Using instructional laboratories to help students construct and test physics concepts

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Traditionally in instructional labs students verify accepted knowledge and apply this knowledge to solve experimental problems where their answer can be compared to an "accepted value". In both types of labs students have to learn "theory" first. Changes in science education, and specifically in physics education, call for the new type of labs: the labs that help students see where "theory" comes from, where students develop and test their own ideas, and participate in authentic physics practices. How do we structure those labs, and do they lead to student learning? In this talk I will share examples of such labs in mechanics and the findings of more than 15 years of studies of such labs and will provide recommendations on how to structure them to make students successful.