

**Proceedings of the 29<sup>th</sup> Conference of the  
International Group for the  
Psychology of Mathematics Education**



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**Volume 1**

**Plenaries, Research Forums, Discussion Groups,  
Working Sessions, Short Oral Communications, Posters**

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*Proceedings of the 29<sup>th</sup> Conference of the  
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*Volume 1*

**Editors**

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## **WELCOME TO PME29: LEARNERS AND LEARNING ENVIRONMENTS**

We are delighted to welcome you to the 29<sup>th</sup> Annual Conference of the International Group for the Psychology of Mathematics Education, being held in Melbourne, Australia. PME29 is being hosted by the University of Melbourne, and the theme of the conference is *Learners and Learning Environments*. This reflects PME's interest in what it is about learners and the circumstances in which they undertake learning experiences that contributes to the successful learning of mathematics. The talks and papers being presented at the conference will give insight into these important questions. We invite all participants to contribute actively to the discourse and analysis of ideas, so that our understanding is deepened. We also encourage all of you to foster a welcoming and stimulating atmosphere at the conference, that all participants may feel included as members of the PME community. We extend a special "G'day" to those attending their first PME conference. Our hope is that the conference will prove a fruitful learning environment for ourselves as learners.

Many of you will be aware of Australia's simultaneously old and young history. We acknowledge the Wurundjeri people of the Kulin Nations, the traditional custodians of the country on which the university stands. The area around Melbourne and the Yarra River was home to the Wurundjeri people for about 40000 years prior to the arrival of European settlers. In contrast to the thousands of years of indigenous history that contribute to our sense of place and identity, the city of Melbourne is much younger, dating from the 1830s. Its character has been influenced heavily by the gold rushes of the 1850s, and The University of Melbourne dates from this time. Melbourne is now a modern city of about 3.5 million people. Waves of immigration, first from the United Kingdom and Ireland, then post-war refugees from Europe, followed by large numbers of other immigrants, including Italian, Greek, Lebanese and Vietnamese, have given Melbourne a wide diversity of cultures.

The history of mathematics education in Australia is one of growing influence and contribution. The Mathematics Education Research Group of Australasia, whose conference precedes PME this year and whose members have contributed to the PME community over many years, is only a year or so younger than PME itself. Australian mathematics educators hosted PME in Sydney in 1984 and ICME in Adelaide in the same year, and always form a large contingent at international mathematics education conferences. With the conference here in Melbourne, we are grateful to those of you who have made the long journey so often made by Aussies in the opposite direction! We promise to be sympathetic if you are feeling slightly jet-lagged!

The Programme Committee and the Local Organising Committee want to express our thanks for the support we have received from experienced PME people, including previous conference organisers who provided useful information. Chris Breen's quiet wisdom and support have been appreciated, and Joop van Dormolen's encyclopaedic

knowledge of PME has been vital. Their advice, suggestions, encouragement, reminders, and understanding have made life easier for us. Joop's amazing database—a labour of love specially designed to keep track of all the things necessary for a PME conference—has been a wonderful asset and its capacity to do many tasks automatically has helped to reduce the workload of the organisers.

Finally, on a personal note, I would like to thank the many people who have contributed to what I hope will be a very successful conference. The Program Committee, listed in full later, laboured mightily and with care over many important decisions, including the consideration of all the proposals. The Level 7 maths education folk of the Department of Science and Mathematics Education—Kaye Stacey, Lynda Ball, Vicki Steinle, Gloria Stillman, Anne Briner, and Jill Brown—have provided both tangible contributions and a wonderfully supportive environment in which to tackle this task. Kaye's wisdom and experience have been especially valuable. Ela Lugin, Sandra Papa, Craig McBride, and Stephen Goldstraw, together with others in the Department of Science and Mathematics Education, have provided extensive administrative support. Finally, and most importantly, my thanks to Jill Vincent without whom the conference would never have happened: her attention to detail and capacity to keep track of the important things have been incredible.

Helen Chick, Conference Chair

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## THE REVIEW PROCESS OF PME28

**Research Forums.** The Programme Committee and the International Committee accepted the topics and co-ordinators of the Research Forum of PME29 on basis of the submitted proposals, of which all but one were accepted. For each Research Forum the proposed structure, the contents, the contributors and the role of the contributors were reviewed and agreed by the Programme Committee. Some of these proposals were particularly well-prepared and we thank their coordinators for their efforts. The papers from the Research Forums are presented on pages 1-93 to 1-202 of this volume.

