Tracking Student Understanding of Chemical Reactions in ChemVLab+

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Abstract: Interactive learning environments provide new opportunities for fine-grained tracking of student performance. These environments typically provide progressions of related problems, and allow students to make multiple attempts at solving each problem as well as access hints or other resources. We explore how students' understanding of chemical reactions changes based on their interactions with ChemVLab+. ChemVLab+ (chemvlab.org) is a series of online activities that allow students to explore real world chemistry questions through problem solving exercises and virtual chemistry labs. Thirteen teachers used four stoichiometry activities in their high school classrooms, and administered pre- and post-test assessments. Using balancing chemical reactions as a case study, we analyze how student performance changed during and after their interactions with ChemVLab+. We find that students' proposed solutions can be characterized by a small number of features, and that assessing understanding using these features demonstrates improvements not revealed by examining only solution correctness.