

RESEARCH PRESESSION

(Final Program)

The 73rd Annual Meeting of the
National Council of Teachers of Mathematics

Tuesday-Thursday, 4-6 April 1995

Sheraton Hotel and Towers
Boston, MA

Sponsored by

Research Advisory Committee of the
National Council of Teachers of Mathematics

Special Interest Group for Research in Mathematics Education
of the American Educational Research Association

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Announcements

A registration fee of \$5.00 is requested to help defray expenses.

The Tuesday evening session and all Wednesday sessions will be held in the Sheraton Hotel. Consult the final NCTM Program for locations of the Thursday sessions.

Informal meetings may be held Wednesday afternoon in Beacon H.

To preserve the interactive nature of the pre-session, we remind each organizer/moderator to allow a minimum of 15 minutes per session for general discussion.

Acknowledgment

Sincere gratitude to Cathryn Speckman for her invaluable help in the preparation of this program.

Tuesday, 04 April 1995

7:30 - 9:00 p.m.

Republic B (Sheraton)

Welcome

Organizers: **Susan Jo Russell, TERC**
Chair, NCTM Research Advisory Committee

George W. Bright, UNC - Greensboro
Co-Chair, SIG/RME of AREA

The NCTM Standards Six Years Later: Where Are We With Mathematics Education Reform?
(Opening Plenary Address)

Moderator: **Mary Lindquist, Columbus College**

Panel: **Joan Ferrini-Mundy, University of New Hampshire**
Susan Jo Russell, TERC
William Tate, University of Wisconsin
Zalman Usiskan, University of Chicago
Glenda Lappan, Michigan State University

The panel will highlight issues about the progress of mathematics education reform in three areas: school change, curriculum reform, and equity. Within each area, the panelists will attempt to point to surprises — outcomes of the reform efforts that we may not have expected or to which we may not be paying enough attention. Following the panelists' opening remarks, the audience will consider these issues in small groups. Then the whole group will reconvene for an interaction between audience and panelists.

A reception will be held in Republic A (Sheraton) following this session.

Wednesday, 05 April 1995

(See center of program for Wednesday's Schedule)

8:30 - 12:00 noon

Beacon B (Sheraton)

Developing Theory of Mathematics Teaching

Chair: Deborah Loewenberg Ball, Michigan State University

Presenters: Martin Simon, Pennsylvania State University
Megan Franke, University of California at Los Angeles
Deborah Schifter, Educational Development Center
Les Steffe, University of Georgia
Jan de Lange, Freudenthal Institute of the Netherlands

This session will explore the need for and recent contributions to theory of mathematics teaching. Representing significant research programs, the panel members will launch a cutting-edge conversation that will include all those present.

8:30 - 12:00 noon

Beacon C (Sheraton)

Early Development of Algebraic Reasoning

Organizer/Presider: James Kaput, University of Massachusetts-Dartmouth

Presenters: Jack Smith, Michigan State University
Patrick Thompson, San Diego State University
Virginia Bastable, Mount Holyoke College
Henri Picciotto, University of California at Berkeley
Jere Confrey, Cornell University
Gail Burrill, University of Wisconsin at Madison

The symposium will address the research, development and policy implications of this enriched, widened and deepened sense of school algebra.

8:30 - 10:00 am

Beacon A (Sheraton)

Creating Effective Designs for Using Telecommunications in Inservice Mathematics Education

Organizer/Presenter: Margaret Honey, Education Development Center for Children and Technology, New York, NY

Presenters: Marvin Cohen, Bank Street College
Barbara Dubitsky, Bank Street College
Bob Spielvogel, Center for Children and Technology

This session will discuss design and development issues involved in the effective use of on-line networks as a tool for professional development in the teaching of mathematics.

8:30 - 10:00 am

Beacon D (Sheraton)

Mathematics as a Verb and Not a Noun

Organizer/Presenter: Dr. Claudia Glamatl, Northern Arizona University

Presenters: Dr. Marion Wieland, Greyhills High School
Ms. Mary Francis Begay, Greyhills High School

The research delves into the differences that have been discovered in the way Navajo students perceive certain mathematical relationships. Its findings present certain ramifications on the teaching, learning and assessment of mathematical knowledge.

