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**Cameron O Byerley** (cameron.byerley@gmail.com), 6719 E Oak St, Scottsdale, AZ 85257, and **Neil Hatfield\*** (njhatfie@asu.edu). *University Calculus Students' Meanings for Fraction and Quotient.*

The research reported here extends our earlier finding that high-performing Calculus students often had weak meanings for quotient and rate. Multiplicative meanings for quotient are critical for understanding derivatives and rates of change. In this study, seventeen math education majors completed a test on fractions and quotient. From this group, one above-average Calculus student was selected to participate in a six-lesson teaching experiment. The major question investigated was “what constrains and affords the development of the productive meanings for quotient and fractions articulated by Thompson and Saldanha (2003)?” The student’s thinking was described using Steffe and Olive’s (2010) models of fractional knowledge. The report focuses on the student’s part-whole meaning for fractions and her difficulty assimilating instruction on partitive meanings for quotient. Her part-whole meaning for fractions led to the resilient belief that any partition of a length of size  $m$  must be into  $m$ , unit size pieces. She repeatedly practiced anticipating the result of partitioning length  $m$  into  $k$  equal pieces and began to develop an iterative fraction scheme. It was non-trivial to develop the basic meanings necessary to understand rate of change, even with a student who passed Calculus. (Received September 25, 2012)