Crash Course in Genomics: Princeton SPLASH
1 hour and 50 min.

About the Course:
- Grades 9-10
- 25-30 students with little to no background in genomics

Goal for the Course: Students will learn some background about what genomics is, what broad areas/ applications of genomics are, why combining biology and computer science is useful

Slideshow/ Presentation:
https://docs.google.com/presentation/d/189rh2nTGSHhzmYElq5fUpw60pi5NZcTO7c7PJ9G77m0/edit#slide=id.g21f4a20abfa_0_0

Topic Areas:
- Defining genomics and 'genomes'
  - How is genomics different from genetics?
- The central dogma of biology
  - Background on the human genome project
  - How there are additional layers to this that we are only now beginning to unravel (like methylation markers, noncoding RNAs, and chromatin organization)
- Give them a sense of the scale of the data
  - Zoom out from looking just at a genome, to adding other data types, to looking at multimodal data from single cells!
- Applications of genomics
  - Uncovering our human ancestry and evolutionary history (paleogenomics)
  - Cancer genomics
  - Viral and bacterial genome biology and mRNA vaccines
  - Plant genomics and biotechnology
  - The human microbiome and other types of microbiomes
  - Using dog genomes to understand the genetic basis of aging :)
  - Fun examples:
    - Using genomics to recreate extinct animals (project to bring back the wooly mammoth!)
    - To create food that is better tasting and better for us (the heritage wheat projects, cheese-making, brewing better beer)
      - The story of how CRISPR was invented in the search for a better way to make yogurt
- Using computer science techniques that inform biology… and biology that can inform computation
  - Reformulate a biological problem as a computational problem (e.g. representing protein-protein interactions as a graph structure)
  - Use biology to create new computational techniques (e.g. neural networks are modeled after neurons in the brain)

- Now, people are applying natural language processing techniques (like the ones powering ChatBot GPT) to DNA and protein sequences to learn about their properties

Potential Activities:
- Pick one of the applications of genomics that speaks most to YOU from those that we just discussed, get into groups based on that, and do a simple activity
  - Read about a cool example from the popular media?
  - Come up with an idea for a simple, high-level genomics experiment that can address the given problem?