



# NEWSLETTER

International Group for the Psychology  
of Mathematics Education

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## Message from PME President

*Dear Friends at PME,*

the PME 43 conference in Pretoria was well organized with a stimulating scientific program. The excursions presented various aspects of South Africa and the conference dinner program had us banging drums like crazy. Big thanks to Johann and his conference team for a job well done!

The conference was also a transition from Peter Liljedahl's presidency to my term of office. On my behalf, I wish to thank Peter for his services for PME and specifically for making the transition smooth. The idea to include one year term as President Elect was a brilliant move. Over the year, I've seen how Peter has facilitated the work of PME International Committee (IC). PME has established very good governance policies and practices and our accounts have a healthy balance. After Peter's term PME is in excellent shape.

PME has been evolving over the last years, and things continue to develop. At the core of PME are the conference presentations and several important changes have taken place over the last year. At the 2019 Annual General Meeting (AGM) of the PME, the membership decided to revise the old rule of four. Now, the number of presentations is still restricted, but there is no longer limitation to how many times a person may be a co-author. Hence, there is more room for collaborative papers in the PME.

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## Message from the Editors

It is a vibrant time. Many of us are in the middle of a term or a semester, preparations for the festive season are in the making in some parts of the world, and some of us may have probably started thinking about their contribution to PME 44 in Khon Kaen, Thailand. (Be honest: Have you? Deadline is January 15th). The newsletter gives a short peak at next years conference and also introduces Merrylin Goos the new coordinator of PME pre-submission support.

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## Message from the PME President (continued)



For PME 43 we also pilot tested an alternate review process sparked by Mogens Niss' talk and the policy meeting in 2018. Allowing people to write their reviews more holistically rather than answering to the different aspects of the study separately proved out to not cause problems. Only a few reviewers used this opportunity, their reviews being of equally high standard than the ordinary reviews. Moreover, the alternative reviews caused no undue challenge for the IPC. As the last change regarding PME presentations, all proceedings have been made open access. At the AGM, this decision was met with applause. With respect to PME proceedings we are still developing authorship guidelines, and the membership will be involved in the discussions. We are also working on a policy on publication ethics and malpractice, as we intend to apply that the proceedings be indexed in Scopus.

There are also some established PME functions that have been significantly revised recently. The PME website has moved to a new platform. This will require all members to sign in to the new website, and you will receive an e-mail about it. For a few years, PME has had a policy for using accumulated surplus for special projects and regional PME conferences. The two regional conferences have been organized in Chile and Russia. The conference proceedings from Chile are available at the PME website and the proceedings from Russia will appear there later. There are also many of the Russian regional conference presentations available on YouTube (search "PME Yandex"). The special project reports keep appearing in PME Newsletter. The PME will continue to fund special projects in 2020.

My first major task as the new president will be to complete the process of PME becoming a Charitable Incorporated Organisation (CIO) under the UK law. Until now, PME has functioned surprisingly well, despite not having any clear legal status under any legislation. However, it has become increasingly difficult to operate PME financially due banks being more suspicious about shady customers. At 2012 AGM authorized the IC to work towards finding a legal status as a CIO. The new constitution fulfilling the demands of a CIO was accepted in 2018 AGM and edited in 2019 AGM. Currently, we have started the application process. Once PME becomes a CIO, it will influence the way PME is run as an organization. Mostly these changes take place behind a curtain and have no impact to the membership nor jeopardize the spirit of PME. Changes concern administration, such as yearly reporting to the Charity

Commission, and decision making at meetings and delegation of power. For the membership, possibly the most notable change will be that in the future the IC will be called the *board of trustees* and that the IC members will be called *charity trustees*.

As the president of PME, I take interest in what kind of impact PME has in the world. Within the field of mathematics education, PME has a big scientific impact. In case we are successful in indexing our proceedings in Scopus, our impact would expand as people in other fields would more easily find our research. I'm also visioning possibilities to increase people's access to PME talks and discussions. Perhaps we can stream keynotes and presentations online or publish the talks on YouTube, like was done at the PME regional conference in Russia. That would also allow PME members who can't attend the conference to be more involved.

I hope PME conferences would also have a positive impact locally. In case of the last PME, we were able to give many researchers in the region their first access to an international conference. But I believe there is more we could do. The gathering of hundreds of mathematics educators across the world would provide many opportunities to inspire local teachers and to discuss with local education policy makers on what research says about good mathematics teaching.

Finally, I am concerned about the environmental impact of PME conference. We should examine ways to reduce our carbon footprint. We have mostly shifted from paper to electronic no longer print proceedings for all, hence reducing use of materials. Are there other ways we could be more resource efficient? Can we reduce food waste or could we prioritize hotels using green energy? The biggest climate impact comes from us flying to the conference venue. Reducing this seems like an impossible task, but we might be able to compensate for the emissions.

The PME 44 will be in Khon Kaen, Thailand. This will be the first time Thailand hosts PME and I'm really looking forward to going there. Not just for the great food and friendly people, but most importantly, to see my PME friends.

Markku Hannula  
IGPME President

## Message from the Editors (continued)

However, the newsletter focuses largely on the wonderful PME 43 in Pretoria. Can you still hear the drums from the conference dinner? The newsletter features reports from most working groups, research forums, and seminars – wonderful ways to engage at a conference and jointly work on our research agendas!

It is also a vibrant time for our IGPME with many things that are new or in the making. For instance, Markku Hannula switched from being president-elect to president. As he writes in his message from the president that the innovation of president-electship turned out to be a great idea. His cooperation with Peter Liljedahl was very fruitful and helped him with starting the presidentship. In his message, Markku describes additional noticeable events, such as IGPME becoming a charitable organisation and providing open access to the current and past [proceedings of PME](#). This is an important step towards the dissemination of PME research and making it more accessible.

This is a vibrant time for our Newsletter as well. Some of you may have noticed that the Newsletter got a slight polish with respect to its outer appearance and, for example, the used fonts. The first big change in its looks was done in early 2015 when we changed the

layout to arrive at a clearer structure. The layout was professionalized late 2016 with the design by Nir Schnapp, the designer who also recently made the design for the new launch of [www.igpme.org](http://www.igpme.org). It all fits together in a corporate design now. We very much like Nir's design but were also interested in producing the Newsletter using open access software. This required some minor changes but the major lines of the design were kept.

Before you start exploring the newsletter, we would like to draw your attention to the revival of open contributions in the Newsletter. To lead by example, we wrote an open contribution on open contributions, giving a rough description on the types of open contributions, that we as Editors, would like to encourage. So, please consider this platform for engaging with the IGPME community and contributing to the advancement of our community. We are very much looking forward to it.

Maike Vollstedt, Igor' Kontorovich & Daniel Sommerhoff

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# PME 44

## Mathematics Education in the 4<sup>th</sup> Industrial Revolution: Thinking Skills for the Future

Submitted by Maitree Inprasitha  
(Conference Chair PME44; Thailand)

The local organizing committee invites you to attend the 44<sup>th</sup> annual meeting of the IGPME in Khon Kaen. The conference will be presented jointly by Khon Kaen University, Thailand Society of Mathematics Education and The Educational Foundation for Development of Thinking Skills.

The theme of the conference is "*Mathematics Education in the 4<sup>th</sup> Industrial Revolution: Thinking Skills for the Future*", which is very timely for this era. This is the first time the conference will be hosted in Thailand and CLMV (Cambodia, Myanmar, Laos, and Vietnam) countries, where mathematics education is underrepresented in the community. Thus, this conference will provide chances to facilitate the activities and network associated in mathematics education in the region.

The plenary speakers for PME 44 are Roberto Araya (Chile; non PME speaker), David Wagner (Canada), Michal Tabach (Europe), and Berinderjeet Kaur (Singapore). The Plenary panel discussion will be held on the topic "*The 4<sup>th</sup> Industrial Revolution will transform/ disrupt the Teaching and Learning of Mathematics*".



Photo: rabbitfinance.com/blog/reason-why-you-could-be-landowner



The panel members will be Hamsa Venkatakrishnan (South Africa) (chair), Lew Hee-Chan (South Korea), David Keith Jones (United Kingdom), Anna Baccaglini Frank (Italy) and Oi-Lam Ng (Hong Kong).



Full details could be found in the first announcement of the conference available on the conference website [pme44.kku.ac.th](http://pme44.kku.ac.th). News and information could be also found on the conference Facebook page PME 44. The system for registration and proposal submission opens during November 2019.

Khon Kaen is a province in the Northeast of Thailand. There are many flights to Khon Kaen airport such as from Bangkok (Suvarnabhumi Airport and Don Mueang Airport), Phuket, Chiang Mai, Hat Yai, and U-Tapao (Pattaya), taking you around an hour. Khon Kaen University is the first university in the Northeast and geographically located close to the Indochina countries, and is a link for Indochinese knowledge. We hope that your visit and stay in Khon Kaen and Thailand will be exciting, impressive, and that you will be fond of the conference, culture, and nature in Thailand, and the great Mekong sub-region. We look forward to welcoming you to the conference in July, 2020.

# PME 43 Reports

## Working Group 1 Report: Conceptualising the Expertise of the Mathematics Teacher Educator

**Submitted by Tracy Helliwell (United Kingdom) and Sean Chorney (Canada)**

Recently, within mathematics teacher education, there has been increasing interest in the development of theories that can account for what and how mathematics teacher educators (MTEs) learn. This working group built on foundations from previous PME working sessions that have been centred around MTEs (Goos, Chapman, Brown, & Novotna, 2011; Beswick, Goos, & Chapman, 2014). Our aim for this working group was to extend existing conceptualisations of the expertise of MTEs beyond descriptions of MTE knowledge (e.g., Appova & Taylor, 2017). Building on the foundations from previous PME working sessions that have been centred around MTEs (Goos, Chapman, Brown, & Novotna, 2011; Beswick, Goos, & Chapman, 2014) we approached the expertise of MTEs by sharing and discussing personal stories hoping to enrich and extend established theories and frameworks. We also opened the discussion to formulating researchable questions based on our shared experiences, in addition to potential methodologies that could support research on these questions. There were over twenty participants from nine countries attending both working group sessions at PME in Pretoria.

In the first session, after a brief introduction of the aims and background of the working group, Tracy and Sean each shared a personal story from their own practice as mathematics teachers and subsequently MTEs. They hoped by sharing a personal story from their experience as mathematics teachers they can make a connection to MTE expertise which could potentially inform research questions directed toward the transition from teacher to MTE. In groups of four, the participants of the working group were then tasked to share their own personal stories from practice, and from those stories, to consider: What issues (problems, questions) do your stories raise? What do your experiences and/or issues suggest about MTE expertise? Can these issues be framed as questions?



The following issues/questions were shared and collected at the end of the session: can a learning trajectory for a mathematics teaching be developed?; what kinds of decisions do MTEs have to make?; how might we simplify/unpack the task of teaching mathematics?; how do MTEs balance complexity with a focussed treatment of an issue e.g., variation?; how do MTEs make use of examples/problems when working with mathematics teachers?; how do MTEs decentre from their own experiences of teaching mathematics and/or as a student of mathematics?; and how does the MTE disrupt/leverage context, conviction, confidence, and/or certainty?

In the second session, these questions and the broader issues they evoked were posted and participants re-grouped depending on which of the issues from the previous session they wanted to focus on. These new groups were asked to: Refine/develop the issues further into researchable questions, paying attention to where the mathematics is (i.e., consider what makes this a problem for mathematics teacher educators rather than teacher educators more broadly). The following list is a selection of some of the questions that the groups generated and then shared more widely: What is the relationship between in the moment decisions of MTEs and teachers? How do MTEs prepare MTs to adapt to curriculum changes (when MTEs also need to adapt)? MTEs model pedagogical practices relevant to curriculum changes, can we articulate these models as MTEs? How do MTEs manage the tension between mathematical "us" and a teaching focus in a PD/preservice sessions? What is different (e.g., adult vs. child) in terms of decentring, for the MTE? How can MTEs become conscious of their beliefs? How do these beliefs affect the adaptations performed by MTEs when working with teachers of mathematics? Groups also discussed and shared potential frameworks which could be utilised and agreed on any intentions they may have for taking these ideas forward.

In terms of ongoing plans for the members of the working group, the intention is for the subgroups formed in session two, to continue their conversations and develop ideas further. We would like to run a follow up working group at PME 44 where we hope to work towards a possible joint output for participants such as a special issue for the *Journal of Mathematics Teacher Education*.

