Raising the Professional Dialogue
Examining Current Research to Improve Student Learning
Welcome to the California Algebra Forum, a gathering focused on the research and discussions of the National Mathematics Panel. This forum is intended to further the research-based dialogue for increasing student achievement in mathematics, and on supporting success in algebra for all students.

Each participant, as part of a regional team, represents a range of perspectives that includes pre-K through higher education educators. Each of you will have a unique opportunity to hear from respected mathematics and education researchers, to interact with regional representatives from around the state, and to create a local and statewide network to become mathematics resources in your region.

Goals of the Forum

- To share knowledge of current research that supports success in algebra
- To develop a statewide network of technical assistance providers to increase local knowledge of the research pertinent to algebra content and instruction
- To share preliminary findings of the National Math Panel and to set the stage for the 2008 Algebra Forum

We want to thank you for the commitment you have made to this forum: attending pre-conference meetings, reading research, planning regional projects, preparing for post-conference events, and agreeing to share your learning throughout a two-year period with organizations, networks, schools and districts.

Through this statewide effort, we can enhance our expertise, increase our capacity to deliver statewide and regional support and shape a professional mathematics learning community that provides support for a clear, cohesive, and consistent vision for mathematics in California.

Sponsors

California Department of Education
Curriculum and Instruction Steering Committee of the California County Superintendents Educational Services Association
California Comprehensive Center at WestEd

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The California Comprehensive Center, a partnership of WestEd, American Institutes for Research, and Social Services of California, is part of the federal network of 16 Regional Comprehensive Centers.
# California Algebra Forum 2007

## Day 1 Schedule

**Tuesday, May 8, 2007**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>7:00 AM</td>
<td>Registration in Breezeway and Continental Breakfast in Foyer</td>
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<tr>
<td>8:00 AM</td>
<td><strong>Introductions</strong>&lt;br&gt;Joyce Wright, Sacramento County Office of Education&lt;br&gt;Fred Tempes, California Comprehensive Center at WestEd&lt;br&gt;Phil Lafontaine, California Department of Education&lt;br&gt;Video Welcome&lt;br&gt;Jack O’Connell, Superintendent of Public Instruction</td>
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<tr>
<td>8:15 AM</td>
<td><strong>Forum Overview and Goals</strong>&lt;br&gt;Linda Menvielle, Imperial County Office of Education&lt;br&gt;Cathy Carroll, California Comprehensive Center at WestEd</td>
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<tr>
<td>8:30 AM</td>
<td><strong>Practices Worthy of Attention in the Teaching of Algebra</strong>&lt;br&gt;Uri Triesman, University of Texas at Austin</td>
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### TOPIC 1: TEACHER KNOWLEDGE

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<th>Time</th>
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<tr>
<td>9:00 AM</td>
<td><strong>Mathematical Knowledge for Teaching Algebra: Recommendations, Research, and Relationship to Practice</strong>&lt;br&gt;M. Kathleen Heid, Pennsylvania State University&lt;br&gt;Break&lt;br&gt;<strong>What Does It Take to Know Mathematics Well Enough to Teach It?</strong>&lt;br&gt;Deborah Loewenberg Ball, The University of Michigan&lt;br&gt;Discussion – Each presentation will be followed by questions and open discussion</td>
</tr>
<tr>
<td>11:30 AM</td>
<td>Lunch in Presidio Ballroom</td>
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### TOPIC 2: INSTRUCTIONAL PRACTICES

<table>
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<th>Time</th>
<th>Event</th>
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<tr>
<td>1:00 PM</td>
<td><strong>Predicting Math Outcomes from Early Number Sense</strong>&lt;br&gt;Nancy C. Jordan, University of Delaware&lt;br&gt;<strong>What Does the Scientifically Based Research Really Say about Mathematics Instruction for Students with Learning Problems and RtI (Response to Intervention) Models?</strong>&lt;br&gt;Russell Gersten, Executive Director, Instructional Research Group&lt;br&gt;Break&lt;br&gt;<strong>Improving Students’ Flexibility in Algebra: The Benefits of Comparison</strong>&lt;br&gt;Jon Star, Michigan State University&lt;br&gt;Discussion</td>
</tr>
<tr>
<td>4:00 PM</td>
<td><strong>Regional Team Debrief and Meetings: Key Learnings and Critical Questions</strong></td>
</tr>
</tbody>
</table>
General sessions in Crystal Ballroom

