Can't Stop Breathing

Facilitator Instructions contributed by Selene Gonzalez-Carillo

Reflection

I guest taught several ESOL classes at Universidad Popular in Chicago. For some students, this was the first math and science class they had in their English-learning program.

After everyone introduced themselves and gave a quick response to how they felt about math, science or statistics, I had them define out loud what the word "statistic" meant by having them give me an example of a statistic they had heard. This activity was helpful because the students then understood that there is a difference between just numbers or data and what you do to those numbers to tell a story. Statistics are the story you tell from the numbers you have. Statistics answer the "so what about this data" question.

I had all the students split up into four groups. Each group was assigned a section in this story. They were to read amongst their group and figure out what was being said and then also come up with a question. The first three groups read the article, while the fourth had the task of reading the graphs and trying to understand them and then reporting back to the class.

This was beneficial in the sense that everyone was able to understand what was going on in the story collectively. The fourth group put the main graph on the board and explained the testing results to the class. After having done this we talked about nanograms per cubic meter, the ratio which was used in the graph for the levels of the pesticide. This was to emphasis just how small the numbers we were looking at were, and how poisonous.

We then looked at the graph and talked about how to find the average level of pesticide among the eight women. We talked about the steps and then did the math together and found that the average was also above the limit accepted for a pregnant woman.

Activity Overview

Students read and discuss stories from California where spraying in orange groves exposes community members to pesticides. Community members collected information about levels of Chlorpyrifos in the air and in their bodies. Students learn what residents found and discuss why it matters.

Steps

1. Launch

- Write the word "statistic" on the white board. Students can introduce themselves along with their answer to the question "Have you heard a math fact recently that stayed with you?"
- Share with the students a definition of statistic as the story you tell based on the numbers. Explain that statistics answer the "So, what?" = Statistics influence our opinions. We need to be critical and savvy. We can use statistics to influence others' ideas of what is important. It smells bad. The air is unhealthy. The air has twice the level of pesticides as other places in town.

Skill:

National Research Council Framework of Science Practices 4 & 5: Analyzing and interpreting data; Using mathematics and computational thinking.

GED Reading Assessment Target R7.2 Analyze how data and quantitative and/or visual information extends, clarifies, or contradicts information in text, or determine how data supports an author's argument.

Objectives:

Interpret graphs

Use vocabulary

Time: 70-90 minutes

Materials

Can't Stop Breathing article and worksheet, 1 per person

Preparation

Enlarge the graph or be ready to project it

Helpful Definitions

Acres n a unit for measuring area, equal to 43,560 square feet.

Pesticide n a chemical substance used to kill insects & small animals.

Severe adj very serious

Pound n a unit of measurement of weight equal to 0.453 kilograms, that is about ½ kilogram.

Insecticide n a chemical substance used to kill insects.

"Getting into" their bodies entering. Spanish: Metiendose

Sample n a small amount of something which shows what the rest is or should be like. Spanish: Muestra

Graph n a drawing that shows lines and curves formed with two sets of measurements or amounts. Spanish: gráfico

- Transition to the article by letting students know they are about to read about residents in California who faced such a situation, where they had a feeling the air was bad, and they wanted the science and the statistics to back up their suspicions.

2. In Groups

- Divide the class into groups of three or four and assign each group a section to read. Ask students to underline words that are unfamiliar and help them understand them (look at the vocabulary list for suggestions). Give students 15 minutes to read.
  NOTE: One of the groups should solely focus on reading the graphs. Assist them in particular to ensure that they understand what each symbol means. That group can replicate the graph on a white board or flip chart paper, or, if possible, project the graph and allow the group to annotate it.
- Give students 15 minutes to read and prepare to share main ideas and important examples from their section.

3. Debrief as a whole group

- Groups assigned paragraphs take 5 minutes to present the main ideas and important examples found in their section.
- Talk through the ideas that are part of environmental issues.

  Exposure—who was exposed and how?
  Sampling—how did people find out how much was in the air?
  What are some of the issues in testing blood and urine?

  The group that read the graphs explains the main ideas and the important labels and symbols, for example, the REL level shown with a black line parallel to the *x*-axis, and its meaning. Confirm that students understand that each "dot (•)" or "square (☐)" on the graphs contains information from the *x*-axis and the *y*-axis.
- Check understanding by asking what the numbers on the y-axis represent (the quantity of Chlorpyrifos) and what the x-axis numbers represent (the dates the Chlorpyrifos levels were recorded). State: "This dot here tells us that during July 15-21 there were about 1000 ng/m³ recorded." Ask individual students to do likewise, picking a point and explaining its meaning. They may highlight with a colored marker the point on each axis that gives them the information about their "dot (•)" or "square (☐)" .
- Elicit from students the answer to "What does ng/m³ mean again?" (Answer should be on the bottom of far right graph-Chlorpyrifos Near a School).
- Write on white board the following then hold up a dime and explain that a gram is about the size of it.

  nanogram = 0.000000001 grams = really, really small part of a gram

- Next you'll want to help the students visualize better ng/m³ by saying "Well we know how much Chlorpyrifos were measuring, less than a dime, but in how big of a space? Are we measuring per

Exposure n a situation or condition that makes someone likely to be harmed

Drift Catcher n a simple, cheap to make device that collects air samples, which can be analyzed for pesticides. Results hold up in court.

Source: Cambridge Dictionary

Answers

The Change Agent, p. 33

1. High levels: 2000 ng/m³ of Chlorpyrifos in Orange Groves /1000 ng/m³ Chlorpyrifos Near a School

2. Average in Orange Groves / Average Near a School

3. Much higher. About 11xhigher in Orange Groves/ 5xhigher Near a School

4. Because there is a higher concentration in the groves after spraying and then pesticide drift occurs

The Change Agent, p. 32

The average is higher than the EPA accepted level of Chlorpyrifos in Pregnant and nursing women (≈ 5.36µg/L)

classroom or per neighborhood block? Wait to see if a student can provide you with the answer "in cubic meters." Then, using the meter stick, pairs or a volunteer outlines a cube with sides of one meter so the students can picture a cubic meter. Check that everyone understands the ratio. "So for every 3D-box we are detecting an invisible amount, a few nanograms."

- Transition to the next task by wondering aloud: Would those numbers be a convincing statistic?

4. Answer Questions

- Return students to their groups and have each group work on answering the questions found on "Tell the Media" pg. 33, *Change Agent*. Give them 15 minutes.

  Write on white board:

$$\text{Average} = \frac{\text{Sum of all Chlorpyrifos levels}}{\text{number of addends}}$$

- Have each group share one answer; correct when necessary.
- Looking at the bar graph on pg. 32 ask: "Is the average of Chlorpyrifos found in these 8 women above or below the accepted level of for a pregnant and nursing women? How do you know?"
- Finally, ask students to share their conclusions on the situation and the actions the residents took.

Worth Noting

In the first graph, the unit is "µ/liter." A microgram is one-billionth of a liter. Most adults have heard of milligrams, based on medications. One thousand milligrams make up a gram. One million of them make up a liter. Compare that to micrograms. One million make up a gram. One billion make up a liter. You need sensitive equipment to detect something that is present in a few parts per billion. Most lab testing for contaminants is expensive.

Smart Moves

√ Slow down.

√ Talk it out.

Use your senses.

√ Connect ideas to whar people already know.

Play with different ways to show it and say it.

√ Show numerical relationships in more than one way.

√ Encourage verification.

Supplementary materials and anything else

N/A