

**University of Colorado's
Upper Division Electricity & Magnetism materials**

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(work supported by University of Colorado's Science Education Initiative,
NSF CCLI Grant #0737118, PIs K. Perkins, S. Pollock, M. Dubson, N. Finkelstein, J. Cumalat)

STUDENT DIFFICULTIES

This collection of student difficulties was constructed over the course of four semesters of a transformed junior-level Electricity and Magnetism course on electro- and magneto-statics. Many instructors have found these to be one of the more useful outcomes of the course transformations. A full-length publication on student difficulties is forthcoming. Developers include Steven Pollock, Stephanie Chasteen, and Rachel Pepper.

This course transformation project included a significant research component. These "resource documents" were compiled from the findings of that research. In particular, we used:

1. Interviews with students using "think-aloud" protocol as they worked through problems or diagrammed their understanding using concept maps
2. Observations during help sessions and tutorials
3. Student questions during lecture
4. Student performance on concept tests / clicker questions
5. Student performance on homework and exams
6. Student performance on the conceptual assessment (CUE) developed for the course.

The asterixes (**) next to each difficulty indicate the prevalence and/or seriousness of that difficulty.

In addition to the student difficulties, these documents include the learning goals associated with that topic, and class activities developed by other institutions to address that topic. As we are not able to publish activities developed by others, if you wish to learn more about any of those activities, please contact us directly at steven.pollock@colorado.edu.

This work was supported by University of Colorado's Science Education Initiative, (NSF CCLI Grant #0737118, PIs K. Perkins, S. Pollock, M. Dubson, N. Finkelstein, J. Cumalat). Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation (NSF).