PSYCHOLOGY OF MATHEMATICS EDUCATION

PME NEWSLETTER

February 2014

PME's New President: Welcome

Message from PME President Barbara Jaworski

Becoming President of PME in its 37th year – its 15th President and its 6th female President – I am aware of the history and strong traditions of this important international group in mathematics education. Part of this tradition is the importance that PME affords to its academic strength and *quality,* manifested in a review process for papers submitted to the conference in order to decide what should be presented and published. This review process is still developing: we cannot claim we have got it "right", and are still seeking even better ways to make decisions on academic quality.

At our next PME conference, PME 38, in Vancouver Canada www.pme38.com , we will introduce a new event to PME, a day for *young*, or *early career*, researchers directly preceding the main conference. For many of us in PME, our attending of PME conferences has been a key element in our growth as researchers in mathematics education. Thus, with the introduction of this YRD (Young Researchers Day), we make overt our commitment to young researchers in PME.

This speaks to another important element of PME, that of *inclusion*. Over the years PME has emphasized its *open* nature, encouraging participation from all countries of the world, especially supporting members from less wealthy or under-represented countries through its Skemp fund. Just as with attention to the *quality* of its academic programme, PME prides itself on *inclusion*, in its open welcome to all who would join it. The Skemp fund is a practical manifestation of that inclusion and we hope that the YRD will become another.

However, quality and inclusion may not always sit comfortably side by side. The review process might be seen as a device that excludes some participants, and these may be people for whom support to develop as researchers is not so readily available as it is for their colleagues in other parts of the world. This is an issue that PME has to tackle overtly and I expect to engage with it during the next three years.

I look forward very much to meeting you at PME 38 in Vancouver.

PME *Message from the Editors*

Welcome to our Newsletter of February 2014! We are really sorry that you had to wait for so long for our newest edition. We promise that the next one will be out soon.
In this issue of the Newsletter we focus on the change in the office of President of PME: We are happy to present you the first Message from our new President Barbara Jaworski along with a retrospection of our past President João Filipe Matos. In this issue you will find PME 37 Discussion Group Reports. Finally there is some interesting information about PME 38 in Vancouver.

We are looking forward to meeting you there!

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Editors of PME-Newsletter

Inside this Issue

Thank You João Filipe Matos
PME President 2010-2013

The PME Newsletter interviewed João Filipe Matos of Lisbon, Portugal as the outgoing President of PME. While at PME 37 in Kiel, Germany we asked João to share some of his memorable experiences as PME president.

What were your first impressions as President of PME?

The start is very funny because I arrived to Brazil three years ago and when I entered the reception, a few colleagues came to me and said "We need to talk to you". So we took a glass of wine and they asked me to stand. I was completely surprised. I asked them to think for two or three days. And then, some of the friends began to press a little bit, so I eventually agreed.

It was not easy during the first year of being president to deal with the dynamics of the International Committee as it was a bit difficult to understand what had happened in the years before. But then after six months or so I understood how it worked. The portfolio groups are an excellent idea. I asked the groups for their agenda for the year. That's how I work with people. People are quite independent, of course they are accountable and people keep in touch during the year. And I keep asking them to press me: "Tell me my homework!" Because I have to put it on my list with high priority and then work my way down.

So most of the changes really came as a result of the whole committee working together? Was kind of vision did you have for the IC?

From the beginning, there were three things that I wanted to change, or at least I wanted to develop. One was the PME status. It's more and more difficult to deal with payments and expenses. So it is crucial to become an official group, a charity organization. We managed to get some big steps on that, I think the final steps will develop very quickly. But it's a very difficult process. It was a great success that last year it was approved that PME is regulated by the laws of England and Wales.

The second thing has been on for twenty years or more, it's the quality of the reviews and of the papers. We started with the quality of the reviews, the reviewing criteria. I think it is very clear that it improved. We provide examples and guidelines to reviewers and so on. I did not make any detailed or statistical analyses but I went through about 80% of the reviews of 2012 and they improved. And I see also that the quality of the papers improved.

The third issue is the newcomer's reception. My wife would say "This is your age talking" but I think it's not a matter of age. I'm deeply concerned about the situation of young researchers. Now fortunately we have many young people and also people young in research coming to the conferences. It is difficult to get a reduced price for PhD students, but hopefully in the near future it is approved. And then there is the idea of pre-conference seminars for young researchers. And there is an offer of opening a fund in memory of Kathleen Hart for that because some people want to give money for that. Well, I did not work on that in the last three years, but I think it should be done in the next years.

The beauty of PME is that we have people from all over, so that all those cultures coming here together. PME is one big family with the young and the elders.

