

INTERNATIONAL GROUP FOR THE PSYCHOLOGY OF MATHEMATICS EDUCATION



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**PROCEEDINGS OF THE 2003
JOINT MEETING OF PME AND PMENA
Volume 1**

**Editors
Neil A. Pateman
Barbara J. Dougherty
Joseph T. Zilliox**

**CRDG, College of Education,
University of Hawai'i**

*Proceedings of the 27th Conference of the International Group for the Psychology of
Mathematics Education held jointly with the 25th Conference of PME-NA*

Volume 1

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Table Of Contents: Volume 1

	Page
Welcome to PME27 & PMENA25	xv
Introduction	
The International Group for the Psychology of Mathematics Education	xix
Proceedings of previous PME conferences	xxi
The review process of PME27	xxiii
List of PME27 reviewers	xxv
Pacific Island Scholars	xxix
List of presenters' addresses & emails	xxxi
Plenary Lectures	1
<i>Studying And Capturing The Complexity Of Practice: The Case Of The Dance Of Agency</i> Boaler, Jo	3
<i>Voyaging from Theory to Practice in Teaching and Learning: A View from Hawai'i</i> Dougherty, Barbara & Joseph Zilliox	17
<i>The Dialectics between Theory and Practice: Theoretical Issues and Practice Aspects from an Early Algebra Project</i> Malara, Nicolina	31
<i>Probing Students' Understanding Of Variables Through Cognitive Conflict: Is The Concept Of A Variable So Difficult For Students To Understand</i> Fujii, Toshiakaira	47
Plenary Panel	67
<i>Teachers Who Navigate Between Their Research And Their Practice</i>	69
Novotná, Jarmila (Co-ordinator)	71
Lebethé, Agatha	77
Zack, Vicki	85
Rosen, Gershon	91
Research Forums	101
<i>RF1 Perceptuo-Motor Activity and Imagination in Mathematics Learning</i>	103
Nemiroskvy, Ricardo (Co-ordinator)	105
Arzarello, Fernando & Ornella Robutti	111
Chazan, Daniel, & Marty Schnepf	117
Borba, Marcelo (Co-ordinator) & Nilce Scheffer	121
Rasmussen, Chris & Ricardo Nemirovsky	127

Research Forums

RF2 Equity, Mathematics Learning and Technology

Vale, Colleen, Gilah Leder, & Helen Forgasz (Co-ordinators)	137
Forgasz, Helen	139
Keitel, Christine	145
Setati, Mamokgethi	149
Leder, Gilah	153
Kaiser, Gabriele	157
Vale, Colleen	161
Secada, Walter	165

Working Sessions

<i>WS1 Embodiment In Mathematics: Metaphor And Gesture</i>	173
Edwards, Laurie & Janete Bolite Frant	
<i>WS2 Exploring Alternative Interpretations Of Classroom Data</i>	174
Breen, Chris & Markku Hannula,	
<i>WS3 Models And Modeling Working Session</i>	175
Lesh, Richard, Helen Doerr, Lyn English, & Margret Hjalmarson	
<i>WS4 Researching The Teaching And Learning Of Mathematics In Multilingual Classrooms</i>	176
Barwell, Richard, Anjum Halai, & Mamokgethi Setati	
<i>WS5 Symbolic Cognition In Advanced Mathematics</i>	177
Hegedus, Stephen	
<i>WS6 The Complexity Of Learning To Reason Probabilistically</i>	178
Stohl, Hollylynne & James Tarr	
<i>WS7 The Design And Uses Of Curriculum Materials</i>	179
Li, Yeping	
<i>WS8 The Role Of Syntax And Technology In The Development Of Algebraic Reasoning In The Early Grades (K-8)</i>	180
Olive, John, Maria Blanto; & Jim Kaput	
<i>WS9 Understanding Learning Through Teaching In The Mathematics Classroom</i>	181
Cockburn, Anne & Fran Lopez-Real	
<i>WS10 Videopapers: An Emerging Way To Publish And Conduct Research And Classroom Analysis</i>	182
Cogan-Drew, Daniel & Ricardo Nemirovsky	

