



Curriculum Units by Fellows of the Yale-New Haven Teachers Institute  
1998 Volume VII: The Population Explosion

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## **The World Population Explosion**

Curriculum Unit 98.07.06  
by Eddie Rose

### **Brief History**

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World population is currently growing by over 80 million people each year, and is projected to exceed six billion people by around the year 2000. Human numbers are expected to increase by around 80 million people annually for roughly the next 30 years, leading to a global population in 2030 of over 8.5 billion. This level of increase and of total population are unprecedented in human history, and create challenges to the environment and the quality of human life previously unimagined.

When nomadic people first came down into the great river valleys to create permanent settlements, the earth's population was perhaps five to ten million. That number was relatively stable, because life was hazardous. Life expectancy was short-perhaps 25 to 30 years-and about, as many people died each year from hunger, accidents, or disease as were born. Population growth, therefore, was approximately zero.

Beginning with the Age of Agriculture some 10,000 to 12,000 years ago, life spans lengthened. Farming provided more stable food supplies, and the relative security of a settled existence allowed more people to survive. As mortality decreased, population increased, and it may be that birth rate also increased. Overall, life expectancy appears to have improved only slightly, however.

By the First Dynasty in Egypt (circa 3000 BCE) global population reached around 100 million. By the height of the Roman Empire and the birth of Christ, that number was perhaps 250 million almost the size of the United States today.

As productivity increased, fostered by inventions such as the plow and the water wheel, as well as a greater understanding of raising plants and animals, food supplies also increased. In response to available food supplies, human numbers also increased. More people then required more land for fields and towns, which in turn led to greater prosperity and productivity and again to more people. By 1,500 CE, world population had reached, perhaps, one-half billion. It was around this time that the era of western colonial expansion began, driven in large part, by the demands of more people for more resources.

Population growth was not always linear. Famine, war or disease often decimated local cultures. In fact, as population grew, another pattern of human history emerged that of overpopulation, which led, unfortunately, to over-exploitation of resources.

Civilizations can grow when resources are available, whether fertile soils and good water, minerals for metalwork, or forests for fuel and building. In the prosperous times that followed, population tended to increase. At some point a threshold was reached, beyond which demand exceeded supply, and the resource base could no longer supply the population. The resulting disruption then generated problems similar to those we see from severe overpopulation today: social and economic collapse, hunger, migration and war.

Human numbers were also limited by disease. Bubonic Plague (the Black Death) devastated large parts of China as early as the third century BCE, then spread west to ravage Constantinople in 542 CE. During the fourteenth century, it killed one third of the population of Europe. Other diseases were equally devastating, if more localized. When the conquistadors invaded Mexico in 1517, the native population was some 25 million. In less than a century, it had fallen to just over one million. The remainder succumbed to introduced disease, just as the Inca Empire was conquered more by smallpox than Pizarro's few soldiers.

Despite these setbacks, however, population continued to grow overall. On the eve of the industrial revolution in 1750, humans numbered around 750 million, and just after 1800, world population reached one billion.

As population increased, identifiable side effects associated with that growth became more apparent, most notably migration either to cities or to other lands and conflict. Internal migration increased as rural populations grew in size and it became increasingly difficult to absorb younger people into the labor force. The onset of mechanization also displaced many workers, who then were forced to move to cities in search of jobs.

As rural families grew over the generations, it often became impossible to divide hereditary lands among all those in need, and more people were forced to leave. Lack of work, economic instability, local food scarcity and lack of available land all contributed to large-scale migration in the past, just as those factors drive migration today.

International migration occurred in the form of colonization particularly by European nations as expanding countries looked beyond their borders for sources of raw materials and wealth. Individual colonists migrated in search of a better life, including access to land and economic opportunity. In virtually every case, population-driven international migration led to conflict.

Conflict between nations increased as competing powers fought over colonies and access to resources in North and South America, Asia and Africa. Conflict also occurred on a more local scale, as the new arrivals clashed with indigenous populations. As European settlers expanded across North America. For example, they displaced or dispossessed Native inhabitants. Those peoples were then forced to migrate, and subsequently displaced the tribes onto whose lands they were driven, (or failed to do so, and vanished as a culture).

