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New Ways of Teaching Upper-division courses: Descriptions and Results RACHEL PEPPER, STEPHANIE CHASTEEN, STEVEN POLLOCK, MICHAEL DUBSON, PAUL BEALE, KATHERINE PERKINS, University of Colorado — Over the past three years, the physics faculty at the University of Colorado have worked to transform two core courses in our upper-division undergraduate physics curriculum, Electricity and Magnetism and Quantum Mechanics, with the goals of (a) improving student learning and (b) developing materials and approaches that other faculty may adopt or adapt to their teaching environment. The transformation of our upper-division physics courses may serve as a model for transformation of other upper-division courses, such as fluid mechanics courses. This work began with faculty working groups meeting regularly to define explicit course learning goals. These learning goals served as the foundation for the course transformations that applied the principles of active engagement and learning theory to these upper-division courses. The development of the full curriculum was guided by the results of observations, interviews, and analysis of student work. In this talk, we will outline the reforms – including consensus learning goals, “clicker” questions, tutorials, modified homeworks, and more – and present evidence of the effectiveness of these reforms relative to traditional courses. Some research-based fluid mechanics instructional materials will also be discussed. All of our curriculum materials are available at <http://www.colorado.edu/sei/departments/physics.htm>.

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