

**Physics Education Research Conference
"The Practice of Analysis as a Window on Theory"**

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"Students' use of rule-based reasoning in the context of calorimetry and thermal phenomena"*

We have been engaged in an ongoing project to investigate and address student learning difficulties with calorimetry, heat, temperature, and related concepts. We have found that students tend to approach calorimetry problems involving two substances with differing specific heats by employing various "rules-of-thumb" such as "equal energy transfer implies equal temperature change," "objects approaching equilibrium with each other undergo equal temperature changes," and "temperature changes are directly proportional to specific heat." The choice of which rule to apply in a particular situation seems to be strongly dependent on context. It appears that instruction is effective in reducing reliance on some, but not all, of the inappropriate rules. However, related confusion regarding fundamental quantities such as temperature, heat, and internal energy has proved strongly resistant to attempts at improved instructional strategies. Moreover, improvements on standard instruction regarding student learning of basic calorimetry concepts have proved elusive as well.

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