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## Working Group 2 Report: Mathematical Learning Disabilities a Challenge for Mathematics Education

**Submitted by Marie-Line Gardes (France), Francesca Gregorio (Switzerland, France), Thierry Dias (Switzerland) and Michel Deruaz (Switzerland)**

In recent times, research interest in learning difficulties has increased around the globe. Some of them are still subject to little research (Lewis & Fisher, 2016). This is the case of Mathematical Learning Disabilities (MLD) which are the source of raising educational and social inequalities. Research regarding MLD is carried out in different fields, with various theoretical backgrounds, research hypotheses and aims (Lewis & Fischer, 2016): cognitive sciences, neuroscience, psychology, mathematics education. There is not a clear scientific consensus about MLD definition and diagnosis. Moreover, the links between these different fields of research are not enough developed and they should be improved. Our team - called RITEAM (see [riteam.ch](http://riteam.ch)) - claims that specific studies should be structured and developed in mathematics education regarding MLD in order to improve the identification and the remediation of MLD in an educational context (Dias & Ouvrier-Buffer, 2018). In particular, that implies a better knowledge of the existing research and educational practices.

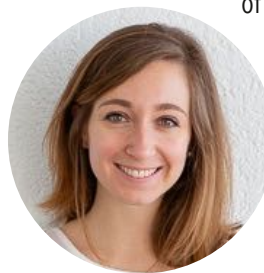
In continuity with the Working Group (WG) of PME 42, we proposed a WG for PME 43 in Pretoria. In session 1, we started with a summary of the principal points treated in WG of PME 42, in which

we focused on the identification of current and future research interests about MLD in math education (Ouvrier-Buffer, Robotti, Dias, & Gardes, 2018). We then proposed a group activity on the basis

of an exploratory literature review about MLD in PME and CERME proceedings (Dias, Gardes, Deruaz, Gregorio, Ouvrier-Buffer, Peters, & Robotti, 2019). Thanks to this literature review we identified different operational definitions of MLD which can be found in literature in mathematics education: students with diagnosis of MLD (often referred as dyscalculia), students with learning disabilities with or without comorbidity, students with specific difficulties in learning mathematics but without diagnosis of MLD. The participants in the WG classified the populations of different articles about MLD from

PME and CERME proceedings according to the three definitions. This activity was an opportunity to discuss the lack of a shared definition of MLD in mathematics education and the need for detailed description of the population in the methodology of research about MLD.

The first session ended with a brief exposition of the main results of the literature review (Dias et al., 2019), pointing out that the great variability of MLD research across countries is reflected in different teaching practices.





## Group activity 2

Choose one subject

&

Identify some crucial questions for the survey



Fig. 1 Themes to be investigated by a survey

The main objective of the second session was to elaborate a survey in order to compare educative practices about MLD in different countries. We identify four important themes to be investigated (see fig.1): teacher training, resources available for teachers, nature of aids implemented by teachers, links between (para)medical practitioners and teachers in student monitoring. A second group activity was proposed: the participants had to identify some crucial questions for the survey about one of the four themes. The WG ended with a discussion about the questions proposed.

Starting from the questions proposed in the second session, we are now constructing a survey with the aim to compare educative practices about MLD in different countries. After a revision by the participants in the WG2 - PME 43, it will be disseminated in the mathematics education community. The analysis of the results will be proposed at PME 45.

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## Working Group 4 Report: International Perspectives on Proof and Proving

**Submitted by David Reid (Norway), Keith Jones (UK), and Ruhama Even (Israel)**

This working group was a new initiative, bringing together research on proof and proving and international comparison. The aim was and is to foster research on proof and proving from an international perspective. The working group was organised by David Reid, Keith Jones, and Ruhama Even and attended by about three dozen colleagues from around the world.

The past two decades have seen a strong increase in research into proof and proving in mathematics education. Much of this has been conducted in single national and cultural contexts. This means that it is not clear whether the results are transferable, or indeed if the assumptions on which the studies are based are valid else-

where. There are four areas in which international comparisons could shed light on the teaching and learning of proof and proving: curriculum (including textbooks and other teaching and learning materials); student learning and achievements; teaching (including teaching practices, teachers knowledge, and professional education and development of teachers); and assessment.

The first session of the working group was mainly focussed on members sharing their interests and some background about proof and proving in their national or regional contexts. This led to very interesting discussions out of which emerged themes for further discussion. The second day began with identifying and making these themes more precise, and then breaking into subgroups

to discuss the themes. The subgroups that formed were:

- How are Argumentation and Proof conceptualised internationally?



- Pre-Primary and Primary Argumentation and Proof
- Proof in the Primary & Secondary school Curriculum
- Secondary Level Argumentation and Proof
- University Level Proof Teaching and Learning

Each group identified possible research questions and methods. In the weeks following PME colleagues who were not able to attend were invited via email to join a subgroup. A sixth group, focussed on interrelationships between visualisation and proving, was

formed during these email exchanges. Each sub-group is now autonomously engaging with the questions proposed a PME, but also exchanging information with the other groups. The organisers intend to propose the WG again for PME 44, so that new members can become involved and sub-groups can report back on their work.



## Working Group 5 Report: Task Design for Early Algebra

**Submitted by Aisling Twohill (Ireland), Sharon McAuliffe (South Africa), Sinead Breen (Ireland), Hamsa Venkat (South Africa), Nicky Roberts (South Africa), and Erna Lampen (South Africa)**

The aim of the Task Design for Early Algebra Working Group of PME 43 was to facilitate robust discussion that could potentially prioritise certain principles for the design of early algebra tasks. Seeking and describing structure in algebraic ways requires teaching approaches that

encourage discussion, justification, conjecturing, and exploration (Radford, 2014). Tasks presented for use by teachers in early algebra lessons should play a dual role in providing a catalyst for children's thinking, while also motivating teachers to facilitate children in thinking deeply about relationships and change. For the purpose of the Task Design for Early Algebra Working Group, we defined a 'task' as information that prompts students' work, including representations, context, questions and instructions (Sullivan, Clarke, &





Clarke, 2013). In referring to tasks and the design of tasks, we sought to foreground the disparities that arise between the intended use of tasks and the enacted use of tasks in classrooms by teachers (Sullivan, Knott, & Yang, 2015).

The 'Task Design for Early Algebra' working group was organised and facilitated by Aisling Twohill (Dublin City University), Sharon McAuliffe (Cape Peninsula University of Technology), Sinead Breen (Dublin City University), Erna Lampen (Stellenbosch University), Hamsa Venkat (University of the Witwatersrand), and Nicky Roberts (University of Johannesburg). Thirty researchers attended one or both of the working group session(s) where they participated in focussed and informed debate on the complexities of task design for early algebra.

The first Working Group (WG) session included presentations of key themes relating to task design, functional thinking, and generalised arithmetic. Participants were invited to engage in structured small group discussion in response to a guiding question that was selected to encourage multiple interpretations and perspectives: *What guiding principles should underpin tasks designed to facilitate learning re functional thinking and generalised arithmetic?* Feedback from groups was collated into a single document that was shared with participants in preparation for the second session of the WG. Seeking to delineate the mathematics of the tasks, the pedagogies, and the student learning, the second WG session afforded opportunities to apply the principles to the analysis of given tasks, thereby refining and expanding the principles (Sullivan, Knott, & Yang, 2015). Participants were asked to remain mindful of cognitive challenge, accessibility for all learners, and how the principles may be interpreted by teachers for use in classrooms.

By conclusion of the second session, the following principles had been suggested by participants, and synopsised by the WG leaders:

1. Tasks should include the potential for:
  - 1.a. exploration and manipulation of structure;
  - 1.b. generalization;
  - 1.c. variation to support both accessibility and the potential for stretching the thinking of children;
  - 1.d. connections within and beyond mathematics;

1.e. multiple solution strategies, along with justification and comparison;

1.f. accessibility for a range of learners to develop their understanding;

1.g. justification and proof, including self-checking of solutions.

2. Progression through levels of communication should be grounded in examples, where possible (for example, from natural language to abstraction, as in "what figure will include 12 red squares?" preceding "what value makes this statement true?" preceding "solve for x").

3. Consideration should be given in task design to supporting teacher understanding of the progression of learning.

4. Tasks should draw from children's contexts, be of interest, and build upon their strengths and existing understandings. They should include local and indigenous contexts where possible and relevant.

The working group team concluded the second session with an invitation to engage in multilateral collaborative research into the applicability of a task design framework for early algebra. The working group suggested potential research questions concerning interpretation within local contexts; and both the relevance and accessibility of a framework to teachers, policy makers, text-book authors, and in-service providers. We invite PME members with an interest in this field to make contact with us.

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## Working Group 7 Report: International Perspectives on Evolution of Research on Teaching Mathematics

**Submitted by Agida Manizade (United States of America), Maria Mellone (Italy), Judah Makonye (South Africa), Miguel Ribeiro (Brazil), and Arne Jakobsen (Norway)**

The aim of this working group was to explore current issues related to the evolution of research on teaching mathematics. The goal was to examine the current state of presage-process-product research in mathematics with respect to conceptualization, instrumentation, and design, and to explore the likely direction of further developments. In the past twenty years, researchers used a wide range of conceptual and theoretical frameworks in an effort to advance knowledge in presage-process-product research in mathematics education. The participants, a diverse international group of researchers, discussed theoretical and methodological challenges associated with developing a domain, instrumentation, and design and analysis of this aforementioned research.

This working group provided a platform for sharing international perspectives on aforementioned variables in the context of pres-

age-process-product research in mathematics. Our intent was to identify future paths for research on effective mathematics teaching. To do so, we started a dialogue amongst researchers in order to

provide a critical review of currently existing presage-process-product research and discussed strengths and limitations associated with conceptualization, developing a domain, instrumentation, and research design.

Researchers used different conceptual frameworks in presage-process-product research in mathematics education when discussing the relationships between 1) activities teachers do outside of the classroom, such as planning, assessment, etc.; 2) activities teachers do inside of the classroom such as presenting a lesson, asking questions, reacting to students' answers, etc.; 3) student learning activities in the classroom; and 4) student learning outcomes measured after the teaching (e.g., Blömeke, Busse, Kaiser, König, & Suhl, 2016; Liljedahl, 2016; Martinovic & Manizade, 2018; Medley, 1987; Ribeiro, Mellone, & Jakobsen, 2016). This working group, based on the aforemen-





tioned theoretical frameworks and inspired by Medley's research, discussed and formulated a structure of six research variables that are under the direct control of a teacher (such as pre-existing mathematics teacher characteristics; mathematics teacher competencies, knowledge, and skills; mathematics teacher activities outside of the classroom; mathematics teacher activities inside of the classroom; student mathematics learning activities; and student mathematics learning outcomes) and four variables that are not under the direct control of a teacher (such as mathematics teacher training and experiences; external context variables such as curriculum, technology, and administrative and parental support; internal context variables; and individual student characteristics). In addition, the participants discussed the relationships among above-mentioned variables under the umbrella of cultural context as well as a technological context of the current post-industrial era.

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## Working Group 8 Report: Mathematical Thinking

**Submitted by Bruce Brown (South Africa), Merrilyn Goos (Ireland), Zingiswa Jojo (South Africa), Erna Lampen (South Africa), Sharon MacAuliffe (South Africa), and Ulla Runesson Kempe (Sweden)**

As mathematics educators, mathematical thinking is something we have all experienced and the enjoyment or appreciation of this experience lies at the root of the commitment of many of us to mathematics education. Yet, few of us are able to define, or characterize, mathematical thinking in substantive ways. This is not a difficulty when working with others who have similar experiences of mathematical thinking, but it is a real problem when faced with the ongoing problem that many children throughout the world are being taught mathematics in ways that are divorced from mathematical thinking, in systems that focus on the reproduction of symbolic mathematical forms (Kilpatrick, Swafford, & Findell, 2001; Devlin, 2012).

The mathematical thinking working group brought together a number of people who are working to include, and raise awareness of, processes involving mathematical thinking, in mathematics teaching and learning. The working group sessions were at-

tended by 33 people and it was a positive experience to share our commitment to, and work for, mathematical thinking, with each other. The group started with a discussion of the work being done in the PrimTED project in South Africa, to incorporate mathematical thinking explicitly as one important element (amongst others) in preservice primary teacher mathematics education, in order to begin to address the tendency to focus on reproduction of symbolic forms in South African early mathematics education. Developing





analytical tools for both researching and developing mathematical thinking was important to enable and organize this work. This was the major focus of the working group – to develop and research conceptual and analytical frameworks that would effectively characterize mathematical thinking for the purposes of development and research.