7:00 – 8:00 AM  Registration in Breezeway and Continental Breakfast in Foyer

8:00 – 8:30 AM  Forum Day 1 and Day 2 Overviews and Regional Team Sharing
Linda Menvielle, Imperial County Office of Education
Cathy Carroll, California Comprehensive Center at WestEd

TOpic 3: Learning Processes

8:30 – 11:00 AM  Reading Interactions That Unnecessarily Hinder Algebra Learning and Assessment
Carl Lager, University of California, Santa Barbara
Break
When High-powered People Fail: Working Memory and “Choking Under Pressure” in Math
Sian Beilock, The University of Chicago
Discussion

11:00 – 12:30 PM  Lunch in Garden Ballroom

Topic 4: Conceptual Knowledge and Skills

12:30 – 3:00 PM  Algebraic Problem-Solving in Elementary Classrooms
Karen Fuson, Children’s Math Worlds Research Project
Break
A Focused PreK–8 Mathematics Curriculum to Support the Development of Concepts, Knowledge, and Skills for Preparation for Algebra
Janie F. Schielack, Texas A&M University
Break
Discussion

3:00 – 3:45 PM  Panel Conversation about Key Learnings and Critical Questions

3:45 – 4:00 PM  Next Steps, Online Community and Resources
Joyce Wright, Sacramento County Office of Education
Fred Tempes, California Comprehensive Center at WestEd
Phil Lafontaine, California Department of Education
Practices Worthy of Attention in the Teaching of Algebra  
*Uri Triesman*

This talk will focus on emerging district strategies for teaching algebra with a special emphasis on meeting the needs of disengaged youth, English Language Learners and special education students. The strategies to be presented surfaced through interviews with a large number of district mathematics leaders and have been vetted by a national panel of experts.

Mathematical Knowledge for Teaching Algebra: Recommendations, Research, and Relationship to Practice  
*M. Kathleen Heid*

As the study of algebra becomes an expectation and a right for all students, it has become increasingly important to identify the mathematical background that can best serve the algebra teacher in his/her work. Efforts to identify that knowledge include recommendations from learned societies, research on the effects of different configurations of mathematical backgrounds, and attempts to build frameworks for the mathematical knowledge of teachers. The Mid-Atlantic Center for Mathematics Teaching and Learning and the Center for Proficiency in Teaching are identifying the mathematics that secondary teachers need to know by looking first at the secondary mathematics classroom, constructing situations based on actual teaching events, and analyzing the opportunities teachers have to use mathematical knowledge in their teaching.

What Does It Take to Know Mathematics Well Enough to Teach It?  
*Deborah Loewenberg Ball*

Although most would agree that effective teaching requires subject matter knowledge, there have been many different propositions about the nature and extent of the mathematical knowledge needed to teach. What does it take to be “highly qualified” and what evidence is there for answering this question?

National Mathematics Panel Update  
*Russell Gersten and Deborah Loewenberg Ball*

Two members of the National Mathematics Panel will provide an update on the topics of instructional practices and teachers and teacher development.

Predicting Math Outcomes from Early Number Sense  
*Nancy C. Jordan*

Mathematics difficulties are widespread in the United States. The consequences of such difficulties are serious and can be felt into adulthood. This session will present key findings from a 4-year longitudinal study of children’s math difficulties. The number sense development of 411 children was examined in kindergarten and first grade. Children’s math achievement was assessed in first, second, and third grades. The number sense battery will be described and this session will show how components of number sense, such as number knowledge and the ability to transform number sets, are powerful early predictors of later math achievement and fluency. Implications for screening, early identification, and intervention will be highlighted.

