

# **Physics Education Research: The Why and the How**

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For the past 30 years physics education research has been changing the ways in which we investigate students' understanding and learning of physics. Utilizing methods pioneered at the University of Washington, we can not only assess student learning gains but also develop curriculum to improve learning. I will present the theoretical basis for these methods, point out parallels to traditional physics research, and contrast this approach with traditional teaching practices and reform efforts. I will provide an example of how these theories and ideas come together by discussing my own work, focused on investigating and improving student understanding of entropy in an introductory calculus-based physics course.