Discussion Groups

<i>DG1 Examining Theses</i>	185
Forgasz, Helen & Kathleen Hart (A Continuation From PME26)	
<i>DG2 Facilitating Conceptual Change In Mathematics</i>	186
Pehkonen, Erkki & Kaarina Merenluoto (A Continuation From PME26)	
<i>DG3 Fostering The Mathematical Thinking Of Young Children: Pre-K-2</i>	187
Hunting, Robert & Catherine Pearn	
<i>DG4 Integrated Mathematics And Science: Setting A Research Agenda</i>	188
Marongelle, Karen & Brian Keller	
<i>DG5 Integrating Equity And Complex Social Problems In Mathematics Teacher Education</i>	189
Mesa, Vilma	
<i>DG6 Research On Gender And Mathematics From Multiple Perspectives</i>	190
Becker, Joanne & Ferdinand Rivera	
<i>DG7 Semiotic And Socio-Cultural Evolution Of Mathematical Concepts</i>	191
Saenz-Ludlow, Adalira & Norma Presmeg	
<i>DG8 Stochastic Thinking, Learning And Teaching</i>	192
Shaughnessy, Michael & Jane Watson (A Continuation From PME26)	
<i>DG9 The Messy Work Of Studying Professional Development: The Conversation Continues</i>	193
Brown, Catherine, Rebecca McGraw & Fran Arbaugh	
<i>DG10 The Rise And Fall Of Mathematics Education Research</i>	194
Teppo, Anne	
<i>DG11 The Role Of Mathematics Education In Social Exclusion: Reviewing The Interface Between Psychological And Sociological Research Paradigms</i>	195
Gates, Peter, Tansy Hardy, Robyn Zevenbergen, Mike Askew, & Stephen Lerman	

Short Oral Communications 197

Alacaci, Cengiz, & Ana Pasztor	199
<i>Effects of Semantic Content on Logical Reasoning With Negation</i>	
Alcock, Lara & Adrian Simpson	200
<i>Logical Consequences Of Procedural Reasoning</i>	
Arvold, Bridget	201
<i>Taking, Playing, and Making the Role of Secondary Mathematics Teachers</i>	
Askew, Mike	202
<i>Mental Calculation: Interpretations And Implementation</i>	
Benken, Babette & Bridget Arvold	203
<i>Transforming Mathematics Teacher Education</i>	

Berman, Jeanette & Lorraine Graham	204
<i>Defining Students' Instructional Needs In Numeration Using Dynamic Assessment</i>	
Bezuidenhout, Jan	205
<i>How Can Students' Ability To Deal Effectually With Calculus Symbolism Be Enhanced?</i>	
Bezuk, Nadine & Jane Gawronski	206
<i>Increasing Content And Pedagogical Knowledge Of Practicing Elementary Teachers</i>	
Booker, George	207
<i>The Impact Of Teachers' Understanding Of Division On Students' Division Knowledge</i>	
Bragg, Leicha	208
<i>The Relationship Between Games, Learning, And Student Responses</i>	
Butto, Cristianne & Teresa Rojano	209
<i>Early Introduction To Algebraic Thinking: An Experience In The Elementary School</i>	
Chang, Ching-Kuch	210
<i>Designing Professional Development For In-Service Mathematics Teachers In Taiwan</i>	
Chung, Jing	211
<i>The Formation Of Discussion Culture In Mathematics Classrooms</i>	
Cranfield, Corvell George	212
<i>How Grade 12 Students Understand And Solve Geometric Problems</i>	
Droujkova, Maria	213
<i>The Role Of Metaphors In The Development Of Multiplicative Reasoning Of A Young Child</i>	
Ejersbo, Lisser	214
<i>Developing The Reflective Competencies Of The Mathematics Teacher</i>	
Engelbrecht, Johann	215
<i>The Impact of Web-Based Undergraduate Mathematics Teaching On Developing Academic Maturity</i>	
Figueras, Olimpia & Alicia Martinez Hernandez	216
<i>Construction Of Personal Symbol Systems</i>	
Francisco, John	217
<i>Students' Epistemological Ideas in Mathematics</i>	
Fried, Michael N.	218
<i>The Usefulness And Limitations Of The Notion Of Incommensurability In Analyzing 8th Grade Students' Understanding Of Algebra</i>	
Fuglestad, Anne Berit	219
<i>Developing Students' ICT Competence</i>	

