Welcome!
17.00 Welcome: from CERME7 to CERME8, and beyond!
17:10 Introduction to WG14 Subgroups
(CW, EN, IB, AGM, GG)
Schedule for Sessions 1-7
17:20 Introduction to today’s group-work
Splitting in small groups
17:30 Group-work
18:15 Small group presentations by nominated participant
18:45 Preliminary discussion of post-CERME8 collaboration
19:00 Closing
### WG14: University mathematics education
#### Session Outline

<table>
<thead>
<tr>
<th>February 5th</th>
<th>February 6th</th>
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<td>Tuesday</td>
<td>Wednesday</td>
<td>Thursday</td>
<td>Friday</td>
<td>Saturday</td>
<td>Sunday</td>
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<tr>
<td>8:30</td>
<td>YERME DAY</td>
<td>WG Session 2</td>
<td>WG Session 4</td>
<td>WG Session 6</td>
<td>WGs Report 1</td>
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<td>Poster session</td>
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<td>11:30</td>
<td>ERME meets Young Researchers</td>
<td>Plenary Talk Alain Kuzniak</td>
<td>WG Session 5</td>
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<td>Lunch</td>
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<td>Lunch + Departures</td>
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<td>13:00</td>
<td>YERME DAY</td>
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<td>13:30</td>
<td>Opening Ceremony</td>
<td>Poster session</td>
<td>Excursion departure</td>
<td>ERME General Assembly</td>
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<td>Plenary Talk Paolo Boero</td>
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<td>Results of elections</td>
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<td>18:30</td>
<td>Forum</td>
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<td>Free time</td>
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<td>Gala Dinner</td>
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<td>21:00</td>
<td>Live Music</td>
<td>Turkish Contributions to Mathematical Sciences Cem Tezer</td>
<td>Live Music</td>
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</tbody>
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   Splitting in small groups*
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19:00 Closing
* Work in four groups each led by GG, AGM, IB and EN. Subgroup CW includes 5 papers, 3 by co-leaders IB, GG and EN. These papers will be discussed within these co-leaders’ small groups. The authors of the other two CW papers (Jaworski, Pinto) will discuss their paper within the subgroup they choose to attend. CW will join the IB group in which his paper belongs. Participants who are not authors can choose their groups freely.

**Small group-work agenda**

*Individual introductions*

Please include your interests and expectations from the WG.

*Preliminary discussion of papers*

Please focus on the subgroup papers and any extra papers as in *. Focus on initial observations of commonalities and differences; and, on making the most of the time dedicated to these papers in Sessions 2-6.
Welcome by co-leader

*Paper Reminder-Presentations* and *Reactions*

Discussion of papers in small groups

Plenary summaries of small-group discussions

Plenary discussion

Closing

*Maximum 5 minutes long assisted *(optional) by one slide of at least 20pt font size.*

**20 minutes**
Part I: Preparing Sunday’s WG14 presentation
• Observations from co-leaders on themes across Sessions 2-6
• Discussion: the structure of Sunday’s WG presentation
• Group-work on presentation sections
• Plenary discussion of group-work outputs and presentation drafting

Part II: Post-conference collaboration
• Preparations for the Proceedings
• Beyond CERME8: Special Issue Proposal, PME37 etc.
8.30-9.20 Paper reminder presentations + reactions (5’+5’)
Bìza - Pìnto - Gueudet - Jaworski - Nardì

9.25-10.00 Discussion of five papers each in one group

NB: each group must choose

– a moderator to ensure the discussion focus on the paper: raise questions, identify main points, discuss possibilities and potentials

– a reporter to take notes (to be given to the team at end of session) and report back orally

10.00-10.25 Short reports from five groups + authors’ final phrase (total ≤ 5 mins/paper)

NB: each author should take notes of points in the discussion and select one or two to mention at this point

10.25-10.30 Final remarks and comments on procedure
16:00 – 17:00 Welcome and paper reminder presentations + reactions

Liebendörfer, Sikko & Pepin, Stadler et al, Toor & Mgombelo, Bergster & Jablonka

17:00 – 17:30 Small group discussion per paper

17:30 – 18:00 Plenary short presentation and discussion

NB: each group must choose
– a moderator to ensure the discussion focuses on the paper: raise questions, identify main points, discuss possibilities and potentials
– a reporter to take notes (to be given to the team at the end of the session) and report back orally

NB: each author should take notes of points in the discussion and select one or two to mention at this point
9:00 – 9:45 Welcome and paper reminder presentations + reactions

