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**Student engagement in modeling and metacognition while troubleshooting a circuit<sup>1</sup>**

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Troubleshooting is an integral part of experimentation in both research and educational settings. In this presentation, I focus on instructor perspectives and student practices related to troubleshooting malfunctioning electric circuits. In particular, I examine the roles of modeling and metacognition during the troubleshooting process. Based on four multi-institution studies, I argue that social metacognitive interactions between students and their peers and instructors facilitate successful troubleshooting in electronics courses. Moreover, I show how students engage in both metacognition and model-based reasoning when diagnosing and repairing malfunctioning circuits. For example, students strategize about which tests to perform and in what order; meanwhile, each test involves comparing a circuit's actual behavior to expectations informed by models of its functional state. After summarizing the major findings of my research, I will describe how these results have shaped the ongoing development of a research-based assessment of students' model-based reasoning in electronics lab courses.

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