As Americans pushed further west in search of more land and resources to supply a growing population, more clashes followed. By the time the western edge of the continent was reached, the majority of land and resources were controlled by the new immigrants, and most surviving indigenous populations were relegated to reservations. Population growth continued through the nineteenth century, spurred by a general economic and immigration expansion, and increased food production. The Industrial Revolution generated a great economic boom, as machine power made mass manufacturing possible. Steam-powered transportation systems allowed people to move easily from one place to another, while mechanization made it possible for fewer farmers to work more land. As the possibility of working for cash wages opened up, opportunities to accumulate capital, and to move it easily, increased.

Despite a drop in birth rates, population growth continued. Advances in medicine and sanitation lowered

mortality and increased life expectancy.

During the Civil War, health care workers demonstrated that steps as simple as doctors washing their hands between operations and sterilizing instruments dramatically reduced infection. Development of safe water sources, sewer systems and food preservation technologies also improved general health.

The work of Lister and Pasteur provided improved understanding of infectious agents, while the development of general anesthetics, X-rays and corrective surgery saved countless lives. The invention of antibiotics, such as sulfonamides and penicillin in the 1930's allowed treatment of many previously fatal infections and vaccinations protected people against diseases such as smallpox, typhoid and measles.

After World War II, relief workers from the United Nations and other organizations introduced public health measures to the less developed regions of the world. Without the historic constraints of hunger and disease, population growth in those regions has been dramatic - so dramatic, in fact, that the term "explosion" has sometimes been used to describe it. In some regions growth rates reached three to four percent annually, which equates to a doubling of population every 17 to 23 years.

Despite the fact that global birth rates have declined in recent years, population increases will continue for the foreseeable future because of a factor known as population momentum. This means that even if people have fewer children on average, there are so many more people having children overall that population continues to grow. Today, roughly one third of the world's population - nearly two billion people - are under the age of 15. As those young people - most of who live in developing regions - start families in the future, world population will soar.

After taking all of human history for population to reach one billion, it took only a little over a century to reach two billion in 1930. The third billion was added in just 30 years and the fourth in only 15 years. Today, we're adding another billion people, and projections indicate that at the current rate of increase, world population will double again in just 47 years.

Less developed regions in particular face a difficult future. Africa is growing at a rate which, if maintained, will lead to a doubling of population in just 24 years. At its current rate of growth, Asia -excluding China, which has slowed growth through its controversial "one child" policy - will double its population in 36 years.

The extent of the alteration of the natural environment through human activity has increased dramatically in the last three centuries. The Scientific Revolution that began in the 1700s was more than just an Industrial Revolution - it transformed medicine, agriculture, settlement, and sanitation. Taken together, these changes enabled people to live longer and more prosperous lives. As a consequence, total population and per capita resources used began to grow exponentially, though not at the same rate everywhere. Total material flow from the resource base, through the human economy and back into the environment as waste, has multiplied many times over and is threatening the environmental systems upon which life on Earth depends. Opinions among scientists, politicians, and citizens are deeply divided as to what the future holds.

The purpose of this unit on "The World Population Explosion" is to develop an awareness of the seriousness of the problems of over population. The unit is designed for use in grades 5-12. The unit will provide a conceptual framework on how to deal with fundamental problems through integrating reading, writing, collaborative activities, science and mathematics. Students will be exposed to subject content and lessons plans that enhance critical thinking and inquiry. A hands-on approach to learning about problem with population growth will be utilized.

This unit introduces students to some of the fundamental questions about the connections among population, resources and energy use, and environmental impacts. What factors have caused the enormous growth of population and energy use in the past? To what extent is population growth responsible for the environmental problems we see today? What opportunities are there for slowing population growth, per capita energy use, or the environmental harm caused by each unit of energy use?

The unit will become an invaluable aid in programs for motivated students. It provides clear guidelines and procedures for involving these children in significant learning experiences in research and high level thinking skills, while not neglecting challenging learning within the respective basic disciplines of science, mathematics, social studies, and writing. The approach is one that engages the interests of children at a deep level.

