Liberian Mathematics Teacher Training Workshop 2023–2024

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About my work with I-Help Liberia

- My inspiration for working in Liberia is Mr. Asumana Jabateh Randolph, whom I met at Hunter College High School in New York City.

- I have helped run 3 STEM workshops in Liberia (Summer 2011, 2013, 2017). The workshops have taken place in Monrovia, Kakata, Suakoko, and most recently Ganta.

- This is the third year of the I-Help Liberia Mathematics Teacher Training Program, which is planned to run for a total of 5 years.

- I have also helped organize "Math Olympics" contests for high school students in Liberia in Summer 2013, 2017, and 2018.

- Over the last three years, Liberian High School students have instead participated in the Wits Mathematics Competition, which is run out of South Africa, and open to all African participants.

About my career

- I received my Bachelor's Degree in mathematics from Harvard College in 2003, and my Ph. D. in mathematics from the University of Pennsylvania in 2009.
- I am currently an Associate Professor of mathematics at Baruch College, one of the senior colleges of the City University of New York (CUNY). I do research in Number Theory and Algebraic Geometry.
- Before coming to Baruch, I taught at Columbia University and the University of Virginia.

This semester

- Our focus for the first half of this semester will be **statistics**, and our focus for the second half will be **plane geometry**.
- In response to feedback from last year, I am going to keep the lessons closer to the Liberian curriculum than I have done in previous years.
- This material will be a little bit more *basic* than what we have studied in the previous two years. But it is among the most important material that your students will learn.
- The training now has a website:
  https://faculty.baruch.cuny.edu/aobus/Liberia.html
- I will post lecture notes and video recordings on this website.
- If you forget the web address, you can put "Andrew Obus Liberia" into Google, and you should get it as the first or second match.

- Starting next week, there will be a few homework problems given out after every meeting. Attempting and discussing the homework is essential for you to get the most out of the program.
- We will usually discuss the homework at the beginning of each class.
- In January, we will have a break for a couple of weeks. During this time there will be a project assigned involving the presentation of statistical data.

- Statistics is the the study of analyzing, interpreting, displaying, and making inferences from data.
- It is *built on* mathematics and probability, but it is *not* the same as mathematics.
- In this training, we will focus on *descriptive* statistics. That is, we *describe* data in useful ways.
- We will not spend much time on *inferential* statistics, although I will say a little about it later today.
- If there is demand, we can cover some inferential statistics in the Spring, even though this goes beyond the high school math curriculum.

— This semester: Univariate Statistics
⮡ *one* variable.

— Later? Bivariate Statistics → *two* variables.

- How do we know whether a blood pressure drug is effective? *bivariate statistics*
- Is Earth's climate significantly warming? → *univariate statistics*
- How does obtaining more schooling affect a child's future income?
- Who is the most effective goalkeeper in the English Premier League? → *univariate*

bivariate statistics

- Graphical presentation of data (frequency tables, frequency curves, bar charts, pie charts, histograms, etc.) *data cloud, best fit line,*
- Percentiles
- Measures of central tendency
- Measures of dispersion
- Probability and relative frequency

- We will not have much time to discuss data collection methods, but collecting data well is very important!
- One standard way to collect data is to use a *survey* or a *sample*, but this has to be done carefully!
- For instance, suppose we want to know how a class did on an exam. We ask everyone sitting in the front row what their score was. Then we compute the average and we guess that this is the average of the class.
- What might be wrong with this method?

  - Maybe average is not enough information.
  - Students' reports could be unreliable
  - Maybe sample size is too small.
  - Maybe biased sample (front row kids pay more attention)

A word on inferential statistics

- When we do statistical analysis, it is on data pulled from real world situations.
- Inferential statistics is the process of extrapolating data drawn from a *sample* to information describing a *population*.
- Even if your sample is chosen well (bias is minimized), how confident can you be that data in your sample describes data in the population? This can depend on the size of your sample, as well as various descriptive statistics about your data.
- Clearly a bigger sample will tend to give you more accurate data, but the data requires more effort to collect.
- For instance, how many voters must be polled to get an accurate prediction of which candidate is ahead in an upcoming election? How can we be sure that our sample is as unbiased as possible?

A word on bivariate statistics

- Often, when we do a statistical study, we collect data on *more than one* attribute of a population.
- For instance, we may look at various cities, and see that the cities with more cars tend to also have more crime.
- In such situations, when two variables (cars and crime) seem to be *correlated*, this does not automatically mean that one variable *causes* the other.
- In this situation, it is probably unlikely that cars create crime. What is more likely is that cities with more cars are bigger, and bigger cities also have more crime.
- That is, a 3rd variable is actually what is behind the correlation.

Probably, cars don't cause crime, but bigger cities have more cars and more crime

→ causation.

- In general, a correlation is not enough information to determine

Thank you for your attention, and I'm looking forward to the rest of the semester and year!

Organizers: Sangay Freeman
Charles Bropleh
Abraham Jabateh
} All on WhatsApp chat.
They can answer practical questions (data distribution, etc.)-