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Secondary students' quantification of ratio and rate: a framework for reasoning about change in covarying quantities.

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Summary: Contributing to a growing body of research addressing secondary students' quantitative and covariational reasoning, the multiple case study reported in this article investigated secondary students' quantification of ratio and rate. This article reports results from a study investigating students' quantification of rate and ratio as relationships between quantities and presents the Change in Covarying Quantities Framework, which builds from *M. P. Carlson et al.*'s Covariation Framework [J. Res. Math. Educ. 33, No. 5, 352–378 (2002; ME 2003f.05237)]. Each of the students in this study was consistent in terms of the quantitative operation he or she used (comparison or coordination) when quantifying both ratio and rate. Illustrating how students can engage in different quantitative operations when quantifying rate, the Change in Covarying Quantities Framework helps to explain why students classified as operating at a particular level of covariational reasoning appear to be using different mental actions. Implications of this research include recommendations for designing instructional tasks to foster students' quantitative and covariational reasoning.

Classification: F83

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