

Abstract

Students often have a surface-level understanding of multiplication and division. They frequently learn these operations without understanding their meanings or applicability. The purpose of this study was to create a lesson sequence to build students' conceptual understanding of multiplication and division in order to enhance their abilities to make multiplicative comparisons. Students participating in the study had just completed fourth grade. Over a 9-week period, we conducted pre-interviews with each student, designed and delivered weekly lessons, and conducted culminating post-interviews. Each week, we retained students' written work, video recorded our lessons, transcribed them, and analyzed these classroom artifacts qualitatively. We selected tasks for each lesson that would help address students' observed weaknesses in mathematical proficiency and build upon their strengths. The initial lessons incorporated problems designed to lead students to a partial quotients algorithm using concrete representational tools such as unifix cubes. In an effort to foster students' conceptual understanding, area models were introduced next. Students were prompted to construct arrays for a variety of everyday situations using concrete materials and drawings. Toward the end of the study, students were asked to make multiplicative comparisons. Although students began to gradually exhibit more conceptual modes of thinking as instruction progressed, at times they clung to the standard algorithms for multiplication and division, even when their use of the algorithms yielded incorrect results. Our research supports the notion that introduction of standard algorithms should be delayed until after students understand multiplication and division conceptually. Introducing procedures before concepts may impair students' learning.