To provide impetus to the discussion, Merrilyn Goos discussed her review (Goos, 2018) of research published in *Educational Studies in Mathematics* over the period 2014–2018, in which she identified problem solving and reasoning as focal areas important for mathematical thinking. The PrimTED mathematical thinking working group then discussed a draft analytical framework that incorporated multiple, individually identifiable, interacting process elements that constitute mathematical thinking. We then worked in small groups on exemplar mathematical tasks appropriate for primary school teachers, that were designed by the presenters to elicit mathematical thinking. This experience was discussed in relation to the frameworks presented as well as the conceptualizations and orientations used by group members in their own mathematical thinking work. Possibilities and problems of our different orientations were then discussed in relation to effective framing of research and development focusing on mathematical thinking.

The following four questions emerged from this discussion:

- Can mathematical thinking form an analytical focus that is not subsumed under particular content areas? That is, can particular mathematical thinking elements be identified across many different mathematical content areas?

- How do particular mathematical thinking elements function in and contribute to the overall process of mathematical engagement?
- How may mathematical thinking elements be effectively identified and assessed in written responses to mathematical questions?
- How may mathematical tasks for teachers be designed and implemented to effectively:
  - Teach and learn mathematical thinking.
  - Generate teachers' awareness of mathematical thinking processes in their thinking.

The working group seeks to generate research into these questions and aims to meet as a working group at the next PME conference to share progress and work together to formulate specific outputs for this research.

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## Working Group 9 Report: Supporting (Preservice) Teachers' Learning to Use Curriculum Resources Productively

**Submitted by Ok-Kyeong Kim (USA, South Korea), Jon Davis (USA), and Hendrik Van Steenbrugge (Sweden, Belgium)**

This new working group at PME 43 focused on ways to support (preservice) teachers' learning to use curriculum resources (a set of resources for daily instruction including student texts, teachers' guides, and digital resources) productively. Our goal was to initiate discussions with participants on what productive resource use means in different cul-

tural contexts and how we can study it, and eventually develop research plans to investigate this topic.

In many countries, mathematics curriculum resources serve as a main tool for instruction. Curriculum resources are complex cultural artefacts in which educational values and goals are encapsulated. As such, using curriculum resources involves teachers' interpretation of the artefacts, which is a challenging task, especially for preservice teachers.



Brown's (2009) notion of Pedagogical Design Capacity (PDC)—"individual teachers' ability to perceive and mobilize existing resources" (p. 29)—highlights the importance of teacher capacity needed for productive resource use. Teachers' curriculum use is a dynamic process and PDC needs to be understood in the participatory relationship between teachers and curriculum resources (Remillard, 2005). In our working group, we not only attend to PDC associated with printed materials, but also relate PDC to digital resources as they come with new challenges related to effective use (e.g., Pepin, Choppin, Ruthven, & Sinclair, 2017).

On the first day of the working group, we discussed this topic's theoretical underpinnings (i.e., Brown, 2009; Remillard, 2005). We also gave a presentation on curriculum resources as cultural artefacts along with specific examples from Flanders, USA, and Sweden, in order to have some specific contexts to think about productive resource use and related issues, such as types of resources and cultural contexts. We then presented an overall framework (see Figure 1) that could be interpreted and used in framing studies on ways to support teachers to use resources productively in different cultural contexts.

Given the theoretical and cultural background with examples, we invited our participants from various places to share the relationship between curriculum resources and the educational context in their countries and the role of curriculum resources for teachers and students. Finally, we encouraged the participants to consider

two fundamental questions of the working group:

(1) What does it mean to use resources effectively given cultural and educational contexts? and (2) What does it mean to support teachers to use curriculum resources productively? These questions were important for thinking about what to study and how to study it, especially in different cultural contexts.

On the second day, we presented two examples that attempted to support preservice teachers to use resources productively, one at the elementary and the other at the secondary level. We also presented characteristics of digital curriculum resources that provide teachers with both challenges and opportunities. These examples and the discussion we had on the first day prompted us to continue to discuss with the participants what it is like to support teachers to use resources productively in different cultural contexts and how it can be studied within and across different cultural contexts.

After the conference, we generated a set of research questions that can be investigated, including those to understand each country's curriculum context, and shared them with the participants. The participants indicated their willingness to participate in the working group in PME 44. We expect that with the participants' attempts and experiences in the coming year we will have specific actionable research plans, whether collaborative or individual, in the next conference.

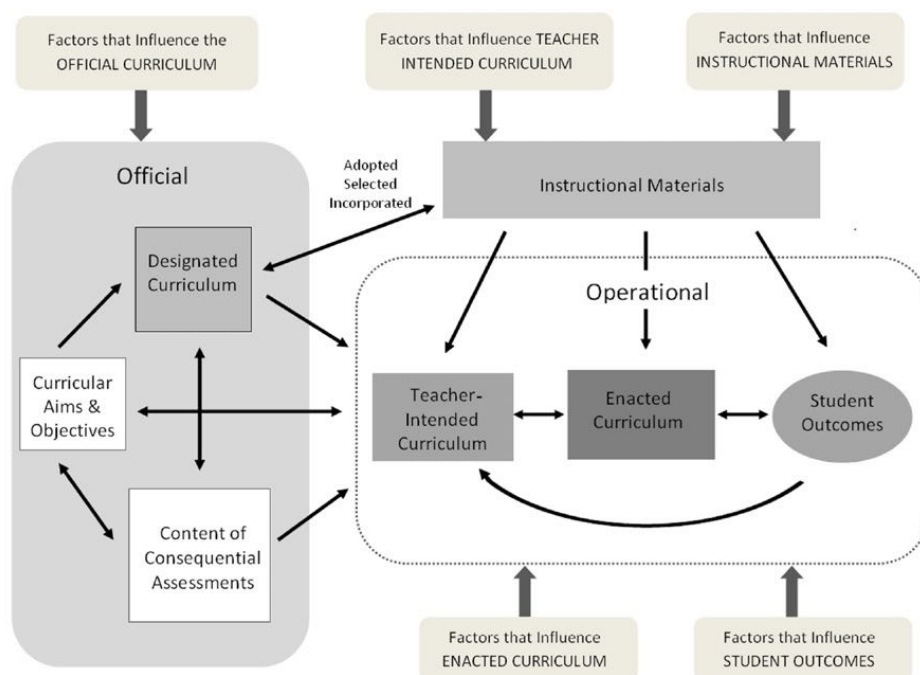


Figure 1. Curriculum Enactment Process (Remillard & Heck, 2014, p. 709)

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## Working Group 11 Report: STEM and Social Justice Education: Initiating International Discussions

**Submitted by Judy Anderson (Australia), Cynthia Nicol (Canada), and Yeping Li (USA)**

Our intention in this Working Group was to build on two agendas that have attracted considerable attention at recent PME conferences – STEM education and teaching mathematics for social justice.

Previous PME Discussion and Working Groups (Singapore, 2017 and Umea, 2018) and PME Research Reports formed the grounding for our Working Group (Anderson & Li, 2017; Anderson & Li, 2018; Anderson and Kreisler 2018; Nicol et al., 2017). Brief notes are provided below on these previous discussions and more detailed reports are available in PME Newsletter November 2017, p. 4 and PME Newsletter 2018 Issue 2, p. 4 (online at <http://www.igpme.org/communication/pme-newsletter/past-newsletters/>)

### **STEM Education Discussion Group in Singapore, 2017**

The question guiding our discussions was “what is the role of mathematics education in STEM”? Issues raised by participants included definitions of STEM education, identifying the skills and dispositions of STEM education, whether there should be a separate STEM education curriculum and if so, how would it be assessed? It was agreed combining the STEM subjects promotes critical thinking and enables the transfer of knowledge. How to prepare and support teachers was considered critical to successful implementation, as well as the need to connect policy and practice. It was evident that representative countries have different approaches to implementing STEM in schools, so how should we research the diversity of approaches?

### **STEM Education Working Group in Umea, 2018**

Similar questions were raised with further consideration of determining the benefits of an integrated STEM curriculum and the implications for pedagogy. Participants were keen to find ways to share practices and to develop a research agenda to collect evidence of impact. It was agreed we should be collecting evidence

from students and teachers and tracking student enrolments in STEM subjects and university-level degree programs. To share our

work, we agreed to develop a proposal for a monograph entitled *Integrated Approaches to STEM Education: An International Perspective*.



### **STEM and Social Justice**

#### **Education Working Group in Pretoria, 2019**

Our working group began with a review of STEM education and summary of discussions of previous working groups. A brief overview of the upcoming Springer volume *Integrated Approaches to STEM Education: An international perspective*, was offered by Judy Anderson and Yeping Li. A second agenda is the area of teaching mathematics for social justice which was also introduced through presentations focused on the need for mathematics education to embrace social justice approaches to address diversity and equity issues in the classroom but also to engage students in what Gutstein (2006) drawing from Freire (1976/2000) refers to as reading (interpreting) and writing (transforming) the world with mathematics.

The focus questions for the working group were:

- What do approaches such as critical mathematics education (Skovsmose, 2012) offer integrated STEM perspectives?
- How can a social justice approach to STEM education open-up critical arenas for curriculum projects and research across international contexts?

Our discussions aimed to draw upon research and practice in the fields of science, technology, engineering and mathematics and the challenges of educational practices that embrace social justice perspectives. The working group discussions also aimed to consider the themes of developing a conceptual basis for teaching and learning mathematics in integrated STEM education for social justice, reviewing research that spans STEM and social justice fields, and as this is a relatively new area of research, developing possible collaborative research agendas across cultures and international contexts.



After brief presentations from Judy Anderson (STEM and teacher professional development), Cynthia Nicol (collaborative research project with colleagues around social justice and approaches to embedding social justice issues in teaching) and Richard Barwell (sustainability from a critical mathematics education perspective), participants raised issues and concerns about STEM education based on local contexts. Questions included:

- What is social justice? How is it different if we consider local versus global issues?
- Is social justice only about sustainability?
- How can a social justice approach to STEM education open-up critical arenas for curriculum projects and research across international contexts?
- How do STEM, Social Justice issues, Sustainability and Mathematics relate and/or connect to each other? Can this relationship be represented diagrammatically?

One group of participants shared the following diagram about this last question:

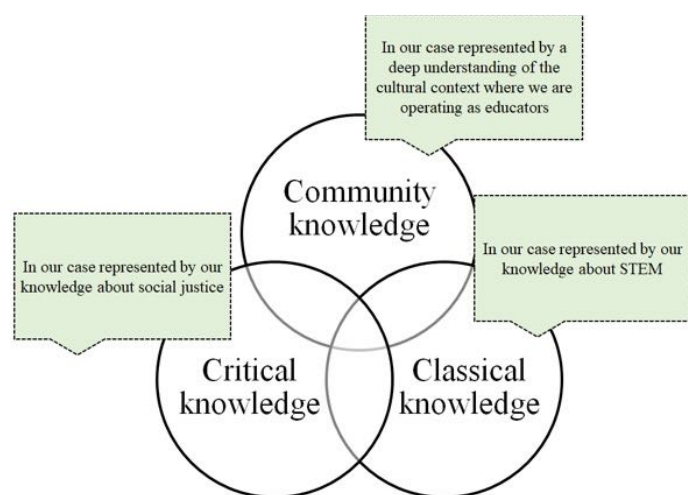


Figure 1. Application of Gutstein's model

The group wrote: Figure 1 shows Gutstein's (2006) model and how it could be mapped to our conversation. The classical knowledge would arguably be our knowledge about STEM. The critical knowledge would be related to questions of social justice and how they interlink with education and the community knowledge would serve creating a contextual platform for international discussions. Yet, we soon discovered that this model falls short as it does not take into considerations questions of superiority and inferiority. It assumes that all three constructs have equal power and can exist in isolation from each other. On the other hand, our discussion showed that the complexity of linking these three constructs together needs to take a different level of depth. We argued that

both STEM (the classical knowledge) and social justice education (the critical knowledge) can only be defined and understood in context. In other words these forms of knowledge mean a different thing and manifest themselves in different ways depending on the context where they are practiced and implemented. Therefore, we developed an adaptation of Gutstein's model (Figure 2) that we thought would better represent our ideas as a group.

