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The Value of Computational Education in Developing Confidence and Insight: Case Studies from Syracuse University

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In addition to its standalone value, computational physics education is a highly valuable tool for nurturing students' overall growth and maturity, as they develop the instincts, insight, worldview, and confidence that characterize successful physicists. Computation provides students ready access to rich physical phenomena and unanswered questions that can quickly lead to rewarding independent research that engenders growth and a sense of ownership and confidence. In particular, computational physics gives students an opportunity to explore unanswered questions from the ground up – creating and implementing models, generating and analyzing data, and drawing physical conclusions – using tools that they have complete ownership of. While many of these benefits can be realized in a computational physics class, I have found that computational physics independent research can be a profoundly rewarding experience for undergraduate physics majors as they grow into physicists. In this talk, I will discuss my experiences at Syracuse University using computation as a tool to foster student growth and confidence, and discuss how computational training helps physics students develop a more mature, expert understanding of physics as a discipline.