Fujita, Taro	220
<i>Critical Review Of Geometry In Current Textbooks In Lower Secondary Schools In Japan And The UK</i>	
Gau, Tonya & Laurie Rubel	221
<i>Teacher Beliefs And Practices Regarding The Black-White Mathematics Achievement Gap</i>	
Gazit, Avikam	222
<i>Carpenter, Tractors And Microbes For Developing Mathematical Thinking: How Do 10th Grade Students & Preservice Teachers Solve Challenging Problems</i>	
Geeslin, William	223
<i>Exploring Fourth Grade Students' Probabilistic Reasoning In A Game Situation Based On Binomial Trials</i>	
Goodrow, Anne & Analucia D. Schliemann	224
<i>Linear Function Graphs And Multiplicative Reasoning In Elementary School</i>	
Gooya, Zahra	225
<i>Mathematics Teachers' View Of Teaching Geometry In Iran</i>	
Gordon, Lynn	226
<i>Parent Contributions To The Collective</i>	
Hart, Lynn	227
<i>The Voice Of The Student: Elementary Students' Beliefs And Self-Efficacy About Mathematics</i>	
Havill, Dale	228
<i>Arabic Students' Probability Judgments</i>	
Herbst, Patricio	229
<i>Enabling Students' Interaction With Diagrams While Making And Proving Reasoned Conjectures</i>	
Hollebrands, Karen	230
<i>Eighth Grade Students' Understandings Of Geometric Transformations In The Context Of A Dynamic Software Environment</i>	
Hsu, Eric & Megan Moore	231
<i>Online Teacher Communities: Measuring Engagement, Responsiveness And Refinement</i>	
Hsu, Hui-Yu	232
<i>An Experimental Study of the Effects of Portfolio Assessment and Paper-and-Pencil Test on Mathematical Concepts, Mathematical Communicating Capability, and Mathematical Learning Attitude</i>	
Hunting, Robert	233
<i>The Role Of Fingers In Pre-schoolers' Mathematical Problem Solving</i>	
Inoue, Noriyuki	234
<i>The Significance Of Interpretive Activity In Problem Solving: Less Is More As A Design Principle</i>	

Jakubowski, Elizabeth & Hasan Unal <i>A Critical Examination Of A Community College Mathematics Instructor's Beliefs And Practices</i>	235
Kaiser, Gabriele <i>Learning Mathematics Within The Context Of Linguistic And Cultural Diversity – An Empirical Study</i>	236
Kim, Ok-Kyeong <i>K-3 Teachers' Learning Of Questioning</i>	237
Klymchuk, Sergiy & Norbert Gruenwald <i>Investigating The Ways Of Reducing The Gap Between The School And University Mathematics--An International Study</i>	238
Koyama, Masataka <i>Research On The Process Of Understanding Mathematics: Ways Of Measuring Area Of Trapezoid</i>	239
Krupanandan, Daniel <i>Problem Solving The Challenge Facing South African Mathematics Teacher</i>	240
Kwon, Seok-II <i>A Historic-Genetic Approach To Teaching The Meaning of Proof</i>	241
Lerman, Stephen & GuoRong Xu <i>Developing Theories Of Mathematics Education Research: The PME Story</i>	242
Liu, Po-Hung <i>College Students' Views of Mathematics And Behavior</i>	243
Martin, Tami & Sharon Soucy McCrone <i>The Teaching and Learning of Geometric Proof: An Emerging Theory</i>	244
Müller, Helena & Dirk Wessels <i>Types & Levels Of Spatial Representation In The Data Tasks Of Grade 4-7Students</i>	245
Nickerson, Susan <i>Changing Instructional Practice And The Classroom Community</i>	246
Ogolla, Penina <i>Changing Teachers' Pedagogical Beliefs</i>	247
Patton, Barba <i>Strategies Used By A Beginning Middle-School Mathematics Teacher Seeking Certification</i>	248
Rider, Robin <i>The Effect Of Multi-Representational Methods On College Students' Success In Intermediate Algebra</i>	249
Scheffel, Tara-Lynn <i>Mathematics As An Aesthetic Experience</i>	250
Sjostrom, Mary Pat & Melfried Olson <i>Effects Of Measure Up On Area Conservation</i>	251
Solomon, Jesse <i>On Culture, Race And Being Explicit In Mathematics Teaching</i>	252

Son, Ji-Won	253
<i>The Usefulness Of Performance Assessment In Students' Understandings Of Fractions In Korea</i>	
Stohl, Hollylynne	254
<i>Prospective Teachers' Development In Teaching With Technology</i>	
Thompson, Ian	255
<i>An Investigation Of The Relationship Between Young Children's Understanding Of The Concept Of Place Value And Their Competence At Mental Addition</i>	
Tirosh, Chaim	256
<i>Prospective Teachers' Knowledge Of Proofs And Refutations</i>	
Tosmur, Nermin, & Behiye Ubuz	257
<i>Professional Engineer's View On University Mathematics And Mathematics Education</i>	
Bazzini, Luciana	258
<i>Students' Solutions To Similarly Structured Inequalities</i>	
Turner-Harrison, Robyn	259
<i>Self Concept & Participation In Mathematics</i>	
Tzekaki, Marianna, Maria Kaldrimidou & Haralambos Sakonidis	260
<i>A Typology Of Teachers' Interventions In Students' Mathematical Work In The Classroom</i>	
Uptegrove, Elizabeth	261
<i>Understanding Pascal's Triangle</i>	
Whitman, Nancy	262
<i>What = Means</i>	
Winbourne, Peter	263
<i>Tracking Beginning Teachers' Developing Expertise Within The Practice Of Primary School Mathematics Teaching</i>	
Yevdokimov, Oleksiy	264
<i>Intuitive Proofs As A Tool For Development Of Student's Creative Abilities While Solving And Proving</i>	
Young-Loveridge, Jennifer	265
<i>Becoming A Part-Whole Thinker: The New Zealand Early Numeracy Project</i>	
Poster Sessions	
Alacaci, Cengiz & Scott Lewis, George O'Brien & Zhongdong Jiang	269
<i>Assessing Graph Sense In Authentic Settings: Preservice Elementary Teachers' Ability To Choose Appropriate Graphs To Represent Data</i>	
Watson, Anne	270
<i>Improving Student Teachers' Understanding Of Multiplication By Two-Digit Numbers</i>	
Augafa, Magdalene & Nancy Lane	271
<i>Ethnomathematics Digital Library</i>	