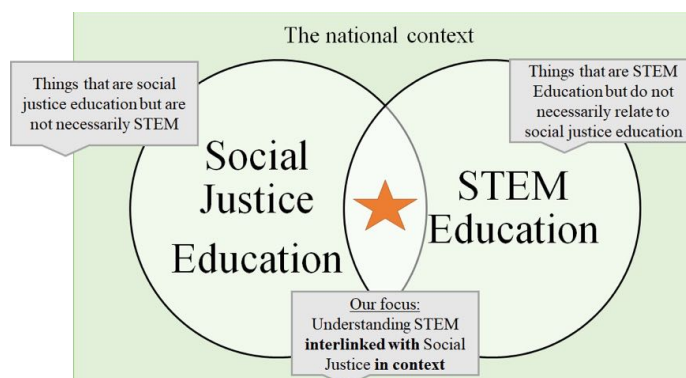


Figure 2. STEM and Social Justice Education in context

We concluded that to study the complexity of STEM Education and its interrelatedness to social justice we need to unpack multiple layers of questions:

- What counts as social justice education but cannot be represented in STEM Education? What counts as STEM Education but not social justice education?
- How can social justice education be understood in context? How can STEM education be understood in context?
- How and where do STEM and social justice education meet?
- How can the meeting point of STEM and social justice education be understood in context?
- To which extent is our understanding of STEM and social justice education influenced by the educational context and to which extent does it influence it?

Finally, several resources were recommended by members of the Working group:

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- O'Neill, C. (2017). Weapons of math destruction: How big data increases inequality and threatens democracy. New York: Broadway Books.

Rosling, H., Rosling Rönnlund, A., & Rosling, O. (2018). *Factfulness: The reasons we're wrong about the world – and why things are better than you think*. New York: Flatiron Books

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Anderson, J., & Li, Y. (2018). *Integrating mathematics in STEM education: an international perspective*. 42nd Annual Conference of the International Group for the Psychology of Mathematics Education. Umea: PME.

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Nicol, C., Bragg, L. A., Radzimki, V., He, T., & Yaro, K. (2017). *Teaching mathematics for justice: Pedagogies of discomfort, contradictions and dialogue*. 41st conference of the International Group for the Psychology of Mathematics Education. Singapore: PME.

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## Research Forum Report: The Use of Video for the Learning of Teachers of Mathematics

**Submitted by Alf Coles (UK), Ronnie Karsenty (Israel), Kim Beswick (Australia), Greg Oates (Australia), and Lawan Abdulhamid (South Africa)**

This Research Forum was a culmination of a number of Working Groups focused on the use of video at recent PME conferences (PME 42: "Exploring the role of facilitators in video-based professional development for mathematics teachers"; PME 41: "Comparing different framework for discussing classroom video in mathematics professional development programs" and also at PME 41: "Videos in teacher professional development – fostering an international community of practice"). The leaders of these working groups came together in putting together a Research Forum proposal. In the thirty-page submission for the proceedings we attempted a *mapping of the terrain* of work on video in relation to mathematics teacher learning, in order to exemplify trends and possibilities. This mapping took the form of five dimensions of variation of video use with teachers of mathematics: (1) what is the purpose of using video?; (2) who watches the video?; (3) what is being watched?; (4) what framework is being used for watching?; and, (5) who leads and guides the use of video?

There were 35 people in attendance at the Research Forum. In the sessions at the conference, we worked with participants on selections of video clips, drawn from each of our respective lines of research. We focused on the following questions: 'What are the dimensions associated with the use of video in contexts of mathematics teachers' learning and development?', drawing on our mapping described above, leading to consideration of: 'What are the implications for video use?'. In the first session Ronnie showed a video clip from the Video LM project that she runs, followed by Lawan showing data from a project involving video stimulated recall. Part of the discussion that ensued was around the dimension of "what is being watched" and the question of what might be



gained from watching videos close to, or far from, one's own practice.

In the second session we asked: 'What do we know about effective facilitation of discussion using video with teachers of mathematics?'; leading to consideration of: 'What are the implications for researching video use?'. Data from projects involving video was offered by Kim, Greg, and Alf. Discussion following these inputs included questions about infrastructure for sharing and using video, the ethics of showing videos, and further issues around "what is being watched" – what length of clip? what supporting resources? who chooses? These issues were seen as subordinate to the dimensions of "what is the purpose of using video" and "who leads and guides the use of video". One over-arching question to arise was how working with video impacts on teaching practice. A suggestion that came from the Research Forum was about the possibility of creating a video database of facilitators working with video, from different perspectives, illustrating a range of variation along the

five dimensions we had identified from the literature.

The group have plans for a joint writing venture as a way of capturing the strands of work in this Research Forum – we would be pleased to hear from any others interested in joining such a project.

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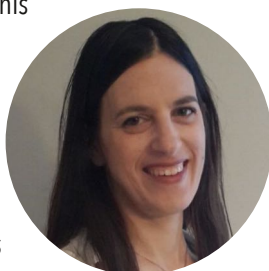
## Research Forum Report: Rituals and Explorations in Mathematical Teaching and Learning

**Submitted by Einat Heyd-Metzuyanin (Israel), Jill Adler (South Africa), Irit Lavie (Israel), Talli Nachlieli (Israel), Michal Tabach (Israel), Sally-Ann Robertson (South Africa), Mellony Graven (South Africa), and Olov Viirman (Sweden)**

Our Research Forum (RF) at PME 43 in Pretoria reported on the work that has been ongoing in the past three years on the theme of "Rituals and Explorations in Mathematical Teaching and Learning". This work, which was also featured in a recent special issue of *Educational Studies in Mathematics* (Heyd-Metzuyanin & Graven, 2019) has mostly stemmed from Sfard & Lavie's (2005) suggestion of the ritual-exploration dyad as a meaningful conceptual pair for describing the progression of learning. Ritual routines are routines in which the goal is to please others or to achieve social rewards, while explorative

routines aim at producing new narratives about the world.

In PME 40, at Szeged, we started a discussion around studies that have been exploring the ritual-exploration dyad. From that Working Group, evolved the ESM special issue and PME 43 presented a lovely occasion to bring the results of this collaborative work back to our community.





The RF was divided into two sessions. The first session was focused on rituals and explorations in learning, while the second session focused on teaching. The first session began with Einat Heyd-Metzuyanin giving a theoretical introduction to the idea of rituals and explorations, with emphasis on the conceptual developments taking place in the last decade from the group of Anna Sfard. Irit Lavie, who has been one of the main drivers of this work in Sfard's group, continued the session with her report on the "de-ritualization" of numerical discourse, focusing on very young children (aged 2.5-4 years old). Following this, Sally-Ann Robertson described her study with Mellony Graven, on South African elementary school learners studying mathematics in their second language, and the struggle to engage them in "exploratory talk" under harsh linguistic constraints. Olov Viirman then reported on how he, together with Elena Nardi, applied the "ritual-exploration" dyad to a very different age-group: under-graduate students of biology in a mathematical-modelling course. This first session was quite dense with conceptual and theoretical information, given out at a pretty speedy rate. We were aware that it may take time to digest this new information, and were thankful to see many of the first-session participants attending the second session, where we had more time to "digest" and discuss how the "ritual-exploration" dyad is relevant for each member in the audience.

The second session opened with a short re-cap of the first session, followed by a report of Talli Nachlieli and Michal Tabach, who showed how they examined ritual and explorative opportunities to learn (OTL) in TIMSS videotaped lessons. Following that, Einat Heyd-Metzuyanin reported on a study that applied the idea of learning progressing from ritual to explorative phases in the learning of teachers in professional development settings. Jill Adler

then gave us a wonderful summarizing commentary, asking some difficult questions about whether and how one can talk about rituals and explorations in the classroom without getting into "deficit talk" (both about the learners and about the teachers). We then had a good 30 minutes for group work and plenary discussion, led by Mellony Graven. In this discussion participants discussed the following question: How can the ritual and explorative dyad forward our efforts to improve mathematics education in various contexts? Interesting comments and thoughts from the audience included relating the concept of ritual routines to attribution theory and to theories of motivation (extrinsic vs. intrinsic motivation). Other participants reflected on how the ritual-exploration dyad and the analyses reported on by the speakers related to their experiences with teachers and learners of mathematics. Many reported that the RF had whet their appetite to learn more about the ritual-exploration dyad and perhaps explore further what it can do for their own research interests. Readers interested in further information on our RF are invited to read the full report in the PME 43 proceedings.

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## Seminar Report: Writing and Publishing Journal Articles

**Submitted by Arthur Bakker (The Netherlands) and Wim Van Dooren (Belgium)**

More and more researchers in mathematics education worldwide indicate that there is an increasing expectation that they publish their research findings in international scientific journals with a high impact factor. Still, this is not an easy endeavor. Even experienced researchers often struggle to get their work published. The good news is that much can be learned.



As coordinators of this session, we started from our position as, respectively, the editor-in-chief and associate editor of one of the A\* journals in the field of mathematics education: *Educational Studies in Mathematics* (Nivens & Otten, 2017; Törner & Arzarello, 2013; Williams & Leathan, 2017). Based on these editorial experiences, as well as our experiences in writing papers for various international journals, we organized this seminar with a twofold goal. One of the sessions was devoted to each goal.

As a first goal we wanted to share advice and experiences regarding how to write a coherent and attractive empirical research article that may convince both the editor and reviewers that publication is worthwhile. Second, we wanted to provide insight into the actual publication process and the various steps involved, including submission, review, various rounds of revision, and finally the publication process. Many aspects were discussed in general, but concrete examples often originated from our experience with *Educational Studies in Mathematics*.

### Session 1 – writing a coherent and attractive research article

On the basis of examples, we discussed the key ingredients of empirical research articles: problem, solution direction, knowledge gap, research aim, research question, key concepts, methodological approach, results, and discussion. Such ingredients need to form the argumentative “skeleton” of the paper (e.g., Bakker, 2018, Chapter 7). We provided tips and tricks that are relevant to the writing of each of these parts, discussed common issues, et cetera.

The second topic that was discussed is how to write a succinct introduction that captures the first part of such chain of reasoning. The

third topic is overall coherence. We presented a number of guidelines on how to promote the coherence, cohesion, and consistency of an article. Fourth, we paid attention to the formulation of research questions –which we consider the heart of any article. Throughout the session, there was space for questions of participants related to article writing, as well as for discussion among participants.



### Session 2 – a peek behind the curtains of the publication process

In the second session, we provided the participants with a peek behind the curtains of the review and publication process. We went through this process step by step, starting with preparing the manuscript for submission, all the way to publication.

First, we paid attention to the importance of choosing the right journal for a particular piece of research (Nivens & Otten, 2017; Williams & Leathan, 2017), and the risk of incurring a reject-without-review decision because a submission is out of scope for the journal. Second, we looked at what a submission looks like, and the formatting guidelines (e.g., APA6). Third, we clarified the typical aspects of papers that editors as well as reviewers look for in order to judge the soundness of the paper and the potential contribution to the field and to the journal. Fourth, we clarified how the selection of reviewers typically takes place, and how the evaluations provided by reviewers are used in coming to a final decision. Fifth, we explained the expectations and good practices in the cases when authors get to revise their manuscript, and illustrate how good response letters are written. Also in this session, there was room for questions and discussion.

The following resources provide more background information:

[https://www.researchgate.net/publication/334397928\\_Writing\\_journal\\_articles](https://www.researchgate.net/publication/334397928_Writing_journal_articles) (session 1)

[https://www.researchgate.net/publication/336900525\\_Writing\\_and\\_publishing\\_journal\\_articles\\_Session\\_2\\_the\\_publication\\_process](https://www.researchgate.net/publication/336900525_Writing_and_publishing_journal_articles_Session_2_the_publication_process) (session 2)

[https://www.youtube.com/channel/UCnOxT-aoAFHNV5u\\_nPAxUXA/featured](https://www.youtube.com/channel/UCnOxT-aoAFHNV5u_nPAxUXA/featured) (webinar on writing journal articles)

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# PME Experiences

## THE WARMTH OF PME 43

### Submitted by Jogymol Alex (South Africa)

Being part of a rural university, I had never thought of attending PME until my Primary Teacher Education Project (PrimTEd) Team told me about it. As such, I am thankful for the financial support I received from the project for making my attendance possible. I am also grateful to Lise Westaway (Rhodes University), whom I worked together with on a submission to present at PME 43. With her encouragement, I have begun a journey with no intention of ever turning back.