8:30 - 10:00 am

Beacon E (Sheraton)

The Relevance of Authority to Conceptualizing Reform in Mathematics Education

Organizer/Presenter: Melvin R. (Skip) Wilson, University of Michigan

Presenters: Thomas J. Cooney, University of Georgia
Barry Shealy, State University of New York at Buffalo
Betty Hopkins, Edmonson Middle School
Lori Brinkerhoff, Edmonson Middle School
Michael Goldenberg, University of Michigan

Discussant: Paul Ernest, University of Exeter

Where should and does the authority to determine mathematical correctness lie? Presentations will present varying perspectives on the role of pedagogical authority in mathematics education reform. Teacher educators, researchers, and classroom teachers will discuss theoretical and practical implications of this issue.

8:30 - 10:00 am

Beacon F (Sheraton)

Evaluating Curriculum Development Efforts: Models, Issues, and Findings from Three NSF-Funded Projects

Organizer/Presenter: Diana V. Lambdin, Indiana University

Presenters: Glenda Lappan, Michigan State University
Mary Berle-Carman, TERC
Jan Mokros, TERC
Harold Schoen, University of Iowa
Christian Hirsch, Western Michigan University

Discussant: Norman Webb, University of Wisconsin at Madison

Principal investigators and evaluators from three NSF-funded multi-year curriculum development projects (one elementary, one middle-school, and one secondary) discuss issues faced and insights gained through conducting research for the purpose of project evaluation.

Mathematical Autobiographies: The Impact of Teachers' Early Experiences on Current Perceptions and Decisions**Organizer/Presider:** Patricia A. Brosnan, The Ohio State University**Presenters:** Jeffrey Smith, The Ohio State University
Diana Erchick, The Ohio State University
Gale Watson, West Liberty State College
Gayle Millsaps, The Ohio State University**Discussant:** Suzanne Damarin, The Ohio State University

Studies of K-12 teachers and preservice elementary teachers showed that early mathematics experiences perpetuated their disposition towards mathematics. Presenters will reveal how teachers' reflections on these early experiences have influenced their current practices and philosophies of teaching and learning.

Large Scale Professional Development for Teachers of Elementary School Mathematics: Research and Evaluation Issues**Organizer/Presenter:** Susan N. Friel, University of North Carolina Mathematics and Science Education Network**Presenters:** George Bright, University of North Carolina at Greensboro
William Bush, University of Kentucky
Rebecca Corwin, TERC

Report from NSF funded conference (11/94) that explored research-based knowledge related to professional development of teachers of elementary school mathematics. An overview of conference and resulting recommendations made to NSF will be provided. Open discussion of research and evaluation issues raised by recommendations will follow.

Exploring the Territory before Proof**Presider/Discussant:** Dan Chazan, Michigan State University**Organizer/Presenter:** Laurie Edwards, University of California at Santa Cruz**Presenters:** Carolyn Maher, Rutgers University
Gershon Harel, Purdue University

The session will highlight research which examines the nature of proof and the processes of learning, discovery and communication which occur prior to and apart from conventional, formal proof. The focus will be on students' own forms of argumentation and explanation, with work drawn from studies involving elementary, middle school and university-level students.

How are the NCTM Standards Documents Being Adapted in Classrooms?: Emerging Issues from Reform-Related Research**Chair:** Frank K. Lester, Jr., Indiana University**Organizer/Presenter:** Paola Sztajn, Indiana University/CNPq-Brazilian Government**Discussants:** Joan Ferrini-Mundy, University of New Hampshire
Sandra K. Wilcox, Michigan State University

Participants will analyze cases of elementary teachers, looking for social and ideological factors that shape the ways these teachers interpret and implement the Standards. The discussants will provide their visions of reform, and a debate will follow.

Multiple Perspectives on Assessment: The Relationship between Theory and Practice**Presider/Discussant:** Max Stephens, Victorian Ministry of Education**Organizer/Presenter:** David Clarke, University of Melbourne**Presenters:** Susanne Lajole, McGill University
Alan Schoenfeld, University of California at Berkeley
Martin van Rheeuwijk, Freudenthal Institute, University of Utrecht**Discussant:** Henk van der Kooij, Freudenthal Institute, University of Utrecht

The terms "Authentic Assessment", "Realistic Assessment", "Constructive Assessment" and "Balanced Assessment" can be identified with particular theoretical positions. Advocates of each position will explain and justify the theory underlying their perspective on assessment and use practical examples to illustrate the consequent approach.

