Biophilia and Energy Usage Data Play

Instructor Background:

The data table below is from the article "**Environmental impacts of food consumption by dogs and cats**" by Gregory S. Okin in the journal *PLoS One*. (full article) The purpose of the study was to evaluate the ecological impacts of cats and dogs based primarily on the animal products they eat and the feces they produce. As Okin states in the abstract, "In the US, there are more than 163 million dogs and cats that consume, as a significant portion of their diet, animal products and therefore potentially constitute a considerable dietary footprint." One measure of an organism's environmental is simply energy inputs and outputs. For cats and dogs, this includes what/how much they eat and what/how much they defecate. The table shows the population of men, women, cats and dogs in the US and their average daily and annual energy usage in kiloJoules. The Energy usage (KJ day-1 cap-1) is expressed as how many Joules of food energy one person uses in one day. The Annual Energy use (PJ/year) is expressed in Petajoules, which is 1x 10^{15} Joules. Students will interpret the data in the graph to draw some conclusions about the scale of the ecological impact of cats and dogs and think analytically about how pet ownership may affect wildlife and the environment.

Table 1. Population and energy requirements of US people, dogs, and cats.

	Number (millions)	Energy Usage (KJ day^{-1} cap^{-1})	Annual Energy Use (PJ/yr)
Men	160.5	10330 ± 91	605 ± 5
Women	160.5	7602 ± 64	445 ± 4
		Men + Women	1051 ± 9
Dogs	77.8	5594 ± 443	159 ± 13
Cats	85.6	1426 ± 79	45 ± 2
		Dogs + Cats	203 ± 15
		Percent of humans' energy used by dogs and cats	19% + 2%
		Number (in millions) of Americans that eat as many calories as US dogs and cats	62 ± 5

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Initial Data Analysis:

Have students employ the I2 strategy (BSCS) for analyzing data to both figures.

- **Identify**: What do you see? Students annotate what they see in the figure/data set. They should mark and describe at least three observations.
- **Interpret**: What does the data mean or what "could" the data mean? Students annotate the trends they see occurring or compare/contrast data points to explain similarities and differences.
- **Caption**: Students use their observations and interpretations to write their own caption for the figure.

Part 2: Scientific Connections

1. There are the same number of men as women in the US. Which population group, men or women, uses more energy units. Use data to answer in a complete sentence.

2. Why do you think this population group (men) uses more energy?

3. Could you use this data to estimate how much an average man weighs compared to an average woman in the US?

4. How many more cats are there than dogs? Express that as a percent, as in "there are _____% more cats than dogs in the US.

5. Which population group, cats or dogs, uses more energy? Use data to answer in a complete sentence.

6. Why do you think this population group uses more energy?

7. Does the amount of cats/dogs correlate with their energy usage? Explain using data and reasoning.

8. Explain what the last two numbers of the right-hand column tell you.

9. Dogs, Cats, and humans all consume other animals for food. Explain in a few sentences what impact this might have on the environment.

10. Extension: List some pros and cons of having pets based on what you learned from the reading excerpt and the data play.