Program,
Department of Psychology,
Howard University

Francis “Skip” Fennell
Professor of Education, McDaniel College
President, National Council of Teachers of Mathematics

David C. Geary
Curators' Professor, Department of Psychological Sciences,
University of Missouri at Columbia

Russell M. Gersten
Executive Director, Instructional Research Group
Professor Emeritus, College of Education, University of Oregon

Nancy Ichinaga
Former Principal,
Bennett-Kew Elementary School, Inglewood, California

Tom Loveless
The Herman and George R. Brown Chair
Senior Fellow, Governance Studies,
The Brookings Institution

Liping Ma
Senior Scholar for the Advancement of Teaching,
Carnegie Foundation

Valerie F. Reyna
Professor of Human Development and Professor of Psychology,
Cornell University

Wilfried Schmid
Dwight Parker Robinson Professor of Mathematics,
Harvard University

Robert S. Siegler
Teresa Heinz Professor of Cognitive Psychology,
Carnegie Mellon University

James H. Simons
President, Renaissance Technologies Corporation
Former Chairman, Mathematics Department, State University of New York
at Stony Brook

Sandra Stotsky
Independent researcher and consultant in education
Member, Massachusetts State Board of Education
Former Senior Associate Commissioner, Massachusetts Department of Education

Vern Williams
Mathematics Teacher,
Longfellow Middle School, Fairfax, Virginia

Hung-Hsi Wu
Professor of Mathematics,
University of California at Berkeley

Ex-Officio Members from Federal agencies:

Daniel B. Berch
Associate Chief, Child Development and Behavior Branch,
Director, Mathematics and Science Cognition and Learning Program,
National Institute of Child Health and Human Development, National Institutes of
Health

Diane Jones
Deputy to the Associate Director for Science,
White House Office of Science and Technology Policy

Thomas W. Luce, III
Former Assistant Secretary for Planning, Evaluation, and Policy Development,
U.S. Department of Education
(May 22, 2006 through November 1, 2006)

Kathie L. Olsen
Deputy Director, National Science Foundation
(May 22, 2006 through January 11, 2007)

Raymond Simon
Deputy Secretary,
U.S. Department of Education

Grover "Russ" Whitehurst
Director, Institute of Education Sciences,
U.S. Department of Education

Principal Staff for the Panel:

Tyrrell Flawn
Executive Director,
National Mathematics Advisory Panel,
U.S. Department of Education

Jennifer Graban
Deputy Director for Research and External Affairs,
National Mathematics Advisory Panel,
U.S. Department of Education

Ida Eblinger Kelley
Deputy Director of Administration and Communications,
National Mathematics Advisory Panel,
U.S. Department of Education

Over the past eight months, the Panel has met five times at institutions that exemplify high educational expectations. In the remaining time before the Executive Order expires on April 18, 2008, there will be at least five additional meetings. For more information on those meetings, see Appendix B.

At each meeting other than the first (which was purely organizational), the Panel used a portion of its time working in task groups with the balance in public sessions, receiving testimony and holding preliminary public discussions about progress in the task groups. Much of the testimony has been organized by the Panel to cover particular topics, such as textbooks, TIMSS, NAEP, and the use of technology, but a portion has consistently been allocated to open testimony on a first-come, first-served basis by individual members of the public or interested organizations. The proceedings of all meetings have been recorded and documented through extensive minutes. Transcripts and other information from the meetings have been posted on the Panel's Web site, which can be found at: <http://www.ed.gov/about/bdscomm/list/mathpanel/index.html>.

Organizations likely to have an interest in the Panel's work were contacted by mail to inform them of the work plan, and to solicit their advice and comments on matters of particular concern. In early December, the Department invited these stakeholders to a briefing in Washington, D.C., at which the Chair discussed the Panel's process and progress, and answered questions from attendees.

At the Panel meeting in May, the Panel chose to divide into task groups focused on detailed examination of particular areas relevant to the Executive Order and other areas of inquiry deemed by the Panel to be crucial to their charge. The full range of issues will be covered in a phased process, with new efforts being undertaken as earlier issues are completed. The four task groups that have been active in this phase all deal with critical elements of mathematics education:

- Learning Processes: what is known about how children learn mathematical concepts and skills, including the processes by which students of various abilities and backgrounds learn mathematics.
- Conceptual Knowledge and Skills: essential mathematical concepts, skills, and knowledge for the Pre-K – 8 grades leading to algebra.
- Instructional Practices and Materials: techniques and tools necessary to teach mathematics.
- Teachers and Teacher Education: development and deployment of the professionals who teach mathematics.