Solving Ethical Dilemmas**Organizers/Presenter:** Judy Sowder, San Diego State University**Presenter:** Edward Silver, University of Pittsburgh

We are increasingly encountering ethical dilemmas associated with our research, particularly as we move from quantitative to more qualitative methods. After a brief introduction to moral positions that influence decisions, participants will discuss hypothetical but realistic dilemmas they might encounter.

Summary of Wednesday Sessions

8:30-10:00	10:30-noon	1:15-2:45	3:15-4:45
Beacon A Honey, Cohen, Dubitsky, Spielvogel <i>Creating Effective Designs for Using Telecommunications in Inservice Mathematics Education</i>	Friel, Bright, Bush, Corwin <i>Large Scale Professional Development for Teachers of Elementary School Mathematics</i>	Fleener, Ross Pourdavood, Roland Pourdavood <i>Learning Organizations in a Quantum Age</i>	Bradley, Cozzens, Kepner, Lesh, Long <i>National Science Foundation Trends and Directions</i>
Beacon B Ball, Simon, Franke, Schifter, Steffe, de Lange <i>Developing Theory of Mathematics Teaching</i>		Cooney, Lester, Members of the JRME Editorial Panel <i>Do We Need to Establish Explicit Standards for Research in Mathematics Education</i>	
Beacon C Kaput, Jack Smith, Thompson, Bastable, Picciotto, Confrey, Burrill <i>Early Development of Algebraic Reasoning</i>		Monk, Nemirovsky, Noble, Schliemann, Tierney, Wright <i>Graphing as a Symbolizing Medium in K-12 Algebra:</i>	
Beacon D Giamati, Weiland, Begay <i>Mathematics as a Verb and Not a Noun</i>	Chazan, Edwards, Maher, Harel <i>Exploring the Territory before Proof</i>	Clements, Sarama, Battista De Villiers <i>Unique Contributions of Computers to Learning and Teaching Geometry</i>	Whitman, Nohda, Hoffer, Lai, Isoda, Li <i>Using the van Hiele Theory and the NCTM Standards to Compare the Geometry</i>
Beacon E Wilson, Cooney, Shealy, Hopkins, Brinkerhoff, Goldenberg, Ernest <i>The Relevance of Authority to Conceptualizing Reform in Mathematics Education</i>	Lester, Sztajn, Ferrini-Mundy, Wilcox <i>How are the NCTM Standards Documents being Adapted in Classrooms?</i>	Webb, Kilpatrick, McLeod, Heck, Tate, Hancock, Mewborn, Schappelle, Millissinos, Stake <i>Critical Components of Reform Efforts in Mathematics Education</i>	Silver, Stein, Grover, Henningsen, Graham, Williams <i>Studying Instructional Practice in a National Reform Mathematics Project</i>
Beacon F Lamdin, Lappan, Berle-Carman, Mokros, Schoen, Hirsch, Webb <i>Evaluating Curriculum Development Efforts</i>	Stephens, Clarke, Lajoie, Schoenfeld, Reeuwijk, van der Kooij <i>Multiple Perspectives on Assessment</i>	Koch, Gordon, Kort, Neuberger, Samuelson, S. Smith, Souza, Taylor, C. Morrow, J. Morrow <i>Research Related to Gender Issues</i>	Hart, Allexaht-Snyder, Becker, Strutchens, Tate, Cuevas <i>Learning from Each Other: Research Perspectives on Equity in Mathematics</i>
Beacon G Brosnan, Jeffrey Smith, Erchick Watson, Millsaps, Damarin <i>Mathematical Autobiographies</i>	Sowder, Silver <i>Solving Ethical Dilemmas</i>	Ball, Thompson <i>To Tell or Not To Tell: Is That the Question</i>	Raymond, Hamersley, Masingila, Shelley, Saenz-Ludlow, Waldamuth <i>Collaborative Action Research in Two Mathematics Classrooms</i>
Beacon H OPEN FOR CONSULTATIONS THROUGHOUT THE DAY			

12:00 - 1:15 p.m.

Lunch

1:15 - 4:45 p.m.