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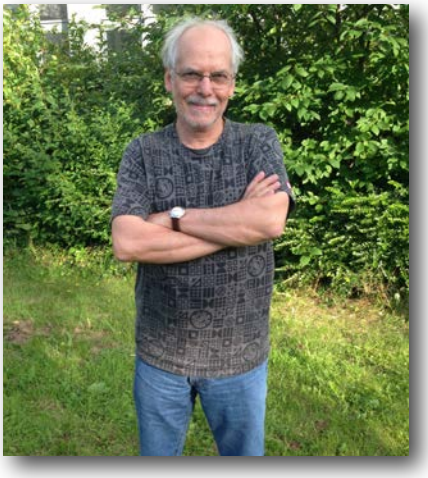
A conversation with João Filipe Matos continued.....

How about underrepresented countries. Is that also a concern?

Yes, that is always present when you discuss things in the IC. The Skemp Fund is working, but it is not working quite well. But it's not a problem of PME but a difficulty that we have in putting together the quality of the contributions with our criteria that now were changed. The difficult thing is that you have to have something submitted and approved, a poster or whatsoever. We have a number of applications and then less than 50% are accepted to present at the conference. So we have 50% of the people out of the Skemp-fund.



Last year we decided to pay the full amount of the flight, the accommodation, etc. Before that there was a maximum of a certain percentage, but imagine: It's impossible and usually many of the people who need support form the Skemp-fund come from far away of the place where the conference is running. Then some people cancel their participation for example because of visa problems. So there is more money in the Skemp Fund than we want.

We need to tell more people about the fund. Maybe the newsletter can write about it, but then only PME members know about it. We need to find a way to tell people who want to come and who are not a member. Maybe local Skemp-fund ambassadors could send emails via local email lists. So we try to have more people applying.

Do you think that three years of being president is a good amount of time?

Before I started I thought that three years is ok. Together with the IC, it's always that people stay and people change. But now I know that after six months or one year you know how things run and what the job is and you start working. And then it stops. Maybe one year more might be useful. But it's difficult to say.

How would you describe your experience as president?

Excellent. The people in the International Committee are excellent people. I have no, absolutely no complaint about people or relationships. And they are all doing volunteer work devoted to all the relevant things. When they took an initiative, they were very careful talking to people. You know, we have this four portfolio groups, and even when someone had an idea and understands that this would work for this portfolio group, then they contact the other group. So excellent people, doing a lot of work, all of them. I understand these [Portfolio] groups like this: I don't need to know everything they are doing, we do not need control everything. When we meet, we report. Well, the Administrative Manager Bettina [Rösken-Winter], she is putting together everything. And most of my communication during the year is with Bettina. Every week we contact because she likes to update me about everything. So it was very easy to work with these people. It was an excellent experience. I learned a lot.

What did you learn?

Well, there are different ways of working. You have Bettina, Stefan, and Aiso, the German people, they are very organized, very reliable. And other cultures are more, well a little bit looser. But there are not only different ways of doing things but you also learn a lot when you have a group and you prepare a conference. It's a challenge to understand the local culture and how it relates to the PME conference. I had conferences in Turkey, then in Taiwan, and than this is the easy one in Germany. As it is Europe, the language is not a problem. I learned a lot with the Turkish team, with the Taiwanese team, and here also, but a different culture makes you learn a lot more about what we propose to these people who come to this kind of conference in relation to the local culture. And we have many discussions mostly with local people. When they propose to have an activity we have to reflect how PME will take this activity on board. Because we know that PME people like to have different experiences but

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A conversation with João Filipe Matos continued.....

they are also conservative. Local culture is strong. I learned a lot with the local people.

What do you think you might leave for the new coming president or for the community?

The most important thing is the people, both in the IC and in PME. We have to talk to people to get them to do the work and be really engaged. So the most important thing is the people. For the PME community, I think the PME community is very healthy. I'd also say that I don't know if they need a President. I'm serious. OK, we need groups taking care of lot's of things. That's business. That's ok because it won't work that 500 or 600 people would take care of business. But if the President is someone that helps the portfolio groups to interact, that's ok. But not just as a control person, from my point of view that does not work. This would mean that the portfolio groups would do things and give their homework to the teacher. And this is not the idea. We want the subgroups to have initiatives, and they have a lot of them, and to make proposals – and not to be afraid to write a new proposal for a couple of pages.

The beauty of PME is that we have people from all over, so that all those cultures coming here together. PME is one big family with the young and the elders. People keep coming back, which is wonderful. And with all those cultures you begin to learn more about yourself because you are reflecting that back and through, and you begin to think more about your own way of doing things. I learned much about myself in these years. That's why I always come to the same conclusion: People is the most important thing we have in PME.

I'm deeply concerned about the situation of young researchers ... It is difficult to get a reduced [conference] price for PhD students, but hopefully in the near future it is approved.

On behalf of the PME community, we wish to acknowledge the great commitment João has made, and thank him for his excellent job. We look forward to João's continued contribution to the PME community in many other ways.

Grading Math Education Research Journals ... Where are BOLEMA and RELIME?

