



FOOD FOR 9 BILLION

The Challenge of Feeding the World

Can We Turn the Population Tide?

Teacher Notes

Before You Start

Grade Level:

Grade 9-12, could be adapted for middle school

Concepts Covered:

Population growth, human impact on the environment, family planning

Estimated Time:

50 minutes

Materials Needed:

Computers with Internet access, student handout

Overview

How are the issues of population growth, food, the environment and social policy connected? Using an interactive timeline, a television story and public data sets, students will explore how human population has changed over time and what the impacts of those changes are.

Objectives

- Students will understand how the world's population has increased since 500 B.C.
- Students will understand connections between policy, population growth and resource management.
- Students will create and analyze a graph.

Prior Knowledge

Students should know the location of the Philippines.

Teaching Tips/ Activity Sequence

1. Activate students' prior knowledge and introduce the activity by asking the class what the world's population is today. Ask if anyone knows the world's population in 500 B.C.
2. Explain that the objective of the activity is to explore how human population growth has changed over time and to explore how issues of population growth, food, the environment and social policy are connected.
3. Allow students to work alone, in small groups, or in pairs to complete the activity. Check in regularly with each group to actively monitor students' understanding as they progress.
 - a. If computer resources are limited, the activity could be done as a whole class activity using one computer hooked up to a projection system.

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4. Gather the group for a final discussion. Encourage students to analyze the pros and cons of family planning as a solution to the problem of people going hungry.

Extensions

- Visit the World Bank's Data website to explore the myriad indicators that are collected about countries worldwide. Have the students devise questions and seek the answers through the data sets. <http://databank.worldbank.org/data/home.aspx>

Standards

Resources

- To use Google Public Data to make a population graph:
 - Go to <http://www.google.com/publicdata>.
 - Choose World Development Indicators and Global Development Finance.
 - On the right menus, choose Environment → Population, and choose Philippines from the menu of countries. The graph should pop up on the right side.

Acknowledgements

Susan Dodge, M.S. Ed for Creative Curriculum, produced these teacher notes and resources in conjunction with the "Food for 9 Billion" project (<http://foodfor9billion.org>), with funding from the National Science Foundation (PGRP grant #1026555; <http://ricediversity.org>) and Cornell University.

A Hungry World?

How many humans are on the Earth now? How has that number changed over time? How are the issues of population growth, food, the environment and social policy connected? Let's work with some data to find out.

Part 1: Explore Human Population Growth over Time

Use the interactive timeline at <http://cironline.org/reports/timeline-food-through-ages>. For each of the following dates, find the population of the earth and calculate the average number of people added each year since the last date the population was measured.

$$\text{Average Annual Population Growth} = \frac{(\text{Present Pop.} - \text{Past Pop.})}{\text{Number of Years}}$$

Date	Population	Average Annual Population Growth
500 B.C	100 Million	-----
0	200 Million	200,000 people / year
1600	500 Million	187,500 people / year
1804	1 Billion (1 thousand million)	2,450,980 people / year
1927	2 Billion	8,130,081 people / year
1959	3 Billion	31,250,000 people / year
1974	4 Billion	66,666,667 people / year
1987	5 Billion	76,923,077 people / year
1999	6 Billion	83,333,333 people / year
2011	7 Billion	83,333,333 people / year

1. Explain the differences in average annual population growth before 1600 and then between 1600 and 1804.

Between 500 B.C. and 1600, the Earth's human population grew by approximately 200,000 people per year. Between 1600 and 1804, that number increased dramatically to over 2 million people per year.

2. What do you think accounted for the change you just described? You can look back on the timeline for clues.

Changes in agricultural techniques and commerce likely made more food available to more people in many places. For example, the British agricultural revolution led to greater food production. Advances in medicine, such as the finding that citrus fruits reduce scurvy, decreased the death rate.

A Hungry World?

3. In the 1900s, the changes in human population are dramatic; you can see that in your data set as well as on the graph available on the timeline. Describe how the annual population growth has changed from the early 1900s to the early 2000s.

Annual population growth has increased rapidly. In the early 1900s (before 1927), the average annual population growth was 8 million people per year. By the middle of the 1900s it had increased to 31 million people per year and in the early 2000s, it increased to 83 million more people per year.

4. What are some of the challenges posed by such a rapidly increasing population?

Student answers will vary, but may include feeding people, preventing disease, water for everyone, adequate housing and space for people, environmental degradation, impact on other organisms and more.

