WHAT IS PATTERNING?
Scales measuring children's ability to understand sequences of items or events have for decades been parts of several intelligence tests, including the Kaufman K-ABC, Raven's Progressive Matrices, and various Wechsler scales (Kaufman & Kaufman, 1983, Raven, Court, & Raven, 1983; Wechsler, 1991).

There is as yet no theoretical explanation of why understanding sequences would be an important facet of intelligence, and hence of achievement, but Pasnak et al. (in press) produced data indicating that instruction on sequences improved understanding of mathematics concepts and Kidd et al. (in press) reported that such instruction improved both mathematics and reading achievement, as measured by several standardized tests. Hence, it appears that there is an empirical basis for instruction on sequences in first grade.

OBJECTIVES
We wished to test whether improving children's understanding of sequences would improve reading and mathematics achievement more than equivalent investments of time and resources directly into reading or mathematics instruction. Accordingly, over the course of two years, we instructed first graders on sequences of letters, numbers, time (clock faces), and ordinary items (please insert Figure 1 here) for the bulk of the school year, and compared the results with those obtained from an equal number of instructional sessions on reading, mathematics, or social studies.

SETTING
Lessons were given in the classrooms of five public elementary schools in a city in northern Virginia.

POPULATION
In each of 36 classes, the eight children who scored lowest on a screening test administered to all 989 first graders participated. After attrition, 145 boys and 132 girls were available for testing. They averaged 6 years, 5.39 months (SD = 3.49) years old. Seven were Caucasian, 35 MidEastern, 83 Latino/Hispanic, 109 African American, and 13 other.

INTERVENTION
Two children in each classroom were randomly assigned to be taught sequences (the experimental condition), two to be taught mathematics, two to be taught reading, and two to be taught social studies (the three comparison or control conditions). The instruction took place thrice weekly, for 15 minutes per session, during "centers time", an hour that was regularly devoted to small group activities. The order of the four instructional conditions was counterbalanced. Thus each child had the same number of 15-minute sessions from his or her teacher as the other children in the experiment, varying systematically only in what was taught.

Materials were appropriate to the instruction in which the children were engaged: coins, manipulatives, number cards, flipcharts, laptops, whisky readers, puzzles, poems, maps, mazes, paste, paints, crayons, and activity pages. The sequences were of three types: progressive, symmetrical, and rotational (see Figure 1).

DESIGN
The design is a comparison for children randomly assigned to be taught one of four subject matters. The same number of children from each classroom participated, equalizing classroom and teacher effects. Barring absences, each child received the same number of instructional sessions during the same time period from October through April.

RESULTS
Children instructed in sequentiation made significantly higher scores on the sequentiation test and the far generalization test than children who received other forms of instruction. They also scored significantly higher on the TERA reading and TOWRE word measures than the children instructed in mathematics and social studies. The instruction in sequentiation produced significantly better scores on three standardized tests of reading than those attained by the children instructed on mathematics or social studies. Differences were 2 – 8 months in grade equivalencies.

CONCLUSION
Improving children's understanding of sequences improves both reading and mathematics. Although often small in a statistical sense, the differences of only one or two months in grade equivalencies are quite meaningful to educators. While instruction in sequentiation always produced the highest reading scores, there was never a substantial difference over direct instruction on reading on any reading measure. But, the instruction on sequences also produced significant differences on mathematics measures. These included superiority over direct instruction in mathematics, as measured by two Woodcock-Johnson and two Key Math scales. It is this effect on achievement in both the verbal and quantitative spheres from one form of instruction that suggests sequentiation is an important ability.