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Abstract for an Invited Paper
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Engaging students in Modeling Instruction: developing and studying students as scientists¹

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Physics Education Research is both about improving instruction and understanding the fundamentals of what learning is and how learning manifests in its many forms. In this talk I describe the development of Modeling Instruction (MI) for University Physics as a research endeavor into improving instruction. Modeling is built on the idea that all science proceeds through an iterative process of model development, evaluation, deployment, and revision. Accordingly, effective science instruction should promote the development of modeling skills by engaging students in the practices of modeling. I describe research within the context of MI classes as the basis for understanding learning broadly. Over the course of this talk I will summarize the theoretical foundations for MI, and describe research that translates the theory into practice in the MI classroom. Drawing on the MI classroom as a context for research, I will report on findings including: improved conceptual understanding, positive attitudinal shifts, the growth of student networks, and even changes to the neurobiology that underpins physics reasoning. Finally, I will describe how these research findings drive further questions and understanding of learning generally.

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