9:45 – 10:15 Small group discussion per paper

10:15 – 10:30 Plenary short presentation and discussion

NB: each group much choose

– a moderator to ensure the discussion focus on the paper: raise questions, identify main points, discuss possibilities and potentials

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NB: each author should take notes of points in the discussion and select one or two to mention at this point
In CERME7 (2011)… 20 years after:

In CERME8 (2013)... 20 years after:

11:00 – 11:45 Welcome and paper reminder presentations + reactions
11:45 – 12:15 Small group discussion per paper
12:15 – 12:30 Plenary short presentation and discussion

NB: each group must choose
— a **moderator** to ensure the discussion focuses on the **paper**:
  - raise questions, identify main points, discuss possibilities and potentials
— a **reporter** to take notes (to be given to the team at end of session) and report back orally

NB: each **author** should take notes of points in the discussion and select one or two to mention at this point
8:30 – 9:15 Welcome and paper reminder presentations + reactions

9:15 – 9:40 Small group discussion per paper

9:40– 10:00 Plenary short presentation and discussions' preparation for session 7

NB: each group must choose
— a **moderator** to ensure the discussion focuses on the **paper**: raise questions, identify main points, discuss possibilities and potentials
— a **reporter** to take notes (to be given to the team at end of session) and report back orally

NB: each **author** should take notes of points in the discussion and select one or two to mention at this point
Discussion of posters, 10 mins

Preparing Sunday’s WG14 presentation*, 50 mins
  • Group work
  • Plenary discussion

Preparations for the Proceedings, 5 mins
  • WG14 leader team convenes and addresses invitations to authors to revise and submit their papers for consideration for inclusion in the proceedings by February 15
  • Invited authors revise and resubmit by April 1
  • Decisions about publication in the proceedings within April
  • Possible outcomes: Accept, Short Contribution, Reject

General discussion on WG structure, content and management, 10 mins

Post-conference collaboration, 15 mins
  • *RME Special Issue Proposal
  • PME37?
  • Beyond CERME8...
Groups (4)
- Transitions
- Affect
- Teacher practices
- Mathematical topics

Group work output
4 slides (max) to feed into the presentation

Group work focus
- Theory
- Research paradigms
- Results
- Rigour/quality

Plenary discussion of group-work outputs and presentation drafting
Thank you!
Stay in touch
See you later...

Elena Nardi e.nardi@uea.ac.uk; Carl Winsløw winslow@ind.ku.dk; Irene Biza i.biza@lboro.ac.uk; Alejandro González-Martin; a.gonzalez-martin@umontreal.ca; Ghislaine Gueudet ghislaine.gueudet@bretagne.iufm.fr
Sunday Presentation
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PC Liaison and Co-Leader:
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Co-Leaders:
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Alejandro González-Martin (Canada/Spain)
a.gonzalez-martin@umontreal.ca

Ghislaine Gueudet (France)
ghislaine.gueudet@bretagne.iufm.fr
Mathematical reasoning and proof in university mathematics
Challenges for teaching mathematics at university level (including the perspectives of university teachers)
The role of ICT tools (e.g. CAS) in the teaching and learning of university mathematics
Transition issues “at the entrance” to university studies of mathematics, or beyond
Novel approaches to teaching Calculus and Linear Algebra
The teaching and learning of advanced university mathematics topics (beyond Calculus and Linear Algebra)
Challenges of teaching mathematics to students in non-mathematics degrees
Assessing the learning and teaching of mathematics at university level
Theoretical approaches to the study of teaching and learning mathematics at university
22 papers, organized in five themes:

*Transition (secondary/university)*
*Affects, students’ interests*
*Teachers practices*
*Mathematical topics*
*Mathematical domains*

5 posters
Use of theory

- Bergster & Jablonka: Bourdieu (cultural capital linked to other types of capital)
- Sikko & Pepin: transition literature
- Toor & Mgombelo: syncretic (compatible?)
- Liebendörfer: SDT (Krapp)
- Stadler et al: Stadler’s own triad of concepts; advanced statistics
Research paradigms

- Bergster & Jablonka: qualitative, pattern spotting
- Sikko & Pepin: quantitative / qualitative
- Toor & Mgombelo: concurrent mixed methods
- Liebendörfer: focus group interview, individual interview data, qualitative content analysis
- Stadler et al: bridging quantitative / qualitative paradigms
Results

