

WORKING GROUP 16

Different theoretical perspectives
and approaches in research
in mathematics education

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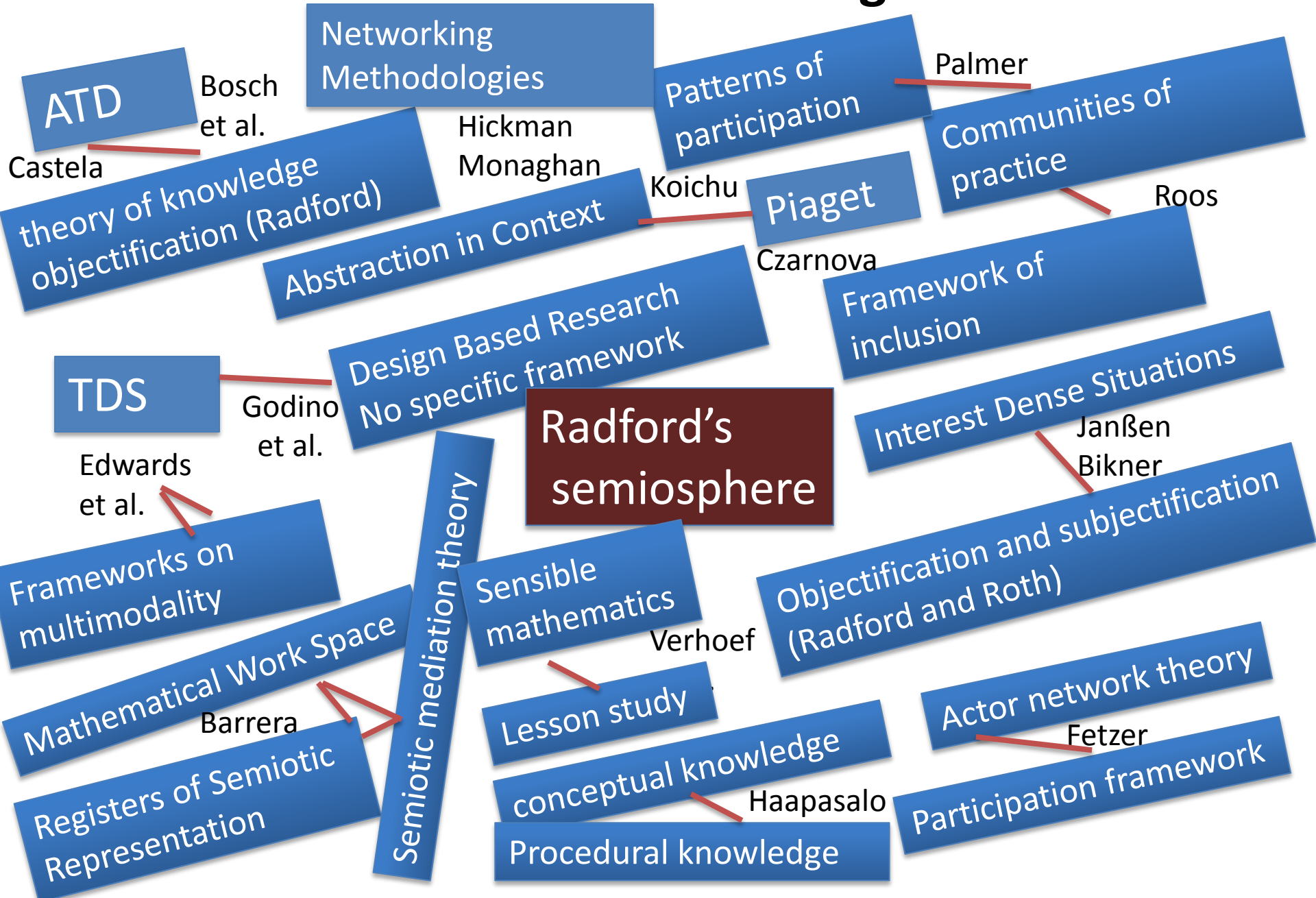
Different theoretical perspectives and approaches in research in mathematics education

- Exploring ways of handling the diversity of theories in order to better grasp the complexity of learning and teaching processes.
- Understanding how theories can be connected in a successful manner while respecting their underlying assumptions.

