Transformed E&M I materials

Electric Displacement
(Griffiths Chapter 4)

STUDENT DIFFICULTIES

Notes
Just what “D” represents is a useful discussion. In the Transformed course, we paid some attention to the fact that the curl of D is not always zero, and that is partly what differentiates it from an “E for bound charge.” This was helpful for a small fraction of students who were ready to consider that concept. The D-field is unchanged by the presence or absence of the dielectric only in situations with sufficient symmetry that we can use Gauss’ Law in integral form (see Griffiths 4.3.2) and the curl of D is zero. Thus D is most useful in situations of high symmetry.

What is “D”? (***)
- Most students don’t grasp what D is. They get the sense that it’s “like E, but not really.”
- Whether D is in the same direction as E (and P) is a bit tricky and students make many mistakes on the homework on this.

Calculating D (*)
- In general students are able to recognize to use the Gauss’ law for D to find E for a dielectric and can set up the right Gaussian surface.
- A useful discussion question was “when can you calculate D and when can’t you?”