Beacon B (Sheraton)

Do We Need to Establish Explicit Standards for Research in Mathematics Education?

- Moderator:** Thomas J. Cooney, University of Georgia
Presenter: Frank K. Lester, Jr., Indiana University
Discussants: Members of the JRME Editorial Panel

This session will consider the value of establishing explicit standards for research in mathematics education. Discussion will be stimulated by a paper prepared by the JRME Editorial Panel on criteria for judging research reports in mathematics education. The paper will be made available to SIG/RME members prior to the research pre-session.

1:15 - 4:45 p.m.

Beacon C (Sheraton)

Graphing as a Symbolizing Medium in K-12 Algebra: Teaching and Research Issues

- Organizer/Presenter:** Stephen Monk, University of Washington
Presenters: Ricardo Nemirovsky, TERC
 Tracy Noble, TERC
 Analucia Schlemann, Tufts University and TERC
 Cornelia Tierney, TERC
 Tracey Wright, TERC

Graphing, as a symbolizing medium, is central to algebra as a K-12 strand. We will present research documenting students' graphical resources, including their visual, kinesthetic, and narrative senses, and explore with the audience the implications of building mathematical understanding on such personal and expressive capabilities.

1:15 - 2:45 p.m.

Beacon A (Sheraton)

Learning Organizations in a Quantum Age: Are Mathematics Education Research Paradigms Adequate?

- Organizer/Presenter:** M. Jayne Fleener, University of Oklahoma
Facilitators: Ross Pourdavood, University of Oklahoma
 Roland Pourdavood, University of Oklahoma

Habermasian ways of knowing will be related to educational and scientific research approaches. Background information on dissipative structures, chaos theory and open-systems analysis will be offered, then participants will be invited to discuss in small groups mathematics education research paradigms.

1:15 - 2:45 p.m.

Beacon D (Sheraton)

Unique Contributions of Computers to Learning and Teaching Geometry: Multiple Perspectives

- Organizer/Presenter:** Douglas H. Clements, State University of New York at Buffalo
Presenters: Julie Sarama, State University of New York at Buffalo
 Michael T. Battista, Kent State University
 Michael DeVilliers, University of Durban -Westville

Are there certain functions computers can perform that other media cannot easily duplicate and that contribute to geometry learning? Researchers using different software environments will lead discussions of the issues involved in the educational application of their software.

1:15 - 2:45 p.m.

Beacon E (Sheraton)

Critical Components of Reform Efforts in Mathematics Education

- Organizer/Presenter:** Norman L. Webb, University of Wisconsin at Madison
Presenters: Jeremy Kilpatrick, University of Georgia
 Douglas McLeod, San Diego State University
 Daniel Heck, University of Wisconsin at Madison
 William Tate, University of Wisconsin at Madison
 Lynn Hancock, University of Georgia
 Denise Spangler Mewborn, University of Georgia
 Bonnie Schappelle, San Diego State University
 Melissa Mellissinos, San Diego State University
 Robert Stake, University of Illinois

The presenters will share findings about critical components of reform in mathematics education from three case studies. Participants will have an opportunity to discuss and react to these findings.

1:15 - 2:45 p.m.

Beacon F (Sheraton)

Research Related to Gender Issues: Theory and Practice

Organizer/Presider: Laura Coffin Koch, University of Minnesota

Presenters: Judy Gordon, Girls Count, Denver
Edle Kort, University of Rochester
Adele Neuberg, Falls Church Schools, Virginia
Stan Samuelson, Mount Holyoke College
Stephanie Smith, University of Wisconsin at Madison
Arna Souza, North Kitsap High School
Lyn Taylor, University of Colorado at Denver

Discussants: Charlene Morrow, Mount Holyoke College
Jim Morrow, Mount Holyoke College

This session is designed to involve participants and attendees in a discussion of the theoretical, methodological and practical frameworks related to research in gender issues. The group seeks to interface with other researchers and practitioners who run programs for young women and who are interested in the research questions related to these programs.

1:15 - 2:45 p.m.

Beacon G (Sheraton)

"Reflecting on Practice" Session: To Tell or Not To Tell: Is That the Question?

