Overview
A comprehensive revision of the lab component of Physics 121 gave us the opportunity to adopt new pedagogical strategies and incorporate new skills. During our revisions, we had two primary goals.

Integrating Discovery
There is a growing body of evidence that confirmational lab activities are ineffective at reinforcing student comprehension of lecture materials [1, 2]. Furthermore, studies have shown that structured labs largely limit student engagement to data analysis and neglect other cognitive tasks frequently encountered by experimental physicists [1]. Our goal was to create labs that would

- impart scientific insights that would be of value to students from all disciplines
- instill a sense of scientific discovery
- demonstrate that meaningful experiments can be done using simple and easily available materials

Integrating Computational Skills
Though scientific computing skills are essential in both academia and industry, UBCO does not yet have a computational physics course. In order to fill this gap, we wrote these labs in Jupyter Notebooks, an open-source interactive coding environment. There are many advantages to using this environment:

- Students completed surveys in the middle of the term and at the end of the term.
- We conducted semi-structured interviews with 8 volunteer students in order to gain more detailed insight
- TAs filled out small survey forms during weekly meetings throughout the term to assess their experiences with each lab

Program Evaluation
In order to evaluate the labs, we collected data from a variety of sources.

- Students witnessed the limits of our assumptions and reveal new physics
- TAs filled out small survey forms during weekly meetings throughout the term to assess their experiences with each lab

Analysis
Analysis of student responses to surveys and interviews will be completed after the deadline to contest PHYS 121 grades has passed during the summer of 2023. However, based on initial observations and conversations with students and TAs, we have two tentative conclusions.

1. The integration of computational skills into the labs was a success. Students seemed to enjoy the format, and the pace at which new computational methods were introduced was appropriate for students with no prior coding experience. TAs also overwhelmingly preferred the digital format to the previous paper format.

2. We managed to introduce some elements of discovery into the labs, but more work is required to achieve our goals. Going forward, we would like to introduce more opportunities for students to work independently and make unexpected observations.

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References