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We have been engaged in a long-term investigation of student learning of thermal physics at the introductory through advanced-undergraduate level. At the same time, we have drawn from our research to develop and test new instructional materials and strategies to address students' learning difficulties. Based on this work, we will present a brief overview of the initial state of students' knowledge as they begin their upper-level courses, along with a preliminary assessment of their response to particular instructional strategies. This overview incorporates an assessment of the evolution of students' thinking on thermal-physics concepts during the transition from introductory to upper-level studies.

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