The membership of these task groups is as follows:

- *Learning Processes*
David C. Geary, Chair

Daniel B. Berch
A. Wade Boykin
Valerie F. Reyna
Robert S. Siegler

- *Conceptual Knowledge and Skills*
Francis “Skip” Fennell, Chair
Larry R. Faulkner
Liping Ma
Wilfried Schmid
Sandra Stotsky (effective January 1, 2007)
- *Instructional Practices*
Russell M. Gersten, Chair
Camilla Persson Benbow
Diane Jones
Tom Loveless
Kathie L. Olsen
Vern Williams
- *Teachers*
Deborah Loewenberg Ball, Chair
Nancy Ichinaga
Raymond Simon
James H. Simons
Sandra Stotsky (May 2006 through December 2006)
Grover “Russ” Whitehurst
Hung-Hsi Wu

In addition, the Panel created two subcommittees to address: a) the development of a stated approach concerning standards of evidence; and b) a plan for a survey of teachers in the field.

The membership of these subcommittees is as follows:

- *Subcommittee on Standards of Evidence*
Valerie F. Reyna, Chair
Camilla Persson Benbow
A. Wade Boykin
Grover “Russ” Whitehurst
- *Subcommittee on a Survey of Teachers*
Tom Loveless, Chair
Deborah Loewenberg Ball
Francis “Skip” Fennell
Vern Williams

The task groups receive support in their survey of the research literature and other relevant materials through contracts with Abt Associates and the Institute for Defense Analyses/Science and Technology Policy Institute (IDA/STPI). The contractors carry out

searches to capture high-quality, relevant research using criteria defined by each task group for its own needs. The results are examined directly by the task groups. The criteria set for searches carried out by the contractors are meant to exclude only the clearly irrelevant items. All final decisions about the rigor, adequacy, and inclusion of items in the research literature will be made exclusively by Panel members working in task groups. The task groups report periodically to the entire Panel, and all final work products are to be reviewed by and accepted by the Panel as a whole.

The Panel intends that every assertion or statement of fact in its Final Report either be labeled as a definition or opinion, or be backed by citation. Wherever practical, the Panel will also seek to convey in the Final Report the quality of evidence that exists for findings or conclusions. These principles adhere to the President's emphasis on the *best available scientific evidence*.

III. CURRENT STATUS

At the time this report was accepted by the Panel at its New Orleans meeting in January 2007, progress was described as follows:

All four task groups are deeply engaged in their tasks, and are in the process of examining relevant literature and materials. The findings of the task groups will inform each other and will ultimately be aligned in forming conclusions. Accordingly, it is premature for the Panel to convey major findings and conclusions.

The Subcommittee on Standards of Evidence has made good progress toward a guide for use by the task groups as they address their issues and the pertinent evidence. However, the Panel believes that methodological principles and details still must be refined as the members use them in reviews of the research. The Subcommittee on the Survey of Teachers has developed goals for the planned survey.

As the present agenda unfolds, the Panel expects to take up parts of the President's charge that cannot be covered with the current task groups.

IV. REFERENCES

- Gonzales, P., Guzmán, J.C., Partelow, L., Pahlke, E., Jocelyn, L., Kastberg, D., and Williams, T. (2004). *Highlights From the Trends in International Mathematics and Science Study (TIMSS) 2003 (NCES 2005–005)*. U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.
- Levy, F., and Murnane, R. (1996). *Teaching the New Basic Principles for Educating Children to Thrive in a Changing Economy*. New York, NY: The Free Press.

- National Academies (2006). *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future*. Washington, DC: National Academies Press.
- Organisation for Economic Cooperation and Development (2004). The Programme for International Student Assessment (PISA). *Learning for Tomorrow's World: First Results from PISA 2003*. Paris, France: Organization for Economic Cooperation and Development.
- Perie, M., Moran, R., and Lutkus, A.D. (2005). *NAEP 2004 Trends in Academic Progress: Three Decades of Student Performance in Reading and Mathematics (NCES 2005–464)*. U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. Washington, DC: Government Printing Office.
- Peter D. Hart Research Associates and The Winston Group. (2006) *Keeping Our Edge: Americans Speak on Education and Competitiveness*. Washington, DC: Educational Testing Service.

Appendix A

Presidential Executive Order

Presidential Documents

Executive Order 13398 of April 18, 2006

National Mathematics Advisory Panel

By the authority vested in me as President by the Constitution and the laws of the United States of America, it is hereby ordered as follows:

Section 1. Policy. To help keep America competitive, support American talent and creativity, encourage innovation throughout the American economy, and help State, local, territorial, and tribal governments give the Nation's children and youth the education they need to succeed, it shall be the policy of the United States to foster greater knowledge of and improved performance in mathematics among American students.

Sec. 2. Establishment and Mission of Panel. (a) There is hereby established within the Department of Education (Department) the National Mathematics Advisory Panel (Panel).