Barwell, Richard & Mamokgethi Setati	272
<i>Multilingual Contexts And The Teaching And Learning Of Mathematics: A Dialogue</i>	
Becker, Joanne Rossi	273
<i>Effects Of Problem Posing Instruction</i>	
Beckmann Kazez, Sybilla	274
<i>Helping Prospective Elementary Teachers Learn The Algebra In Mental Math Strategies</i>	
Benken, Babette	275
<i>Investigating The Complex Nature Of Mathematics Teaching: The Role Of Beginning Teachers' Perceptions In Their Practice</i>	
Bikner-Ahsbabs, Angelika	276
<i>Insight Into A Theory About Interest-Dense Situations In Maths Classes</i>	
Choi-Koh, Sang Sook	277
<i>Students' Development In Exploration Using A Hand-Held Calculator</i>	
Choi-Koh, Sang Sook & Hokyung Koh	278
<i>The Development Of The Checklists For Evaluating Students' Linguistic Interaction With Their Technology-Based Learning Of Mathematics</i>	
Chval, Kathryn	279
<i>Calculator Keystrokes: Tools For Thought And Communication</i>	
Ciancetta, Matthew, Michael Shaughnessy & Daniel Canada	280
<i>Middle School Students' Emerging Definitions Of Variability</i>	
Contreras, Jose	281
<i>Pre-Service Elementary Teachers' Use Of Contextual Knowledge When Solving Problematic Word Problems</i>	
de Mendicuti, Teresa Navarro, Yolanda Campos Campos & Gloria Y. Velasco,	282
<i>Mathematical Didactic Strategies Supported By Technology</i>	
Droujkova, Maria & Sarah B. Berenson	283
<i>Software Design As A Method Of Accessing Students' Understanding</i>	
Ferreira, Rosa Antonia	284
<i>Improving mathematics written tests: Impact of research on student teachers' conceptions</i>	
Fitzgerald, Shawn	285
<i>The Effects Of Different Instructional Methods On Statistics Achievement: A Meta-Analysis</i>	
Fulmer, James	286
<i>Evaluating the Implementation of Technology Standards in Mathematics Education Courses</i>	
Gagatsis, Athanasios, Eliada Elia & Leonidas Kyriakides	287
<i>The Nature Of Multiple Representations In Developing Mathematical Relationships</i>	

Geoghegan, Noel & Ann Reynolds	288
<i>Learning Mathematics: Systems Theory As A Guide To Practise</i>	
Glass, Barbara	289
<i>Towers, Pizza, And Pascal: Students Connecting Mathematical Ideas</i>	
Graham, Lorraine, John Pegg & Anne Bellert	290
<i>An Exploration Of The Effect Of Improved Automaticity And Retrieval Of Basic Number Facts On Middle-School Students' Higher-Order Problem-Solving Performance</i>	
Gusev, Valery & Ildar S. Safuanov	291
<i>The Structure Of Mathematical Abilities</i>	
Hanan, Innabi	292
<i>Empowering Mathematics in the Arab World: Educators' responsibility</i>	
Hegedus, Stephen & James J. Kaput	293
<i>Exciting New Opportunities To Make Mathematics An Expressive Classroom Activity Using Newly Emerging Connectivity Technology</i>	
Jakubowski, Elizabeth & Hasan Unal	294
<i>Motivational Challenges In Large Lecture Classroom: Perceptions And Practices</i>	
Jirotkova, Darina & Nada Stehlikova	295
<i>Constructivist Approaches In The Mathematical Education Of Future Teachers</i>	
Ju, Mi-Kyung, Jung-Sook Park Oh-Nam Kwon, Kyung-Hee Shin & Kyoung-Hee Cho	296
<i>Gesture In The Context Of Mathematical Argumentation</i>	
Kelleher, Heather & Cynthia Nicol	297
<i>Learning To Learn From Students: Teacher Learning In The British Columbia Early Numeracy Project</i>	
Koirala, Hari	298
<i>Student Created Mathmagic And Their Relationship To School Algebra</i>	
Krainer, Konrad	299
<i>Students As Teachers, Teachers As Researchers</i>	
Kwon, Oh-Nam, Kyoung-Hee Cho, Mi-Kyung Ju, Kyung-Hee Shin & Jung-Sook Park	300
<i>Students' Conceptual Understanding And Attitudes In RME-Based Differential Equations Class</i>	
Leu, Yuh-Chyn	301
<i>Investigation of the Elementary School Teachers' Knowledge And Beliefs In Mathematics Teaching From A Question Containing Extraneous Information</i>	
Martinez-Cruz, Armando & Jose N. Contreras	302
<i>How To Pose It: An Empirical Validation Of A Problem-Posing Model</i>	
Mashiach-Eizenberg, Michal	303
<i>Inter-Relations Between Control Processes And Successful Solutions Of Combinatorial Problems</i>	
McGraw, Rebecca	304
<i>The Process Of Facilitating Mathematics Discussions</i>	