What Does the Scientifically Based Research Really Say about Mathematics Instruction for Students with Learning Problems and RtI (Response to Intervention) Models?  
*Russell Gersten*

This session will provide results of a recently conducted meta-analysis on effective ways to teach students with difficulties in mathematics using only studies with valid experimental design. Pros and cons of using such an approach will be discussed. Implications for practice and dilemmas
facing mathematics teachers will be described. The presenter will also discuss implications for response-to-intervention approaches currently being advocated in special education.

**Improving Students’ Flexibility in Algebra: The Benefits of Comparison**

*Jon Star*

This session will focus on how students can learn to be flexible problem solvers in mathematics, particularly in algebra. Flexibility means that students should know several ways to approach algebra problems and be able to select the most appropriate or best way for any given problem. The session will focus on research and studies of various small-scale interventions improve students’ flexibility, particularly among middle school algebra learners.

**Reading Interactions That Unnecessarily Hinder Algebra Learning and Assessment**

*Carl Lager*

This interactive session will raise participant awareness of a critical, but usually underappreciated and poorly addressed component of algebra instruction, curricula, and assessment — language. Specific reading and writing strategies will be shared to meet the language needs of all students, but especially English learners.

**When High-powered People Fail: Working Memory and “Choking under Pressure” in Math**

*Sian Beilock*

For many people, the desire to perform their best in academics is high. Consequences for poor performance, especially in examinations, include poor evaluations by mentors, teachers, and peers; lost scholarships; and relinquished educational and employment opportunities. Why do poor performances occur in those very situations where individuals are set on doing their best? This talk will present work examining how one's knowledge and abilities in mathematics interact with social and emotional factors to impact performance in high-stakes situations. Implications of this work for mathematical education and assessment will be discussed.

**Algebraic Problem-Solving in Elementary Classrooms**

*Karen C. Fuson*

Reported here are crucial attributes of an algebraic approach to word problem solving in grades K through 5. This approach brings the word problem solving of U.S. students more in line with that of students in high-achieving countries and prepares students for formal algebra methods and dispositions. This approach was developed in the 15-year-long Children's Math Worlds (CMW) Research Project carried out in a wide range of classrooms. We report types and levels of solution methods for addition/subtraction and for multiplication/division word problems, discuss the centrality of math drawings and of Math Talk for meaning-making and for student solving and explaining, identify for each word problem type research-based mathematically-desirable and accessible numerical situation drawings that support problem analysis and solutions, exemplify and explain a Conceptual-Phase model of problem solving and teaching activities to support each phase, and outline a Learning Path Classroom Framework that identifies student learning paths, phases of teaching, and a Classroom Inquiry Zone that supports meaning-making.

**A Focused PreK–8 Mathematics Curriculum to Support the Development of Concepts, Knowledge, and Skills for Preparation for Algebra**

*Jane F. Schielack*

The National Council of Teachers of Mathematics has produced an example of a grade-by-grade mathematics curriculum built around three major focal points per year. The overarching goal of this focused curriculum is to prepare students for high school mathematics, particularly algebra. This presentation will provide some background as to the decision-making involved in the design of the NCTM Curriculum Focal Points and will highlight the connections of this project to the issues being considered by the Concepts/Knowledge/Skills Task Force of the National Math Panel.
Philip “Uri” Treisman, Ph.D.

Philip “Uri” Treisman is professor of mathematics and director of the Charles A Dana Center at the University of Texas at Austin. He chairs the Chancellor’s Advisory Panel for Mathematics in New York City and the advisory board of the Urban Mathematics Leadership Network. For his work in developing minority mathematicians and scientists, he was named a MacArthur Fellow (1992–1997). In 2006, he was named “Scientist of the Year” by the Harvard Foundation for his outstanding contributions to mathematics. In all his work, he advocates for equity and excellence in education.

M. Kathleen Heid, Ph.D.

M. Kathleen Heid is Distinguished Professor and Co-Professor-in-Charge of Mathematics Education at Pennsylvania State University. She is Co-PI for the Mid-Atlantic Center for Mathematics Teaching and Learning and Editor-Designate for Journal for Research in Mathematics Education. Her scholarship focuses on technology in mathematics education and mathematics for secondary mathematics teaching.