(b) The Panel shall advise the President and the Secretary of Education (Secretary) consistent with this order on means to implement effectively the policy set forth in section 1, including with respect to the conduct, evaluation, and effective use of the results of research relating to proven-effective and evidence-based mathematics instruction.

Sec. 3. Membership and Chair of Panel. (a) The Panel shall consist of no more than 30 members as follows:

(i) no more than 20 members from among individuals not employed by the Federal Government, appointed by the Secretary for such terms as the Secretary may specify at the time of appointment; and

(ii) no more than 10 members from among officers and employees of Federal agencies, designated by the Secretary after consultation with the heads of the agencies concerned.

(b) From among the members appointed under paragraph(3)(a)(i) of this order, the Secretary shall designate a Chair of the Panel.

(c) Subject to the direction of the Secretary, the Chair of the Panel shall convene and preside at meetings of the Panel, determine its agenda, direct its work and, as appropriate to deal with particular subject matters, establish and direct the work of subgroups of the Panel that shall consist exclusively of members of the Panel.

Sec. 4. Report to the President on Strengthening Mathematics Education. In carrying out subsection 2(b) of this order, the Panel shall submit to the President, through the Secretary, a preliminary report not later than January 31, 2007, and a final report not later than February 28, 2008. Both reports shall, at a minimum, contain recommendations, based on the best available scientific evidence, on the following:

(a) the critical skills and skill progressions for students to acquire competence in algebra and readiness for higher levels of mathematics;

(b) the role and appropriate design of standards and assessment in promoting mathematical competence;

(c) the processes by which students of various abilities and backgrounds learn mathematics;

(d) instructional practices, programs, and materials that are effective for improving mathematics learning;

(e) the training, selection, placement, and professional development of teachers of mathematics in order to enhance students' learning of mathematics;

(f) the role and appropriate design of systems for delivering instruction in mathematics that combine the different elements of learning processes, curricula, instruction, teacher training and support, and standards, assessments, and accountability;

(g) needs for research in support of mathematics education;

(h) ideas for strengthening capabilities to teach children and youth basic mathematics, geometry, algebra, and calculus and other mathematical disciplines;

(i) such other matters relating to mathematics education as the Panel deems appropriate; and

(j) such other matters relating to mathematics education as the Secretary may require.

Sec. 5. *Additional Reports.* The Secretary may require the Panel, in carrying out subsection 2(b) of this order, to submit such additional reports relating to the policy set forth in section 1 as the Secretary deems appropriate.

Sec. 6. *General Provisions.* (a) This order shall be implemented in a manner consistent with applicable law, including section 103 of the Department of Education Organization Act (20 U.S.C. 3403), and subject to the availability of appropriations.

(b) The Department shall provide such administrative support and funding for the Panel as the Secretary determines appropriate. To the extent permitted by law, and where practicable, agencies shall, upon request by the Secretary, provide assistance to the Panel.

(c) The Panel shall obtain information and advice as appropriate in the course of its work from:

(i) officers or employees of Federal agencies, unless otherwise directed by the head of the agency concerned;

(ii) State, local, territorial, and tribal officials;

(iii) experts on matters relating to the policy set forth in section 1;

(iv) parents and teachers; and

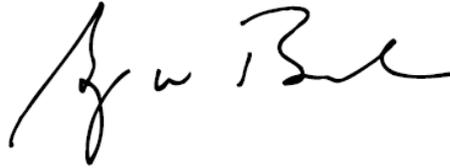
(v) such other individuals as the Panel deems appropriate or as the Secretary may direct.

(d) Members of the Panel who are not officers or employees of the United States shall serve without compensation and may receive travel expenses, including per diem in lieu of subsistence, as authorized by law for persons serving intermittently in Government service (5 U.S.C. 5701–5707), consistent with the availability of funds.

(e) Insofar as the Federal Advisory Committee Act, as amended (5 U.S.C. App.) (the "Act"), may apply to the administration of any portion of this order, any functions of the President under that Act, except that of reporting to the Congress, shall be performed by the Secretary in accordance with the guidelines issued by the Administrator of General Services.

(f) This order is not intended to, and does not, create any right or benefit, substantive or procedural, enforceable by any party at law or in equity against the United States, its departments, agencies, entities, officers, employees, or agents, or any other person.

Sec. 7. Termination. Unless hereafter extended by the President, this Advisory Panel shall terminate 2 years after the date of this order.



THE WHITE HOUSE,
April 18, 2006.

