

## Imagery and Affect in Mathematical Learning

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Representation in learning mathematics includes not only external structured physical configurations, but also internal systems that encode, interpret, and operate on mathematical image and symbol configurations (Goldin & Janvier, 1998). Continuing the discussion begun at PME-24 in Hiroshima, we focus on imagery, affect, and their interplay with natural language, formal notations, heuristics, beliefs, and especially with each other. Traditional views of mathematics as an abstract, formal discipline have tended to relegate visualization, metaphor and metonymy, emotions, and the relation between feeling and mathematical imagination to incidental status. Yet we have a case for the centrality of imagistic reasoning, analogies, metaphors, and images in mathematical learning (English, 1997; Presmeg, 1998). Lakoff and Nunez (2000) even aim to recast the foundations of mathematics in terms of metaphorical image schemas. The essential role of affect, encoding information and influencing learning and performance, has also been stressed (McLeod, 1992, Goldin, 2000). It may even be the most fundamental system in powerful mathematical learning and problem solving (DeBellis & Goldin, 1997; Gomez-Chacon, 2000).

Our general purpose is to explore the nature and role of affective and imagistic representational systems in mathematical learning and problem solving. The first session will begin with brief presentations by the coordinators, focusing on: analogies, metaphors, images, affect, meta-affect, and beliefs in mathematical reasoning and problem solving, including highlights of last year's discussion. Participants are encouraged to cite examples of imagery, affect, and their interplay in children and adults doing mathematics, for group discussion and interpretation. We shall discuss some of the difficult issues in the empirical investigation of these topics through classroom observation and structured clinical interviews; identify key research issues, and shape plans for future development of these ideas.

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