

GESTURE IN THE CONTEXT OF MATHEMATICAL ARGUMENTATION

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This poster presents a longitudinal analysis of gesture students used in an undergraduate differential equations course based on the philosophy of Realistic Mathematics Education (RME). In this research ‘gesture’ is used to specifically mean movements of the hands and arms in the progress of communication. Gesture provides a visible indication of different levels of discourse structure and functions to shed light on learners’ cognitive background before actions (Kenon 1997). Here gesture is taken as the analytic unit in this research to investigate the process in which taken-shared mathematical meaning emerges through meaning renegotiation in the context of mathematical argumentation. The analysis specifically focuses on kinds of gestures the students used, their characteristics, and the tendency in the gesture use through a semester to provide evidence that a student becomes socially transformed through legitimate peripheral participation in the practice of mathematics (Lave & Wenger, 1991).

McNeil (1992) categorized gesture into three types: iconic, metaphoric, and deictic gesture. In particular, McNeil has shown that metaphoric gesture accompanies the technical discourse of mathematicians, which was of parallel significance in this differential equations class. However, one of the salient patterns in the use of gesture is concerned with the switch between the three types of gesture. From the perspective of this research, it is important to note that the students’ gesture become transformed from the pictorial metaphoric/iconic gesture to the deictic gesture of simple pointing. When a new concept was introduced, the students had to describe their understanding in detail because there was no shared ground for argumentation, which emerges through follow-up meaning negotiation. Thus, the switch in the use of gesture can be interpreted as the sign of the emergence of shared mathematical meaning among the students.

The tendency described above implies that the use of gesture is closely tied to social aspects of the students’ mathematical argumentation. The transition into deictic gesture suggests that a learner’s mathematical meaning becomes reformulated in the context of mathematical argumentation. When considering that the students’ mathematical practice is fundamentally situated within the historical and cultural context of a broader mathematics community, the switch in the gesture use implies that a learner becomes socially transformed according to cultural norms and values developed in a mathematics community. This suggests that university teacher education program should prepare future mathematics teachers as representative of a mathematics community for delivering the communal intellectual tradition.

References [A list will be made available at the session]