U.S. DEPARTMENT OF EDUCATION
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NATIONAL MATHEMATICS ADVISORY PANEL MEETING
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WEDNESDAY,
JUNE 28, 2006
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SUMMARY
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KENAN CENTER, UNIVERSITY OF NORTH CAROLINA
CHAPEL HILL, NORTH CAROLINA
9:00 AM
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PANEL AND EX OFFICIO MEMBERS PRESENT:

LARRY R. FAULKNER	Chair
CAMILLA BENBOW	Vice Chair
DEBORAH LOEWENBERG BALL	Member
A. WADE BOYKIN	Member
FRANCIS FENNELL	Member
DAVID GEARY	Member
RUSSELL GERSTEN	Member
TOM LOVELESS	Member
LIPING MA	Member
VALERIE REYNA	Member
WILFRIED SCHMID	Member
ROBERT SIEGLER (PRESENT VIA CONFERENCE PHONE)	Member
SANDRA STOTSKY	Member
VERN WILLIAMS	Member
HUNG-HSI WU	Member
DAN BERCH (PRESENT VIA CONFERENCE PHONE)	Ex Officio Member
DIANE JONES	Ex Officio Member
GROVER WHITEHURST	Ex Officio Member

PANEL AND EX OFFICIO MEMBERS NOT PRESENT:

NANCY ICHINAGA	Member
JIM SIMONS	Member
TOM LUCE	Ex Officio Member
KATHIE OLSEN	Ex Officio Member
RAY SIMON	Ex Officio Member

STAFF MEMBERS PRESENT:

TYRRELL FLAWN	Executive Director
DIANE MCCAULEY	
IDA EBLINGER KELLEY	
JENNIFER GRABAN	
ALYSON KNAPP	

SESSION 1

PANEL DISCUSSION: STANDARDS OF EVIDENCE

Dr. Faulkner stated that the President's Executive Order calls for the Panel to address the results of research related to effectiveness of evidence-based mathematics instruction and to marshal the best available scientific evidence. To begin to address the question of standards of evidence, he suggested that, at the very least, the Panel make sure that any assertions made have citations associated with them. A Subcommittee on Standards of Evidence has been put together to establish more specific criteria for evidence. Valerie Reyna will chair the Subcommittee. The other members are Wade Boykin, Russ Whitehurst, and Camilla Benbow.

Dr. Benbow expressed her hope the Panel will be driven by evidence, rather than by politics. She hopes they can also agree upon some general standards for the use of evidence.

Dr. Reyna stressed the importance of developing a hierarchy of evidence, which will help provide a distinction between what is classified as high quality scientific evidence and what is merely promising or suggestive as a subject for future research. She also said the Panel must consider whether the designs of their studies are appropriate to the types of inferences the Panel wants to make. The Panel must also take sample size into consideration and ensure that dependent measures are reliable, valid, and sensitive. Interventions must be conducted long enough to show an effect. Although not absolutely conclusive, the results of smaller scale studies may be suggestive and worthy of further investigation.

Dr. Boykin said the Panel should adhere to conventional principles for good research methodology, such as reliability, internal validity, and external validity. Under reliability is included the replication of findings, as well as internal reliability of measures, observations, and other data gathering tools. With regard to internal validity, the Panel needs to determine whether the outcomes obtained are the results of the programs deployed. With regard to external validity, the Panel needs to determine whether the results obtained through tightly controlled experiments apply to the real world complexities of classrooms. They must keep in mind that evidence is not always absolute and can be applied appropriately or inappropriately under different circumstances. They need to focus on evidence of math learning, math performance, and achievement outcomes in math, as well as process outcomes, such as task engagement, persistence, efficacy, motivation, effort, and attention. They must then use this evidence to achieve their goals of enhancing math learning and math achievement. They must also work to eliminate the achievement gaps that exist between certain groups in schooling populations.

Mr. Whitehurst pointed out that the President's charge to the Panel requires them to provide recommendations even in the absence of strong evidence. Thus, he stressed the importance of developing a hierarchy of evidence. This will allow them to consider a wide range of evidence, which will in turn allow recommendations based on the strongest evidence available. It will also help the Panel to be clear about the quality of evidence being used. Dr. Faulkner concurred.