A Reaction to Guenter Toerner and Ferdinando Arzarello's article *Grading Math Education Research Journals that appeared in* PME Newsletter March 2013.

Hola Mathematics Education!!

We found the article on the evaluation of MER journals in the last PME Newsletter to be extremely helpful and interesting. There is however a curiosity that may be of interest to readers who have not spotted it. Until 2008 only one mathematics education research journal was listed by the *Thompson-Reuters Social Sciences Citation Index*: *Journal for Research in Mathematics Education* (JRME). In 2008 *Educational Studies in Mathematics* (ESM), *Boletin de Educacao Matematica* (BOLEMA) and *Revista Latinoamericanas de Investigacion en Matematica Educativa* (RELIME) were added to the list.

It comes as no surprise that JRME and ESM were so highly rated in the survey carried out by the European Mathematical Society, but it is rather curious that BOLEMA and RELIME are not mentioned at all given that they are major journals published in a European language. In Europe as a whole, roughly speaking, native English speakers outnumber Spanish speakers by less than 3 to 2

Natividad Adamuz University of Cordoba;
Alexandre Pais Manchester Metropolitan University;
Tony Brown Manchester Metropolitan University

PME 37 Kiel Germany ...

4,160 Cups of Coffee, 1000 Pretzels and 626 Attending

When we think back to the last PME conference in Kiel, we all have our own memories. We all remember nice meetings with old friends, some chats with colleagues that might probably become friends and interesting presentations. Some might also think about wonderful excursions and nice walks at the sea, a trip to a beach club or a drink at the pontoon bar. Probably even the grandchildren or the favorite pets of our plenary speakers that are great at math and can be taught some tricks might come to our minds.

However, apart from this very personal review to the last PME conference, we can also have a rather mathematical retrospection – one that is in all likelihood not familiar to the participants. Nevertheless we'd like to draw your attentions to this unfamiliar view on a conference as this gives another impression what it means to organize such a big event.

When you have a detailed look at your proceedings you can count that there were 166 Research Reports (RR), 135 Short Oral Communications (SO) and 51 Poster Presentations (PP) in addition to 4 Research Forums (RF), 8 Discussion Groups (DG) and 2 Working Sessions (WS). But did you know that we ate 1000 pretzels and 1800 sandwiches at the opening reception and had 960 pieces of cake, 75 kg cookies, 300 kg fruits together with 4160 cups of coffee and 460 cups of tea at the coffee breaks? Not to mention 45 litres sparkling wine, 120 litres red wine, 115 litres white wine, 380 litres beer, 100 litres apple juice, 25 litres orange juice, and 60 litres coke at the conference dinner?

All this brings back to our minds the great organization of Aiso Heinze, Anke Lindmeier and their wonderful team: 21 people from the local organizing committee worked together with 48 student helpers. In addition to the seemingly uncountably infinite working hours of the local team, the student helpers invested 1,600 working hours – this explains why it seemed that there was always someone in a blue shirt we could ask and who guided us with their friendly help. Thank you to all for a rememberable conference in Kiel!

PME 37 Discussion Group Reports

Each year the PME Newsletter publishes the Discussion Group Reports from the recent PME conference. In this issue we have six reports to present, each offering the focus, activities and follow-up actions discussed during the meeting.

PME 37 Discussion Group Report 2: Emotions in the Psychology of Mathematics Teaching and Learning

Submitted by Gerald Goldin

This discussion group was co-organized by Gerald A. Goldin (Rutgers University, USA) and Markku S. Hannula (University of Helsinki, Finland). We focused on how emotions interact with cognition in the complex social environments of math classrooms. In doing this, we set out to draw consciously on ideas from educational and social psychology, math education, psychology of emotion, sociocultural theory, and cognitive science.

Across our two meetings 49 people took part (including the organizers), from the following countries: Australia (2), Austria (2), Canada (1), Chile (1), Finland (3), Germany (12), Greece (2), Hungary (1), Israel (5), Mexico (1), Netherlands (1), Norway (2), Taiwan (1), Portugal (1), Spain (1), Sweden (1), Thailand (3), Turkey (1), UK (4), USA (4).

The first meeting day (Monday July 29), after introductions and an outline of our goals, Markku Hannula presented a jointly-prepared set of slides surveying key ideas in the study of emotion in math education that draw from the referenced disciplines. These included: emotions as states ("in the moment") or as traits; positive and negative emotions (valence); pathways of emotion; intensity of emotions; meta-affect; biological foundations (embodiments) of emotion; relation of emotions to goals and to achievement; emotions as representations; and methods of research (qualitative and quantitative).

This was followed by subgroup discussions by the participants, out of which many examples of students' emotions in mathematical contexts were recalled and shared, with an eye toward identifying important research questions. There was broad agreement as to the central role of emotions in mathematics learning. It was brought out, too, that the emotions of teachers were also central.