The theme of PME was 'Improving access to the power of mathematics' and this was especially relevant in the South African context. Although there has been remarkable progress in providing this powerful knowledge, many of our learners and teachers struggle to access it; I hope that the conversations and collaborations we have engaged in will serve as a catalyst for further progress.

Attending conferences fully dedicated to mathematics teaching and learning is something I really enjoy, and so it was extremely



difficult to choose which sessions to attend for fear of missing out. However, I was highly impressed with all the sessions I chose to attend. The highlight of PME for me was attending the Working Groups meeting. I was especially interested in attending the 'International perspectives on proof and proving', as my doctorate study of 2012 centred on geometry teaching and learning in South African rural schools. Many of the authors I had cited in my study were present and meeting them had me star-struck.

The wealth of information I have received, as well as the tremendous encouragement and support have been wonderful. I am excited to be part of this energetic team to foster research in proof and proving in the international context. Having been promoted to Associate Professor very recently, I feel that this international collaboration will provide me with great exposure and enhance my career as a mathematics education researcher.

It might have been winter in Pretoria, but those of us who experienced the warmth and joy at PME did not notice it at all!





## ¡Thanks South Africa!

### Submitted by Claudia Cornejo Morales (Chile)

I am Claudia Cornejo Morales, elementary school teacher, PhD student in mathematics education at Pontifical Catholic University of Chile, and this is my experience at PME 43.

In life there are difficult things, growing and communicating for example, and I have decided to work doing two difficult things: being a primary school teacher and a researcher in mathematical education. Also, I decided to try one of the two mentioned first: communicating effectively with others.

Achieving this has meant taking a path that has been long and very rewarding, especially when you meet great people and have unforgettable experiences. PME 43 has been one of those experiences and I hope it keeps being like that. Sharing with expert and new researchers has enriched/enhanced my professional development, and even more, my development as a person. The fact that participants of the congress help you improve your research and that they tell you about their research and personal experiences is invaluable.

The journey was long and the challenge was big. The journey had two moments: preparation and experience moment. Preparing for PME43, the first congress outside of America I would attend, was very challenging. I studied English for a year, we wrote the contribution text (in just one page!), I got a scholarship and got in a plane for 17 hours. First PME, first trip alone, first English-speaking country, first presentation in English ... they were many first experiences!

I arrived. Apparently, the English classes had an effect and I felt very proud about that. Meeting many people ... and communicating with them was the biggest and most entertaining of the challenges. Realizing that you know only a small part of the world and that in a congress like this one you can know more places through the eyes of others is fantastic. Attending conferences and presentations is a great theoretical, methodological and investigative ex-

perience. Contacting professionals who have the same ideas about research as you and being able to develop work together is a very rare opportunity that should not be missed. Wednesday came and I must show my presentation. Nerves. It was very enriching because attendees were very interested in my contribution and encouraged me to continue developing it while offering their help and knowledge to do it. The following days were even better and I felt calmer because my presentation was successful.

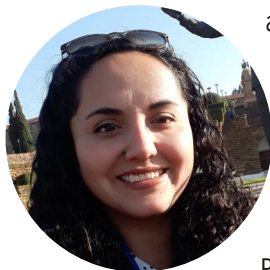
PME ends and I am already thinking what I will do to get to the next one.

Side note: I petted an elephant! And I saw the beauties of nature that Africa has to show.

PME 43 was a turning point in my professional, research, and personal development.

¡Thanks South Africa!

See you in Thailand.



## Power of mathematics – Power of the PME

**Submitted by Julia Rey (Germany)**

### Before the conference ...

The PME 2019 in South Africa (Pretoria) was my first international conference. It was recommended to me by my doctoral supervisor.

I decided to submit an Oral Communication (OC), focusing one main aspect of my doctoral thesis research: The analysis of methods of the natural sciences and their interplay with mathematical learning processes.

For my first contribution to international conference presentations, the OC format was a good choice. During the preparation for the conference I was a little nervous about the audience interaction – not because of the subject, but rather due to the fact that English is not my mother tongue.

### During the conference ...

When I came to the conference site, I went to a First-Timers-Meeting. Here, we received a brief outlook for the upcoming conference. Furthermore, small groups were put together, to get to know each other. This meeting was especially helpful in order to get in contact with different people from all over the world. As we all share an interest in mathematics, we soon found a common topic of conversation. During the ensuing conversations, I presented my research – a wonderful preparation for my upcoming talk.

Afterwards, a first joint welcoming program began, central point was the motto of the conference "Improving access to the power of mathematics".

You really felt the power during the presentations. This motto really accompanied me throughout the conference in different ways. For example, in terms of content, I asked myself, how my research contributes to the access to mathematics. In short, I can say: The power of experimental work is an access to proof learning via empirical references.

I would like to summarise the conference as follows: Besides the interesting and valuable presentations, a really great and organised program was created for us. In addition to a fantastic shuttle service, polite students as tour guides and assistants, there were various opportunities for international exchange (within the working groups and presentations, during coffee breaks, excursions, or evening programs). There were many exciting discussions not only about my research interest, but also about other school systems,

different perspectives on mathematics, different educational theories and about South African history.

### After the conference ...

I can now report – the first nervousness was completely in vain! What I got out of this experience? New contacts, literature references, and other interesting project ideas. But most importantly, many unforgettable impressions; I am so happy and above all motivated to start further research projects! It was a full and varied program and I am looking forward to the next PME 2020 in Thailand, which I would like to visit – perhaps presenting a research report.

With love – Mit lieben Grüßen – Met alle groete



# Introduction of New Members of the PME International Committee

## Jodie Hunter



I am currently a Senior Lecturer in Mathematics and Pasifika education at Massey University in New Zealand. Within this role I am the co-director of the Centre for Research in Mathematics Education and co-leader of a large-scale professional learning and development project called "Developing Mathematical Inquiry Communities". This work involves working closely with schools and in classrooms with teachers to support a shift in pedagogical practices to better serve the diverse learners that com-

prise mathematics classrooms in New Zealand.

My research interests include culturally responsive and sustaining teaching and equity focused mathematics education. I am also interested in developing early algebraic reasoning in primary school classrooms and investigating student perspectives in a range of contexts.

I attended my first PME conference in Melbourne, Australia in 2005 and since then I have been to a further five PME conferences. I am a member of the Secretary Portfolio Group and look forward to both working with and contributing to the PME community.

## Ceneida Fernández

I am an Associate Professor in Mathematics Education at the Department of Innovation and Teaching Methods, University of Alicante, Spain. My research focuses on both pre-service teachers' learning and on primary and secondary school students word problem solving training. Concerning pre-service teachers' learning, my interest resides in pre-service teachers' means of developing professional competences and knowledge with regard to mathematics teaching.

I have participated and presented research reports in each and all PME conferences since PME 32 held in Morelia (Mexico) in 2008,

which was my first one. The sole exception was 2012. The PME conference has provided me with the opportunity to meet and work with international colleagues, with whom I have shared and expanded my experiences, discussing my practice and research.

As part of the Vice President Portfolio Group in the PME International Committee, I very much look forward to contributing to and working with the PME community.



## Yasmin Abtahi



Dr. Yasmine Abtahi is a Full Professor of Mathematics Education in the Western Norway University of Applied Sciences. In her current research, Yasmine investigates if and how the domination of a certain form of math-

ematical knowledge privileges the domination of certain ways of knowing leading to the domination of certain cultures over the others. In other words, by ignoring the diverse range of ways of knowing that exist in the world, students' abilities to act, interact, and learn mathematics could be diminished, thus propagating multiple injustices.



## Arindam Bose

I work as an Associate Professor at the Centre for Education Innovation and Action Research (CEIAR) in Tata Institute of Social Sciences (TISS), Mumbai, India. I lead the Mathematics Team in the Connected Learning Initiative (CLIX) Project (a technology enabled initiative at scale for high school students) and Coordinator of the Science and Mathematics Education Group, CEIAR at TISS. I have a PhD degree in Mathematics Education from Tata Institute of Fundamental Research (TIFR), Mumbai. I have taught mathematics at the undergraduate level in Patna University, India for five years and was a member of the mathematics focus-group of the Bihar Curriculum Framework 2006. My research interests are at the interface of culture and mathematics cognition (ethnomathematics) and mathematics learning in language di-



verse environments. In particular, together with Mamokgethi Phakeng and Nuria Planas, I explore meaning making in mathematics classrooms in trilingual contexts. We three, along with Richard Barwell, Judith Moschkovich, and Susanne Prediger, organised a Research Forum on research on language diversity in Pretoria. I also look at the nature and extent of mathematical knowledge embedded in work-contexts and trace its implications for school learning.

My first PME conference was in PME 33 in Ankara, Turkey and since then I have attended a further four PME conferences. I am a part of the Policy Portfolio Group and eagerly looking forward to working with the PME community and contributing to it.

# PME Pre-submission Support

## Introducing the New Coordinator

### Submitted by Merrilyn Goos (United Kingdom)

Are you a novice or inexperienced researcher thinking about writing a paper for a PME conference? You might be eligible for PME's pre-submission support if you have limited access to expert advice in your own environment. I am pleased to have taken on the role Pre-submission Coordinator, which involves assigning an experienced PME researcher to mentor eligible applicants for this support.



### Who am I and why am I doing this?

I am currently Professor of STEM Education at the University of Limerick, Ireland. Previously I worked for 25 years at The University of Queensland in Australia, and I also held a 6-month appointment as Professor of Mathematics Education at Loughborough University in the UK. I have enjoyed mentoring new or inexperienced researchers while working in a variety of roles – as a journal editor, book editor, reviewer, co-author, doctoral supervisor, Head of School, and research centre Director. Early in my research career I was nurtured by excellent mentors, but I know that not everyone has access to this kind of support. So I have assembled a small team of experi-

enced researchers from Europe, America, Asia, Africa, and Australasia to help me deliver PME pre-submission support.

### What do you need to do to access pre-submission support?

Email me at [merrilyn.goos@ul.ie](mailto:merrilyn.goos@ul.ie) before 1 November in the year preceding the conference you wish to attend, with your draft paper (Research Report or Oral Communication) attached. Also provide a statement that describes:

1. your limited experience in writing research reports (or journal articles) and
2. your limited access to expert advice.

If you are eligible for pre-submission support, I will assign a mentor who will provide feedback on how to strengthen your written paper. Your paper will still have to go through the normal PME conference reviewing process, and acceptance is not guaranteed. However, I hope that this individual attention and guidance will be beneficial in helping you prepare a conference submission.

# Credits for Former IC Members

## Peter Liljedahl - Outgoing President

### Submitted by Einat Heyd-Metzuyananim (Israel)

This year, the PME community bid farewell from our enthusiastic and energetic president - Peter Liljedahl. Peter served as the president from 2016-2019. His unique contribution to the PME community will be remembered, beyond all else, in the materialization of the "Charity Status" project. Turning the PME into a charitable organization was Peter's major goal during the three years of his presidency. He worked on it days and nights, pushing against the bureaucratic challenges while also skillfully managing the extensive decision-making and voting process that was needed within the PME organization. Aside from that, Peter was a wonderful leader to have in the IC. He was always highly organized, managed

meetings in a very timely fashion, and was friendly and responsive to all members of the IC. Peter had a unique way of leading discussions in a way that would give everyone a sense that they were heard, while never getting stuck for too long on a certain point. His strong leadership skills and devotion were an asset to the Executive committee, to the IC and to the PME membership as a whole. We wish him much success in his future endeavors.



## Kai Lin Yang

### Submitted by Laurinda Brown (United Kingdom)



Thank you, Kai Lin Yang, for your work in the Treasurer Portfolio Group of PME

When Cris Edmonds-Wathen was Treasurer of IGPME and I was in my first year as a new recruit to the Treasurer's Portfolio Group, what I remember most is the calm efficiency and wisdom of Kai Lin Yang,

Taiwan, able to comment on spreadsheets from conference organisers, both budgets and final accounting and her support with the process for managing submissions for regional

conferences and special projects. Seeing her comments helped to attune me to what to notice.