Moving into the discussion of the full Panel, Dr. Stotsky asked if the Panel would be able to create rationales to address questions that cannot be addressed through experimental evidence, such as the relationship between learning and the length of the school day or the school year. Dr. Reyna pointed out that other forms of evidence besides a randomized trial could be used to address these questions. Dr. Siegler asked if the Panel should be addressing issues such as school-year length and teacher pay, since these issues, although still relevant to math education, have more to do with broader social policies. Dr. Faulkner said that the Panel must attend to its

charge, first, and decide later on whether or not the Panel must address any broader social policy questions.

In response to Dr. Stotsky's question, Dr. Faulkner replied the Panel might make recommendations that are not based on evidence, as long as they make it clear that their recommendations are not based on evidence. Dr. Gersten commented that, although some interesting and important case-study research exists on the nature of math disabilities, there is not much for them to draw on at any of the upper tiers of the evidence hierarchy. Dr. Ball said that it is only during the last several decades that a serious treatment of the differences across disciplines has begun to be made. In order to draw a conclusion about mathematics instruction, one must first determine goals and methods of mathematics instruction. However, higher order goals cannot always be generalized out of these studies. Generalized ability in this field is treacherous, given that subject matter often doesn't figure in. Dr. Ball also stressed the need to consider what is being measured when the Panel examines conclusions, as well as the degree to which the models were specified for finding these conclusions. Dr. Wu said they should take mathematics education into account, and that the way in which fractions are taught is fundamentally flawed. Dr. Schmid said that, in order to fulfill the charge, the Panel must first determine what skills are necessary to succeed in algebra and advanced mathematics. Scientific evidence will not help the Panel to do this. Dr. Faulkner said that matters of definition do not require scientific evidence. Dr. Jones reminded everyone that there is some flexibility to the Executive Order, and that they may recommend that a body of research be developed in a particular area. Dr. Stotsky concurred, and said that it might be beneficial to look through the older bodies of research and to identify deficiencies and omissions within them. The Panel can then make recommendations for research in the areas that have not been sufficiently covered. Dr. Ball said that the Panel should ensure that relationships and correlations are valid. Russell Gersten, in an effort to address Dr. Ball's concern, suggested that the Panel utilize primary sources. Dr. Faulkner commented on the importance and difficulty of the Panel's charge. Although the Panel is not charged with making final decisions, it must recommend the best courses of action based on imperfect knowledge. For this reason, the Panel must be forthright in admitting the basis of its recommendations.

Dr. Faulkner continued on to say that the staff are working on a contract to get some help in searching the literature for the task groups. Both the task group chairs and the panel members need to review this contract. The goal is to complete the literature review in time for the Boston meeting. Dr. Wu reminded the group that the National Research Council has a panel that is looking at teacher preparation and that the National Math Panel should stay abreast of their work. Dr. Reyna said that it is important for the Panel to discuss the literature search criteria in advance, in order to make the criteria effective, explicit, and transparent. This will ensure that any application of the criteria will produce the same results.

Dr. Faulkner called the first session of the full Panel meeting to a close.

SESSION 2

Dr. Faulkner reported that Congress has not yet reached a decision on the Math Now Initiative. He reminded the Panel their preliminary report is due January 31st, 2007, and a final report is due by February 28th, 2008.

REPORTS FROM THE TASK GROUP CHAIRS

TASK GROUP ON CONCEPTUAL KNOWLEDGE AND SKILLS: FRANCIS "SKIP" FENNELL

Francis Fennell, Wilfried Schmid, Liping Ma, and Larry Faulkner are the members of the Conceptual Knowledge and Skills Task Group. Dr. Fennell said the goal of this task group is to suggest critical concepts and skills that are necessary to learning algebra. The task group also made an attempt at defining algebra. To the task group on instructional practices, this task group would recommend consideration of the role of the calculator in teaching algebra. To the task group on learning, this group would recommend consideration of the learning of topics at particular levels of development. To the task group on teacher background, the task group on conceptual knowledge and skills would recommend consideration of the preparation of algebra teachers. This task group is examining several reports from the Curriculum Center Project, which analyzes learning expectations across state curricula. The task group is also looking at the Common Ground document published by the Mathematical Association of America. They will have access to information on the 19 states that have course-level expectations for high-school mathematics and will use this information to determine the commonality of expectations across the states. The task group will also be looking at curricula from other countries. They will examine a draft of the Curriculum Focal Points, a series of three major instruction-related documents published by the National Council of Teachers of Mathematics. Dr. Loveless asked if the task group would look at any historical documents to see how K-8 curricula have been defined in the past, or how algebra has been defined in the past. Dr. Fennell replied that they should certainly do this.

