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Student learning of thermochemical concepts in the context of solution calorimetry

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Abstract:

Student understanding of heat and thermal phenomena has been the subject of considerable investigation in the science education literature. Published studies have reported student conceptions on a variety of advanced topics, but calorimetry - one of the more elementary applications of thermochemical concepts - has apparently received little attention from science education researchers. Here we report a detailed analysis of student performance on solution calorimetry problems in an introductory university chemistry class. We include data both from written classroom exams for 207 students, and from an extensive longitudinal interview series with a single subject who was herself part of that larger class. Our findings reveal a number of learning difficulties, most of which appear to originate from failure to understand that net increases and decreases in bond energies during aqueous chemical reactions result in energy transfers out of and into, respectively, the total mass of the resultant solution.
