

Abstract Submitted  
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**Thinking Like a Physicist: Transforming Upper-Division Electricity & Magnetism (E&M)**<sup>1</sup> STEPHANIE CHASTEEN, STEVEN POLLOCK, MICHAEL DUBSON, ED KINNEY, PAUL BEALE, KATHERINE PERKINS, University of Colorado — We are often disappointed in physics students' skills – such as the ability to justify problem-solving strategies, choose and apply problem-solving techniques, and recognize the interconnectedness of ideas in physics. We use research-based methods to transform junior E&M to explicitly define and address these learning goals and help students become more sophisticated thinkers through active engagement. We used the principles of learning theory to guide teaching practices, and student observations and interviews to identify common student difficulties with the course content. The transformed course included consensus learning goals, interactive lecture with “clicker” questions and small group activities, weekly tutorials, homework study groups, and a conceptual diagnostic assessment. We will highlight key results regarding course effectiveness.

<sup>1</sup>All reform materials are available through <http://www.colorado.edu/sei/departments/physics.htm>. This work was funded the University of Colorado's Science Education Initiative and the National Science Foundation Grant No. 0737118.

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