Among the kinds of research questions discussed were the relation of emotions to goals and to mathematics achievement, how teachers can promote optimal emotional pathways, and the importance of "negative" as well as "positive" emotion in the mathematical development of the student. Domain-specific features of emotion (i.e., what patterns are particular to mathematics) were discussed. A small bibliography had been made available in advance; it was suggested that this needed to be expanded considerably, to include especially research in languages other than English. Participants were invited to submit additional references so that a resource list on our topic could be created.

The second day (Wednesday, July 31), Gerald Goldin presented (replaying as desired) a videotaped math classroom episode in which students display a variety of postures and behaviors from which emotion might be inferred. Participants discussed the episode in groups, drawing inferences and debating interpretations. This led to interesting exchanges of ideas about uncertainty in the interpretation and meaning of emotions. Research techniques ranging from questionnaires to stimulated-recall retrospective interviews were mentioned.

Next Igor Verner (Technion, Haifa, Israel) was invited to share a video excerpt from a study of patterns of engagement occurring in a multicultural, ethnomathematically-based teacher education course at the Technion (Haifa). Among other points, his presentation raised interesting questions about culturally-dependent emotional responses, and cultural norms pertaining to expressions of emotional feelings.

It was generally felt that our Discussion Group successfully opened the conversation about an important but somewhat overlooked dimension of the psychology of mathematics education. PowerPoint slides and reference lists are available from the organizers on request.

We wish to thank Lina Sanchez-Leal (Rutgers University) for her substantial organizational assistance to our Discussion Group.

PME 37 Discussion Group Report 3: Mathematics Teacher Educators' Knowledge

Submitted by Kim Beswick, University of Tasmania, Australia and Olive Chapman, University of Calgary, Canada

AIMS

This Discussion Group aimed to set directions for future research in this growing and an important area of research in mathematics education. The following themes that emerged from an ICME 2012 Discussion Group of this topic formed the basis for discussion:

- The nature of the knowledge needed by Mathematics Teacher Educators (MTEs): How do Mathematics Knowledge for Teaching (MKT) and mathematics knowledge for MTEs differ? How do MTEs' conceptions of teaching and learning develop? How do these translate into teaching?
- Different types of MTEs and implications for the knowledge needed: Who are the MTEs? Is the same knowledge needed by all MTEs?
- Research approaches: In what ways might teacher collaborative inquiry among MTEs provide a methodological framework for research in this area?
- Acquisition of knowledge for mathematics teacher education: How can professional development for existing MTEs be provided? How can MTEs develop the capacity for inquiry into their own practice?
- The importance of research in this area: How can we ensure that the appropriate resources are allocated towards this work?

THE DISCUSSIONS

The first session was attended by more than 40 participants from a range of countries and with varying experience and expertise in relation to the topic. Small groups were formed that focussed on discussing themes 1, 3 and 4. A greater proportion of second session participants had conducted research related to mathematics teacher education and the smaller group size (about 20) meant enabled the discussion to be conducted as whole group. The group considered:

- The extent to which the various knowledge types for mathematics teachers are applicable to mathematics teacher educators. Aspects of Ball et al.'s (2008) model were used as a stimulus to this discussion.
- Ways in which MTEs' knowledge can be researched. Possibilities discussed included self-study, participant observer, and use of a research team. Several participants shared their own experiences of using these sorts of approaches to research their own or colleagues' knowledge.
- The differences between reflecting on one's practice as a MTE and researching one's practice and aspects of the design of research on one's own instructional practice.

OUTCOMES

Several participants expressed interest in contributing to a special issue of the Journal of Mathematics Education. It is anticipated that a call for papers will be made before the end of 2013.

References

Ball, D. L., Thames, M. H., & Phelps, G. (2008). Content knowledge for teaching: What makes it so special? Journal of Teacher Education, 59(5), 389-407.

The Problem@Web International Conference on Technology, Creativity and Affect in Mathematical Problem Solving, jointly promoted by the University of Algarve and the Institute of Education of the University of Lisbon, will be held in Vilamoura, Portugal, on May 2-4, 2014. This conference stems from a Portuguese research project (The Problem@Web Project) focusing on mathematical problem solving that extends beyond the mathematics classroom.

The research field is based on mathematical problem solving competitions of an inclusive nature taking place through the internet, and addresses three strands: *Technology*: Strategies and representations used in technology-based problem solving approaches; *Creativity*: Students' mathematical creativity in mathematical problem solving; and *Affect*: Attitudes and emotions of students, parents and teachers regarding mathematical problem solving.

Website: **www.fctec.ualg.pt/problemweb2014/**. The official language is English.

PME 37 Discussion Group Report 5: Building a Thinking Classroom

Submitted by Peter Lijedahl, Simon Fraser University, Canada and Gaye Williams, Deakin University, Australia

The discussion group on Building a Thinking Classroom was something that began as a conversation between the two organizers at PME 32 in Morelia, Mexico. The conversation continued through the years until PME 36 in Taipei, Taiwan when the decision was made to act on it.

