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Session B14 - Investigations of Student Understanding.

INVITED session, Saturday morning, May 01

Plaza Court 3, Adam's Mark Hotel

[\[B14.001\] Students' reasoning regarding heat, work, and the first law of thermodynamics](#)

David E. Meltzer (Department of Physics and Astronomy, Iowa State University)

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Abstract for an Invited Paper
for the APR04 Meeting of
The American Physical Society

Students' reasoning regarding heat, work, and the first law of thermodynamics¹

DAVID E. MELTZER, Department of Physics and Astronomy, Iowa State University

I will present results of an investigation into students' reasoning regarding heat, work, and the first law of thermodynamics in an introductory calculus-based physics course. Responses to written questions by 653 students in three separate courses were very consistent with results of detailed individual interviews carried out with 32 students in a fourth course. Although most students seemed to acquire a reasonable grasp of the state-function concept, there was a widespread and persistent tendency to improperly over-generalize this concept to both work and heat. A large majority thought that net work done and/or net heat absorbed by a system during a cyclic process must be zero, while only 20% or fewer were able to make effective use of the first law of thermodynamics even after instruction was completed. Students' difficulties seemed to stem in part from the fact that heat, work, and internal energy all share the same units.

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