Deborah Loewenber Ball, Ph.D.

Deborah Loewenber Ball is Dean of the School of Education and William H. Payne Collegiate Professor at the University of Michigan. Ball’s work draws on her many years of experience as an elementary classroom teacher. Her research focuses on mathematics instruction, and on interventions designed to improve its quality and effectiveness.

Nancy C. Jordan, Ed.D.

Nancy C. Jordan is Professor of Education at the University of Delaware. She received her doctoral degree from the Harvard Graduate School of Education and completed a post-doctoral fellowship at the University of Chicago. Dr. Jordan is principal investigator of a 5-year longitudinal project on the development of mathematics difficulties, funded by NICHD. She is the author or co-author of many articles on math learning difficulties.

Russell Gersten, Ph.D.

Dr. Russell Gersten is executive director of RG Research Group, as well as professor emeritus in the College of Education at the University of Oregon. Dr. Gerston’s expertise includes evaluation methodology on ELLs, mathematics, and reading comprehension. He has extensive experience conducting randomized controlled trials, and currently serves on the National Math Panel and is a PI on two major national studies.

Jon Star, Ph.D.

Dr. Jon R. Star, currently at Michigan State University, and as of July, moving to Harvard University, is an educational psychologist who studies students’ learning of mathematics, particularly algebra. Before earning his Ph.D. in Education and Psychology at the University of Michigan, Star was a middle school and high school mathematics teacher for several years.
Carl A. Lager, Ph.D.

Carl A. Lager, Ph.D. is an assistant professor at the Gevirtz Graduate School of Education at the University of California at Santa Barbara. Within mathematics education, his research foci include identifying and addressing mathematics-language interactions to improve secondary mathematics instruction, curricula, and assessment for English learners (ELs). His research continues to be influenced by a range of related professional experiences. Those experiences include having taught teaching mathematics to middle and high school ELs in both English and Spanish; developing, facilitating, and evaluating pre-service and in-service mathematics education professional development projects focused on integrating academic English language development with algebraic instruction; and developing large-scale mathematics assessment policies and items that explicitly address language load and comply with No Child Left Behind Act mandates.

Sian L. Beilock, Ph.D.

Sian L. Beilock is an assistant professor in the Department of Psychology at The University of Chicago. She received a B.S. in Cognitive Science from the University of California, San Diego in 1997 and Ph.D.s in Psychology and Kinesiology from Michigan State University in 2003. Dr. Beilock’s work examines how individuals learn and perform complex skills (such as math) and why skill failure often ensues in demanding high-pressure or high-stakes testing environments. Dr. Beilock’s research is funded by the National Science Foundation and the U.S. Department of Education (Institute of Education Sciences) and she was recognized by the Chronicle of Higher Education as one of four “Rising Stars” across all academic disciplines in 2005.

Karen C. Fuson, Ph.D.

Professor Karen C. Fuson received her B.A. in mathematics from Oberlin College, taught high school math in Chicago, received a Ph.D. in mathematics teaching from the University of Chicago, and was on the faculty of Northwestern University for 27 years. Her research career has focused on how children learn mathematics and on developing materials and approaches to facilitate such learning. She directed the Children’s Math Worlds Research Project, which worked with classroom teachers in many different classroom settings, including many ELL classrooms, to develop a world-class research-based Kindergarten through Grade 5 program of teaching and learning published by Houghton Mifflin as Math Expressions. Professor Fuson was involved in two National Research Council reports: Adding It Up: Helping Children Learn Mathematics and How Students Learn: Mathematics in the Classroom. She also wrote the research summary chapter on whole number operations in the NCTM Research Companion to the Standards.

Jane F. Schielack, Ph.D.

Dr. Jane F. Schielack is a Professor and Associate Dean for Assessment and PreK–12 Education in the College of Science at Texas A&M University. She recently served as the chair of the writing group for the National Council of Teachers of Mathematics Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics: A Quest for Coherence.
CALIFORNIA ALGEBRA FORUM

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Examining Current Research to Improve Student Learning

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