One of the most exciting things about independent learning is that students can become an "expert" about a subject that their friends may not understand. "Kids Teaching Kids" allows students to share their knowledge with others. The process of teaching requires you to do much more than acquire knowledge, however, and that is what research is all about. Students will be synthesizing information, which means that they will take facts that are known and build them into something that has not existed before. Students may go on to create something new!

With "The World Population Explosion" you may require students to conduct research. Few children, however, possess the necessary skills to complete this type of project successfully. The Research Guide is designed to help them learn and practice some basic skills: how to locate, record, organize, and present information about topics they study. Even though the handouts are detailed, students will need some guidance and instructional support from you as they undertake their first research projects.

The activity on poverty, can be in preparation for the CAPT Interdisciplinary Assessment. Students use knowledge and skills they have gained through their social studies, science, mathematics, language arts and other classes. Students are presented with several source materials (e.g., newspaper or magazine articles, government documents, editorials, political cartoons, maps, charts or graphs) related to a significant issue. The lesson begins with a brief group discussion. The purpose of this collaborative activity is to give students the opportunity to begin thinking about the topic and to share their ideas with others before starting the task.

For the graphing activity "Where in the United States Are You," we can use the number line and ordered pairs to locate points on a plane. 1. Construct the United States geographic coordinate system (2 number lines one vertical, one horizontal) on your map of the United States. 2. Use this system to locate points on the map of the United States.

The activity on projecting the rate of population growth can be in preparation for the CAPT Mathematics Assessment. It will assess students' understanding of important skills and knowledge in mathematics. The questions will require students to apply their understanding of mathematics to real situations that occur in everyday living. Students will be able to use a calculator for all of the problems in this activity and on the actual test.

The Mathematics CAPT Assessment will consist of two types of questions, open-ended and grid items. For the open-ended questions, students' response may be to write an explanation, fill out a form, create a graph, or draw a diagram. For the grid questions, students will solve a problem and then record their answer in a number grid. For many of these questions, there may be more than one acceptable answer, depending on how they solve them.

The unit provides students with the concepts and tools needed to make sense of the often contradictory and contested information on population, energy, and environment, and to encourage them to draw their own conclusions based on a comprehensive understanding of the linkages among demographic, economic, environmental, and resource systems. The activities are designed to develop students' appreciation of the global linkages among population, energy usage, and environmental impacts understanding of the basic concepts and dynamics of population growth' understanding of energy usage and links to economic activity and growth and assessment of the enormous and value-changed complexity of the population-environment relationship. Throughout, students are challenged to think critically and practically about the own habits and lifestyles.

## INFORMATION FOR BOTH STUDENTS AND TEACHER

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When confronted with the issues of world population growth and the resulting impacts, many people feel overwhelmed and powerless. The problem seems so big and so complex that they don't believe they can do anything about it. Individuals can make a difference, in a variety of ways, and on a number of levels.

Consider the example of a mobile hanging from the ceiling. If we exert even a slight pull on any one piece, all the other pieces move as well. This is how seemingly small problems can have a large impact, and how seemingly small solutions can effect positive change in a number of areas. We need to understand the power of our own personal choices, and that small actions can have a large effect. We need the faith, the courage and the commitment to make those choices and take those actions.

While population growth is greatest in developing regions, the industrialized world is extremely important because of our much greater comfort level. In light of the fact that Americans consume almost one quarter of global resources (with only one twentieth of the world's population), the planet would benefit tremendously from reversing even solve population growth in the United States.

There are a number of ways to reduce your own environmental impacts - from recycling, using fluorescent light fixtures and driving less, to planting trees and restoring wildlife habitat. It sounds simple - but even such small steps as turning off the lights when leaving a room and turning down the thermostat on the house or water heater can help. Conserving energy means less has to be generated. Less fuel is burned, and fewer emissions are released into the atmosphere, reducing smog and slowing global warming. Buying a more efficient car not only saves you money, but also saves energy, and reduces pollution. Walking or riding a bike instead of using a car for short trips is both energy-efficient and healthy.

Cut down on the amount of garbage you generate. Recycle glass, plastic, paper, ferrous, metals, aluminum and tin cans. See if a local thrift shop or charity will take items you have no use for, rather than throwing them in the trash. Start "pre-cycling" as well as recycling. That means buying only products in recyclable or reusable containers, and limiting purchases of products with excessive packaging. (About one third of all trash thrown away in America is packaging) Start a compost pile for your yard or garden. Composting food scraps and yard wastes keeps them out of landfills, and builds up soil and fertilizes plants.

