Children’s Developing Strategies for Dealing with Problems that Require Multiplicative Reasoning

**Literature Review**

The Common Core State Standards that provided concrete goals for our instructional sequence encouraged students to create their own engaging multiplication and division word problems (Common Core State Standards Initiative, 2010). Our instructional sequence encouraged students to move from working with physical manipulatives to using their conceptual understanding to work with larger, more abstract multiplication and division problems (Gurung & Wallace, 2005). The Common Core State Standards that provided concrete goals for our instructional sequence encouraged students to move from working with physical manipulatives to using their conceptual understanding to work with larger, more abstract multiplication and division problems (Gurung & Wallace, 2005). The Common Core State Standards that provided concrete goals for our instructional sequence encouraged students to move from working with physical manipulatives to using their conceptual understanding to work with larger, more abstract multiplication and division problems (Gurung & Wallace, 2005). The Common Core State Standards that provided concrete goals for our instructional sequence encouraged students to move from working with physical manipulatives to using their conceptual understanding to work with larger, more abstract multiplication and division problems (Gurung & Wallace, 2005).

**Methodology**

**Participants:** Our cohort consisted of 2 girls and 2 boys who just completed fourth grade. They were assigned the pseudonyms Jessie, Chase, Robbie, and Sarah.

**Attendance:** Jessie, Chase, and Robbie attended 9/5 sessions.

**Instructional Cycle:** Over the course of nine weeks, we conducted individual 30-minute pre-interviews with the students, taught 7 one-hour lessons, and concluded with individual 30-minute post-interviews that mirrored the pre-interview script. Each lesson was tailored toward the students’ needs, which were documented and analyzed each week according to the cycle below.

1. Teach the lesson to the class, video record, and retain written class work.
2. Run a trial of the lesson on the faculty and peers, get feedback, make appropriate corrections and adaptations.
3. Create a lesson plan designed for teaching students’ reasoning patterns.
4. Have students complete the tasks on the pre-lesson during the interview to solve this problem. Sarah correctly chose to multiply initially, but reflected on her work and adjusted her solution correctly. Robbie completed the problem correctly using partial quotients. Chase’s solution was very similar to his pre-interview solution.

**References:**


**Empirical Teaching and Learning Trajectory:**

**Key Task 1:** Sarah correctly chose to multiply initially, but reflected on her work and adjusted her solution correctly. Robbie completed the problem correctly using partial quotients. Chase’s solution was very similar to his pre-interview solution.

**Key Task 2:** Chase used the same strategy from the pre-interview to solve this problem. Sarah correctly chose to use the diagram correctly, but used colored tiles and found the area. Jessie could not find the area or model it. She still had trouble with the second part of the problem.

**Key Task 3:** Jessie and Sarah struggled to model the diagram correctly, but used colored tiles and found the area. Jessie could not find the area or model it. Chase modeled the diagram correctly and computed the area, but could not connect the product 3 x 7 to the area of 21 tiles. Robbie was unable to complete due to time.

**Reflection and Discussion:** Throughout the experience, our students displayed a high level of competence with standard algorithms, but lacked conceptual understanding of the operations. It was difficult to break our students’ habits of focusing on key words in word problems and/or defaulting to what they claimed was an “easier”, but incorrect, operation. Our students also experienced difficulty navigating between the number of groups and group size in multiplicative word problems.

To discourage reliance on key words, we utilized physical manipulatives and student drawings to encourage understanding of word problems. We then scaled-up previously discussed word problems, so that students could work with larger quantities than they had previously experienced. We suggest that teachers involve students in modeling problems that rely on multiplicative reasoning and not solely focus on mastery of the standard algorithms. Such teaching strategies provide opportunities for students to develop conceptual understanding.