TASK GROUP ON LEARNING PROCESSES: DAVE GEARY

David Geary, Valerie Reyna, Wade Boykin, Daniel Berch and Robert Siegler are the members of the Learning Processes Task Group. One of the goals of this task group is to link the experimental work to some of the national surveys. The task group will begin by looking at some of the large-scale studies, and by getting data from the factor analyses. They will then cluster these items together to forge links with the experimental work. The literature review will include all articles that explicitly address diversity issues, such as race, ethnicity, gender, socioeconomic status, learning disabilities, and cultural background. Content domains will range from pre-k to algebra. Within each of these areas, the task group will attempt to develop an understanding of children's conceptual understanding domain, the procedural skills associated with it, skill acquisition in both of these domains, and factual knowledge. They will do reviews of pre-k and kindergarten spatial mathematics relationships. The task group may also look at elementary arithmetic, operations in base 10, fractions, and algebraic procedures and concepts. Other areas the task group may look into include probability, measurements, and ratios. They also hope to provide a tutorial on some general principles of learning, including the importance of memory in problem solving, and the mechanisms of learning transfer. In summary, the task group hopes to provide both general principles, as well as examples within the specific content areas by September.

Dr. Fennell said that his task group would frame information in their review on the labeling of different levels of mathematics, as well as on the ability of children to learn particular skills at particular times. Dr. Loveless asked Dr. Geary under what topic the role of practice and memorization will be included in the review. Dr. Geary replied that it would be included under the topic of automaticity.

TASK GROUP ON INSTRUCTIONAL PRACTICES: RUSSELL GERSTEN

Russell Gersten, Camilla Benbow, Vernon Williams, Thomas Loveless and Diane Jones are members of the Instructional Practices task group. Dr. Gersten said his task group should coordinate with the task group on conceptual knowledge and skills. As the instructional practices task group does its work, it plans to use the list of criteria mentioned earlier in the day. In terms of curricula, the task group plans to use the National Research Council's book on evaluating curricula, which declares that there is no evidence to support the use of any particular curriculum. The What Works Clearinghouse is currently reviewing studies in both elementary- and middle-school math curricula, which may be relevant to the Panel's charge. Thus, it is advisable the Panel share resources with the Clearinghouse. Another source that the task group has agreed to use is the meta-analysis on instructional methods for students with learning disabilities. This may be used in several different ways. First, the task group may use it as a framework for looking at instruction in general, including areas that are left out of special education research. The task group may also use some of the criteria mentioned earlier in the day to look more closely at the study in terms of some relevant details. In addition, they hope to use information on how children function with whole numbers and basic arithmetic to find evidence on how to teach children who are struggling with fractions and proportions. In doing so, the task group plans to use such books as *Adding It Up* and *Learning and Understanding* as guiding frameworks. The task group may also look at the evaluation of the systematic Study of School Improvement (SSI), as well as the Promising Practices Initiative (PPI) studies. This brings up the resource issue of whether or not there is any evidence to support the effectiveness of tutoring programs that might inform the Department in terms of No Child Left Behind. In terms of the practice area, they have many meta-analyses that look at the whole population in terms of acceleration and skipping. These use whatever research is available on grouping and peer-assisted learning strategies. The task group also hopes to explore the possibility of finding evidence on real-world problems. However, it may not be practical to ask the contractor to go through all of the experimental studies that have been made since 1985 dealing with aspects of practice. Another issue is how to deal with qualitative studies. The task group also wants to look at summaries in the Trends in International Mathematics and Science Study (TIMSS) of practices recorded at different schools, as well as the video analysis to see what its implications are for practice. In summary, Dr. Gersten said although they have made some progress towards determining future directions, the task group is still struggling with how to use the contractor to find resources.