Save water by fixing dripping faucets, installing low flow shower heads, and not leaving the water running while brushing your teeth. Even those simple steps can save thousands of gallons a year. Learn about natural landscaping with indigenous plants which require less water, and consider replacing lawns (a major cause of

water use, as well as pesticide and fertilizer applications with drought-resistant ground covers).

Learn about and support environmentally sound industries and technologies, such as sustainable agriculture, sustainable forestry, eco-tourism, and renewable energy such as wind power. Support those activities whenever possible in your community. Buying produce from a local farmer or gardener saves the energy of transporting food products from distant areas, and boosts the local economy. Buying wood products from a sustainable forestry operation saves habitat and promotes biodiversity as does use of alternative building materials.

It may be necessary to help create positive options in many areas. If there isn't a recycling program in your community, for example, talk to local officials and businesses about starting one. If eco-friendly forestry products are not available from your local lumberyard, ask the owner how to find them and encourage him or her to stock and advertise such materials.

If pre-cycling is hard to do because of a lack of products and packaging that are environmentally friendly, write to the manufacturers of the products you use most, and ask them to introduce more "eco-friendly" products. Tell them you'll ask your local merchants to carry those products, and will buy them if they're available.

If people support environmentally sound products and services, sales of those products and services will increase. As manufacturers and merchants see increases in sales of a given market segment, they will shift production and merchandising to accommodate that growth.

If for example, a significant number of consumers decide to buy more fuel efficient cars, auto manufacturers will respond by developing and producing more fuel-efficient vehicles. If grocers suddenly discover that shoppers want (and will pay for) local agriculture products produced in a sustained manner, they will stock those products. If growers discover a market for products produced in a sustainable manner, they will shift production to respond to that market.

Educate yourself about the problems we face. Of course, one can learn about all the complex issues before us, so choose the ones that you feel are most important. Study them, debate them, and educate others about them. Talk to your friends, parents, neighbors and co-workers about the issues you feel are important.

Learn how various actions and impacts interact. Explore the connections between population trends, economic and social systems, and regulatory and legislative structures. Be aware of the consequences of your actions on a larger scale. If you leave the lights or television on, for example, somewhere a power plant or hydroelectric dam must burn more fuel or release more water through the turbines to supply the electricity. The end result is more carbon emissions in the atmosphere, or disruptions of fish stocks.

Join and support at least one environmental organization such as the Natural Resources Defense Council, Worldwatch Institute or the National Wildlife Federation. If you can support more, do so. Choose a group working on the issues most important to you, and become involved in the programs. If you can't afford to give money, give time and effort. Help with mailings, phone trees or petition drives in support of causes you care about. Become a member of a population education organization, such as Population Action International, the Population Reference Bureau or Zero Population Growth. Share their materials with others who are concerned about the environment.

On a global level, learn about and support programs to educate and empower people—especially women.



When women are given the opportunity and materials to control their own fertility, they have fewer children. Even minimal levels of education have proven beneficial in reducing fertility and delaying childbearing. The longer a family waits to have children, the greater their contribution to slowing population momentum. The more education a woman has, the more power she is likely to have in family decisions, the more economic options she has, and the less likely she is to need or want several children.

Learn about and support programs to help people achieve economic security in a sustainable manner. Enabling people to achieve a secure and sustainable livelihood significantly reduces pressure on the environment and on social structures, and it helps reduce population growth, because numerous children are no longer necessary to help support the family.

Learn about and support programs to provide health care, especially reproductive and child and maternal care. High rates of infant and child mortality are linked to higher fertility rates. Where child mortality is high, parents often have more children than really want, because they expect some of their children to die.

Considerable political opposition exists in this country to supplying family planning funding in the developing world. Typically, this is expressed as opposition to abortion. However, since unwanted and mistimed pregnancies are the principal causes of abortion, reproductive health advocates argue that improving family planning programs would be the single most effective means of reducing abortions.