Considerable work on thinking (e.g., Dreyfus, Hershkowiz, & Schwarz, 2001), collaboration, classroom discourse (e.g., Cobb, Wood, Yackel, & McNeal, 1992), classroom norms, mathematical norms (Yackel, 2001), and relational understandings developing through such activities has been undertaken in mathematics education. This work has illuminated the nature of mathematical thinking, the value of collaboration in fostering such thinking, and research into associations between the nature of discourse and developing mathematical understanding is ongoing.

All this work is predicated on mathematics lessons being a context in which thinking, collaboration, and discourse are already part of normative classroom behaviours. What is missing is a clear sense of how to create those classroom cultures that enable mathematical thinking to flourish. Given this gap we felt it appropriate to harness the combined knowledge of interested PME participants through conversations on Building Thinking Classrooms within the context of a discussion group.

Day 1 began with a thought experiment. The 70 or so participants that were present were asked to imagine a thinking classroom using whatever understanding of thinking classroom they had access to. They were also asked to imagine a non-thinking classroom, again using whatever understanding of this that was available to them. They were then asked to organize themselves into semi-random groups and discuss what differentiated the two classrooms in the thought experiment. From this they were asked to produce a list of characteristics of a thinking classroom.

These lists were written down on giant post-it note papers and put up on the walls around the room. A gallery walk followed with opportunities for participants to view the lists of other groups. After this, each group had an opportunity to extend their lists and then a whole group discussion ensued with the intention of positing the most important attributes of a thinking classroom. Some of the characteristics that emerged were:

- students needed to be challenged with a problem while feeling comfortable and motivated to meet that challenge;
- there need to be multiple student to student and student to teacher (focused and intense) interactions;
- there needs to be communication for creating new ideas, an openness to these ideas, and a taken-as-shared understanding of the goal of the communication;
- there needs to be teamwork and the building of a shared mathematical identity;
- and there needs to be time sufficient enough to achieve these aforementioned characteristics.

After this discussion groups were asked to continue their work – this time crafting a definition of a thinking classroom. These definitions were again written down on post-it notes, posted on the walls, and a gallery walk ensued. Day 1 ended with a sharing of some of these definitions.

Day 2 began with review of what had happened during Day 1. The 50 participants who returned for this session were then asked to discuss in their groups some possible strategies for either building thinking classrooms of their own, or helping teachers to build thinking classrooms. These strategies were, again, recorded and posted, followed by a gallery walk and whole group discussion.

The final activity for the groups was to posit possible researchable questions for those interested in pursuing an evidence-based inquiry focused around Building Thinking Classrooms. It became apparent that groups were not yet ready to focus on such research questions. Group conversations continued to focus instead around the previous three activities. It was clear from these discussion choices, and comments from various participants, that another discussion group session at PME 38 is warranted before a research agenda is developed.

This discussion group should be around the aspects of building thinking classrooms we want to know more about and what research designs could be appropriate. As a result, the plan is for the organizers it to submit a proposal to for PME 38 called Building Thinking Classrooms: Shifting from Practice to Research.

Cobb, P., Wood, T., Yackel, E., & McNeal, B. (1992). Characteristics of classroom mathematics traditions: An interaction analysis. American Educational Research Journal, 29(3), 573-604.

Dreyfus, T., Hershkowitz, R., & Schwarz, B. (2001b). The construction of abstract knowledge in interaction. In M. van den Heuvel-Panhuizen (Ed.), Proceedings of the 25th conference of the International Group for the Psychology of Mathematics Education (Vol. 2, pp. 377-384). Utrecht, The Netherlands: PME.

Yackel, E. (2001). Explanation, justification and argumentation in mathematics classrooms. In M. van den Heuvel-Panhuizen (Ed.), Proceedings of the 25th conference of the International Group for the Psychology of Mathematics Education (Vol. 1, pp. 9-24). Utrecht, The Netherlands: PME.

PME 37 Discussion Group Report 6:

Tasks, Misconceptions and Feedback: Assessment for learning as diagnostic teaching revisited

Submitted by Guri Nortvedt, University of Oslo, Norway

This discussion group (DG) was organised by Patrick Barmby, Durham University, UK; Margrethe Naalsund, Norwegian University for Life Sciences, Norway; and Guri A. Nortvedt, University of Oslo, Norway. Olaf Köller, Leibniz Institute for Science and Mathematics Education, Germany, was part of the group that proposed and planned the DG but could not attend. Silke Rönnebeck from his institution participated in his place.

We believe the title—Tasks, misconceptions, and feedback: Assessment for learning as diagnostic teaching revisited?—gives a clear hint as to the aim and rationale for the DG. While assessment for learning (AfL) has been a buzzword in education for the past 15 years, evidence that demonstrates how feedback can promote learning does exist (Wiliam, 2007; Hattie, 2009); clearly, AfL is more than a catchphrase.