Now that I am Treasurer, in my first year, I relied on her experience to do the initial work on giving comments on the submissions for spending the surplus, since she had developed criteria in the previous year. She did this, whilst having mentioned that she had already taken on a senior editing role for a journal and so would have less time than previously. I wish you well in your work and life, Kai Lin, knowing that you are a very safe pair of hands.

## Mellony Graven

### Submitted by Markku Hannula (Finland)

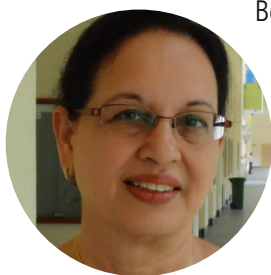
Professor Mellony Graven was elected to the IC in 2015. First, she worked two years in the Vice President Portfolio Group, and the years 2017-2019 she served in the Policy Portfolio Group. Despite not leading a portfolio, she carried the responsibility for the on-



going work on new PME policies regarding conference co-presentations. Moreover, she served in both the Local Organizing Committee and the International Program Committee for PME 43 in Pretoria. She was always an active discussant in the IC meetings.

## Berinderjeet Kaur

**Submitted by Einat Heyd-Metzuyanim (Israel)**



Berinderjeet Kaur served on the IC during the years 2015-2019. She was part of the Secretary's Portfolio Group and was always timely and responsive to every task. During the year 2016-2017, Berinder served as an important liaison between the IC and the Singapore LOC as

she was the chair of PME 41. Berinder was unique in her warmth and in the happy relationships she formed with all the members of the IC. She was a great member to have onboard and the IC will certainly miss her.

## David Gomez

**Submitted by Markku Hannula (Finland)**

Professor David M. Gómez was a key actor in the International Committee of PME. He served in the IC for 2015-2019. He led the Policy Portfolio Group for the year 2016-2017 and the Vice President Portfolio Group for the years 2017-2019. He was involved in the development of many PME activities and policies. For example, he was involved in developing the Early Researcher Days, and the policy for using the surplus that had accumulated to PME accounts over the years. His latest main contribution was completed at the

2019 AGM, where the membership decided to accept a new conference submission and co-authoring policy (replacement of the "rule of 4"), which was prepared under his leadership. It is also worthy to note that he was the main organizer for the first regional PME conference in Chile, 2018 – even if this was not part of his role in PME IC.





# PME IC Reports

## Policy Portfolio Group (PPG) Report

### Submitted by Richard Barwell (Canada)

The Policy Portfolio Group (PPG) currently consists of Arindam Bose (India), Anika Dreher (Germany) and Lovisa Sumpter (Sweden) and is led by Richard Barwell (Canada).

The main work for PPG relates to the formulation and recording of PME policy. It is important to keep track of different policy decisions taken by the AGM or the International Committee. With the move to charitable status, decisions will be recorded at three levels: the constitution (governed by UK charity law), bye-laws (which can be formulated by PME, within the parameters of the constitution), and policies and decisions (specific matters decided by the IC, in some cases approved by the AGM, within the parameters of the constitution and bye-laws).

The following files are currently being worked on by the PPG:

- Completing updates to our record-keeping processes
- Development of research and publication ethics policy



- Examination of concerns relating to the pre-registration fee

- Consideration of the idea of including professional workshops at PME conferences.

During the conference in Pretoria, we ran a lightning survey of PME members to get feedback about the last point concerning professional workshops. Thank you to the 259 people who responded! We learned that 64% of respondents would definitely or probably be interested in this kind of activity in the conference program. The level of interest falls to 43% ("definitely or probably interested") in the case that professional workshops are part of pre-conference activities for which a fee is charged. The most popular topics were specific research designs, methodologies or methods (74%), data analysis software and associated methods (45%) and research project management (31%). We will review these findings as part of our work on this file.

## Vice President Portfolio Group (VPPG) Report

### Submitted by Einat Heyd-Metzuyananim (Israel)

The Vice President Portfolio Group (VPPG) currently consists of David Gomez (Brazil; outgoing), Ceneida Fernández (Spain), Maitree Inprasitha (Thailand), Maria Mellone (Italy) and is led by Einat Heyd-Metzuyananim (Israel, Incoming).

The VPPG is responsible for issues relating to scientific matters of the PME conference. Last year, the VPPG was mainly busy with two issues: (1) proposing an alternative to the "rule of four" which had been in place for many years. This alternative rule was voted on and accepted during the AGM of PME 43 in Pretoria. Authorship is now not limited to 4 contributions. However, other restrictions (such as being a lead author on only one RR or OC) still apply. For more information, please see the AGM minutes of PME 43 at the [members.igpme.org](http://members.igpme.org) website (2) Designing a new, format-free review option for Research Reports that do not fit the current review criteria. This has been pilot tested



in PME 43 and found to be a useful option. This year, we will look further into how this solution can be incorporated into the ConfTool workflow.

An important issue that we have put at the front of our attention this year is the issue of accessibility. We have a new "early bird" reviewer – Marilyn Goos, who has taken the place of David Wagner in this role. We wish to take this opportunity to thank David for his service in this important job for the last four years. In addition, since the issue of accessibility and equity is a complex one, we are experimenting with a new form of involving members on this matter. The new PME Constitution allows IC to nominate a sub-committee for a well-defined task. We want to use these sub-committees to engage volunteering non-IC members with passion about the task. Currently, Talli Nachlieli (Israel) has volunteered to start a sub-committee that will look into ways to support researchers from under-represented countries to attend the PME.

## Secretary Portfolio Group (SPG) Report

### Submitted by Einat Heyd-Metzuyananim (Israel)

The Secretary Portfolio Group (SPG) currently consists of Man Ching Esther Chan (Australia), Jodie Hunter (New Zealand; incoming), Miguel Ribeiro (Brazil) and is led by Judy Anderson (Australia) with Einat Heyd-Metzuyananim (Israel) filling in until end of 2019.

**Responsibilities:** The Secretary Portfolio Group (SPG) is responsible for facilitating communication with PME members, including future conference organizers, for communicating with external organizations such as the ICMI, and for keeping records of all PME activities. In the past half year, the group's work was mostly concerned with the transfer of the IGPME website to a new host, including its redesign.

The transfer of the site resulted from our former website development company announcing at the end of 2018, that they would no longer be able to provide maintenance services to the IGPME website. Following this announcement, we looked for alternative solutions that would enable IGPME as much flexibility as possible concerning adding information and maintenance. We decided on



a Wordpress solution that would be maximally portable while minimally expensive.

The new IGPME site has been up and running at <http://igpme.org> since July 2019. This site features a new design (developed by Nir Schnapp) and is open for all. It includes most of the information on the IGPME organization, including all past proceedings, which are now open-access. An additional, members-only site at <http://members.igpme.org> holds information on PME policies, AGM meetings and agendas, and several fora for communication between members, including the "path to AGM" forum.

Quincy Wang, from Simon Fraser University, has been working with Birgit Griesse (our Administrative Manager) and with us on building the site and transferring all the content from the old website. The work on this has turned out to be more time consuming than initially expected, yet is now reaching conclusion. Quincy will continue to provide technical support and development of the website for us as needed.

## Treasurer Portfolio Group (TPG) Report

### Submitted by Laurinda Brown (United Kingdom)

The Treasurer Portfolio Group (TPG) currently consists of Yiming Cao (China), Yasmine Abtahi (Canada and Norway), Anthony Essien (South Africa) and is led by Laurinda Brown (United Kingdom).

After PME 43, we are welcoming Yasmine and Anthony as new members to the group and wish Kai Lin Yang well as she finishes her time within the group.

The Treasurer Portfolio Group responsibilities include: managing the financial transactions of IGPME (e.g., making payments and deposits, responding to financial queries, issuing confirmations); maintaining records; advising on fiscal questions from present and future conference organisers; managing the surplus fund for Regional Conferences and Special Projects and preparing annual financial reports.



IGPME's banking is with Barclays Bank UK, requiring at least one member of the IC (i.e., an officer of the organisation) to be from the UK. Laurinda Brown as Treasurer currently holds this position. There is one account that is in pounds sterling, however, at the AGM, PME 43, it was agreed that we will be exploring setting up a Euro account that will separate out the Skemp Fund monies. Once we have a separate account and have achieved charitable status, we will be able to accept separate donations to this fund at any time during the year.

Our goal of becoming a registered charity is nearing another milestone. All papers are now in order, many thanks to Markku Hannula for his work on this, and Laurinda Brown will take this forward with our solicitors late in November. All members of the IC will become trustees if we are successful. We have been working towards being a registered charity for many years now, becoming a non-profit or-

ganisation with the introduction of the surplus policy. At the AGM PME 43, the TPG reported that there would be just less than 10 000 Euros to be spent on Special Projects this year. When PME 43 and Russia Regional Conference accounts have been presented and monies transferred, almost certainly before Christmas 2019, we will be in a position to know if we can offer two or three special projects of less than 5000 Euros. This decision will be supported by setting our first zero budget for the year, 2020, a change in structures in line with charitable status, which we will then discuss at the next AGM. So, look out in January for the timeline for submission of Special Projects of less than 5000 Euros. We aim to make decisions as an IC by March and projects will need to be completed by December 2020, with final reports and accounting by February 2021.

IGPME continues to retain a minimum reserve fund of €35 000 to cover pre-conference expenses in case of unforeseen circum-

stances. It is intended that conference budgets from the initial stages through to final accounts will be overseen by one member of the TPG in consultation with other members, the treasurer liaising with Executive and IC where necessary.

My first year as Treasurer seemed to fly by. Thank you to people who attended the AGM of PME 43 in Pretoria and asked useful questions to take our work forwards; Cris Edmonds-Wathen, previous treasurer, who made the steep learning curve of becoming PME treasurer manageable by responding quickly to my many questions in the early days and who has been willing to act as auditor for a regional conference; and to Peter Gates, who was a thorough and questioning auditor of PME accounts, making me realise that I already knew a lot about the systems and who worked with me in improving them still further.





# PME Special Project Report

## The Strathmore Mathematics Education Research Meeting

**Submitted by Mary Achieng (Kenya)**

The Strathmore Mathematics Education Research Meeting (SMERM), was held on August 12-16, 2019 at Strathmore University in Nairobi Kenya. The theme of the meeting was School Mathematics: Connections to Social and Cultural Contexts in East Africa. 26 graduate students and early career faculty from Kenya, Uganda, Tanzania and Rwanda attended the meeting. The program included workshops and paper presentation sessions. There were five workshop sessions which addressed the following areas:

1. Developmental research into knowing, understanding and developing mathematics teaching-for-learning-Prof Barbara Jaworski
2. Conducting and communicating classroom-close research that makes an impact-Dr. Jennie Golding
3. Ethno mathematics-Prof Linda Furuto (via conference call)
4. Research on Lesson Study-Prof Takuya Baba
5. Publication-Dr Esther Levenson (via conference call)

### Program Highlights

A total of 21 papers were presented during the paper presentation sessions. In addition to the comments and questions that were addressed at the end of each presentation, each morning and afternoon session had a time when there was discussion to wrap up ideas that came out of the presentations and particularly to relate

the ideas to local research contexts. Below is a summary of the main ideas discussed.

### Quality and Approaches to Research

Some of the ideas discussed included the need for rigor in research and being open to different methods of study design.

Participants discussed the need to link positivist and constructivist approaches in research and open up to different methodological approaches, that will allow research to support understanding of local mathematics teaching and learning contexts. The need to explore qualitative research methods was highlighted since most researchers present tended to lean towards quantitative research as was evident in the presentations.

There is also need for more cross cutting longitudinal studies. The need to consider the impact of research and in particular research that can inform policy was a major highlight of Jennie Golding's workshop. This workshop also addressed research dissemination. It was also evident that there was a gap in research in the region at the tertiary level. This came out in the discussions after Prof. Jaworski's presentations which provided a motivation for such research and illustrated through the projects described in the presentations. Dr. Michael Obiero, a pure mathematician gave a presentation



titled, *"Providing High Quality Student Feedback Through Electronic Assessments."* The intention was to start a conversation on the issue of assessments in mathematics courses at universities in the region particularly to address the issue of large class sizes.

### Publication

Challenges related to publication, were discussed during the publication session by Esther Levenson. One of the challenges was access to high quality journals because some of the local universities may not have subscriptions to highly ranked journals. This was an even greater challenge for graduate students as they are not able to stay in touch with research trends and the latest in research in their areas of interest. Proposals for addressing how to stay in touch with latest research included conference proceedings, which are often freely accessible.

