Embodiment, Gesture, and Mathematics Education

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The study of mathematical thinking and learning has, for the most part, focused on how learners and teachers reason and communicate about mathematics using language and symbols. Data may include written inscriptions, diagrams, and/or verbalizations between teacher and learner, or among learners. However, the utilization of gesture for both the construction and communication of mathematical understanding has received much less attention in the research community. The purpose of this working group is to investigate the nature of the use of gesture in mathematical learning and knowledge. This focus will be situated within the context of recent work in cognitive science, including the theory of embodied mathematics (Lakoff & Nunez, 2000), research on gesture and thought (McNeill, 1992) and perspectives on number from cognitive neuroscience (Dehaene, 1997). In addition, specific research on gesture and number (Draisma, 2000; Gerdes & Cherinda, 1993; Fuson & Kwon, 1992) will be summarized to provide a background for the work that will take place within the two sessions.

In accordance with the purposes of a Working Session, the sessions will provide opportunities to participate in developing a research perspective and engaging in analysis of data within this perspective. The first portion of the initial session will be devoted to preparing a theoretical and practical grounding for the work. We will then present two video case studies, one focused on young children and gesture arithmetic (Draisma), and the other on motion graphics (Frant). A preliminary analysis of each case will be presented by the researchers, followed by an opportunity for participants to further analyze each case in small groups, as well as to engage, for example, in learning gesture arithmetic themselves. The groups will then present their analyses within the whole forum for further discussion. The session will conclude by considering possible ways to move forward in this area of investigation.

Dehaene, S. (1997) The number sense: how the mind creates mathematics. New York: Oxford.

Draisma, J. (2000) "Gesture and oral computation as resources in the early learning of mathematics", in Proceedings of PME24 (Hiroshima), Vol. 2, p. 257-264.

Lakoff, G. & R. Nunez. (2000) Where mathematics comes from. NJ: Basic Books.

McNeill, D. (1992) Hand and mind: what gestures reveal about thought. Chicago: Chicago University Press.

Gerdes, P. & Cherinda, M. (Nov. 1993) "Words, gestures and symbols", UNESCO Courier, Paris, p. 37 - 39.

Fuson, K. & Kwon, Y. (1992). Korean children's single-digit addition and subtraction: numbers structured by ten. Journal for Research in Mathematics Education, Vol. 23, Nº 2, 148-165.