Today, nearly 90 percent of national governments view family planning programs as integral to the basic services available to their populations. By supporting and funding health care programs that provide appropriate technologies, deliver services effectively, and support positive behavior changes in a culturally appropriate manner, you can help stabilize population and improve the quality of people's lives.

If families have access to reproductive health care, they can control both the number and spacing of their children. This is a key factor not only in stabilizing population, but also in saving lives. Unwanted or high-risk pregnancies kill tens of thousands of women each year. In some developing countries, maternal mortality is the leading cause of death among women aged 15 to 45. An inadequate birth spacing is linked to both child and maternal mortality.

According to United Nations Demographic and Health Surveys, more than 100 million couples want to control their reproduction, but lack access to safe, affordable means to do so. Because of lack of access to family planning information and materials, the incidence of unwanted or mistimed pregnancies remains high in much of the developing world, reaching 35 percent in Egypt, 55 percent in Kenya and 59 percent in Peru.

Bringing the issue of population out into political consciousness is extremely important. Write a letter to the editor of your local newspaper outlining population issues and impacts. Create a poster informing people about these issues. Volunteer for a candidate who supports sustainable ability, reproductive health and environmental protection. Write, call, fax or e-mail your state and federal representatives and express your concern about population issues, and ask about their positions on these issues. (Don't settle for a form letter reply. Demand specifics.)

It is extremely important to remember that most politicians are not leaders, but followers. They generally act to implement change only when their constituents demand it. If citizens want elected officials to support sustainable population and production policies, and to pass legislation to provide funding and implement those policies, they must lobby their representatives to do so. As the richest and most powerful nation on the planet, the United States can help stabilize global population both by initiating programs, and by setting an

example for other nations to follow. Our legislators must be moved to act.

When working to protect the environment, stabilize population and improve the quality of people's lives, it's important to remember that every effort you undertake is part of a large context. René Dubos perhaps said it best when he coined the phrase, "Think globally, act locally." Every contribution in your own community has a ripple effect which can spread across the planet, and which supports other efforts. As the United Nations International Conference on Population and Development reported, "efforts to slow population growth, to reduce poverty, to achieve economic progress, to improve environmental protection, and to reduce unsustainable consumption and production patterns are mutually reinforcing."

We can stabilize world population at a sustainable level, protect and enhance the environment, and balance out the inequalities between nations, individuals and genders. We have the knowledge, the technology and the capital available to do so. What we lack at this point is a vision of the world we would like to create, and the political will to implement it.

If we fail to recognize the severity of these problems and to implement appropriate solutions, the future of the human species is in dire jeopardy. The choice is ours to make. We must make it now.

## **Population and New Urban Environment**

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For some cities these are the best of times and the worst of times. Many rapidly growing cities have, for now, some of the best living environments for children. That growth comes at a very high price. As these new urban centers experience explosive growth, the lifeblood is sucked out of cities which were once bustling and diverse.

To see the challenges facing children in America's cities clearly, we need a wide-angle lens. Thriving cities or struggling cities are really two aspects of the same urban phenomenon. When the middle-class takes flight, we end up with economic segregation and an extraordinary geographic concentration of poor children. It might not portend all that well for the thriving cities either, as cities may follow a "boom and bust" cycle where we see once-gleaming shopping malls or downtown areas that are transformed over time into half-vacant relics unable to compete with the onslaught of super stores.

When we pave over farmland and obliterate small towns to create a spanking new city, we are in effect tossing an old central city onto the scrap heap. Millions of children live in those cities, victims of explosive growth, middle-class flight and a failure to invest in good schools, safe streets, and decent health care. They are our children. They deserve better.

One goal is to examine the relationship between quality of life and population dynamics. There are some revealing correlations between children's quality of life and total population, population density, and population growth rates in cities. Of these three population variables, population change has the most significant impact on quality of life.

Findings should support the argument that faster rates of population growth in the suburbs are linked to declines in quality of life in the city. Even though the data shows that cities growing at a rapid pace provide a better environment for children. They may not conclude that faster rates of population growth cause these cities to provide a better environment for children. Better environmental growth in a city, or related factors



could contribute to the association between rapid population growth rates and a positive environment for kids.