Mgombelo, Joyce & Florence Glanfield <i>Using Manipulatives As Generative Mechanisms For Explaining Mathematics Phenomena</i>	305
Moseley, Bryan & Charles Bleiker <i>Pre-Service Early Childhood Teacher's Representations of Quantity Relations: The Role of Math Mediated Language</i>	306
Ninomiya, Hiro <i>How To Summarize What We've Learned: Two Types Of Summary In Mathematics Learning</i>	307
Novotná, Jarmila & Jana Kratochvilova <i>Influence Of The Procedural (Process) And Conceptual (Gestalt) Word Problem Assignment On The Choice Of The Solving Strategy</i>	308
Olson, Judith, Fay Zenigami, Linda Venenciano & Melfried Olson <i>An Overview of Measure Up: Algebraic Thinking Through Measurement</i>	309
Owens, Kay Dianne, Rex Matang & Wilfred Kaleva <i>Ethnomathematics In Papua New Guinea: Practice, Challenges and Opportunites for Research</i>	310
Pasztor, Ana, (Presented by Alacaci, Cengiz) <i>Making Sense (Literally!) Of Students' Mathematics Experience</i>	311
Patacsil, Peter <i>Using Ethnomathematics To Enhance Elementary Classroom Teaching In Guam</i>	312
Pegg, John, Lorraine Graham, Howard Doran & Anne Bellert <i>An Analysis Of Long-Term Effects Of An Intervention Program Designed To Enhance Basic Numeracy Skills For Low-Achieving Middle-School Students</i>	313
Pehkonen, Erkki, Hanna Maijala, Markku Hannula & Riitta Soro, <i>Understanding And Self-Confidence In Mathematics</i>	314
Person, Axelle, Michelle P. Longest, Sarah B. Berenson, Joan J. Michael & Mladen A. Vouk <i>Relationship Between Proportional Reasoning And Achievement for Early Adolescent Girls</i>	315
Peter-Koop, Andrea <i>Open Real-World Problems In The Primary Classroom: Investigating Pupils' Interactive Modelling Processes</i>	316
Piatek-Jimenez, Katrina <i>Undergraduate Students' Beliefs and Misconceptions About Proof</i>	317
Rhine, Steve <i>Considerations Of Veteran Mathematics Teachers As They Prepare Their Lessons</i>	318
Richardson, Sandra <i>A Design of Useful Implementation Principles for the Diffusion of Knowledge In the Mathematics Classroom</i>	319
Rosu, Luisa <i>Learning From Ancient People...</i>	320

Rosu, Luisa & Bridget Arvold <i>Questioning In Action, An Inherent Attribute Of Teaching Mathematics In The Future</i>	321
Sacristan, Ana Isabel <i>Implementing Computer Programming Activities For Mathematical Learning In Mexican Schools</i>	322
Satianov, Pavel & Miriam Dagan <i>One Problem - Ten Models And Cumulative Cognitive Affect</i>	323
Soares, Maria Tereza Carneiro <i>Oral And Written Practice At Initial Teaching Mathematics: Teachers' Knowledge And The Creation Of Didactic Situations</i>	324
Stohl, Hollylynne & Robin L. Rider <i>Is This Die Fair? An Analysis Of Students' Technology-Based Exploration</i>	325
Sztajn, Paola <i>Developing A Mathematics Education Community In An Elementary School</i>	326
Tsai , Wen-Huan <i>Supporting Teachers In Building Classroom Discourse Centered On Mathematics</i>	327
Ubuz, Behiye & Isil Ustun <i>Figural And Conceptual Aspects In Identifying Polygons</i>	328
Unal, Hasan & Eric Jakubowski <i>A Technology Tool To Support Teachers In Motivational Dimension Of Math Lessons</i>	329
Wallace, Michelle <i>Mathematics and Physics: A Shared Language</i>	330
Warner, Lisa & Daniel Ilaria <i>The Interplay Between Teacher Questions And Flexible Mathematical Thought</i>	331
Webster, Pamela <i>Developmental Mathematics Course Interventions And The Texas Academic Skills Program Test</i>	332
Wessels, Dirk & Helena Müller <i>Data Arrangement Types Of 10-12 Year Old Students</i>	333
Wilson, Melvin (Skip) & Laura Jacobsen Spielman <i>Secondary Teachers' Conceptions of Graph Theory and Functions: Implications for Teaching</i>	334
Yoon, Caroline <i>Student-Controlled Factors Enhancing Creative Mathematical Problem Solving</i>	335
Kirshner, David & James Madden <i>Mathematics for Future Secondary Teachers</i>	336
Research Report	337
Owens, Kay Diane <i>Facilitating the Teaching of Space Mathematics: An Evaluation</i>	339