Call for papers

- Specific benefits when **connecting theories**
- Empirical and theoretical **difficulties** in connecting theories
- Examples of **strategies** for connecting theories
- **Limits** of connecting theories: how are these limits determined by the aim of the connection and the specificity of the theories that are being connected?
- Conditions for a productive **dialogue** between theorists
- Difficulties and strategies when **gathering results** from different frameworks
- The role of the **empirical material** (research data) in the networking and design of theories
- The interaction between **contexts** and theoretical approaches: the diversity of approaches towards context in different didactic cultures

Different theoretical backgrounds



What did we have?

- 12 papers and 3 posters, almost all new participants in the group

- The papers can be listed with regard to three main issues
 - (1) Networking & Epistemology
 - (2) Methodology
 - (3) Theory & Practice



Networking & Epistemology

- Bosch, Ruiz-Munzón and Gascón: Algebra according to Theory of Knowledge Objectification (TKO) and ATD.

The use of a reference epistemological model for networking the 2 approaches and to clarify how each approach defines what is algebraic thinking

- Godino, Batanero, Contreras, Estepa, Lacasta and Wilhelmi: Didactic Engineering (DE) and Design Based Research (DBR)

DE (Artigue, 1989 –closely linked to TDS) focuses on epistemological questions; DBR does not adopt a specific theoretical framework, nor an epistemological questioning



Networking & Epistemology

- Janßen and Bikner- Ahsbahs : Algebraic structure sense in TKO and structure seeing (IDS)

The specific contribution of two coordinated theories is pointed out focusing on the boundary between the theories and on the process of crossing it during the research that leads to a deepened insight into the development of structure sense.

- Castela (poster): ATD and communities of practice



Methodology

Networking methodologies & Methodology of networking

- Barrera: geometrical interpretation of product linking
geometrical work place with cognitive approaches

*Analyzing students' paths within an experimental lesson
connecting multiplication and some of its geometric meanings*

- Fetzer: Latour's sociology of objects

*Latour as a 'background' theory. The focus is to understand
(and trace) the role of 'objects' in mathematical learning
processes- to develop and integrated theory-methodology for
tracing the influence of objects.*



Methodology

- Hickman & Monaghan: Livescribe pen in think-aloud protocols (T-AP) and task-based interviews (T-BI)

How an artefact can enable the networking of methodologies; what a methodology is and its relationship with 'theory'

- Koichu: iterative unpacking of theories as applied to research on problem solving and posing

One theory may serve as an overarching framework in one case and as a source of conceptual tools for elaborating on elements of another theory in another case

- Palmer: communities of practice and patterns of participation

Primary school mathematics teachers identity development.

Theory and teaching practice

- Roos: Communities of practice and inclusive pedagogies
The main aim is to understand the phenomenon of inclusion in mathematics and see how to problematize it.
- Verhoef: Japanese Lesson Study and Tall-Bruner-Freudenthal approaches
Empirical study: how six mathematics teachers investigated their teaching practices using a lesson study approach to determine characteristics of sensible mathematics.
- Czarnova (poster): Garcia & Piaget triad and fairy tales
- Godino (poster): instructional design tools based on the ontosemiotic approach



From CERME 4 to CERME 8: continuity

CERME 4 2005

- The central term that emerged from the working group was *networking*
- To make explicit the level at which a theory operates (discussed at CERME 8 Session 4)
- Awareness of the underlying assumptions of each theory... underlying assumptions also concern questions such as *the nature of mathematical objects* (CERME 8 Session 2)

