TEACHERS' CONCEPT OF SLOPE AS REPEATED ADDITION

Janet G. Walter and Hope Gerson
Brigham Young University

We present an analysis of the complexities surrounding one teacher's real-time presentation of her emergent understanding of slope as repeated addition. Our lens on the social collective as a learning group positions the teacher within the community of learners collaboratively building on prior experiences. This research is situated in a three-year professional development program for twenty-five practicing elementary teachers preparing to work as numeracy coordinators in one school district. Teachers were asked to determine which is steeper, a slope of 1/2 or a slope of 2/3, and to provide two convincing representations to support their conclusions. They had been using Cuisenaire rods in an earlier investigation, and the rods remained available for teacher use. Specific videotaped episodes, in which teachers articulated, inscribed, or kinesthetically presented slope, were identified as critical events and analyzed through the use of open coding and constant comparison (Powell, Francisco, & Maher, 2003).

Teachers with prior knowledge of slope plotted points by counting rise over run. Lyn, a teacher without prior knowledge of slope, began to use the Cuisenaire rods to literally build a presentation of her emerging understanding of slope. Lyn presented 2/3 slope to the entire class by forming a stair-step arrangement of light green Cuisenaire Rods which she called "threes". Similarly, Lyn built a representation for 1/2 slope using the red rods, which she called "twos". Several other teachers questioned Lyn, as was the custom in the collaborative learning community.

Lyn: One, two…so I just go two,two,two (*stacking the red rods*)
Christine: Why do you think those are twos though?
Lyn: Cause they're just twos (*referring to the red rods*), I'm using the twos, I'm just using twos as halves.
Linda R: How come you only went over 1 (*referring to the slope of 2/3*)?
Brenda: (*responding instead of Lyn*) That's two-thirds one time and two-thirds two times so you're adding two-thirds to it each time.
Lyn: I've never done slope in my life.

Lyn's representation of slope was grounded in the recursively defined functions she studied previously. Lyn built her representation for slope as a process of repeated addition before thinking about rise-over-run. Teachers with limited formal mathematical backgrounds tried to make sense of both traditional and non-traditional representations rather than rush to use standard formulas in building their knowledge of slope.

References

Powell, A., Francisco, J., & Maher, C. (2003). An analytical model for studying the development of learners' mathematical ideas and reasoning using videotape data. *Journal of Mathematical Behavior 22*(4), 405-435.

Speiser, R., Walter, C., & Maher, C.A. (2003). Representing motion: An experiment in learning. *Journal of Mathematical Behavior 22,* 1-35.