USING CARTOGRAMS TO LEARN ABOUT LATIN AMERICAN DEMOGRAPHICS

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Rationale

Cartograms are special purpose maps used to illustrate some feature other than area. The cartographer (map-maker) tries to keep the countries in the same relative position and shape as they would be on a real map, but the size of each country is distorted according to how large or small the statistic is for that particular category of information. For example, on a cartogram for oil production, Saudi Arabia would appear to be the largest nation on the face of the earth, and tiny countries such as Bahrain and Kuwait would appear to be very large as well.

By making their own cartograms, students will be actively learning, rather than passively listening to a teacher's explanation. They will draw connections between physical, economic, social and cultural geography and will gain an understanding of the interrelationship between these fields of study. They will begin to develop a mental map of Latin America as they strive to maintain the shapes and relative location of the countries on their cartograms. The students will develop map analysis skills which will be useful as they interpret special purpose maps in the future. They will also need to employ math, research, and problem-solving skills to complete the task from an interdisciplinary approach.

In the final stage of the lesson, students will compare and contrast their two cartograms. They will then need to research and/or use higher level thinking skills to infer explanations for discrepancies

between the two cartograms. This will make them more responsible for their own learning. By including the United States in their cartograms, students will be able to draw on their own experience for purposes of comparison. Students will be working in pairs and cooperative groups during this lesson.

Lesson Overview

In this lesson, students will make their own cartograms, one illustrating the population of Western Hemisphere nations, and the other showing Gross Domestic Product. In the final stage of the lesson, students will compare and contrast two cartograms, one for population, and the other for Gross Domestic Product.

Objectives

Students will

1. learn the meaning and importance of several geographic terms, including special purpose map, cartogram, GDP, and per capita GDP,
2. understand the importance of the physical environment on economic development and standard of living of a country,
3. understand the interrelationship between physical, social, political and economic geographical factors in countries and regions,
4. learn to apply math skills to transfer numerical data to a graphical representation on a cartogram,
5. learn to analyze information and infer explanations for discrepancies on two special purpose maps.

Time Needed

2-3 class periods

Materials

1. Graph paper - 1 sheet per student, plus extra paper in case students make mistakes and want to start over
2. Plain white paper (optional)
3. Colored pencils or makers - 1 set of 5 to 6 colors per pair of students
4. Fine line black maker - 1 per pair of students
5. Lists of population and GDP statistics for Western Hemisphere countries - one per student OR resource materials for students to research and find these statistics on their own.

Procedures

1. Explain to students the following terms:

   special purpose maps: Maps that are intended to illustrate a single statistical feature

cartograms: Maps which show political units such as countries in their appropriate shape and relative location, but size is determined by the amount of whatever statistic is being illustrated. (Show students an example of a cartogram, if possible, from their text or on a wall map)

Gross Domestic Product (GDP): This is the total dollar value of goods and services produced in a country in one year.

2. (optional) Have students use their text or research materials to compile a list of Western Hemisphere countries, along with the population and GDP of each country. Another option is to have students find this information on the Internet. Possible sources for this information are listed in the bibliography.

3. Explain to students that they will be making their own cartograms. They will work in pairs, with one student making a cartogram for population, and the other will make a cartogram for Gross Domestic Product. Describe the process they will follow:

* Determine the number of squares on the graph paper by counting down and across, and multiplying.

* Determine how many people each square will stand for on the population cartogram. Remember to leave room for white space on the cartogram. Some countries may be left off the cartogram if they are "too small" to occupy a full square. (Note to teacher: On standard 4X4 ruled graph paper, one square per million people will work nicely)

* Do the same for the GDP cartogram. How many dollars will each square stand for? (On standard 4X4 ruled graph paper, one square per $10 billion GDP will work.)

* Working in pairs, one person will begin shading in the countries on the population cartogram, while the other will shade in the countries on the GDP cartogram. They should remember to keep the shapes and relative locations as accurate as possible.

* Students should use the same colors for each country as their partner, since they will be comparing their results. They will have to use the same colors more than once, but make sure that no two countries that bordereach other are the same color.

* (Optional:) For a cartogram with a more pleasing appearance, lay a plain white sheet of paper over the graph paper, and trace the patterns on the plain white paper.

* Outline the countries is fine line black marker.

* Every map must have a title. Ask students what an appropriate title would be for each cartogram, and remind them to title their cartograms.

* Every map must have a legend (key). These cartograms should have either be a statement such as "one square equals 1 million people" or the square may be illustrated and followed by the statement "= 1 million people."

4. When students have finished their cartograms, put pairs together into cooperative groups of four, and hand out the following worksheet. At this point, you may have students speculate on answers, or you may ask them to research to find the answers. Encyclopedias, U.S. State Department Fact Sheets, and your geography text book make good research materials. Other sources are listed in the bibliography.

