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We will present modeling scenarios used in an ordinary differential equations course to motivate student learning of boundary-value problems and linear systems. In this modeling-first approach, students learn concepts by working through activities rather than listening to a traditional lecture and then solving homework problems. The SIMIODE community (www.simiode.org), Systemic Initiative for Modeling Investigations and Opportunities with Differential Equations, advocates teaching and learning differential equations using this approach and maintains a large collection of modeling scenarios for use throughout an undergraduate differential equations curriculum. We will discuss our experiences implementing these projects including student work, measures of learning, what we thought went right and wrong, and how we can expand on this in future classes. (Received September 22, 2015)