

Abstract Submitted  
for the 4CF09 Meeting of  
The American Physical Society

**Upper-Division Transformation in Physics**<sup>1</sup> STEVEN GOLDHABER, STEPHANIE CHASTEEN, STEVEN POLLOCK, MICHAEL DUBSON, ED KINNEY, OLIVER DEWOLFE, PAUL BEALE, KATHERINE PERKINS, RACHEL PEPPER, University of Colorado at Boulder — While much research has informed teaching methods in lower-division courses, less attention has been granted to how we train future physicists. Aiming to improve student mastery of upper-division material, we have transformed an upper-division Electricity & Magnetism (E&M) course and an upper-division Quantum Mechanics (QM) course. Transformations were based on the results of observations, interviews, and analysis of student work as well as on guiding principles of learning theory. Reform efforts were focused with the help of consensus learning goals while specific classroom transformations include “clicker” questions, study groups, interactive lecture techniques, and tutorials. We have also developed new conceptual assessment instruments for both upper-division E&M and upper-division QM. In this participatory poster, we present these instruments and ask for feedback from the visitors.

<sup>1</sup>Work funded by The CU Science Education Initiative and NSF-CCLI Grant # 0737118.

Steven Goldhaber  
University of Colorado at Boulder

Date submitted: 16 Oct 2009

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