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Student Engagement and Learning with PhET Interactive Simulations

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Recent research conducted with PhET Interactive simulations has focused on the specific aspects of simulations that help students build a conceptual understanding of the science; specifically the value of showing the invisible, the use of analogy and effective levels of guidance with simulations. Educators have found that use of heavily guided activities does not elicit deep thinking and learning from students; while other studies have found that with pure discovery learning students are not able to “discover” the science for themselves. Recent studies reveal that appropriate scaffolding of the material is needed to help students build a mental framework about concepts. Then students can construct their own understanding within this framework. Our work has focused on understanding how students use simulations to construct this mental framework and the effect levels of guidance have on students’ use of simulations. Hundreds of individual student interviews have been conducted during which the students describe what they were thinking as they interact with simulations. Careful analysis reveals that showing the invisible and use of analogy both facilitate students’ construction of their understanding; while the nature of guidance influences the amount of student engagement.