HAND WASHING DATA POSTER FURTHER ENGAGEMENT

There are lots of ways to engage your students with this data visualization about hand washing. Explore all or some of the ways noted below. Do them all at once or in shorter moments.

While looking at the hand washing data visualization poster itself:

- Discuss the questions on the poster with your students. You could create a visual with their answers (chart, word web, pictograms, etc.)
    ◊ These questions might seem simple but they are key data science questions that start the discovery and critical thinking process all data scientists use to analyze data sets and data visualizations.
    ◊ Blurb on poster: This hand washing visual was made from collecting our own data on the Truman State University campus. Do you think this visual would be different if the data was collected at your school?

- Discuss the key parts of the visualization and humanize the data itself. Humanizing the data refers to thinking about the data in the context of the humans who were involved at every stage of the data process: idea creation, collecting data, analyzing data, and visualizing data. Humanizing the data makes unseen work visible again. (Alamalhodaei, Alberda, & Feigenbaum, 2020; D'Ignazio & Klein, 2020)
    ◊ Who collected this data?
    ◊ What might they be trying to tell us/convince us of?
    ◊ Who was the data collected about?
    ◊ What would you do differently if you were creating the visualization and/or the data set?

You can do this CDC hand washing activity to collect your own data set and create your own data visualization. Lesson 4, Activity 1 Hand Washing Experiment (55 minutes): **https://www.cdc.gov/healthyschools/bam/teachers/documents/epi_4_hand_wash.pdf** (or search "CDC handwashing activity" online)

- Students should decide what information is most important to convey and what is the best way to convey it.

- Have students track their data and then create their own data analysis and visualization.
    ◊ Students could complete the project as described by the CDC, evaluating the hand as a whole, collecting a single cleanliness rating for each hand, and creating a chart.
    ◊ Students could decide how to collect separate cleanliness ratings for various regions of the hands, perhaps collaborating to identify key regions on a diagram of the hand and record cleanliness of each region separately. These regions could then be used to create their own version of multicolored hands.
    ◊ Students could also decide on the best way to aggregate data from multiple hands into their data visualization.
    ◊ For younger students you can do it as a class activity, discussing what should or should not be included.

- Encourage creativity and out of the box thinking as students create a data visualization.

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More questions and concepts to consider:

- **Image analysis**: transforming photographic images into a "standard" hand for analysis; changing images into numeric representations of how much residue was left on the hands (this is what we did for our visualization).
    - ◊ How does choice of color palette help or hinder information communication?
    - ◊ Does everyone in the class interpret the poster's color palette in the same way?
    - ◊ For advanced students:
        - How could digital photographs replace subjective cleanliness ratings? (Note: We found washable green paint easier to photograph than Glo-Germ, and found analysis of individual RGB color channels effective.)
        - How can images of different hands be "standardized"?

- Doctors and nurses wash their hands many, many times a day. How can hospitals make sure hands are being washed correctly, as often as they need to be, while not violating ethical boundaries in collecting data about individuals?
    - ◊ **Deep learning**: researchers trained computers to recognize good practice in videos of someone washing their hands (Lulla et al., 2021)
    - ◊ **Machine learning**: a hospital wanted to be less intrusive so they trained the computer to recognize time patterns in proper soap and hand sanitizer use (all dispensers were wired to a system) so that they could pinpoint areas where hand hygiene was most likely to be lax, allowing interventions without having to monitor individuals. (Diller et al., 2014)

Key takeaways:

- Data visualizations are complex with lots of data included and lots of data excluded.
    - ◊ What kind of decisions have to be made?
    - ◊ What ethical concerns should someone have when working with data?

- A lot of human work goes into creating data and data visualizations. Think about who collected and organized the data, who volunteered (or not) to have their data collected, what decisions were made to collect, process and organize the data. Many human hours go into creating a visualization like this one.

- Don't take a visualization at face value. Question it. Think deeper.
    - ◊ How might it be misleading?
    - ◊ How might you have done it differently?
    - ◊ What was done well?
    - ◊ What could be done better?
    - ◊ What other questions does the visualization lead you to have?
- When it comes to data and data visualizations: **keep asking questions!**

References:

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