

How Big Is Your Footprint?

Grades: 5-8, 9-12

Topic: Energy Efficiency and Conservation

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HOW BIG IS YOUR FOOTPRINT?

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Overview: The ecological footprint concept is a way to roughly measure the impact of a person's choices on the environment. People have become so accustomed to their diet, cars, homes, and energy usage that they don't realize that the Earth will not be able to provide the needed resources indefinitely. When students go online to calculate how many Earths it would take if everyone on the planet lives the way that they do, they will be astonished. For many students, it is the beginning of increased awareness about the delicate balance of the planet.

Objectives: Students will:

1. Increase their awareness of the impact of their choices on the Earth. This awareness is to result in a goal to reduce their personal impact (footprint).
2. Learn the mean, median, mode, and standard deviation of a set of data.

Subjects: Mathematics (Statistics or a Statistics unit in *General Math*, *Algebra 1* or *2*)

Suggested Grade Level: 8th through 12th

Time: 2 class periods (50 minutes each) or 1 block period.

Materials:

- Access to the Internet. If a class set of computers is available, it will take each student about 15 minutes to complete the questionnaire. If only a handful of computers are available, then the calculation for the number of acres needed to support each students' lifestyle will take a little longer.
- Graph paper or poster paper
- Calculators



BACKGROUND INFORMATION

One possible introduction to the lesson could be a discussion of how much food a farm produces. Have students guess the number of acres in a small farm. Students might not even know how big an acre is, roughly 40,000 square feet or a square plot of land about 200 feet by 200 feet. Could 1 acre provide all the food needed for one person for one year? What about provide the materials needed to build a home? What about heating costs? Could

the farm provide wood for a fireplace? Could the farm provide energy for equipment? Students may realize that a farm cannot provide gasoline or electricity (usually). So there are other resources needed to provide our comfort and lifestyle for a year. What is the average number of acres to provide for the needs of our students? What is the greatest amount? What is the least amount? Suppose this number of acres

were to be translated into the number of planet Earths needed if everyone on the planet lived as a member of the class does. What would be a reasonable number?

PROCEDURE



1. Students will go online to the URL www.mec.ca/Apps/ecoCalc/ecoCalc.jsp or <http://www.earthday.net/footprint/index.asp>. There are other sites that calculate an ecological footprint; you can do a google search to find others. This site has 13 questions that students are to answer. From their answers, the site calculates the number of acres needed to sustain that person's choices. The site also converts the acres into the number of Earths needed to sustain the planet's population if everyone lived in the same manner.
2. When students have arrived at the number of acres and Earths, you may collect all of their data in one of several ways. Each student can write
3. their values on the board, or if privacy is critical (and some students may feel awkward about how many Earths they are using), then students may write their values on a small piece of paper and the results could be collated, copied, and distributed the next day, without names attached.
3. Have students calculate the mean number of planets needed, and the mean number of acres needed to sustain the members of the class. Students should prepare a graph of the data, either in bar graph form, a number line, or a stem and leaf plot. Identify the high and low values for the class. How is the mean affected by these values?
4. Demonstrate how to calculate the standard deviation for a set of data. This measure of variation describes the spread of the data. If the standard deviation is more than 50% of the mean, then there may be some people in the class with large values for acreage or Earths.

FOR DISCUSSION



1. What is the average number of acres for the students in the class? What is the average number of Earth's needed?
2. Which statistic would you use if you wanted to point out the lack of awareness of the environment? Which statistic would you use if you did not want to alarm the public?
3. What is the biggest factor that contributes to a high number of acres? Or, which area do you think could conserve the most of the earth's resources?

4. Suppose you were to calculate the mean again eliminating the highest 3 values. Is the mean still greater than 1 Earth? What does that mean for future generations? Is it enough to change only the extreme lifestyles? Or does everyone need to change if we are to get the number down to below 1 Earth needed?
5. What are the next steps? How can we carry this message to other people? The students might want to have their parents and other family members take the online questionnaire. Perhaps later in the year the class can repeat the lesson and see if the average number of acres has been reduced.

RESOURCES

The Display of Quantitative Information, Edward Tufte.

Mathematics: A Human Endeavor, Harold Jacobs, Freeman Publishing

Elementary Statistics, Ron Larson

Exploring Data