

## The Role of Gesture as a Form of Participation in Networked Classrooms

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We have been studying the role of gesture as a mechanism to understand how students make sense of mathematical structures (e.g. families of functions) in networked classrooms. We have integrated SimCalc software into Algebra High School classrooms. The software works on a TI-83/84+ and in parallel on a desktop PC, in conjunction with TI-Navigator's wireless network. The software allows students to create functions algebraically or graphically (e.g. dragging hotspots) and see dynamic representations of these functions through animations of actors whose motion is driven by the defined function. We have created sets of activities that exploit these new technological affordances in mathematically meaningful ways. For example, students are in groups and are asked to create a function that moves an actor for 6 seconds at a speed equal to their group number. So groups 1, 2 and 3 create  $y=x$ ,  $y=2x$  and  $y=3x$  respectively for a domain  $[0,6]$ . Students' work is then aggregated into the computer software via the network, and the teacher then has control of what is shown, (e.g., the collective motion, the graphs, the algebraic expressions) to meet various pedagogical purposes. We have built a hide/show feature to allow students to collectively conjecture and make generalizations about how their contributions are contextualized within a class set of contributions. In such an activity, the important concept is slope as rate (something that underlies the mathematics of change and variation), and the family of functions vary via the parameter  $m$ , in  $y=mx$ , their group number. The parameter is identifiable and hence more meaningful for students as their independent contributions create the variation. As their collective responses emerge and they are asked what they expect to see, we have observed an interesting combination of mathematical speech and gesture as students reason and make sense of the family of functions. In this activity, students in various school settings, describe the whole set as a "fan" and have used their hands (fingers splayed out) to describe what they expect to see before the teacher shows the set of graphs (for example). Our poster will describe a set of categories of gesture that relate to our various activities we have used in classrooms and describe how gesture is an expressive form of participation and mathematical reasoning. The diagram below illustrates screenshots from the calculator to the computer, and a student gesturing a "fan".