### Teachers as Researchers

Participants were sensitized to the need to incorporate practicing teachers in mathematics education research as researchers and not just as participants. This was demonstrated from the workshop by Barbara Jaworski and the reality of such research brought closer home by the presentation on *"Advancing Mathematics Education through a Suitcase, a case of Takawiri Island Primary school."* One of the presenters, Benta Ouma, is a teacher at Takawiri Island Primary School and took part in the project as a researcher.

### Curricula

Some countries in the East African region are in the process of implementing competency-based curricula (CBC) and therefore a number of presentations were on that. Presentations and discussion on CBC focused on preparation of teachers for CBC and highlighted the need for mathematics education researchers, to identify the kinds of support teachers may need for effective implementation of CBC.



Participants also expressed concerns about the teacher training curriculum and how it impacts classroom instruction in mathematics. The challenges of rigid curriculum programs that do not allow teacher preparation to address emerging issues related to the teaching and learning of mathematics were discussed. Pedagogical approaches that would support preservice teachers' development of conceptual understanding of mathematical ideas and in turn develop instructional skills that will support conceptual understanding in mathematics classrooms were also discussed.

### Recommendations by participants

1. Consider the possibility of having an East African journal that will support dissemination of research that is relevant to local contexts.
2. Invite some of the stakeholders like the policy makers for similar events in the future.
3. Research in mathematics education be enhanced across all levels, primary, secondary and tertiary levels.
4. Build capacity of mathematics education researchers to ensure the quality and relevance of research conducted in the field.
5. Examine the role of the local community in trying to promote mathematics education agenda.

Promote collaboration in research among East African researchers that would also support supervision of graduate students.

### Feedback and Observations

The response rate to the feedback survey was 50%. The participant feedback on the extent to which they had benefited from the different parts of the program indicated all sessions were beneficial even though the extent varied for different parts. The sessions leading in terms of the number of participants who expressed that they had benefited very much were *Developmental research into knowing, understanding and developing mathematics teaching-for-learning* and *Conducting and communicating classroom-close research that makes an impact* (a tie at 79% of participants for each of the two).

One aspect of the program that participants would want to see changed was the amount of time allowed for discussion, something that we had noticed as we prepared the program. We erred in accepting too many papers for presentation given that we did not have parallel sessions.

Some of the topics participants would like to see addressed in future include: The competency based curriculum; statistics education; writing and publishing; conceptual and theoretical

frameworks; research design and analysis; undergraduate mathematics; emerging, contemporary issues in the teaching and learning of mathematics; and longitudinal research in mathematics education.

This feedback suggests that there is ongoing need for support on how to conduct research in mathematics education. Future events to address this may take the form of workshops that focus on particular aspects of research and address them thoroughly. Research

clinics for those working on their Masters and PhD research may also provide forums for consultation and support that some of the participants may not have access to at their institutions. Participants' interactions with the four senior mathematics education researchers (Barbara Jaworski, Jennie Golding, Penina Kamina and Marguerite Khakasa O'Connor) that were present at this meeting confirmed the need for such consultative forums.

# Open Contributions

## An Open Contribution on Open Contributions

**Submitted by Daniel Sommerhoff (Germany), Maïke Vollstedt (Germany), Igor' Kontorovich (New Zealand)**

The PME newsletter – in its current form – was introduced in 2009 by Fou-Lai Lin (PME president at that time) and the editors Christina Frade and Zhonghe Wu. It was meant to be a “rope that connects the PME website, PME information and PME members tightly” (Fou-Lai Lin, Issue 1, 2009) and a means of communication within the PME community. In particular, the newsletter was targeted at:

1. Sharing information from the president and the IC with the PME members.
2. Informing PME members about topics of interest (e.g. PME conferences and special projects).
3. Serving as a platform for discussion and open exchange.

As editors of the newsletter, we continuously strive to achieve these goals alongside reflecting on how we are doing and how our doings could be improved. From our point of view, the first two goals are regularly achieved as each issue of the Newsletter contains messages from the PME president, reports from various PME committees, updates on upcoming PME-conferences, projects and initiatives. Relevant information from

partner communities (such as ICME) are also published. However, the third goal seems to fall behind as only a small number of open exchanges and dis-

cussions have been published until now.

To advance the third goal of the newsletter, we would like to include more open contributions by the PME members. So, what should these contributions talk about and what should they look like? We intentionally avoid having a blanket approach to these questions not to limit the passion and creativity of our future contributors. Instead, we encourage the PME members to write about issues that lie at the heart of the PME community and deserve an open debate. This might be important news that not all the members are aware of, critical reflections on the processes that our community is going through, general musings about our discipline, and more. We especially encourage contributions that address complicated or delicate topics that may not be in consensus by all the members; in our experience, such topics often matter the most. However, the PME newsletter is no substitute for publications that rather belong to a scientific journal and have an exclusive focus on mathematics education content. As Editors, we'd like to move the newsletter's focus to be stronger on communication and discussion – and this should also be reflected in open contributions. And just to clarify, open contributions go through a review process just like all other pieces that we publish.

We are open to your open contributions and look forward to providing the floor for exciting discussions on important topics.





## ICMI Awardees for 2019 and 2020 – Citation

In the current issue of the Newsletter of the International Commission on Mathematical Instruction (ICMI), the president of ICMI, Jill Adler, is happily announcing the awardees of the 2019 ICMI Felix Klein medal honoring a lifetime achievement, the 2019 Hans Freudenthal medal recognizing a major cumulative program of research, and the 2020 Emma Castelnuovo medal recognizing outstanding achievements in the practice of mathematics education.

We are very grateful to our colleagues from the ICMI-Newsletter,

Abraham Arcavi, Merrylin Goos, and Lena Koch, for giving their consent to republish the citations on the awardees. The original text can be found [here](#).

If you want to nominate a colleague for one of the medals in the future, watch out for the call for nominees issued sometime in 2021-2022. You will not miss it if you register for the ICMI-Newsletter [here](#).

### Tommy Dreyfus 2019 Felix Klein Medal

**Submitted by the Felix Klein and Hans Freudenthal Awards Committee (Anna Sfard (chair) and five other members)**

The Felix Klein Medal, with which ICMI honors the most meritorious members of the mathematics education community, is given in 2019 to **Tommy Dreyfus**, Professor Emeritus at Tel Aviv University, Israel, in recognition of his life-time achievement. This distinction acknowledges Professor Dreyfus's contribution to research as well as his leading role in shaping and consolidating the research community and in fostering communication between researchers.

For four decades, Tommy Dreyfus's research has been systematically deepening our understanding of mathematics learning. Trained as a mathematical physicist, Tommy has been drawing in this work on his deep understanding of mathematics and his first-hand familiarity with ways in which mathematical ideas come into being and evolve.

Since the late 1970s and for the next two decades his research has been focusing on students' conceptualization of mathematical objects such as function, and on the role of intuition, visualization and aesthetics in mathematical thinking. With years, his interests have been gradually shifting from the individual student to learning-teaching processes of the classroom. In the last twenty years, his empirical and conceptual work has been devoted to the study of epistemic activities such as proving and abstracting.

These efforts resulted in the theory known as AiC – Abstraction in Context, which he developed with Baruch Schwarz and Rina Her-



shkowitz. Conceived in the late 1990s, the AiC framework has become increasingly influential. Since its inception, it has generated much empirical research all over the world.

The theory has been found to be useful also to teachers, whom it provides with tools for monitoring student learning. As impressive in its scope, breadth, depth and impact as Professor Dreyfus's research is, it constitutes only a part of the contribution for which he is honored today with this special distinction.

Another outstanding part of his work is his ongoing project of shaping and consolidating the international community of research in mathematics education, a goal that he tries to attain in multiple ways.

First and foremost, through his extensive editorial work he has been setting standards and giving directions for research in mathematics education. Particularly influential has been his 30-year long association with *Educational Studies in Mathematics*, which included his three-year long term as the editor-in-chief. Professor Dreyfus has also been serving in, and shaping, numerous professional organizations, with PME (the international group for the Psychology of Mathematics Education) and ERME (the European Society for Research in Mathematics Education) among them. In addition, he played key roles in numerous professional committees in Israel, Europe and America. His influence on research and on policy directly affecting mathematics teaching is keenly felt over the world.

In all these activities, Professor Dreyfus has been consistently promoting cross-discursive dialogues. He has done this by organizing international meetings, establishing trans-continental collaborative research projects, appearing worldwide as an invited speaker and by extensive mentoring in his own country and beyond. Probably the most important and innovative among Professor Dreyfus's consolidating activities have been his multifarious efforts to spur and improve communication among researchers working within differing theoretical frameworks. Being concerned about the fragmentation of the field of mathematics education, Professor Dreyfus has been looking for ways in which community members can engage in a productive dialogue across discursive boundaries.

These attempts began with his own cross-theoretical research collaborations. It continued with his conceptual work on the possibility of "networking theories", the activity of employing multiple theories in the attempt to produce a synergetic, cumulative effect. Through these initiatives, Professor Dreyfus has contributed to changing the dominant narratives about theoretical diversity. With his help, the multiplicity of research discourses is now seen less as a problem to solve than as an opportunity to embrace.

Born in Switzerland and now living in Israel, Tommy is fluent in a number of languages, which makes him particularly well equipped for the project of consolidating the international community. After his 1975 doctorate in mathematical physics from the University of Geneva, endowed with several prestigious fellowships and awards, Tommy began visiting universities all over the world. Since then, he never stopped.

In parallel to his work at the Weizmann Institute and at the Center

for Technological Education in Holon, and later as a full professor of mathematics education at Tel Aviv University, Tommy served as a visiting professor in 14 universities over the world, including in Canada, Germany, Finland, Israel, New Zealand, Norway, Sweden, Switzerland, and the USA. On all these occasions, he spent much time teaching and working with both young and seasoned researchers. By all accounts, he left an indelible mark in all the places he visited. This owes, among others, to his ability to communicate fluently and easily, to his sensitivity to other cultures and to his general sense of inclusiveness. His willingness to listen and to share his own insights and his devotion to a common effort of understanding and improving mathematics education have touched everyone with whom he has come into contact. Officially retired since 2015, he remains as active and engaged as ever.

To sum up, over the 40 years of his career, Professor Dreyfus has been contributing to our collective endeavor of promoting mathematics education in great many ways: as a researcher, as an editor, as an organizer and policy adviser, and as a teacher and mentor. So far, he has published more than 120 research papers and book chapters, 9 edited volumes, and diverse teaching materials. His writings continue to be read and cited widely, and research programs he initiated or helped establish continue to thrive and inform the field. Even now in his retirement, he continues to shape the field, to foster young researchers and to influence research and policy, both in his own country and abroad. For all this and his many other contributions to our community, Tommy Dreyfus is an eminently worthy candidate for the Felix Klein Award.

## Gert Schubring 2019 Hans Freudenthal Medal

**Submitted by the Felix Klein and Hans Freudenthal Awards Committee (Anna Sfard (chair) and five other members)**

The Hans Freudenthal Medal, with which ICMI honors innovative, consistent, highly influential and still ongoing programs of research in mathematics education, is being awarded in 2019 to Professor **Gert Schubring**, a long-time member of the Institut für Didaktik der Mathematik at Bielefeld University, Germany, and an extended visiting professor at the Universidade Federal do Rio de Janeiro in Brazil. This award is being granted



to Gert Schubring in recognition of his outstanding contribution to research on the history of mathematics education.

Gert's research of over four decades has opened new, important avenues of research into the phenomenon of mathematics education. Trained as a mathematician, Gert has been a member of the Institut für Didaktik der Mathematik since 1973, when this interdisciplinary research institute for mathematics education was founded. In his doctoral dissertation, defended in 1977, Gert wrote on the genetic principle in approaching historical

research in mathematics. Afterwards, he extended his interests, producing wide-ranging writings on the history of mathematics education within and across countries, and publishing on the history of mathematics.

One of Schubring's earliest publications came out of the symposium, "Comparative Study of the Development of Mathematical Education as a Professional Discipline in Different Countries", presented at the Fourth ICME conference in Berkeley in 1980. This set the stage for the mathematics education community's reflection on itself as a discipline, and how its own social context had framed its objects and methods of study. By inviting us to place ourselves in front of a mirror, Gert also sparked interest in the history of earliest efforts in mathematics education, including the work of Felix Klein, on which Gert has recently co-edited the important book, *The Legacy of Felix Klein* (2019, Springer).