Black and Wiliam (2012) discussed the theoretical underpinnings of AfL: how tasks, peers, meta-cognitive awareness, and teacher feedback can steer learning. The learning models they discussed strongly resemble the ideas advocated by Alan Bell in his 1993 article, Principles for the design of teaching" (Bell, 1993). The aim of the DG was to discuss the theoretical foundations of AfL and diagnostic teaching to see if diagnostic teaching might be considered to be a special case of AfL. A second aim was to discuss the role of misconceptions in mathematics classrooms by focusing on AfL.

Approximately 35 participants attended each DG session, with an overlap of about 20 people in each. The first session opened with a short theoretical introduction giving the rationale and scope of the DG. The remainder of session 1 was spent on two rather open discussions on the topics a) Tasks for AfL/ diagnostic assessment and b) The role of misconceptions in diagnostic assessment. For each discussion, after a short introduction raising key questions, participants were divided into small groups to discuss and offer feedback for the DG. As some participants in session 1 felt the discussions were too open, it was decided to narrow the discussions in the second session and present more closed and directed questions for discussion.

Session 2 started with a summary of key issues emerging from the discussions in session 1. The topics for session 2 were a) The role of meta-cognition in AfL and Diagnostic teaching and b) Beliefs and diagnostic assessment. Participants were asked to discuss statements about meta-cognition and learning in session 2 part a. In session 2 part b, some statements were also given for discussion. However, equally important, participants were asked to identify one research question to be discussed if a second DG or a working session (WS) were to be held during PME38. Proposals were voted on.

A large part of the suggestions centred on the interaction between teacher, students, task, and feedback. Understanding what a good assessment task would provide, the nature of the communication between teacher and student, the role of meta-cognition were offered by the participants as topics that might be followed up in PME38.

It was decided that DG chairs will contact interested participants during the autumn and provide the PowerPoints that were used as well as a summary of each discussion's key points. A list of 19 e-mails was collected. Following the feedback from the participants, a WS proposal will be prepared and submitted for PME38. Provided the proposal is accepted for PME38, some literature and WS material should be provided prior to PME38 to take the discussion further. Material might be provided from some of the participants with an expressed intention to attend a future WS. It is an aim that the endpoint of the work started in PME37 is an edited book on assessment for learning in mathematics education.

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Bell, A. (1993). Principles for the design of teaching. *Educational Studies in Mathematics, 24*, 5–34.

Black, P., & Wiliam, D. (2012). Developing a theory of formative assessment. In J. Gardner (Ed.), *Assessment and learning* (2nd ed.). (pp. 206–229). London: Sage.

Hattie, J. (2009). *Visible learning.* New York, NY: Routledge.

Wiliam, D. (2007). Keeping learning on track. In F. K. J. Lester (Ed.), *Second handbook of research on mathematics teaching and learning* (pp. 1053–1098). Charlotte, NC: Information Age.

PME 37 Discussion Group Report 7:
Engineering Students' Learning of Mathematics: Addressing mathematical competencies

Reinhard Hochmuth, Leuphana Universität Lüneburg, Germany; Bettina Roesken-Winter, Ruhr-Universität Bochum, Germany; Barbara Jaworski, Loughborough University, England

Three perspectives were discussed in the two sessions:

- Strand 1 - Competence framework**:** What mathematical competencies do engineering students need? How can such competencies be operationalized and measured?
- Strand 2 - Workplace analysis: What mathematical topics should be taught and learned? What didactical constructs does mathematics education provide to analyze students' use of mathematics in engineering contexts?
- Strand 3 - Learning through inquiry: How does the learning take place? How can inquiry based learning help to develop meaning of mathematical objects?

SESSION ONE:
Presenting the different lenses (10 min per presentation)
Strand 1:
What mathematical competences do engineering students need?

- Mathematical competence is the ability to recognize, use and apply mathematical concepts in relevant contexts and situations (European Society for Engineering Education (SEFI), 2011)
- Information on typical curricula for mechanics and advanced mathematics
- Information on the SEFI competence framework

Strand 2:
Workplace analysis - What mathematical topics should be taught and learned? What didactical constructs does mathematics education provide to analyze students' use of mathematics in engineering contexts?

- Mathematical concepts and symbolism: different potential meanings; it becomes only clear from the context, which one has to be utilized
- How deal the students with the different and partly contradictory meanings and demands?
- Are there essential differences between treating tasks from Higher Mathematics or from basic engineering courses?
- Information on ATD: Anthropological Theory of Didactics (Chevallard et al.).

Strand 3:
How do mathematical competencies relate to inquiry-based tasks designed to create students' conceptual understanding

- Presentation of mathematical competencies
- Small group work on specific mathematics tasks designed for an introductory mathematics course for engineering students: exploring links between tasks and competencies
- Whole group discussion of relationships between tasks and competencies

Small group discussion (45 min) on strands 1 and 2, and strand 3.