From CERME 4 to CERME 8: continuity

CERME 7 2011

- **The central term that emerged from the working group was *transformation***
- *Transformation* after networking, you have been transformed: you are able to see things that you could not see before.
- Negotiating meanings/ what are the conditions for a language to allow the dialogue?
- **Thinking about networking theories: methodologies of networking**

From CERME 4 to CERME 8: continuity ... and changes

The importance of the 'CERME spirit' of inclusivity,
especially with regard to **'new' researchers**

... and the need to consider the structure of the sessions
(difficulty to 'get involved' during the first sessions)

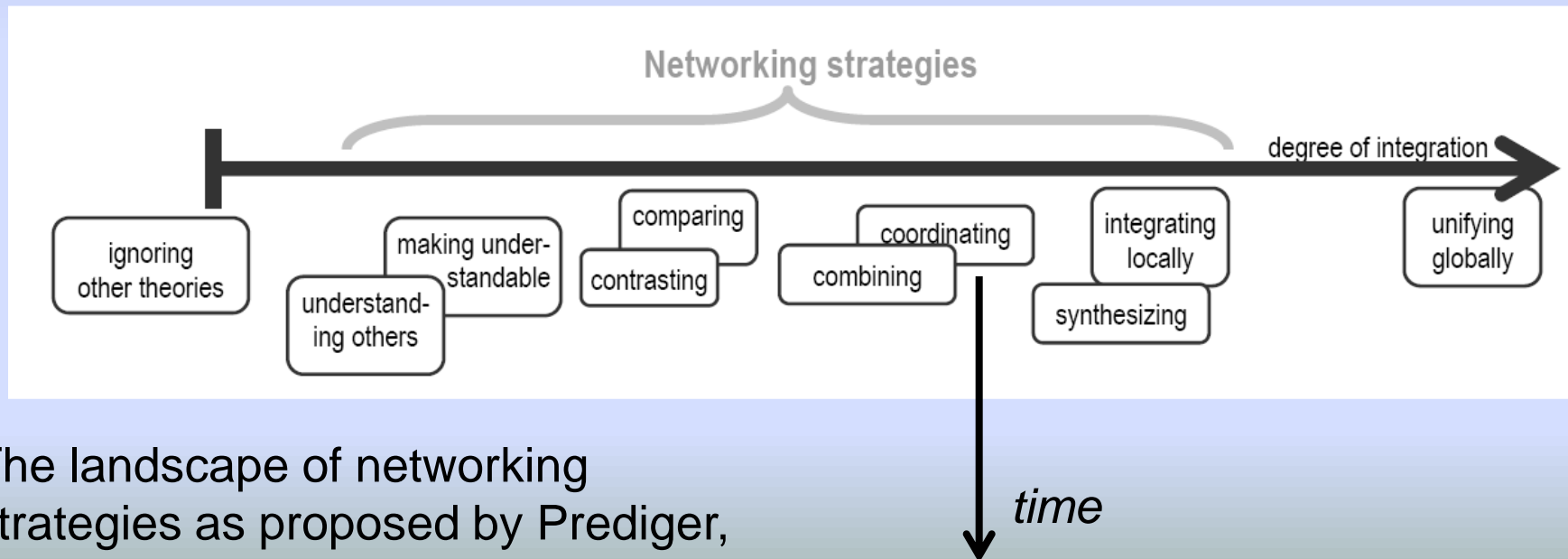
New issues compared to last CERMEs:

- Specific focus on **methodology** and its relation to theory
- The dimension of **'time'** in networking strategies
- Problem of **professional development**
- Problems and **phenomena**



From CERME 4 to CERME 8: continuity ... and changes

The dimension of 'time' in networking strategies



The landscape of networking strategies as proposed by Prediger, Bikner-Ahsbahr & Arzarello, 2008

Proposals for the future

- Reintroduce the stress on theories, not only networking
- Analyse the dependence between theories and methodologies\problems\results
- New researchers are welcome for initial theoretical reflexions