Examination of data shows that a predicting factor of both quality of life and rate of population change is a city's location within its metro area. Suburban cities located at the perimeter of metro areas have higher population growth rates and better quality of life scores than cities which are more centrally located in their metro area. Because class and race are frequently distributed according to these same geographic boundaries, it is reasonable to assume that these two social factors are integral in determining the quality of life a city provides for its children.

The data shows that a city's population size per se has little correlation to the quality of a child's life. While smaller cities tend to score better on many indicators than larger cities, the only indicator with which total population has a significant correlation is population density cities with more people tend to have a higher density.

## Population Density

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Population density has important associations with some quality of life variables. Some cities with higher population densities tend to have slower growth rates, higher unemployment and higher high school dropout rate. High density cities experience more violent crime, have more juvenile arrests, and have a lower number of family practice or general practitioner physicians than lower-density cities. Nonetheless, while these relationships are statistically significant, they are not particularly strong. For example, a city's high population density does not necessarily lead to a higher crime rate. Nor does a higher crime rate necessarily predict high population density's connection to the final score and general quality of life is relatively weak.

**Population Change** Of the three population variables, population growth rate has the strongest relationship to the quality of life indicators. Although no causal relationship is established, cities with faster population growth rates receive a better overall score. They tend to have lower percentages of children in poverty, lower rates of infant mortality and fewer teen births. These cities generally have higher family incomes and lower crime rates. On the other hand, higher population growth rates have loose-but significant associations with higher student-to-teacher ratios and with poorer air quality.

Even though the data indicates that children are better off living in cities with higher rates of population growth than they are living in cities that are losing population, this does not mean that a better quality of life is a result of population growth. Nor does it mean that related factors do not contribute to a higher quality of life.

Population increases and an improved quality of life can have an interdependent relationship. When people have the resources, they tend to move to cities that can provide the quality of life they desire. A growing economy, a low unemployment rate and a low crime rate will draw new families into a community, thus contributing to population growth. When people migrate to an area, they attract and bring capital and investment. Their presence creates jobs, with the attending tax base necessary to improve the infrastructures, education, and social services.

For the minority of children in this data who happen to live in a rapidly growing city, quality of life improvements can be seen as a result from a better quality of life.

Just as big population increases can correlate with a better quality of life, population declines caused by out-migration of the middle-class correlate with high rates of child poverty, infant mortality and teen births. The lowest ranking cities in the data saw population declines. The fastest declines city in the data is Hartford, CT. Hartford, ranked 169 out of 169, lost over percentage of its total population between 1980 and 1996.

Education for both young and old is the key to find solutions for the many complex problems caused by the population explosion.

## STUDENTS RESEARCH GUIDE

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Research is the process you go through to find information about a topic that interests you. This guide explains some basic tools needed to find and record information. It gives advice about how to conduct a research project and also provides many suggestions for developing a presentation of the topic.

A list of skills that you will use during research projects includes finding resources, choosing topics, writing and note taking, summarizing, organizing ideas, scanning, planning, and interpreting data.

Of course, the real quality of a project is determined by the personal characteristics you bring to it-things like patience, motivation, accuracy, neatness, humor, persistence, and creativity. There are no handouts that teach these things, but they are perhaps the most essential ingredients of a successful project.

1. Outlining: it sorts ideas and facts into categories.
2. Bibliographies: is a standard method for recording where information came from.
3. Notecards: are used to record and collect information.
4. Where to go for information: Libraries, Newspaper, State agencies or teachers.
5. Fact sheet: to record information that will be included in a presentation or report.

### Where in the United States Are You

Use two number lines to locate points on a plane. Locate places in the United States. Construct a vertical number line and a horizontal number line on a map of the United States. Use this system to locate points in the United States.

### Material

Map of the United States  
Atlas  
Globe

## Objectives

Locate points on a number line

Locate points on a plane.

Divide the plane into four regions called quadrants

Find the slope

## Procedure

1 Make a single number line and mark off the population of some cities.

1 Place the population of your hometown on the number line.

1 Make a number line and plot the distance from the state capitol to your hometown.

1 Mark the location of the center of the United States, somewhere in Kansas. At the center of the United States make a horizontal, and vertical number line. Explain what the Origin of a coordinate system is.

1 Mark the location of your hometown on the map of the United States. What is the distance from the two number lines to your hometown?

