actionbioscience.org lesson

To accompany the peer-reviewed article by Don Hinrichsen and Bryant Robey:
"**Population and the Environment: The Global Challenge**" (Fall 2000)
http://www.actionbioscience.org/environment/hinrichsen_robey.html

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Our Population and Its Impact on the Planet (July 2002)

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Grades & Levels:

- **Handout 1**: high school (advanced/AP)
- **Handout 2**: undergraduate (year 1-2)

Time Recommendations: 1-2 class periods for article review and 2 weeks for projects

NSES (USA) Content Standards, 9-12:

- NSES 1.3. Unifying Concepts & Processes: change, constancy, and measurement
- NSES 4.4. Life Science: interdependence of organisms
- NSES 7.2. Science in Personal & Social Perspectives: population growth
- NSES 7.3. Science in Personal & Social Perspectives: natural resources

Note: View the NSES content standards on this site to choose other curricular applications for additional activities at:
http://www.actionbioscience.org/educators/correlationcharts.html

Lesson Objectives: Students will…

- explore environmental problems due to the growing worldwide human population
- examine the growth rate of human populations
- compare the impacts of population growth in developing and developed countries
- consider the social, economic, and environmental issues in population growth and sustainable development
- discuss possible ways to stabilize population growth and increase sustainable development

Key Words Include:
biodiversity, developing/developed nations, environmental degradation, fertility rate, natural resources, per capita, population growth, sustainable development

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Preparation

Article Discussion:
Provide copies of the Hinrichsen/Robey article or have students download it from: http://www.actionbioscience.org/environment/hinrichsen_robey.html. Several approaches are possible for using the Article Discussion questions on page 2. After students have read the article on their own:

a) the instructor can pose these questions for whole class discussion.
b) the students can divide into small groups for discussion and the groups can report back to the entire class with results of their discussions.
c) the students can complete the questions on their own, perhaps as a short-answer writing assignment; they could then discuss their answers, and the more complex questions, as a large group or in small groups.

Student Handout 1 or 2:

- Part A of each student handout provides a list of topics for essays on the article.
- Part B of each student handout provides a list of projects that require investigation to be done individually or in teams of 2 or more. Completed projects can be summarized in written reports or presented in a visual or oral format.
- Refer students to the "Useful Links" in the *Educator Resources* section at end of article. These links provide students with information about human populations for their activities and provide a source for research information.

For Educators: Article Discussion

About the article by Don Hinrichsen and Bryant Robey:
"Population and the Environment: The Global Challenge"
http://www.actionbioscience.org/environment/hinrichsen_robey.html

Article Content Questions:

1. Define these terms as they are used in the article and explain how they are important in the discussion of the human population and natural resources:
   a) biodiversity b) sustainable development c) fertility rate
   d) per capita demand for resources e) developing and developed countries
2. What is the relationship between coastline degradation and human population changes?
3. What steps can be taken to make development more sustainable?
4. What is the relationship between human birth rates and death rates in the world, and how are both rates contributing to changes in the human population?
5. Why does family planning improve family welfare?
6. In one part of the article, the authors say that developing countries have rapid population growth, yet in another they say that fertility rates have been falling in developing countries. How can both of these statements be true?
7. The authors say that the world's population is projected to continue to expand for the next 50 years. Why can't we slow it down faster?

Extension Questions:

1. How can use of environmental resources help living standards? How can abuse of environmental resources deteriorate living standards?
2. How can human overuse of freshwater be reduced?
3. In what ways have population pressures contributed to degradation of agricultural lands?
4. Why has the absolute number of people in the world increased if the human population growth rate has slowed down?
5. What are the reasons that population control is a controversial issue for many cultures and people?
6. If 1 billion people are added to the world every 13 years, how many people would that be in one year? In one month? In one day?

Our Population and Its Impact on the Planet
Student Handout 1

PART A. ESSAYS ON THE ARTICLE

Write an essay on one of the following topics:

1. In what ways could the expanding human population hurt our current standard of living?
2. What are social, economic, and political factors that might interfere with an international commitment by all countries to population stabilization and resource conservation?
3. Describe a program that would benefit sustainable development in your community.