Strands 1, 2: The group analysed a mechanics task with respect to the following questions:

- What mathematical competences in terms of the SEFI framework do students need when solving the problem?
- How can knowledge of mathematics and mechanics be integrated to tackle the task?
- What didactical constructs can help to understand students' possible problem solving behavior?

Small group discussion (15 min)

Strand 3: The group split into smaller groups to work on specific mathematical tasks that have been designed for and used with students, addressing the following questions:

- What is required of students in working on these tasks – what understanding is needed and how can it be discerned?
- In what ways does it seem that work on these tasks would demonstrate competency according the given competencies.

SESSION TWO:
Strands 1, 2: Remaining questions for session two:

- How do students access the knowledge they have in the context of solving a particular problem?
- Are there any patterns of association of knowledge elements when using mathematics to solve engineering problems?
- As theoretical background the work by Tuminaro and Reddish on Epistemic games served as basis for answering the above-mentioned questions.

Strand 3:

- Each small group reported on their activity and thinking from Session 1.
- Discussion followed in the whole group of the nature of tasks, their relation to competencies and ways in which such tasks might achieve desired competencies.
- It seemed that there was a synergy between the inquiry-based nature of the tasks and desired competencies. Research is needed to look into ways in which such synergy might be realised in practice.

Psychology of Mathematics Education Feb 2014

PME 37 Discussion Group Report 8: Role Playing in Mathematics Education

Submitted by Rina Zazkis and Nathalie Sinclair, Simon Fraser University, Canada

In this discussion group, participants considered various ideas for implementing role-playing in diverse mathematics education contexts and discussed advantages and limitations of this pedagogical approach. We attended to *enacted* role-playing as well as to *imagined* role-playing.

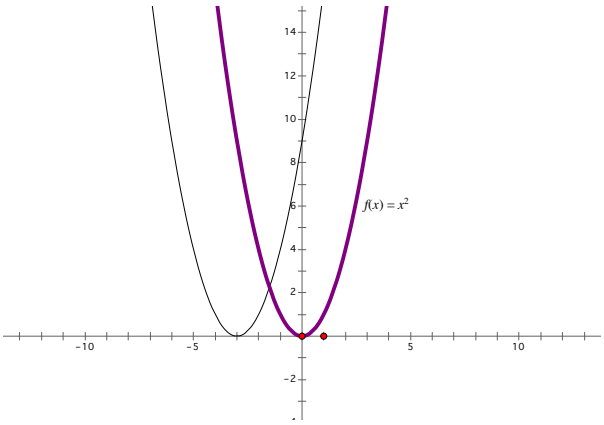
Role-playing is considered a valuable pedagogical approach in a wide variety of setting. Increased understanding of the content and enhanced interaction among group members are often mentioned as advantages of this strategy. However, mathematics education role-playing has been referred to as an "underused resource" (Pimm & Johnston-Wilder, 2011). Rare examples of its use include recreating realistic situations such as a shop in an elementary school mathematics classroom.

However, when implementing role-playing in a classroom, the limitations of time become obvious. As such, we turned to "imagined role-playing", where prospective teachers wrote scripts for plays. We briefly reviewed several studies that implemented script writing. This included 'proof-scripts', where the participants created dialogues among the characters around particular proofs and in such clarified perceived difficulties in the proofs (Koichu & Zazkis, 2013; D. Zazkis, 2013), and 'lesson plays', where participants presented a flow of a lesson in a form of a scripted interaction between a teacher and students (Zazkis, Sinclair & Liljedahl, 2013).

To provide a first hand experience the DG participants engaged in two tasks. First, they were presented with several prompts and were asked to enact scenarios of instructional interaction based on these prompts. Two of the prompts are presented below:

Parabola prompt:

Teacher: We have the graph $y=x^2$. Would you please draw the graph of $y=(x-3)^2$
Student: It just moves 3 points left.
Teacher: And why do you say this?
Student: Because of the -3

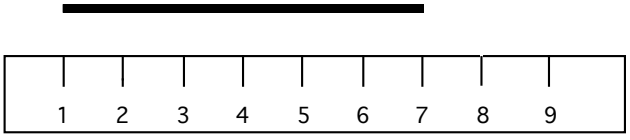


Measuring length prompt:

Students in your class were asked to measure the length of different objects.
The teacher collected their responses.

Teacher: Johnny, how long is the stick that you measured
Johnny: It is … seven
Teacher: Seven what?
Johnny: Seven centimeters
Teacher: Can you show me how you measured?

(Johnny places the stick next to the ruler as shown below)



Second, the DG participants were presented with excerpts from plays written by prospective teachers that followed the measuring length prompt. (The prompt and the excerpts are from Zazkis, Sinclair and Liljedahl, 2013.)