Dr. Schmid asked if the task group is addressing the issues of calculator use and decimal tracking. Dr. Gersten replied they are tackling these issues. Dr. Boykin asked Dr. Gersten to what extent his task group had considered the connection between instructional practices and the actual learning processes that take place within the classrooms. Dr. Gersten replied that the integral relationship between instructional practices and learning had been implicit throughout the task group's discussion. Dr. Boykin said this indicates a convergence of the three task groups. Dr. Gersten said a determination must be made as to how the task groups can coordinate in a productive manner. He also stressed the importance of creating coherent materials for dissemination. Dr. Faulkner urged Dr. Gersten's task group to focus on a small number of important messages. Dr. Schmid commented that the choice of topics on which they focus should

be made by the Panel as a whole, rather than by Dr. Gersten's group alone. Dr. Stotsky asked if Dr. Gersten's task group would be looking at the research bases for the use of practical or real-world activities, reading and writing activities, and manipulatives in math classes. Dr. Gersten replied that all three of these topics are on their list for consideration. Dr. Ball asked how Dr. Gersten's group would make a distinction between means of instruction and goals. She also asked to what extent his task group is concerned with the limits of the evidentiary base, as well the content specificity of particular research bases. Dr. Gersten replied he is very concerned about the shortage of information on many topics, and that the Panel must be extremely cautious in making generalizations. Dr. Loveless said the confusion between means of instruction and goals brings them back to the fundamental question of what is meant by mathematics.

TASK GROUP ON TEACHERS: DEBORAH BALL

Deborah Ball, Nancy Ichinaga, James Simons, Sandra Stotsky, Hung-Hsi Wu and Grover "Russ" Whitehurst are members of the Teachers task group. Dr. Ball said the goal of her task group is to identify the range of definitions for "teacher," along with the various forms and levels of teacher knowledge and education. She then said she would outline seven recommendations that might be made by the task group. However, the scope of these recommendations is larger than what the task group is likely to take on. First, the task group may make a recommendation regarding the importance of teachers' mathematical knowledge, and its relationship to student gains. Second, the task group may make a recommendation regarding entry requirements for both undergraduate and graduate teacher-education programs. In order to do this, the task group would need to investigate what is known about the relationship between the sorts of evidence that have already been gathered, as well as what is known about the relationship between entry requirements and teachers' success in their professional preparation, and their subsequent success as teachers. Third, the task group may make a recommendation regarding both the mathematical content that teachers must teach, as well as the intersection of mathematical content knowledge and teaching. However, the members of the task group disagreed as to whether or not they should be attempting to make recommendations at all regarding curricula for teacher education. Fourth, the task group may make a recommendation regarding the research on the effectiveness of certified versus uncertified teachers. Fifth, the task group may make a recommendation regarding the relationship between the retention and tenure of teachers, and the ability of teachers to produce student achievement. Sixth, the task group may make a recommendation regarding the effectiveness of various types of professional development. Finally, the task group may make a recommendation regarding the relationship between student achievement and certification requirements for teachers. So far, the group has only looked into two or three of these seven areas to see what evidence exists. Dr. Ball concluded by saying the task group needs to determine how the Panel's report will differ from other reports that already exist on similar topics. Otherwise, there will be no purpose in fulfilling the charge.

Dr. Loveless pointed out that the Panel does not have enough time to conduct meta-analyses on all of the documents that will be taken into consideration, which means that they will be relying heavily on meta-analyses that have already been conducted. However, if the Panel relies on meta-analyses already conducted, the Panel will not be able to produce any new results. This is a problem that should be addressed. Dr. Gersten agreed with Dr. Ball that the Panel should produce a report that is different from the reports that are already in existence on similar topics. Dr. Boykin asked to what extent Dr. Ball's task group had considered the issue of the different forms of preparation required for elementary versus secondary teachers. Dr. Ball replied that more studies are currently being conducted on elementary teachers than on secondary

teachers, and that her task group had explored the possibility of making recommendations regarding different structures of elementary school teaching.

As a way to avoid repetition of previous studies, Dr. Stotsky recommended the Panel concentrate on addressing gaps or problems in the current research literature. Dr. Ma suggested if the Panel simply works towards its goal of preparing students to learn algebra, it could make a difference in the field. Dr. Jones added that, unlike other groups, the Panel is striving to reach conclusions based not merely on consensus, but on sound research. Dr. Faulkner said the Panel's report would be different from other reports not only because of its focus, but also because of its audience. Leaders who are in a position to act upon the report's recommendations have requested that it be developed, thus giving it greater potential for consequence. Dr. Loveless added that the report would also be different in that it would not make false claims about the quality of the evidence upon which it relies. Dr. Gersten said in order to have an impact, the Panel's report must be focused, compelling, and coherent. Dr. Siegler commented the Panel should develop key principles upon which recommendations can be made.