AUTHOR INDEX ALL VOLUMES

Volume 1	347
Volume 2	351
Volume 3	353
Volume 4	355

WELCOME TO PME27 AND PMENA25

It has been over ten years since it was possible to welcome members of both PME and PMENA to a Joint Annual Conference of the International Group for the Psychology of Mathematics Education. The local organizing committee is therefore doubly pleased to offer a very warm aloha to members of both groups, and to assure you all that the spirit of friendship and grace that is characteristic of the Pacific Islands will embrace everyone during the Conference. We extend a special welcome to the Pacific Island Scholars who are attending for the first time in the history of PME.

When we offered to host the joint meeting, we had no idea of the amount of work that would be involved. As the starting date of the Conference approaches, we can reflect back on that work, and with deep appreciation express thanks to many people who assisted us in the preparations for the Conference.

The Program Committee, listed below, spent two very intense weekends, one in late January and one in late March, matching reviewers to papers and then making the difficult final selection of research papers, short orals and posters for the conference.

Dr. A. J. (Sandy) Dawson (PREL), Chair	Dr. Judy Olson (Western Illinois Univ.)
Dr. Barbara Dougherty (UH)	Dr. Melfried Olson (Western Illinois Univ.)
Dr. Janete Bolite Frant (Brazil)	Dr. Neil Pateman (UH)
Dr. Anne Berit Fuglestad (Norway)	Dr. Mary Pat Sjostrom (UH)
Dr. Rina Hershkowitz (Israel)	Dr. Hannah Slovin (UH)
Dr. Marit Johnsen Høines (Norway)	Dr. Catherine Sophian, (UH)
Dr. Masataka Koyama (Japan)	Dr. Judith Sowder (San Diego State Univ.)
Dr. Julie Kaomea (UH)	Dr. Joseph Zilliox (UH)

The academic quality of the conference rests in the hands of the many colleagues who reviewed proposals for the Program Committee. They and the Program Committee did an outstanding job of maintaining the high standards established previously.

The local organizing committee, chaired by Sandy Dawson, and composed of Barbara Dougherty, Neil Pateman, Yvonne Yamashita, and Joe Zilliox, with Sandra Dawson and Glen Schmitt handling 'Ohana arrangements, spent countless hours attending to the details of conference registration, accommodation, and the multitude of details required to launch the conference. They have done a remarkable job.

Neil Pateman developed an exceptional academic database for the conference. Pam Ishii was extremely diligent in her work of maintaining this database and cataloging and managing the vast number of proposals that were submitted to the Conference. Neil also spent endless hours editing accepted proposals so that they matched Conference guidelines thereby generating a set of Proceedings that look as scholarly and professional as possible.

The Conference is co-hosted by Pacific Resources for Education and Learning (PREL) and the College of Education of the University of Hawai'i (UH). Both organizations have been unstinting in their support of the Conference for which we give our heartfelt thanks, and in particular we wish to acknowledge Dr. Tom Barlow, CEO of PREL, and Dr. Randy Hitz, Dean of the College of Education.

More formally, we would like to thank the following for their generous support:

