

LINEAR FUNCTION GRAPHS AND MULTIPLICATIVE REASONING IN ELEMENTARY SCHOOL

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As most teachers and researchers realize, many children rely on additive reasoning to solve problems that are multiplicative in nature. In fact, we noted that, prior to the third grade year, our students preferred to use scalar or additive approaches to complete multiplicative function tables (Schliemann, Goodrow, & Lara-Roth, 2001). For most of them, relating two quantities across a row was difficult. This may not be unusual. Data from NAEP (1992) suggests that even fourth grade students may rely on additive reasoning to solve multiplication problems (Kenny and Silver 1997).

One purpose of line graphs is to display functional relationships between variables. Therefore, as children come to understand the conventions for building function graphs, they encounter a rich environment for learning about multiplicative structure concepts such as fraction, ratio, and proportion.

As part of this NSF funded study, 70 children in four classrooms participated in six to eight Early Algebra 90-minute lessons during each school semester. The children attended a public school in the Greater Boston area. More than 75% of them came from immigrant families. The two lessons we will describe took place during the second semester of the children's third grade year.

The first lesson focused on exploring multiplicative relationships by constructing a "human graph" on a coordinate grid in the gym. In the next lesson, students graphed multiplicative functions on paper and drew on their experience in the gym. We examine the students' understanding of the multiplicative relationship represented by points on a line, as well as their ideas about the class of relations represented by each line.

Our results show that working with line graphs and solving multiplicative function problems on the coordinate grid may support and scaffold students' development and transition to multiplicative reasoning.

References

- Kenny, P. and Silver, E. (1997) Probing the foundations of algebra: Grade 4 pattern items in NAEP. *Teaching Children Mathematics*, 3(6), pp. 268-274.
- Schliemann, Goodrow, & Lara-Roth, (2001). Functions and graphs in third grade. Paper presented at the 2001 NCTM Research Presession Meeting, Orlando, Florida, April.