

Student Understanding of Integration in the Context and Notation of Thermodynamics: Concepts, Representations, and Transfer
Preliminary Research Report

Students are expected to apply the mathematics learned in their mathematics courses to concepts and problems in physics. Little empirical research has investigated how readily students are able to “transfer” their mathematical knowledge and skills from their mathematics classes to other courses. In physics education research (PER), few studies have distinguished between difficulties students have with physics concepts and those with either the mathematics concepts, application of those concepts, or the representations used to connect the math and the physics. We report on empirical studies of student conceptual difficulties with (single-variable) integration on mathematics questions that are analogous to canonical questions in thermodynamics. We interpret our results considering the representations used as well as the lens of knowledge transfer, with attention to how students solve problems involving the same mathematical principles in the differing contexts of their physics and mathematics classes.

Keywords: Physics, integrals, conceptual understanding, representations, transfer