Mr. Williams asked Dr. Ball about the body of research that is available relating to alternative forms of teacher certification and suggested that no evidence beyond statistics is necessary to reach the conclusion that current certification is a major problem. Dr. Ball replied that research is available on teacher preparation and its relationship to teacher quality and student learning. Her task group will review this literature before making any recommendations.

Dr. Boykin asked if they should consider math intervention programs such as the Missouri Math Project as part of the charge, and if so, which task group should take this on. Dr. Gersten replied that his group would take these programs into consideration. Dr. Stotsky asked if the Panel's final report would include the visions of individuals that are not encompassed by the recommendations of the Panel as a whole. Dr. Faulkner replied that it would be best to avoid minority reports. Dr. Benbow ended the session by saying that, although it is too early for the Panel to know what messages are most important for it to deliver, this will probably become clear over time.

I certify the accuracy of these minutes.

Chair's Signature _____ Date _____

Vice Chair's Signature _____ Date _____

ADDENDUM: PUBLIC PARTICIPANTS

Last Name	First Name	Organization
Alsop	Danielle	Flemington/Raritan School District
Alsop	Linda	Flemington/Raritan School District
Bass	Hyman	University of Michigan
Baughman	Marcy	Pearson Education
Bourland	Lu Anne	Voyager Expanded Learning
Broadway	Everly	NC Department of Public Instruction
Burdick	Don	Metametrics Corp
Burg	Samantha	Metametrics Corp
Catlla	Anne	Association for Women in Mathematics
Ciason	Rebecca	Walter M. Williams High School
Crawford	Ann R., Dr.	Independent Consultant
Davis	C. E.	North Carolina Department of Public Instruction
Duckhorn	Patricia	Sacramento County Office of Education
Dunham	Alden	Carnegie Corporation of New York
Friel	Dr. Susan	UNC-Chapel Hill, School of Education
Frysinger	James R.	University/College of Charleston
Guckian	Lisa	James B. Hunt, Jr. Institute
Harter	Randy	Buncombe County Schools
Holoman, Ph.D.	Verna L.	The University of North Carolina
Humphrey	Florita	Independent
Humphrey	Kenneth	Independent
James	Thomas, Dr.	UNC Chapel Hill, School of Education
Jobrack	Beverlee	SRA/McGraw-Hill
Kimball	Robert	Independent
Klein	Rosemary	TODOS
Klein	Benjamin	Davidson College
Klimko	Jennifer	Metametrics Corp

Last Name	First Name	Organization
Knight	Genevieve	Fayettevile State University
Kohlberg	Gavi	Digi-Block, Inc.
Kulka	Richard	Abt Associates Inc.
Leiva, Ph.D.	Miriam A.	President, TODOS: Mathematics for All
Maggart	Mike	Classmate Math
Malloy, Ph.D.	Carol E.	University of North Carolina at Chapel Hill
Maynor	Johannah	Durham Public Schools/NCCU
Moeser	James	UNC Chapel Hill
Munn	Geraldine, Dr.	Fayetteville State University
Murray	Elizabeth	North Carolina Department of Public Instruction
Nantambu	Nana Anoa	Neighborhood Math Place, Inc.
Norwood	Karen	The Benjamin Banneker Association, Inc.
Pantula	Sastry G.	Department of Statistics, North Carolina State University
Pittock	Janet	Scholastic
Rachlin	Sid	The Association of Mathematics Teacher Educators
Rall	Ashley	Independent
Rowlett, Ph.D.	Russ	UNC Center for Mathematics and Science Education
Saxberg	Bror, M.D., Ph.D.	K12, Inc.
Schneider	Tuck	North Carolina State University
Singer	Michael	North Carolina State University
Slattery	Dennis	Pearson Prentice Hall
Sztajn	Paola	National Science Foundation
Weiss	Iris	Horizon Research, Inc.
Wilkinson	Bill	Harcourt Achieve
Young	Robert	North Carolina State University
Zimmer	Janie L.	NCSM