

Google Colab Implementation Plan

Rationale -

- 1) Google Colab is a cross platform tool that can be used to teach students about data analysis and coding
- 2) Integrates with their existing Google Accounts
- 3) Has applications in a wide range of fields (not just physics)
- 4) Plays nice with online & remote learning situations
- 5) Allows students to work together to solve problems using code in a very structured way

Year-long Plan (This can apply to both Regents and AP classes)

September

- Intro to Google Colab (Notebook 0 from Adam),
- Introduce graphing & curve fitting as part of Lab #1 - Circumference vs Diameter (Google Sheets & Colab)
- Vectors (Need to create or find one)
- Falcon 9 x,v,a plots
- Projectile Motion & Air Resistance (Tweak Notebook 2 from Adam, add in sections for normal projectile motion to compare w/ air resistance)

October

- $F = ma$ concept could be useful here (Need to think on that)
- Planet Data for doing Universal Gravitation?

November

- Particle Physics conservation of momentum - [Case of Hidden Neutrino](#)

December

- Particle Physics - Conservation of Energy & Momentum - Muon Mass (#4 from Adam)

January

- SHM - [Mass on a Spring](#)
I'm planning on using this Colab notebook to replace an existing lab I do for finding the spring constant Hooke's Law. I typically do this during my Energy Unit, but can push it back a bit to better align with the SHM concepts (period of motion, amplitude, frequency) that will be needed in the waves unit. With the added coding I'm expecting this to take 2-3 classes (~40 min each) but I hope to be pleasantly surprised in their abilities at this point in the year. (Assuming I can stick to the plan and sprinkle these activities in leading up to this one.)

I've noticed that my students need a more intuitive understanding of trig waves (probably because they've never really dealt with them before pre-calc & Regents), so I'm adding this curve fitting section on to see if that would help.

The plan right now is to have the students share their collabs with me so that I can track progress through the activity. Frequent check-ins (face to face or google meet equivalent) would let me get a feel for the struggle level and general feedback. Doing some sort of exit ticket in the Colab might be a good idea too (Last 5 min, write me a comment with your thoughts on the day, progress and where you're going next, etc). I like the idea of Socrative to do this too, but my admins have made it clear that if we're going online again we need to cut down on the # of different sites we're having kids go to so they don't get overwhelmed.

- SHM - Pendulum

Feb & March

- Electrostatics?
- Circuits? (Maybe a RC simulation, but only if there's time in Regents)

April - Waves

- Interference

- Doppler Effect?

May - Modern (Regents)

- Particle Histograms (Rolling w/ Rutherford or #1 from Adam)
- #5 from Adam

May - Thermo & Fluids (AP)

- Not sure, maybe some atmospheric stuff (or ocean current mapping?)

Other Classes:

Physical Computing (My coding & electronics class)

- Add a colab section for large data sets (star mapping, weather data)
- Look @ other data sets for inspiration but basically repeat the Wed - Thursday activity over a week timespan.

To Do: (Take a look at NYS NGSS model standards and see where else I can incorporate this.)