His seminal works have helped to realize the importance of considering the social context in the study of the history of mathematics education. If this field of research is now well acknowledged, it is in large part due to his theoretical and methodological contributions, as well as to his leadership in scientific communication.

Another, related but separate, strand of Gert's pioneering work was the study of textbooks, which he began in his investigations on the evolution of mathematics teaching in Latin America. This is yet another area of research that he helped to recognize as worth attention. In 2017 he also chaired the International Program Committee for the Second International Conference on Mathematics Textbook Research and Development held in Rio de Janeiro, Brazil.

Schubring has also laid out the formal structures that helped in turning the study of the history of mathematics education into an academic field. He was the founding co-organiser of International Conference on the History of Mathematics Education (ICHME), a forum that since 2009 has already met six times. After leading the Study Group on the 'History of Teaching and Learning Mathemat-

ics' at the 10th ICME conference in 2004, Gert became the founding editor of the *International Journal for the History of Mathematics Education*. Gert also co-edited the *Handbook on the History of Mathematics Education* published in 2014, in which he contributed to four of the handbook chapters. He is co-editor of the new book series *International Studies in the History of Mathematics and its Teaching*, which includes the 2019 volume he edited himself, titled *Interfaces Between Mathematical Practices and Mathematical Education*.

An important aspect of Gert Schubring's work was his straddling of the communities of the history of mathematics and of mathematics education. His own book in the former field, *Generalization, Rigor and Intuition*, published in 2005, is a major reference in the history of mathematics focused on 17th–19th-century mathematics. Additionally, several publications in mathematics education journals (such as *For the Learning of Mathematics*) introduced tools and concepts from the history of mathematics, such as methodologies for analyzing historical texts, that greatly enrich mathematics education research.

Similarly, Gert brought ideas in mathematics education, such as the notion of "mathematics for all" back into the fold of the history of mathematics, to examine what kind of knowledge mathematics has been taken to be in different cultures and historical periods.

For decades, Gert has been actively promoting the study of the history of the field of mathematics education, while simultaneously conducting significant historical studies of his own. No other researcher has had a greater impact on establishing the social history of mathematics education as a dynamic field of scholarly endeavor.





## The National Council of Teachers of Mathematics (NCTM) 2020 Emma Castelnuovo Medal

### Submitted by the ICMI Emma Castelnuovo Award Committee (Konrad Krainer (chair) and five other members)

ICMI is delighted to announce that the 2020 Emma Castelnuovo Award for Outstanding Achievements in the Practice of Mathematics Education goes to **NCTM – the National Council of Teachers of Mathematics (USA and Canada)** – in recognition of 100 years of development and implementation of exceptionally excellent and influential work in the practice of mathematics education.

Founded in 1920, NCTM is the world's largest mathematics education organization, with 40,000 members and more than 230 state, provincial, and local affiliate organizations and other affiliates whose scope covers the USA and Canada.

The Award Committee found evidence to fulfill all criteria related to the Emma Castelnuovo Award. In the following, some exemplary activities of NCTM's past 30 years are highlighted.

His work has not only made us aware of the past of mathematics education but has also provided important insights into mathematics education as it stands today and sets directions for its future. It informs current teaching by showing ways in which historical mathematical texts can inspire pedagogy. It makes us aware of future possibilities and of the fact that they do not have to be merely determined by the past, but rather can be moulded by new understandings of past practices, values and ways of thinking. All these important contributions make Professor Gert Schubring an eminently deserving recipient of the Hans Freudenthal Medal for 2019.

These activities fall into a wide range of domains – principles and standards as foundations for policy and practice, publications including research journals, professional development, legislative and policy leadership, and international collaboration.

In 1989, NCTM presented Curriculum and Evaluation Standards for School Mathematics, which turned out to be a highly influential document, not only in North America, but all over the world. This document was followed by a series of further book-length reports aimed at establishing a broad framework to guide reform in school mathematics, Professional Standards for Teaching Mathematics (1991), Assessment Standards for School Mathematics (1995), Principles and Standards for School Mathematics (2000), Curriculum Focal Points (2006), Principles to Actions: Ensuring Mathematical Success for All (2014) and Catalyzing Change in High

School Mathematics: Initiating Critical Conversations (2018).

Since its inception in 1920, NCTM has published professional journals for teachers of mathematics. Starting with January 2020, a single journal Mathematics Teacher: Learning and Teaching PK-12, published 12 times a year, will replace what has been for the past 30 years three journals. In 1970, NCTM began publishing the Journal for Research in Mathematics Education, one of the world's first journals devoted to this subject. These periodic publications are supplemented by an extensive publication catalogue for teachers at all levels. Some NCTM publications have been translated into other languages, including Arabic, Chinese, German, Korean, Portuguese, Spanish and Swedish.

For the professional development of teachers, principals, and other stakeholders important for mathematics teaching, NCTM holds an annual meeting and exposition along with three regional meetings each year, with a combined attendance of about 25,000. In addition, NCTM offers multiple professional development activities, professional services, and resources via its webpage. NCTM's Mathematics Education Trust (MET), established in 1976, provides funds directly to classroom teachers, affiliates, and institutions to enhance mathematics education. MET offers 30 grants annually, totaling USD 125,000. In addition, it offers scholarships, award programs, and – usually two – annual lifetime achievement awards.

NCTM is influentially engaged in constructive policy discussions among all stakeholders (in particular in the USA), focusing on improving mathematics teaching for all students. This process is supported by the NCTM Advocacy Toolkit, a collection of materials which provides NCTM members with tools and the guidance they need to advocate for mathematics and education.

For spreading NCTM ideas internationally and for establishing contacts and collaboration worldwide, NCTM founded the International Corresponding Societies, currently with 19 organizations in all continents, and has supported several initiatives with educators in Latin, Central, and South America.

NCTM's work has influenced the efforts by teachers, researchers, administrators, and other stakeholders to foster excellence in the practice of mathematics education. Here are some selected quotations from letters supporting NCTM's nomination for the Emma Castelnuovo Award.

An internationally well-known mathematics educator stresses: "I have never lived or worked in the United States, and yet, as a teacher and as an academic, I was aware of the work of the NCTM. I drew on their resources and publications knowing that I could access a wealth of high quality materials developed by expert practitioners in the field. ... (T)he NCTM Principles and Standards and the Curriculum Focal Points are curricular documents that I return to frequently when looking at putting together mathematics teacher education courses for pre- and in-service teachers in ways that ensure breadth and depth, with inclusion of the big ideas in mathematics.

I have often passed these documents on to students from many parts of the world to use to think about the relative emphases and absences in their own national and regional curricula. Later, as an academic, I made widespread use of articles published across the raft of NCTM journals. ... The NCTM has worked tirelessly to advocate for high quality mathematical access for all children. ... The NCTM is an organization that has succeeded in doing this kind of work at a scale that is bigger than any other organization that I can think of."

An internationally well-known mathematics educator from the USA emphasizes, among other considerations, the important role NCTM plays in supporting ICMI activities, for example by providing grants to NCTM members for attending ICME conferences, and by supporting the writing and distribution of documents about mathematics education in the USA since ICME-9 in 2000.

Finally, here is the voice of a former mathematics teacher in the USA: "NCTM has been an integral part of every stage of my nearly 50-year career in mathematics education, from classroom teacher, to school and district supervisor, to state mathematics director, to my varied leadership efforts that continue at the state, local, national, and international levels. ... It is clear that the National Council of Teachers of Mathematics has been the voice of mathematics education for at least these past five decades of my personal involvement. More than that, there is no doubt in my mind that the Council has also served as the leader within our profession – articulating a shared vision of professional mathematics educators, supporting and disseminating research behind that vision, and providing resources for the classroom and the board room to make that vision a reality. NCTM is absolutely indispensable to anyone who cares about or works in any area related to mathematics teaching and learning."

There are many more such quotations that could have been included. It is fully evident that NCTM is an outstanding organization that well deserves the recognition of the Emma Castelnuovo Award for excellence in the practice of mathematics education.



# PME Announcements Forum on the PME Website

The PME website ([www.igpme.org](http://www.igpme.org)) is the main portal for all communication and information regarding PME. A useful feature for PME members is the Announcements Forum as this is the place to post items of information for PME members such as job announcements, conference announcements, and so on. To access the Announcements Forum, please visit

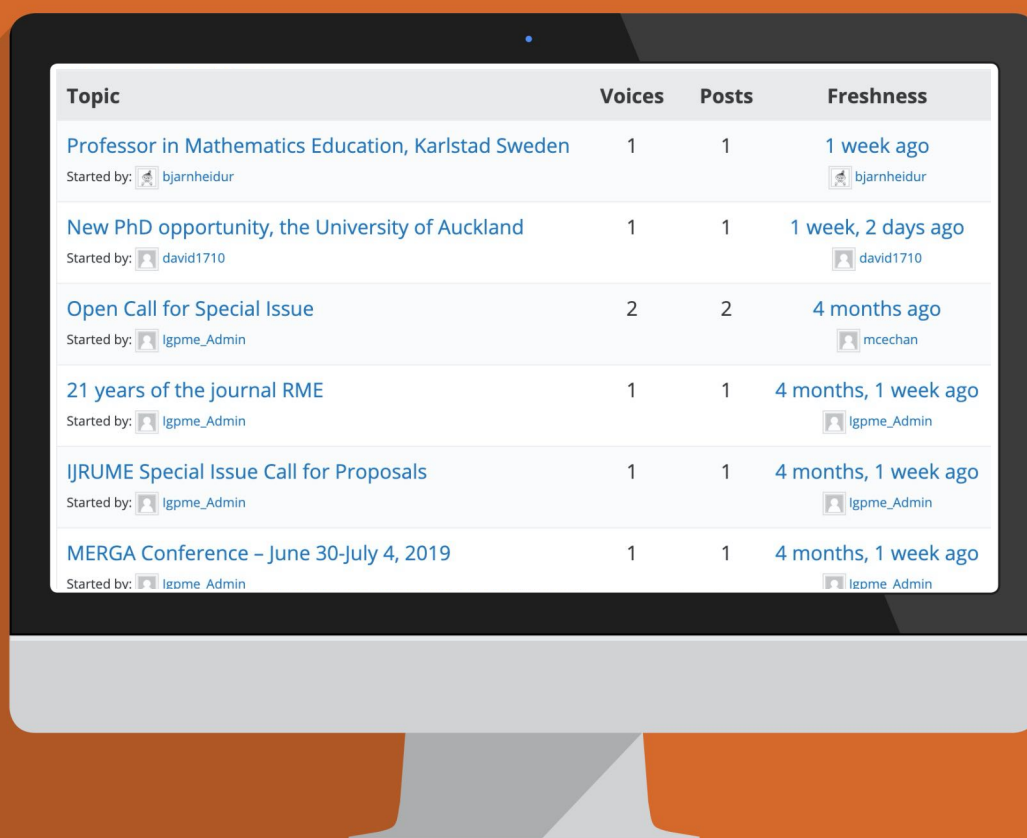
<http://members.igpme.org/>













and use your PME member login. You can then find the forum in the main menu. By clicking on 'subscribe' in the forum, you then

receive an email each time an announcement is posted in the forum.

Since the previous PME Newsletter, the following items have been posted on the PME Announcements Forum:

1. Professor in Mathematics Education, Karlstad Sweden
2. New PhD opportunity, the University of Auckland
3. Open Call for Special Issue



Topic	Voices	Posts	Freshness
<a href="#">Professor in Mathematics Education, Karlstad Sweden</a> Started by:  barnheidur	1	1	1 week ago  barnheidur
<a href="#">New PhD opportunity, the University of Auckland</a> Started by:  david1710	1	1	1 week, 2 days ago  david1710
<a href="#">Open Call for Special Issue</a> Started by:  igpme_Admin	2	2	4 months ago  mcechan
<a href="#">21 years of the journal RME</a> Started by:  igpme_Admin	1	1	4 months, 1 week ago  igpme_Admin
<a href="#">IJRUME Special Issue Call for Proposals</a> Started by:  igpme_Admin	1	1	4 months, 1 week ago  igpme_Admin
<a href="#">MERGA Conference – June 30-July 4, 2019</a> Started by:  leome_Admin	1	1	4 months, 1 week ago  leome_Admin