

WS8 THE ROLE OF SYNTAX AND TECHNOLOGY IN THE DEVELOPMENT OF ALGEBRAIC REASONING IN THE EARLY GRADES (K-8)

John Olive, Maria Blanton and Jim Kaput'

Early Algebra Working Group investigates and describes the possible geneses of algebraic reasoning in young children. It develops and investigates ways to enhance that reasoning through innovative instruction, applications of appropriate technology and professional development.

Our two 90-minute sessions will be organized around two important themes from our discussions at PME-NA XXIV: (1) *the role of syntax competence* and (2) *the development of and technological support for students' functional thinking*. The first session will begin with a brief report from the PME-NA XXIV EAWG discussions that will provide an overview and focus (5-10 minutes). The main questions to be addressed at this first session will concern syntax competence – *What is it and does it belong in early algebra? Is it ruled out of early algebra or just hidden?* We plan to begin with a panel discussion (approximately 30 minutes) with representatives from: TERC/Tufts University, University of Hawaii, Universite du Quebec a Montreal, University of Georgia, Cinvestav-Mexico, and UMASS-Dartmouth. In their brief presentations panelists will refer to the research reports they will be presenting at the PME/PME-NA 2003 meeting. Group participants are encouraged to read the reports or to attend the corresponding research report sessions. The panel discussion will be followed by an open debate of the issues raised by the panel concerning syntax competence in early algebra.

The second session will focus on issues concerning the development of functional thinking, including the representational forms students use, how they understand and express variation in quantities, and how technology may support this. Researchers who have been using dynamic visualization tools will briefly present (approximately 30 minutes total) examples of young learners working with these tools to explore phenomena that include co-variation (for example), and expressing their understanding of quantitative relations and their algebraic reasoning through use of the tools. The examples will come from a few dynamic visualization tools being used in several research projects (e.g. SimCalc, the Freudenthal Institute, the Dynamic Visualization in Mathematics for Young Learners project, the CoSTAR project at the University of Georgia). The remaining time will be dedicated to discussion between all participants. There will be opportunities for participants to interact with the various tools outside of the working group sessions.

We see our session themes as connected and one of our goals is to make those connections explicit. The representational forms that students use, as well as how they negotiate these forms, brings to the fore issues of syntactic competence as students engage with notions of variation and co-variation. We expect the dynamical software and panelists' video segments to serve as a context for articulating these connections and identifying concrete ways in which early algebraic thinking can be supported.