- The National Science Foundation (ESI-0209393) for its support in bringing the Pacific Island Scholars to PME27/PMENA25. The Pacific Island Scholars are twenty-seven mathematics educators from across the Pacific region served by PREL, three each from American Samoa, the Republic of Palau, the Commonwealth of the Northern Mariana Islands (CNMI), Guam, the Republic of the Marshall Islands (RMI), and the Federated States of Micronesia which includes the states of Chuuk, Kosrae, Pohnpei, and Yap;
- Pacific Resources for Education and Learning (PREL) for supplying the conference bags and program;
- The Eisenhower Pacific Regional Mathematics/Science Consortium for assistance with local transportation arrangements, support for the conference volunteers, and providing poster board materials for the Pacific Island Scholars;
- The Office of the Chancellor of the University of Hawai'i for financial and administrative support to the Conference;
- The University of Hawai'i Conference Center for the administration of Conference registration and accommodation services;
- The College of Education for providing secretarial and equipment support in the preparation of Conference materials;
- The Curriculum Research and Development Group of the College of Education provided generous support in the printing of the Proceedings;
- Maile Beamer Loo and her H_lau Hula 'O Kaho'oilina Aloha for performing Kaliko Beamer-Trapp's chant and introducing the international PME community to the beauty and intricacies Hawaiian hula;
- Dr. Kerri-Ann Hewett for arranging to hold the Opening Plenary and Reception at the Kawaiaha'o Church;
- Outrigger Hotels International for providing the incredibly economical hotels rates that enabled so many participants to attend the Conference;
- Hawai'i Convention Center for providing the use of its facilities at such a reasonable rate;
- John Held of Kaeser & Blair for producing the participant and volunteer tee shirts and bags.

We wish you fond "Aloha" and hope you have a wonderful time in Hawai'i.

Sandy Dawson

on behalf of the PME27/PMENA25 Conference Committees

July 2003

INTRODUCTION

THE INTERNATIONAL GROUP FOR THE PSYCHOLOGY OF MATHEMATICS EDUCATION (PME)

History and Aims of PME

PME came into existence at the Third International Congress on Mathematics Education (ICME3) held in Karlsruhe, Germany in 1976. Its past presidents have been Efraim Fischbein (Israel), Richard R. Skemp (UK), Gerard Vergnaud (France), Kevin F. Collis (Australia), Pearla Neshet (Israel), Nicolas Balacheff (France), Kathleen Hart (UK), Carolyn Kieran (Canada), Stephen Lerman (UK) and Gilah Leder (Australia).

The major goals of both PME and PMENA are:

- To promote international contacts and the exchange of scientific information in the psychology of mathematics education.
- To promote and stimulate interdisciplinary research in the aforesaid area with the co-operation of psychologists, mathematicians and mathematics educators.
- To further a deeper understanding into the psychological aspects of teaching and learning mathematics and the implications thereof.

PME Membership and Other Information

Membership is open to people involved in active research consistent with the Group's goals, or professionally interested in the results of such research. Membership is on an annual basis and requires payment of the membership fees (US\$40 or the equivalent in local currency) per year (January to December). For participants of PME27 Conference, the membership fee is included in the Conference Deposit. Others are requested to contact their Regional Contact, or the Executive Secretary.

Website of PME

For more information about PME as an association see its home page at **igpme.tripod.com** or contact the Executive Secretary, Joop von Dormolen.

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PROCEEDINGS OF PREVIOUS PME CONFERENCES

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All proceedings, except PME1 are included in ERIC. Below is a list of the proceedings with their corresponding ERIC codes.

PME INTERNATIONAL			
No.	Year	Place	ERIC Number
1	1977	Utrecht, the Netherlands	Not available in ERIC
2	1978	Osnabrück, Germany	ED 226945
3	1979	Warwick, United Kingdom	ED 226956
4	1980	Berkeley, USA	ED 250186
5	1981	Grenoble, France	ED 225809
6	1982	Antwerpen, Belgium	ED 226943
7	1983	Shoresh, Israel	ED 241295
8	1984	Sydney, Australia	ED 306127
9	1985	Noordwijkerhout, Netherlands	ED 411130 (vol. 1) ED 411131 (vol. 2)
10	1986	London, United Kingdom	ED 287715
11	1987	Montréal, Canada	ED 383532
12	1988	Veszprém, Hungary	ED 411128 (vol. 1) ED 411129 (vol. 2)
13	1989	Paris, France	ED 411140 (vol. 1) ED 411141 (vol. 2) ED 411142 (vol. 3)
14	1990	Oaxtepec, Mexico	ED 411137 (vol. 1) ED 411138 (vol. 2) ED 411139 (vol.3)
15	1991	Assisi, Italy	ED 413162 (vol.1) ED 413163 (vol. 2) ED 413164 (vol.3)
16	1992	Durham, USA	ED 383538
17	1993	Tsukuba, Japan	ED 383536
18	1994	Lisbon, Portugal	ED 383537
19	1995	Recife, Brazil	ED 411134 (vol. 1) ED 411135 (vol. 2)
20	1996	Valencia, Spain	ED 453070 (vol. 1) ED 453071 (vol. 2) ED 453072 (vol. 3) ED 453073 (vol.4)
21	1997	Lahti, Finland	ED 416082 (vol. 1) ED 486083 (vol. 2) ED 486084 (vol. 3) ED 486085 (vol. 4)