1 Divide the map of the United States into four regions. What are the names of regions 1, 2, 3 and 4? (Northeast, Northwest, Southeast, Southwest) Explain Quadrants?

1 How far North of the point in Kansas is New Haven? How far East?

1 The following requires adding the coordinates of various cities to that of New Haven:

How far North of Atlanta is New Haven? (Add the N-S coordinate, Kansas to

Atlanta to the N-S coordinate Kansas to New Haven.)

How far West of New Haven is Seattle? (Add the E-W coordinate, Kansas to

Seattle to the E-W coordinate, Kansas to New Haven.)

1 Scales: Measure with a ruler the distance from New Haven to Los Angeles. Use the map scale to translate that into miles.

1 How far south of New Haven is Los Angeles? How far West of New Haven is Los Angeles? Add the two. Is that the distance from New Haven to Los Angeles that you measured with the ruler? Why not?

1 Use Pythagoras' Law ( $a^2 + b^2 = c^2$ , where  $a$  is the N-S difference and  $b$  is the E-W distance) to calculate the distance from Los Angeles to New Haven. Is that the distance that you measured with the ruler? Explain how Pythagoras' law, and not simple addition is used to find distances.

1 Coordinates on a sphere: Show students a globe. Students should know, or be introduced to, the geographic terms North Pole, South Pole, and Equator. This may be some student's first experience with latitude and longitude. Explain how latitude and longitude act as grid lines on a sphere. Begin with a brief discussion of these terms, mentioning that the lines perpendicular to the equator are called 'meridians' and are used to measure longitude. The circles parallel to the equator are called 'parallels' are used to measure latitude.

### **Projecting the Rate of Population Growth**

The purpose of this activity is to familiarize students with the size of Connecticut's population, the rate at which it is currently growing and the historical pattern of growth. This exercise asks students to analyze data

in order to prepare them for a discussion of birth and death rates as they determine rate of population growth.

## **Materials**

Connecticut Registration Report

City Kids Count (Table 1. Infant mortality rate 1991 - pg 108)

Connecticut State and County Population Estimates Source (CEIS populations statistics)

<http://www.state.ct.us/ecd/research/ceis/population/projections.html>

Calculator

Worksheet

Basic math formulas sheet

IDB Summary Demographic Data

<http://www.census.gov/ipc/www/idbsum.html>

## **Objectives**

Students will:

1. Understand the effect of the rate of population growth upon the state of Connecticut.
2. Interpret a line graph.
3. Demonstrate the relationship between birth and deaths.
4. Find the percent of population increase or decrease.
5. Find the doubling time of population growth with percentages.

## **Procedure**

1. Calculate the population growth rate for the state of Connecticut from 1970 to 1990.
2. Using Table 1 shows the infant mortality Rates in 50 cities in the United States. Have students construct graphs of the 4 regions infant mortality rate?

- Take the population of the state of Connecticut in 1980 and increase the population yearly by 3%, 4% and 5% until the population doubles.
2. Make a prediction of the state of Connecticut's population what will it be in the year 2200.
  3. Graph your conclusions.
  4. Discuss doubling of the population.
  5. Have students look at (Java Version of the PoPClocks)  
<http://www.census.gov/aprd/www/html/clock.html>
  6. Look at world population growth rate.

## **A Cause of Poverty**

In this activity students will think about and respond to an important issue—is teenage pregnancy and childbearing a cause of poverty. Students will discuss the issue with their classmates, read and evaluate several sources of information related to poverty. Write a letter in which they take a position on poverty. Students will use skills and knowledge they have learning in their language arts, mathematics, science, social studies and other classes.

## **Materials**

Teenage Pregnancy and Poverty  
City Kids Counts  
Connecticut Registration Report  
Article on teenage pregnancy and childbearing  
Basic math formula  
Earth Matters Students Research Guide

## **Objectives**



1. Promote the concept of "Kids teaching Kids."
2. Discuss, as a class, the importance of accurately recording sources of information used in research.
3. Present what they have learned to the rest of the class.
4. Discuss and analyze the project upon its completion.