**Working Sessions and Discussion Groups.** The aim of these group activities is to achieve greater exchange of information and ideas related to the Psychology of Mathematics Education. There are two types of activities: Discussion Groups (DG) and Working Sessions (WS). The abstracts were all read and commented on by the Programme Committee, and all were accepted. Our thanks go to the coordinators for preparing such a good selection of topics. The group activities are listed on pages 1-205 to 1-218 of this volume.

**Research Reports (RR).** The Programme Committee received 187 RR papers for consideration. Each full paper was blind-reviewed by three peer reviewers, and then these reviews were considered by the Programme Committee, a committee composed of members of the international mathematics education community. This group read carefully the reviews and also in some cases the paper itself. The advice from the reviewers was taken into serious consideration and the reviews served as a basis for the decisions made by the Programme Committee. In general if there were three or two recommendations for accept the paper was accepted. Proposals that had just one recommendation for acceptance were looked into more closely before a final decision was made. Of the 187 proposals we received, 130 were accepted, 26 were recommended as Short Oral Communications (SO), and 18 as Poster Presentations (PP). The Research Reports appear in Volumes 2, 3, and 4.

**Short Oral Communications (SO) and Poster Presentations (PP).** In the case of SO and PP, the Programme Committee reviewed each one-page proposal. A SO proposal, if not accepted, could be recommended for a PP and vice versa. We received 73 SO proposals initially, of which 59 were accepted and 5 were recommended as posters; later an additional 19 SO proposal were resubmitted from RR. We received 33 initial PP proposals, of which 24 were accepted and 2 were recommended as SO; later an additional 6 PP proposals were resubmitted from RR. The Short Oral Communications and Poster Presentations appear in this volume of the proceedings.

## LIST OF PME29 REVIEWERS

The PME29 Program Committee thanks the following people for their help in the review process:

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All of the single page Short Oral Presentations are available in the one document.

### Short Oral Communications

Abdul Rahman, Roselainy & Mohammad Yusof, Yudariah & Mason, John H.  
*Mathematical knowledge construction: Recognizing students' struggle*

Acuña, Claudia  
*Figural interpretation of straight lines through identification, construction and description focussed on slope and y-intercept features*

Baharun, Sabariah & Mohammad Yusof, Yudariah & Ahmad, Tahir & Arshad, Khairil Annuar  
*Thinking mathematically: Personal journey in the modeling of a clinical waste incineration process*

Bazzini, Luciana & Bertazzoli, Luisa & Morselli, Francesca  
*The fruitful synergy of paper & pencil and Cabri géomètre: A case study*

Beckmann, Sybilla  
*Development of a rationale in a US text and in Singapore's school mathematics texts*

Borba, Rute Elizabete de Souza Rosa  
*How children solve division problems and deal with remainders*

Bower, Michelle L. W.  
*Student mathematical talk: A case study in algebra and physics*

Breen, Chris  
*Ethical considerations in a mathematics teacher education classroom*

Brown, Tony & Bradford, Krista  
*Ceci n'est pas un "circle"*

Bruder, Regina & Komorek, Evelyn & Schmitz, Bernhard  
*Development and evaluation of a concept for problem-solving and self-guided learning in maths lessons*

Calder, Nigel  
*Mathematical problem-solving in a spreadsheet environment: In what ways might student discourse influence understanding?*

Caswell, Rosemaree & Nisbet, Steven  
*The value of play in learning mathematics in the middle years of schooling*

Cedillo, Tenoch  
*The potential of CAS to promote changes in teachers' conceptions and practices*

Chang, Yu-Liang & Wu, Su-Chiao  
*Pre-service teachers' self-efficacy toward elementary mathematics and science*

Cretchley, Patricia  
*Students and software: Tales of anxiety, songs of support*

Cunningham, Robert F. & van der Sandt, Suriza  
*Composition and decomposition of 2-dimensional figures demonstrated by preservice teachers*

Davis, Sarah M.  
*What's in a name? Anonymity of input in next-generation classroom networks*

Dindyal, Jaguthsing  
*Students' use of different representations in problem solving at high school level*

Finnane, Maureen

*Automatised errors: A hazard for students with mathematical learning difficulties*

Gooya, Zahra & Karamian, Azar

*Teaching geometry in two secondary classrooms in Iran, using ethnomathematics approach*

Groves, Susie & Doig, Brian

*Teaching strategies to support young children's mathematical explanations*

Hansen, Alice & Pratt, Dave

*How do we provide tasks for children to explore the dynamic relationships between shapes?*

Hardy, Tansy

*Participation, performance and stage fright: Keys to confident learning and teaching in mathematics?*

Herbert, Sandra & Pierce, Robyn

*An emergent model for rate of change*

Holton, Derek & Linsell, Chris

*The role of activities in teaching early algebra*

Izsák, Andrew

*Coordinated analyses of teacher and student knowledge engaged during fraction instruction*