Computer simulations are vital to materials science and engineering (MSE), and a recent survey of faculty indicates that these topics should be included in the MSE curriculum. I developed a module on visualizing crystal structures for an introductory MSE course. By measuring student learning across the quarter, we found that some misconceptions, such as missing atoms in the unit cell, were commonly fixed. However, a smaller fraction of students corrected misconceptions related to the adjacency of atoms. Black-box simulations such as this allow students to focus on MSE fundamentals. In contrast, I require students to write code in my Kinetics of Materials course. To develop mastery, these assignments are scaffolded to first review programming fundamentals and then advance to discipline-specific tasks such as simulating spinodal decomposition using the phase-field method. The simulations’ design aims to motivate students through a scenario prompt (e.g., “Your supervisor has requested you to analyze…”) based on the expectancy-value framework of motivation. Simulations can support student learning of MSE topics but also require careful consideration of prior knowledge and student motivation.

**BIOGRAPHY**

Susan Gentry is an Associate Professor of Teaching and Vice-Chair of the Materials Science and Engineering Department at the University of California, Davis. She earned her B.S. from Northwestern University and completed her Ph.D. and post-doctoral research at the University of Michigan, where she investigated 3D printing of ceramics and phase-field modeling of metals. Her current research interests focus on the use of simulations and experiments in materials science education. At UC Davis, she integrates computer-based assignments and simulations into her teaching at both the undergraduate and graduate levels. Her awards include the Bradley Stoughton Award for Young Teachers from ASM International and the New Educator Award from the Materials Division of the American Society for Engineering Education.