Part 2: Listen, ponder and work with some data

Now let's see how, in one corner of the world, the drastic growth in human population is impacting ecosystems as people seek the food they need. Go to <http://cironline.org/reports/turning-population-tide> to view the video segment, "Turning the Population Tide."



1. Why is the Danajon Double Barrier Reef in the southern Philippines being damaged?

Fishermen are trying to catch fish, a major source of protein in the Philippines. The fish population is declining, so fishermen are using illegal tactics (dynamite, cyanide) and gear to try to catch more.

2. What is the current population of the Philippines? When is it expected to double?

The current population is around 100 million people and is expected to double to 200 million in 2080.

Stop the video after the first two minutes. Take a break! Go to Google Public Data and use the tools to make a graph of the total population of the Philippines since 1960.

- Go to <http://www.google.com/publicdata>.
- Choose World Development Indicators and Global Development Finance.
- On the right menus, choose Environment → Population, and choose Philippines from the menu of countries. The graph should pop up on the right side.

A Hungry World?

3. What organization is the source of the data? Explain the trend in the data.

The data comes from the World Bank. The population has risen significantly, from 26 million people in 1960 to 93 million people in 2010.

4. Population grows with every birth and shrinks with every death. Explain the effects of birth rate (the number of births in a population over a period of time), death rate (the number of deaths in a population over a period of time) and lifespan on population growth.

Birth rate impacts how quickly individuals are added to the population. High birth rates lead to rapid population increases. Low birth rates in Europe and other places can lead to shrinking populations. High death rate—often due to war or disease—can cause a population to contract. More commonly, advances in medicine and nutrition have led to low death rates and population increases. Longer lifespans mean that people are part of the population longer, thus contributing to population increase. Teacher Note: The population indeed rises when the death rate falls, but only for a while; then the rate falls dramatically. One understanding is that the single most effective way to slow population growth -- even more than making family planning services available -- is to reduce child mortality.

5. Now change your indicator to population growth rate. How has the population growth rate changed over time in the Philippines? How do you reconcile that trend with what you saw in the total population graph?

The population growth rate has decreased over time, from 3.35% in 1960 to 1.65% in 2010. However, even though the growth rate is decreasing, it remains positive, which means the population continues to increase. Note: students often struggle with the relationship between growth rate and population.

6. The video said that that Philippines has one of the highest growth rates in Southeast Asia. Add at least three countries from Southeast Asia to your graph. Explain how the growth rates in those countries compare.

Student answers will vary.

7. Print your graph!

Now back to the video. Continue watching the news story.

8. The reporter talks with a couple in a village. What reasons do the couple cite for deciding to have only two children?

The couple wants to be able to feed their family. Both parents grew up in poor families and remember going hungry when there wasn't enough to feed everyone. The father shares that his income is just right to feed his family three meals a day.

A Hungry World?

9. What does the PATH program do in rural villages and what has been the impact on family size?

The PATH program makes family planning possible by working with local partners to make birth control pills and condoms available. Family sizes have dropped in six years, from as many as 12 children per family to a maximum of 4 children per family today.

10. What impact does the family planning program have on the ecosystem, especially the reef?

Reducing the number of children in a family reduces the amount of food the fishermen have to catch to feed their families, which means that they don't have to over-fish the reef. The fishermen in the one village were able to set up a marine preserve to protect a portion of the reef.

11. Explain why family planning resources are not accessible in most of the rest of the country.

The Catholic Church, a powerful religious institution, opposes most forms of birth control, and has worked to prevent making birth control accessible to people.

Wrap Up

The villagers in the video see family planning as a path to long-term food security and as a way to be better stewards of the environment, but others in the country feel that family planning is not the right answer. Write a paragraph that presents your view about whether or not family planning should be readily accessible throughout the Philippines in order to address the challenges of human population growth in that country. Be sure to cite evidence from the story to develop your position.

Student answers will vary. Accept all answers that are thoughtful, complete and logical.

Name: _____



Date: _____ Class: _____

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10. What impact does the family planning program have on the ecosystem, especially the reef?

11. Explain why family planning resources are not accessible in most of the rest of the country.

Wrap Up

The Philippines is just one example of the impact of human population growth and the challenges posed by that growth. The villagers in the movie see family planning as a path to long-term food security and as a way to be better stewards of the environment, but others in the country feel that family planning is not the right answer. Write a paragraph that presents your view about whether or not family planning should be readily accessible throughout the Philippines in order to address the challenges of human population growth in that country.