[FR Doc. 06-3865
Filed 4-20-06; 8:45 am]
Billing code 3195-01-P

Appendix B Panel Meetings

1. Washington, DC, May 22, 2006
Hosted by the National Academies
2. Chapel Hill, North Carolina, June 28-29, 2006
Hosted by the University of North Carolina at Chapel Hill
3. Cambridge, Massachusetts, September 13-14, 2006
Hosted by Massachusetts Institute of Technology
4. Palo Alto, California, November 5-7, 2006
Hosted by Stanford University
5. New Orleans, Louisiana, January 10-11, 2007
Hosted by Xavier University of Louisiana
6. Chicago, Illinois, April 19-20, 2007
To be hosted by Fermi National Accelerator Laboratory
7. Miami, Florida, June 5-6, 2007
To be hosted by Miami Dade College
8. St. Louis, Missouri, September 6-7, 2007
To be hosted by Washington University in St. Louis
9. Denver, Colorado, October 23-24, 2007
To be hosted by Community College of Denver
10. Washington, DC, February 2008
Adoption and presentation of final report

Meeting Summaries

Since the Executive Order was issued by the President, the National Math Panel has held five meetings across the country. The meetings consisted of Panel work sessions, and public comments and invited testimony from mathematicians, researchers, parents, educators, textbook publishers, software developers, assessment companies, and others.

National Academy of Sciences, Washington, DC -- The first meeting, which was held in Washington, D.C., in May 2006, provided an opportunity for the Panel members to be sworn in and discuss the process the Panel would follow.

University of North Carolina, Chapel Hill, NC -- The second meeting, which was held in Chapel Hill, North Carolina, in June 2006, included time for the Panel to meet in its respective task groups. The Panel also heard public comments from representatives of the following organizations:

- Davidson College;
- K12, Inc.;
- University of North Carolina;
- Starboard Training Systems;
- Association for Women in Mathematics;
- National Council of Supervisors of Mathematics;
- Classmate Math;

- North Carolina State University;
- Fayetteville University;
- Buncombe County Schools;
- University of Michigan;
- College of Charleston in Charleston;
- MetaMetrics Corporation;
- Horizon Research;
- Association of Mathematics Teacher Educators; and
- Neighborhood Math Place, Inc.

Massachusetts Institute of Technology, Cambridge, MA -- The third meeting, which was held in Cambridge, Massachusetts, in September 2006, was an opportunity for the Panel to work in task groups, as well as hear invited testimony about the newly released National Council of Teachers of Mathematics' *Focal Points* report. The Panel also heard invited testimony from representatives of:

- Harcourt, Inc.;
- Houghton Mifflin Company;
- Pearson Education;
- McGraw-Hill Companies;
- National Science Foundation; and
- Academic Competitiveness Council.

The Panel heard public comment from concerned parents, teachers, and representatives of the following organizations:

- North Middlesex Regional School District;
- Worcester State College;
- MIT;
- Consortium for Mathematics and its Applications;
- Education Development Center;
- Adult Numeracy Network;
- Teachers College at Columbia University;
- Boston Public Schools;
- University of the District of Columbia;
- University of Chicago;
- City College of New York;
- National Center for Learning Disabilities;
- Association of Teachers of Mathematics in Massachusetts; and
- Association of Teachers of Mathematics in New England.

Stanford University, Palo Alto, CA -- The fourth meeting, which was held in Palo Alto, California, in November 2006, included task group work sessions and was an opportunity for the Panel to hear about U.S. students' readiness for college-level mathematics. Invited testimony consisted of experts from the College Board and ACT, and researchers who shared information from the Trends in International Mathematics and Science Study (TIMSS) and National Assessment of Educational Progress (NAEP). Additional testimony from the following groups covered the role of instructional technology, including calculators, and research and instructional practices:

- Software & Information Industry Association;
- Texas Instruments, Inc.;
- Empirical Education, Inc.;
- Carnegie Learning;
- MIND Institute;
- SRI International; and
- Researchers from the University of Arizona and the University of Delaware.

The Panel heard public comments from software companies, parents, and educators from the following organizations:

- National Education Association;
- Palo Alto Unified School District;
- Key Curriculum Press;
- Mathematically Correct;
- APREMAT, USA;
- Art of Problem Solving, Inc.;
- MathScore;
- Curriculum Development and Supplemental Materials Commission; and
- Interactive Mathematics Program.

Xavier University of Louisiana, New Orleans, LA -- The fifth meeting, which was held in New Orleans, Louisiana, in January 2007, was largely focused on task group work sessions in preparation for the Preliminary Report and continued progress on each task group's research questions.

A public comment session was held, and testimony was heard from representatives of:

- U.S. Metric Association, Inc.;
- Plato Learning; and
- Researchers from Louisiana State University, University of Minnesota, and University of Maryland.

The Preliminary Report was discussed and adopted by the Panel as a whole at the conclusion of the session.

To find more in-depth summaries and the transcripts of these meetings, please visit:

<http://www.ed.gov/about/bdscomm/list/mathpanel/meetings.html>.