Excerpt #1

Teacher	Oh I see, you started there because that is the first number that you saw!
Johnny	Yep – we always start at one!
Teacher	Johnny, you are right! Usually when we are counting we do start at one! But guess what, when we are measuring – there is a special trick that we use when we count!
Johnny	Really? We use a trick?
Teacher	When we measure, we start at the far side here and that is a zero! To make it a little bit easier for you, how about we draw a 0 on your ruler with your pencil so that it will remind you where to start!

PME 37 Discussion Group Report 8 continued:

Excerpt #2

Ms. G	Do you remember two important rules for measuring?
Johnny	Um.. Don't skip spaces for measuring and … um…
Ms. G	And make sure to start at the base. A ruler has a baseline too Johnny. Whenever we measure anything against a ruler, we must start at the baseline. Can you tell me what number is at the baseline this ruler?
Johnny	Yes, it's zero

They were asked to analyse these experts, paying particular attention to the way in which the script writing task might affect learning about teaching, teaching about teaching, and research on teaching. A discussion emerged on the affordances of the approach. Possible avenues for implementation in research and teacher education were considered.

Excerpt #3

Teacher	If you were to place the stick upright on the table *(the teacher demonstrates with his hands)* would it be the same length if you measured it with your ruler?
Johnny	Of course.
Teacher	Try it
	(Johnny takes the stick and measures it upright. He makes a face when the ruler reads 6 instead of 7)
Teacher	What happened here?
Johnny	I don't know. Magic?
	[…]
Johnny	I was counting one extra
Teacher	One extra what?
Johnny	One extra centimetre
Teacher	So where should you start?
Johnny	From 0 centimetres.

References

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MASTER AND DOCTORAL PROGRAMME 2013-2014

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Mathematics Education at the Edge
PME 2014 Vancouver ...

by Diana Royea PME 2014 Local Organizing Committee


Diana Royea

The local organizing committee for the joint meeting of the 38th Conference of the International Group for the Psychology of Mathematics Education (PME 38) and the 36th Conference of the North American Chapter of the Psychology of Mathematics Education (PME-NA 36) is excited to invite all PME and PME-NA members to join us at the University of British Columbia (UBC) in Vancouver, Canada from July 15 to July 20, 2014.

The theme *Mathematics at the Edge* has been selected for PME 38/PME-NA 36 to provide the opportunity to examine mathematics education research that is on the cutting edge. Exploring *Mathematics on the Edge* allows us to examine innovative mathematics education research and research methodologies. This theme also provides an opportunity to consider mathematics education issues and groups of people that are often located on the edge of educational research. Some of these peripheral education issues include social justice, equity, and Indigenous education. *Mathematics at the Edge* even describes the geographical location of the conference. Not only is the city of Vancouver situated at the edge of the country on the Pacific Ocean, but the beautiful UBC campus is also located on a peninsula at the edge of city.


The University of British Columbia, Vancouver, Canada site of PME 2014

Mathematics Education at the Edge: PME 2014

Four plenary addresses will respond to the theme *Mathematics at the Edge* from four different perspectives thereby unifying diverse threads mathematics education research into a rich tapestry of sorts. Representing the host country, *Luis Radford*, specialist in theoretical and practical aspects of mathematical teaching and learning from Laurentian University in Sudbury, Canada will speak about *Mathematics on the Edge* from a sociocultural theorist's perspective. Furthermore, *George Hart*, mathematical sculptor/designer and research professor in engineering at Stony Brook University in New York, USA, *Orit Zaslavsky*, pioneer in the development of both practical and theoretical perspectives of mathematics teacher educator research, and *Gabriele Kaiser*, Germany, specialist in teacher education and mathematics learning under the conditions of lingual and cultural plurality will also speak about various perspectives of the conference theme.

In addition to these four plenary addresses, a plenary panel on *The Calculus of Social Change – Mathematics at the Cutting Edge* will be offered. The panel members for PME 38/PME-NA 36 will be *Mamokgethi Setati Phakeng* from South Africa, *Dave Wagner*, from Canada, *Paola Valero* of Denmark, *Margaret Walshaw* of New Zealand, and *Anjum Hali* of Pakistan and Tanzania.

The Co-Chairs of PME 38/PME NA 36, *Peter Liljedahl* and *Cynthia Nicol*, and the local organizing committee from Simon Fraser University and the University of British Columbia are proud to be hosting the conference in our beautiful, coastal city. Based on the number of submissions to date, this conference has the potential to be rather large. We are keeping the challenges of hosting such a large conference at the forefront of planning as we prepare for PME 38/PME NA 36. Holding the conference on the UBC campus provides many advantages by having all of the conference venues, participant accommodations, restaurants, and access to all necessities within walking distance directly on campus. We look forward to welcoming you to Vancouver next summer. For more information about the PME 38/PME-NA 36 conference please visit the website at www.pme38.com.

The University of British Columbia, Vancouver, Canada site of PME 2014