- Bergster & Jablonka: Culture and environment influence our choice of studies ways of coping with our studies.
- Sikko & Pepin: Lectures do not attend to students’ needs on how they learn best Peer work is a helpful survival technique.
- Toor & Mgombelo: gender differences in self image of capability.
- Liebendörfer: demonstrate capacity of SDT tool.
- Stadler et al: identify several differences between beginners and more experienced students.
Theoretical Frameworks

- Enculturation of mathematics / philosophy of mathematics (Hoffkamp, Schnieder & Paravicini)
- Task-design to support Transition (Breen, O’Shea & Pfeiffer)
- Student Errors (Fardinpour & Gooya)
- ATD (Winslow)
- Curriculum-(re-)design & Multiple representation (Schmidt)
Paradigms

- Research-based development with evaluation / action research (Breen, O’Shea & Pfeiffer; Schmidt; Hoffkamp, Schnieder & Paravicini)
- Error analysis (Fardinpour & Gooya)
- Practice based development of theory (Winslow)
Results

- Non-standard tasks can facilitate students’ transition (Breen, O’Shea & Pfeiffer)
- Findings from Ireland confirm int. research results on students’ problems (Breen, O’Shea & Pfeiffer)
- Beginning with complex numbers/functions can improve basic skills (Schmidt)
- Being explicit and intentional about metamathematical foundations can help students’ thinking about mathematics (Hoffkamp, …)
- Capstone courses assume an advanced standpoint in relevant mathematics (Winslow)
- Model captures difficulties students encounter with ODEs (Fardinpour & Gooya)
Theory

- Used:
  - Biza, Jaworski: Communities of practice and communities of enquiry
  - Pinto: Planning curriculum and implemented curriculum
  - Pinto: Decision making theory (Schoenfeld, 2011)
  - Gueudet: Resources – Documentational genesis

- Further suggestions:
  - Didactic situations
  - Teacher knowledge at university level
• Research Paradigms
  – Biza: Analytical reflective practice: reflective practitioner analyses his/her practice (insider research)
  – Jaworski: Within socio-cultural frame, developmental study in which insider and outsider researchers work collaboratively.
  – Pinto, Gueudet: Ethnographic approach including observation and reflective analysis
  – Nardi: Literature study with implications for teaching
  – Gueudet, Pinto: Case study
• Results
  – Biza: Hypothesis generating for hypothesis testing
  – Gueudet: Importance of the articulation of paper/pencil and digital resources
  – Gueudet: Evolution of the collective work linked to the digital resources
  – Jaworski: Confirmation of the integrity of the design of teaching and of the problematic nature of discerning conceptual understanding leading to a theoretical reconceptualisation
  – Pinto: The impact of the teaching experience, agenda and identity on teachers’ decision
  – Nardi: Proposition of teaching intervention for PGR students in mathematics education
Theoretical approach

- «Understanding» (Berman, Hyvarinen, Pettersson, Schlarmann)
- Theoretical diversity (commognition, ATD, cognitive approaches, ...).
- Older approaches (Skemp, Pierce).
- Richness.
- More cognitive approaches than in CERME7 (Alvarado, Berman, Hyvarinen, Pettersson, Schlarmann).
- Using / cobining different frameworks (Alvarado, Berman, Pettersson) : use and misuse
● Research paradigms
  ● More or less the same topics as in last CERME (functions, calculus, proof, linear algebra).
  ● Sfard’s framework is probably evolving to develop research methodologies (Viirman, Pettersson).
  ● Methodologies we wave used are really diverse.
  ● Long-term studies (Alvarado, Hyvarinen, Pettersson).
Results

- A greater focus on teaching and predicting learning (Gonzalez-Martín, Viirman), epistemological approaches (Hausberger), constructive activities (Alvarado).
- The focus is more on what you learn, how you learn it...
- We would like to see more applications for teachers and want to share with teachers. Papers with mathematical notions are maybe easier to share.
Rigour / Quality

- In practitioner research, subject and object of research can be too close
- Results are dependent on the context and on the local institution
- The collection of data relies only on practitioner’s reflection
- Triangulation is needed
- Collection of data from different sources is needed
- Transparency of the nature of the interpretations
- Coherence - Is our framework adequate to address our problem?
- Combination of frameworks and coherence and not incompatibility.
- Bias when the teacher is the researcher.
- Caution in the use of statistics
- nuance, ground for apparently self evident claims
- isolating slice of data for reporting
- need to further test
- emerging results, not ready yet for dissemination?
- small sample
- convenient sampling: opportunistic? Importance of context then!
- Hypotheses have to be verified in other contexts
- Strengthen theoretical models to improve validity of results