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Embodied semiotic activities and their role in the construction of mathematical meaning of motion graphs.

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Summary: This paper examines the relation between bodily actions, artifact-mediated activities, and semiotic processes that students experience while producing and interpreting graphs of two-dimensional motion in the plane. We designed a technology-based setting that enabled students to engage in embodied semiotic activities and experience two modes of interaction: 2D freehand motion and 2D synthesized motion, designed by the composition of single variable function graphs. Our theoretical framework combines two perspectives: the embodied approach to the nature of mathematical thinking and the Vygotskian notion of semiotic mediation. The article describes in detail the actions, gestures, graph drawings, and verbal discourse of one pair of high school students and analyzes the social semiotic processes they experienced. Our analysis shows how the computerized artifacts and the students' gestures served as means of semiotic mediation. Specifically, they supported the interpretation and the production of motion graphs; they mediated the transition between an individual's meaning of mathematical signs and culturally accepted mathematical meaning; and they enable linking bodily actions with formal signs.

Classification: C34 G24 R24
Keywords: motion graphs; graphic icons; embodied semiotic activity; semiotic mediation (Vygotsky); technological artifacts; tools
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