22	1998	Stellenbosch, South Africa	ED 427969 (vol. 1) ED 427970 (vol. 2) ED 427971 (vol. 3) ED 427972 (vol. 4)
23	1999	Haifa, Israel	ED 436403
24	2000	Hiroshima, Japan	ED 452031 (vol. 1) ED 452032 (vol. 2)
25	2001	Utrecht, Netherlands	In process
26	2002	Norwich, United Kingdom	In Process

PME NORTH AMERICAN CHAPTER

2	1980	Berkeley, CA (with PME2)	ED 250186
3	1981	Minnesota	ED 223449
4	1982	Georgia	ED 226957
5	1983	Montréal, Canada	ED 289688
6	1984	Wisconsin	ED 253432
7	1985	Ohio	ED 411127
8	1986	Michigan	ED 301443
9	1987	Montréal, Canada (with PME11)	ED 383532
10	1988	Illinois	ED 411126
11	4989	New Jersey	ED 411132 (vol. 1) ED 411133 (vol. 2)
12	1990	Oaxtepec, Mexico (with PME14)	ED 411137 (vol. 1) ED 411138 (vol. 2) ED 411139 (vol. 3)
13	1991	Virginia	ED 352274
14	1992	Durham NH (with PME16)	ED 383538
15	1993	California	ED 372917
16	1994	Louisiana	ED 383533 (vol. 1) ED 383534 (vol. 2)
17	1995	Ohio	ED 389534
18	1996	Panama City, FL	ED 400178
19	1997	Illinois	ED 420494 (vol. 1) ED 420495 (vol. 2)
20	1998	Raleigh, NC	ED 430775 (vol. 1) ED 430776 (vol. 2)
21	1999	Mexico	ED 433998
22	2000	Tuscon, AZ	ED 446945
23	2001	Snowbird, UT	In process
24	2002	Athens, GA	In process

Abstracts can be inspected on the ERIC website (<http://www.accesseric.org>) and on the website of ZDM/MATHD1 (<http://www.emis.de/MATH/D1/htm>). Microfiches may be available at university libraries or purchased from ERIC/CSMEE, 1929 Kenny Rd. Columbus, OH 443210-1080; Tel: (614) 292-6717; FAX: (614) 293-0263; email: ericse@osu.edu.

MATHD1 is the web version of the Zentralblatt für Didaktik der Mathematik (ZDM, International Reviews on Mathematical Education). For more information, contact Gerhard König FAX: +49 7247 808 461; email: gk@fiz-karlsruhe.de.

REVIEW PROCESS OF PME27

The reviews (3 for each proposal) of all research report (RR) proposals were examined by the Program Committee, a committee composed of 17 members of the international mathematics education community. All reviews are read and a decision made based on the reviews. PME policy is that proposals which receive 3 accepts, or 2 accepts and 1 not accept from reviewers are accepted for inclusion in the conference. A proposal that receives 3 not accepts from reviewers is not accepted by the Program Committee.

PME policy is that research reports which receive 2 not accepts and 1 accept from reviewers are scrutinized carefully, that the Program Committee then makes a decision to accept the RR or not, if the decision is to not accept the proposal, a further decision is made as to whether the report should be recommended to be offered as a short oral or a poster.

The Program Committee also examines the reviews in cases where a Research Report receives 3 not accepts from reviewers, 3 accepts from reviewers, or 2 accepts and 1 not accept from reviewers. This is done in order to make sure reviews are reasonable, respectful, and offer the proposer useful information and guidance regarding the proposal. In rare cases, a proposal receiving 3 not accept reviews might be recommended for offering as a short oral or a poster particularly if the proposal is from a scholar who has not submitted to PME previously. In the case of Short Oral and Poster Proposals, each is reviewed by the Program Committee. Posters are accepted or not. A short oral, if not accepted, may be recommended for presentation as a Poster.

The **Program Committee** (PC) for PME27 completed the task of the selection of research reports, short orals, posters, discussion groups, working sessions. To give you an idea of the level of activity presented for the conference, the outcomes of the PC meeting was as follows:

Research Reports		Short Orals		Posters	
Received:	280	Received:	92	Received:	44
Accepted:	176	Not accepted:	37	Not accepted:	2
<i>(acceptance rate of approximately 63%)</i>		<i>(acceptance rate of approximately 60%)</i>		Recommended to be Short Orals:	1
Not accepted, recommended as Short Orals:	25	Accepted:	55	Accepted:	42
Not accepted recommended as Posters:	24	Accepted from Research Reports proposals:	25	Accepted from Research Report proposals:	24
Not accepted:	55	Accepted from Posters:	1	Accepted from Short Orals:	21
		Potential Short Oral sessions:	81	Potential Posters:	87

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