

2024 UNM summer workshop agenda July 15-17, 9am-4pm

UNM Quarknet Center Coding Workshop Agenda

Objectives

Participating teachers will:

- Apply physics principles to reduce or explain the observations in data investigations.
- Examine simulated and experimental data. Identify patterns within the data and consider the causes of those patterns.
- Create, organize and interpret data plots; make claims based on evidence and provide explanations; identify data limitations.
- Develop a plan for taking students from their current level of data use to subsequent levels using activities and/or ideas from the workshop.

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- We will be meeting at the PAIS building at UNM in room 2210
 - Parking available at the Cornell Parking Structure. Keep your daily receipts for parking!
 - If your school has Google Colab blocked, you will want to use a personal Google account to access the notebooks used in this workshop.

Monday July 15, Day 1: Coding

9:00 Opening session

- Welcome, sign-in & introductions
- Attendance Registration (<https://forms.gle/FZs2cPoN2SAr2Ur87>) and create/login to Google account
- QuarkNet Updates & [QuarkNet Opportunities](#)
- [Norms Poster](#) (from STEP UP program)

9:30 Why coding?

- Video: Pair programming how-to ([YouTube](#)) ([Amara w/Sp subtitles](#))
- Video: [What Most Schools Don't Teach](#)
- Why do we teach coding?
- How else can teachers use coding?
- A look at the [Data Activities Portfolio](#)

9:45 Intro to Coding activities ([GitHub](#))

- [Introduction to Jupyter](#)
 - Skills: run, edit, & save a notebook
- [Probability](#)

- Task: Simulate flipping a coin and make a histogram of the number of heads for each trial.
- Skills: generate random numbers, create and format a histogram
- [Position graphs](#)
 - Task: analyze Position graphs
 - Skills: modify a loop, define a function, format a plot

11:00-12:00 Particle Detector Lab Tour

- Tour given by Luis Flores-Sanchez

12:00 Break

- Lunch

13:00 Review challenges from the morning session

- Share observations, challenges
- How do you think your students would handle these tasks?

13:15 Try another coding activity

- Physics
 - [Velocity graphs](#)
 - Task: Analyze Velocity graphs
 - Skills: modify a loop, define a function, format a plot
 - [Projectile in Air](#)
 - Task: Model the motion of a projectile in air
 - Skills: modify a loop, define a function, format a plot
 - [Motion of a pendulum](#)
 - Task: Take data and model the motion and period of a pendulum
 - Skills: Importing data, making a scatter plot, make a best fit line/curve
- Earth & Space Science
 - [Quakes](#)
 - Task: Identify patterns in global seismic activity
 - Skills: read in a large data set from the web, visualize complex data
 - [Global Temperature](#)
 - Task: Describe the differences between land and water on temperature
 - Skills: read in a large data set from the web, visualize complex data
 - [Tides](#)
 - Task: Identify patterns in tidal height over time
 - Skills: read in a large data set from the web, visualize complex data, manipulate time series data

- Misc
 - [Bigfoot sightings](#)

15:30 Group Discussion

- Share observations, strengths, challenges for the day
 - What are you hoping to get out of tomorrow?
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Tuesday July 16, Day 2: Coding

9:00 Welcome back

- Sign-in
- Recap from yesterday
- What stood out? Any new thoughts?
- Group photo

9:15 Introduction to Muon Mass Notebook

- Introduction to Muon Mass notebook
- [Muon mass](#)
 - Task: measure the invariant mass of a muon
 - Skills: calculate invariant mass given its 4-vector (energy and x/y/z-momentum), make a mass plot
- Finish early? [Muon tracks with machine learning](#)

11:00 Speaker

- Grad student: Andrew Gentry "[The Future of Particle Physics: The Plans of The Particle Physics Community for Discovery in the Next Decade and Beyond](#)"

12:00 Break

- Lunch

13:00 All Hands Meeting

- Share observations, challenges from the morning
- How do you think your students would handle these tasks?

13:15 Try another coding activity

- Math
 - [Wrapping paper](#)
 - Task: Use coding to figure out how much wrapping paper is needed for a given gift size
 - Skills: mathematical operations, make changes to a dataframe, saving student responses to a google sheet
- Earth & Space Science
 - [Sunspots](#)
 - Task: visualize sunspot data
 - Skills: import, filter, and plot data
 - [Stars Notebook](#)
 - Task: Visualize star data and make an H-R Diagram
 - Skills: create and format a plot
- Chemistry
 - [Elements](#)
 - Task: visualize and interpret patterns in element properties
 - Skills: import, sort, and plot data
 - [Mass of a Penny](#)
 - Task: create a histogram using data taken from measuring the mass of pennies from different years
 - Skills: import data, make a histogram
- Physics
 - [Falcon 9 Rocket Data](#)
 - Task: Use real launch data to make graphs and calculations
 - Skills: import data, make and save a graph, plotting multiple data sets on the same graph, calculating velocity and acceleration

15:45 All hands meeting

- Share observations, challenges
 - How do you think your students would handle these tasks?
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Wednesday July 17, Day 3: STEP-UP & Implementation

9:00 Welcome back

- Sign in
- Recap from yesterday
- What stood out? Any new thoughts?