PART B. PROJECTS ON HUMAN POPULATION AND THE ENVIRONMENT

a) Visual Presentations

1. Make a graph showing the human population in 1999 and the estimated number in 2025, if the growth rate is 1 billion people every 13 years.
2. Make a poster or other visual display that illustrates the relationship between developing countries (with rapid population growth) and developed countries (with greater use of natural resources); point out the contribution of each type of country to depletion of global natural resources.

b) Investigations

1. How does your community contribute to sustained development? Contact your community planning board or commission for information. Present your findings in class.
2. Contact your community government agencies to find out the number of people in your community or region. What fraction of the total human population (6.1 billion) do those numbers represent? See if you can get data on how those numbers have changed over the last few decades. If you have access to video equipment, present your findings as though it were a feature for your local TV news.
3. It's hard to grasp the difference between millions and billions. Make a poster to help others in your class understand the difference. There are now about 6.1 billion people in the world. Find out how many are in your country (see web site references). How long would it take to count 1 million beans if you were counting them at 1 bean per second? How long would it take to count 1 billion beans at the same rate? What if someone told you to wait for a million seconds -- how long would that be in days/years? What if they said to wait a billion seconds? Again figure out that time in days/years. Illustrate these numbers in your poster.

Our Population and Its Impact on the Planet
Student Handout 2

PART A. ESSAYS ON THE ARTICLE

Write an essay on one of the following topics:

1. How does slowing the population growth rate help the quality of life? Give 5 specific examples of conditions that might change and the effect those changes would have on lifestyles.
2. What social, economic, and political factors might interfere with an international commitment to population stabilization and resource conservation?
3. Describe the "worst case scenario" if the population continues uncontrolled over the next 100 years. Describe the changes in lifestyle and availability of natural resources that may happen.

PART B. PROJECTS ON HUMAN POPULATION AND THE ENVIRONMENT

a) Visual Presentations

1. Make a graph of the growth rate of the human population from 0 AD to 2025 using the numbers below. Notice that all but 2 of the years will be close together at the right side of the graph. In your visual, explain the growth of the human population as illustrated in this graph. What kept the numbers low until recent times? What factors have contributed to growth in the 20th century?

HUMAN POPULATION GROWTH STATISTICS

Years 1950-2025 data from the United Nations "World Population Prospects Population Database" web site:
http://geography.about.com/gi/dynamic/offsite.htm?site=http%3A%2F%2Fesa.un.org%2Funpp%2F

Year (AD)	Population
0	250,000
1850	1,000,000
1950	2,519,495
1955	2,754,717
1960	3,020,177
1965	3,333,716
1970	3,690,925
1975	4,065,508
1980	4,429,747
1985	4,824,509
1990	5,254,820
1995	5,661,862
2000	6,056,715
2005	6,441,001
2010	6,825,736
2015	7,207,361
2020	7,579,278
2025	7,936,741

2. If you live in a developed nation, compare your situation to that of citizens in one developing nation (or *vice versa*). Research the various ways that your country and the one you have chosen for comparison use natural resources in different ways and how that relates to the impact of human population on the environment. Write a radio script to present your findings about both countries. Record the script and play it in class. Alternatively, create a chart to show the comparison.

3. The human population is not evenly distributed across the planet. Using a world map, color the 20 countries with the largest populations. Data is available from the web sites listed in "Useful Links" in *Educator Resources* at the bottom of the Hinrichsen/Robey article. What does that distribution tell you about the distribution of human populations? Why do you think that people settled where they did? Present your analysis in a written report or visual presentation, such as a short video documentary.

b) Investigations

1. Interview a person from your community planning board or commission about the actions in your community to promote sustainable development. Ask permission to record the interview. In your questions, ask that person how population growth or control is included in the overall development plan. Play the interview in class.

2. Interview a person from a local agency or organization that addresses population growth or control. Ask permission to record the interview. Your interview should cover:

- changes in population in your community and in your country in general
- ideas on relationships between population size and quality of life in your community

3. Contact a local agency that deals with population data. Ask for information on the changes in human population in your community or region over the last 25 or 50 years. Graph the data. Discuss with your class the increase or decrease in the population, reasons for the population changes in your community, and possible effects on the environment.

4. You are a member of an organization that advocates a balanced environment. Design an educational program that addresses the problems of human population growth and sustainable development. The brochure will be handed out at a public event.

5. From local organizations and governmental agencies in your community, find out how public use of freshwater, development in agricultural lands, or cutting of forested areas has changed over the last few decades. Write up your results and discuss them in class. Alternately, produce a short documentary using your research results.