



TSG 10 Teaching and learning of early algebra

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Topic Study Group 10 aims to bring together researchers, developers, teachers, and teacher educators with a research interest in early algebraic thinking within elementary- and early middle-school-aged children (up to about 12 years of age). We invite both theoretically and empirically grounded contributions that address one or more of the following issues in the teaching and learning of early algebra:

- Nature of algebraic thinking (e.g., early algebra as generalized arithmetic, as reasoning about functional relationships, as describing mathematical relations in a general way; comparisons of 'early algebra' and 'pre-algebra' approaches; connections between early algebraic thinking and later algebraic reasoning)
- Characteristics of algebraic thinking (e.g., constructing relational meaning for equality; generating rules within pattern generalization; representing the relations in various problem situations)
- Analysis or development of curricular materials fostering algebraic thinking (e.g., analysis of mathematical topics related to algebraic thinking in elementary and early middle-school mathematics curricula; various approaches for introducing algebraic thinking in mathematics curricula; ICT tools and other representations for developing algebraic thinking; approaches providing for the emergence of algebraic thinking within 'typical' elementary mathematics curricula; cross-national comparative analyses)
- Teaching practices and challenges in diverse classroom settings where algebraic thinking is cultivated (e.g., task design related to algebraic thinking; teacher questioning or teacher intervention; teaching strategies to support children's algebraic thinking; benchmarks for teaching and

learning of early algebra; teaching sequences for a mathematical topic where children's algebraic thinking is deliberately encouraged; professional development strategies for fostering the instructional practice of cultivating children's algebraic thinking)

- Diagnosis and assessment of children's algebraic thinking (e.g., diagnostic instruments; analysis of various levels, affordances, or difficulties related to children's algebraic thinking; evolution or significant shifts in algebraic thinking across grade levels; children's use of multiple representations and gestures to signify the relations in problem situations or in the process of generalization)

For those TSG 10 participants who would like to submit a written contribution, information is available from the Second Announcement on the ICME 13 website. A selection of these submitted papers will be presented during the TSG 10 sessions.

A central activity of the four 90-minute TSG 10 time-slots will be plenary presentations, each of which will be followed by discussion among TSG participants and plenary presenters. The first session will feature a plenary panel, addressing the topic: *An Epistemological Perspective on Early Algebra: What Constitutes Algebraic Thinking in Elementary and Early Middle School?* The panel, whose moderator and discussant is Carolyn Kieran, will highlight four contributions: one by John Mason and a joint one by each of the three teams of Maria Blanton – Bárbara Brizuela, Nicolina Malara – Giancarlo Navarra, and Analucia Schliemann – David Carraher.

Other plenary presentations will focus on the teaching and learning of early algebra and involve contributions by JeongSuk Pang, Swee Fong Ng, and Deborah Schifter. These plenaries will synthesize the research literature related to the cognitive processes evoked in primary and early middle school students as they interact with early algebra activities and tasks, and include findings from recent work in cognitive neuroscience in the area of early algebra, as well as socio-cultural analyses of classroom environments where early algebraic thinking is supported by specially-designed instructional materials and specific teaching approaches.

We look forward to having a forum for generating discussion, exchanging insights, and establishing a state-of-the-art sketch of early algebra, including implications for early algebraic thinking as a foundation for mathematical reasoning across the various grade levels of school mathematics.