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Patterns, sets of outcomes, and combinatorial justification: two students' reinvention of counting formulas.

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Summary: Counting problems provide an accessible context for rich mathematical thinking, yet they can be surprisingly difficult for students. To foster conceptual understanding that is grounded in student thinking, we engaged a pair of undergraduate students in a ten-session teaching experiment. The students successfully reinvented four basic counting formulas, but their work revealed a number of unexpected issues concerning justification in counting. In this paper, we describe the students' successful reinvention of the four counting formulas, we critically examine their combinatorial reasoning in terms of *E. Lockwood's* [J. Math. Behav. 32, No. 2, 251–265 (2013; ME 2013c.00710)] model of students' combinatorial thinking, and we offer several directions for further research.

Classification: K25 C35

Keywords: combinatorics; reinvention; counting problems; teaching experiment

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