Organizer: Research Advisory Committee

Presider/Discussant: Deborah L. Ball, Michigan State University

Presenter: Patrick Thompson, San Diego State University

Pat Thompson will share a videotape of himself working with a student who had severe difficulty solving problems involving the concept of rate. Despite the current dogma which disdains didactic instruction, the videotape shows him doing a lot of "telling" while working with this student. Participants will analyze this students' thinking and Pat's moves as teacher. The appropriateness — or not — of telling will be a key pedagogical issue in the discussions. Deborah Ball will discuss the substance of the session and the format of "Reflecting on Practice" sessions.

3:15 - 4:45 p.m.

Beacon A (Sheraton)

National Science Foundation Trends and Directions

Presenter: John Bradley, National Science Foundation
Margaret Cozzens, National Science Foundation
Henry Kepner, National Science Foundation
Richard Lesh, National Science Foundation
Madeleine Long National Science Foundation

Representatives of the National Science Foundation will discuss trends and directions that are likely to take shape over the next few years at the Foundation. There will be an opportunity for members of the audience to ask questions.

3:15 - 4:45 p.m.

Beacon D (Sheraton)

Using the van Hiele Theory and the NCTM Standards to Compare the Geometry Curriculum, Instruction and Students in Japan and Hawaii

Organizer/Presider: Nancy Whitman, University of Hawaii at Manoa

Presenters: Nobuhiko Nohda, Univ. of Tsukuba Institute of Education
Alan Hoffer, University of California at Irvine

Discussants: Morris Lai, University of Hawaii at Manoa
Masami Isoda, Univ. of Tsukuba Institute of Education
Yeping Li, University of Pittsburgh

A discussion of cultural differences in the Japanese and Hawaiian geometry curriculum, teaching and student achievement using the NCTM Standards and Japanese Ministry of Education National Courses of Study and the van Hiele theory. The problems of cross-cultural studies will also be discussed.

3:15 - 4:45 p.m.

Beacon E (Sheraton)

Studying Instructional Practice in a National Reform Mathematics Project: Methods and Frameworks used in the QUASAR Project

Presider: Edward Silver, University of Pittsburgh

Organizer/Presenter: Mary Kay Stein, University of Pittsburgh

Presenters: Barbara Grover, University of Pittsburgh
Marjorie Henningsen, University of Pittsburgh

Discussants: Karen Graham, University of New Hampshire
Steve Williams, Brigham Young University

The methodology and frameworks that have been developed and used to guide the study and interpretation of classroom instruction within the QUASAR Project will be presented and discussed.

3:15 - 4:45 p.m.

Beacon F (Sheraton)

Learning from Each Other: Research Perspectives on Equity in Mathematics Teaching and Learning

Organizers/Panelists: Laurie E. Hart, University of Georgia
Martha Allestaht-Snyder, University of Georgia

Panel Members: Joanne Rossi Becker, San Jose State University
Marilyn Strutchens, University of Kentucky
William F. Tate, University of Wisconsin at Madison

Participants will address the question of how researchers who study gender and those who study issues of race, class, and ethnicity in mathematics education can learn from and serve as catalysts for one another.

3:15 - 4:45 p.m.

Beacon G (Sheraton)

Collaborative Action Research in Two Mathematics Classrooms

Organizer: Anne M. Raymond, Indiana State University

Presenters: Brad Hamersley, Honey Creek Middle School
Joanna O. Masingila, Syracuse University
Barbara Shelley, Westhill High School
Adalira Saenz-Ludlow, Purdue University
Cathy Waldamuth, Washington Elementary School

The session is about collaborative action research in mathematics classrooms. Two teams of university researchers and classroom teachers share their collaborative experiences in documenting changes made in each teacher's mathematics classroom.

Thursday, 06 April 1995

8:00 - 10:00 a.m.

TBA

Mathematics of Growth and Change: Algebra throughout the Grades (Research Extended Session: Admission by ticket only)

Presenter: Cornelia Tierney, TERC

This session is #2 in the NCTM program. It was arranged by the Research Pre-session organizers.

9:00 - 10:00 a.m.

TBA

Algebra K-12: Prospects and Problems

Presenter: Stephen Monk, University of Washington

This session is #37 in the NCTM program. It was arranged by the Research Advisory Committee, the Special Interest Group/Research in Mathematics Education, and the National Council of Supervisors of Mathematics.