9:15 STEP-UP

- Introduction to the [STEP UP program](#) - [Motivation \(slides\)](#)
- [Step up discussion norms poster](#)

- Step up lessons and resources from STEP UP website
 - [Careers in Physics](#) - [quick reference](#)
 - [Women In Physics](#) - [quick reference](#)
 - [Everyday Actions](#) - [quick reference](#)
- **Try out Careers in Physics lesson** - [QuarkNet DAP version](#)
 - Brainstorms careers in physics - Post-It Notes
 - [Online Career Matching Tool](#)
 - Read a couple of profiles
 - Be ready to share out a summary of one profile
 - [Careers in Physics slides](#) - view these, then discuss
 - Overview of student assignment: [Make a personal profile](#)
- **Try out Women in Physics lesson** - [QuarkNet DAP version](#)
 - [Pre-Assignment](#)
 - [WIP Group Assignment](#) - Jigsaw this...each person responsible for a section
 - Personal reflection
 - Brainstorm - Possible ways to decrease bias.
 - Post-Assignment
- **Everyday Action** - overview
 - [Link](#)

~11:15 Change from student hat → teacher hat!

- Where might these (or your own) coding activities fit into your course?
- Develop a coding activity and integrate it into your course plan.
- Some resources:
 - See [CODINGinK12.org](#) site and the [UCI Machine Learning repository](#) for data sets
 - Coding Fellows [Colab Survival Guide](#)
 - [HEP resources](#)
 - embedding an image from your Google Drive ([source](#)):
 - In a text cell, embed an image with: `![alt text label](URL-to-image)`
 - Original URL:
<https://drive.google.com/file/d/0B6wwyazyzml-OGQ3VUo0Z2thdmc/view>
 - Edit the URL to look like this:
<https://drive.google.com/uc?export=view&id=0B6wwyazyzml-OGQ3VUo0Z2thdmc>
 - [Opening a Google Sheet in Colab](#)
 - **File > Share > Publish to the web > Comma-separated values > Publish.**
 - That gives you a link to a CSV copy of the file. The copy will update automatically from time to time.
 - Superscript example: In a text cell:
 - word `<sup>exponent</sup>` will display as word ^{exponent}
 - Alternative to google colab:
 - [Binder](#)

- [Replit](#) (can make a free account, set up as teacher and students, works with Google classroom, but cannot run separate code blocks)
- Create an implementation plan.
 - The format should be whatever is useful to you. How do you sketch out your lessons? Do you use a form from your school or district?

12:00 Break

- Lunch

13:00 Continue working on implementation plan

- Get help on coding issues
- Finish your coding activity and drafting an implementation plan

14:30 Share out - Connect to Zoom: <https://notredame.zoom.us/my/swood5>

- Teachers take turns (5-10 min each) sharing your ideas for how coding (or other activities) might make it into your classroom. If your Colab notebook is ready for others to try out,
 - Click the Share” button in the top right of the Colab notebook.
 - Copy the link to give others **view-only** access.
 - Post that link to this [share-out document](#)

15:30 Closing

- Closing thoughts? Where to next?
- Any receipts or other orders of business
- Teacher Survey
 - If a teacher completed the Full Teacher Survey anytime in 2023, then complete the UPDATE: 2024 Teacher Survey (once during 2024). <https://www.surveymonkey.com/r/JNRN6BD> Plan for ~6 minutes here.
 - OR...Spanish version of Update Survey: <https://www.surveymonkey.com/r/JNP67QJ>
 - If a teacher did NOT complete the Full Teacher Survey anytime in 2023, then complete The Full Teacher Survey. <https://www.surveymonkey.com/r/G8P3C8R> We ask that an individual teacher complete this only once in 2024. Plan for ~15-20 minutes here.

Quick 2 Question Workshop Evaluation - [Link](#)

Resources

- New Mexico Science Instructional Scope - [Link](#)
- Coding in K-12 - [Link](#)

- [UCI Machine Learning repository](#)
- [Colab Survival Guide](#)
- [STEP UP program](#)
- [Edpuzzle](#) (embed questions in videos to assign, works well with google classroom)
- [snexplores.org](#) (science news, students can find an article related to current topic)
- [Codingbat](#) (python coding activities)
- [Thatquiz](#)
- Schedule a physicist to give a zoom talk to your class - [physicists to go](#)

Contacts

- [Shane Wood](#), QuarkNet Staff
- [Kayla Mitchell](#), QuarkNet Fellow and UNM QN Lead Teacher