## **Procedure**

1. Give students the Student Research Guide it introduces them to the general requirements of a research project.
2. Have a discuss about what kind of thing's research is used for and why it is important for a person to be able to find information, record it, put it into some kind of order, and present it to other.
3. Arrange the class into small groups of three or four students each.
4. Provide students with some source materials containing several pieces of information related to teenage pregnancy, childbearing and poverty.
5. Students begin their research, using sources that are available or have provided themselves. that they
6. Each member of the small group will compose a letter to their congressperson to inform him/her of position.
7. The student will present their letter to the whole class.

## **Reading List**

Teenage Pregnancy and Poverty: The Economic Realities  
<http://www.bookconnection.com/books/0823922499.html>  
Listen Up! Teenage Mothers Speak Out  
<http://www.bookconnection.com/books/0823922545.html>  
Adolescent Pregnancy  
<http://www.cfoc.org/pregnacy.html>  
Teenage Pregnancy  
<http://cbs1.cornell.edu/Pam380598/teenagepregnancy.html>

## Worksheet #1

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### Counties

### Predictions

Place	Population	3% increase	4% increase	5% increase
Connecticut	3107576			
Fairfield C	807143			
Hartford C	807766			
Litchfield C	156769			
Middlesex C	129017			
New Haven C	761337			
New London C	238409			
Tolland C	114823			
Windham C	92312			

Source Connecticut 1980 Census

### Projection

Cities

Place Population 3% 4% 5%

### Datasheet

County	Births	Deaths	Infant Death	Mother teen
Fairfield	12510	7171	68	332
Hartford	10966	7861	86	528
Litchfield	2027	1572	4	41
Middlesex	1874	1336	14	32
New Haven	10723	7682	79	454
New London	3496	2141	22	125
Tolland	1591	849	7	28
Windham	1268	927	6	57

Source 1996 Connecticut registration report

### Basic Math Formulas

Percent increase or decrease = (birth rate-death rate)/10

Rate Score = (Highest rank-Lowest rank)/The range of rank

In order to determine the rate score, the first step is to figure out the city value and rank then from 1 to 169. Then find the range by subtracting the highest rank from the lowest rank.

Pop. 3%

100 3

103 3

106 3  
109 3  
112 3  
115 3  
118 3

121 3

**World Population Growth from year Zero to 2150**

Year	Population in Billions
0	0.30
1000	0.31
1250	0.41
1500	0.50
1800	0.98
1850	1.26
1900	1.65
1910	1.75
1920	1.86
1930	2.07
1940	2.30
1950	2.52
1960	3.02
1970	3.70
1980	4.45
1990	5.30
1994	5.63
2000	6.23
2025	8.47
2050	10.02
2100	11.19
2150	11.54
2200	11.6

**Infant mortality rate (deaths per, 1,000 live births) in 1991**

Rank	City	Rate
1	Miami	5.3

2	Austin	5.8
3	El Paso	6.4
4	Honolulu	6.5
5	San Diego	6.8
6	San Francisco	6.8
7	San Jose	6.9
8	San Antonio	7.1
9	Los Angeles	8.2
10	Phoenix	8.2
11	Boston	8.4
12	Nashville-Davidson	8.6
13	Long Beach	8.7
14	Tucson	8.7
15	Dallas	8.9
16	Seattle	9.1
17	Albuquerque	9.4
18	Houston	9.4
19	Tulsa	9.6
20	Sacramento	9.7
21	Oakland	9.8
22	Charlotte	9.9
23	Fort Worth	10.0
24	Omaha	10.5
25	Portland	10.5
26	Fresno	10.6
27	Denver	10.8
28	Indianapolis	10.8
29	Columbus	10.9
30	Jacksonville	11.0
31	Milwaukee	11.2
32	New York	11.4
33	Cincinnati	11.7
34	Oklahoma City	12.4
35	Toledo	12.6
36	Kansas City	12.7
37	Minneapolis	12.8
38	Virginia Beach	12.9
39	Baltimore	13.2
40	Atlanta	14.4
41	Philadelphia	14.5
42	New Orleans	14.6
43	Pittsburgh	14.6
44	Chicago	15.2

45	Buffalo	15.5
46	Memphis	16.3
47	Cleveland	17.0
48	St. Louis	17.2
49	Detroit	19.4
50	District of Columbia	21.0

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