INVESTIGATING VARIATIONS IN PROBLEM-SOLVING STRATEGIES FOR SOLVING LINEAR EQUATIONS

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To investigate variations in students’ strategy development, the proposed research engages students in problem-solving interviews, which have been widely used in research on mathematical problem solving (e.g., Star, 2001; Hunting, 1997). Specifically, study participants were prompted to share and explain their ideas before and after they solved problems. Data from these problem-solving interviews were used to identify, categorize and analyze students’ developmental changes of strategies in problem solving.

Videotaped problem-solving interviews were conducted with twenty-three 6th grade students (12 males and 11 females). Students participated for a total of five hours over five consecutive days. Each student was given a pretest, twenty minutes of instruction, three one-hour videotaped problem solving sessions, and a posttest. In each of the three one-hour problem-solving sessions, students were asked a series of questions as they solved linear equations, including prompts to explain their choice of problem-solving strategies.

Of particular interest here is the level of sophistication of students’ utterances relating to their written strategies. In order to analyze variations in students’ strategies (as evidenced by students’ utterances), several coding categories were employed. These categories include the consistency between utterances and written strategies, relations between actions and subgoals, goal-subgoal structure, certainty of utterances, speed of utterances, students’ justification of strategy choice (e.g., quickest, most accurate, more familiar). Together these categories were aggregated to provide a measure of the sophistication of students’ utterances.

There are three main results. First, students’ utterances got more sophisticated as they gained problem solving experience. Students gradually increased the detail and rationale included in their descriptions of strategies as they engaged in more problem-solving practice. Second, students’ written strategies got more sophisticated as their utterances got more sophisticated. Several students changed or added new written strategies when their utterances displayed more detail about their choices on problem-solving strategies. Third, students became more successful problem solvers (getting more correct answers) as their written strategies and utterances became more sophisticated.

The research reported here can extend our understandings of the developmental stages of problem-solving strategies for solving linear equations that have been highlighted in recent research on mathematical learning (Star, 2001; Catrambone, 1998).

References