5. As a class, go over the worksheet. The last question leads into a discussion on GDP, GNP, and per capita GDP, which is very important for students to understand.

Extending the Lesson

1. Explain to students the meaning of the term: "per capita GDP," which is found by dividing GDP by population. Have students create a cartogram illustrating "per capita GDP" on nations in the Western Hemisphere. Per capita GDP figures for this cartogram could be obtained from many of the same sources listed for finding population and GDP figures, or students could calculate per capita GDP themselves, using the formula: per capita GDP = GDP/population

2. Have students create a cartogram based on energy production. Next, they will compare and contrast their population cartogram with the energy consumption cartogram and draw conclusions from their findings.

3. Either as an assignment, or for extra credit, have students create cartograms based on other demographic data, such as highway miles, number of telephones, available nutrition, etc.

Worksheets and Handouts

Latin American Cartogram Activity

After you and your partner have completed the "Population of North and South America" and the "Gross Domestic Product—North and South America" cartograms, answer the following questions:

1. How does the GDP of the United States compare with that of the rest of the Western Hemisphere? Why might this be?

2. On which cartogram does Cuba appear to be smaller? Why might this be?

3. Haiti and the Dominican Republic are located on the island of _____. Which one has the lower GDP? Why might this be?

4. On which cartogram do the countries of Central America appear to be smaller? Why might this be?

5. On which cartogram do the South American countries of Paraguay and Bolivia appear to be smaller? Why feature do they share, which inhibits economic development? (Hint: Paraguay and Bolivia are the only countries in the Western Hemisphere with this feature.)

6. Which South American countries did not "shrink" too much from the population cartogram to the GDP cartogram? Why might this be?

7. Which countries appear to have the highest standard of living? Do we know this for sure? Why or why not?

Worksheet Answers (might include, but are not limited to the following):

1. The GDP of the United States is far greater than that of all the other countries in the Western Hemisphere combined. The United States also has the highest GDP of any country in the world. The United States has a wealth and large variety of natural resources, and is a world leader in industry and trade.

2. Cuba has few natural mineral resources. While they do produce agricultural products, sugar is the only major export. Cuba's economy was once subsidized by the Soviet Union, who paid artificially high prices for Cuban sugar, but that ended with the breakup of the USSR. Russia and the other former Soviet republics still buy Cuban sugar, but at market prices. Cuba's economic development is greatly limited by the United States embargo. Most of the countries in Latin America list the United States as their major trading partner, but U.S. companies are prohibited by law from trading with Cuba because of Castro's communist philosophy.

3. Hispaniola. Haiti has very little natural resources. They have limited deposits of bauxite (aluminum ore), but no other mineral deposits. While the Dominican Republic is not exactly rich in natural resources, they do have more than Haiti.

Also, the prevailing winds in these latitudes are from the East. The middle of the island of Hispaniola is mountainous. The winds blow moisture-laden air from the Atlantic Ocean up the slopes of these mountains, cooling the air, and forcing it to drop its moisture in the form of precipitation on the Dominican Republic's side of the island. Most of Haiti is in a rain shadow, and is quite dry. Therefore, agriculture is much more productive in the Dominican Republic, where sugar is a major export crop. Many Haitians work for low wages harvesting the sugar cane in the Dominican Republic, but the majority of the profits from the crop remain in the Dominican Republic.

4. All of the Central American countries appear to be very tiny on the GDP cartogram. Most of these countries lack mineral resources and industry is not well developed in Central America. Agriculture is difficult because of a mountainous terrain and rain forest environment, so only a small portion of the land is cultivated. These factors make development and movement of goods difficult as well. Political instability and revolution have also hindered economic development in Central America.

5. Paraguay and Bolivia appear to be much smaller on the GDP cartogram than on the population cartogram. These two countries are landlocked, which means they have no coastline. This makes trade with other countries very difficult, because neighboring countries will generally charge a fee for goods to pass through their territory. Bolivia appears to be fairly close to the Pacific Ocean, but the high Andes Mountains act as a barrier.

Bolivia is actually very rich in mineral resources. In addition to the distribution problems already mentioned, many of these minerals are very difficult to access and develop because the western portion of Bolivia is high in the Andes Mountains and much of the eastern region of the country is a dense rain forest. Political instability and revolutions in both Bolivia and Paraguay have also hindered economic development.

6. Venezuela, Brazil, Chile, and Argentina do not "shrink" as much as the other South American countries in South America. The most common theme is an abundance of natural resources in these countries, especially mineral resources.

Venezuela is rich in natural resources, especially oil, which is one of the most important natural resources in the world today because it is the most common source of energy. Brazil has a wealth of natural resources including precious metals (gold, silver) and some oil. Although the rain forest is not very productive for agriculture, there are areas in Brazil that are productive. Chile is the world's leading producer of copper and nitrates, and gold is present as well. Argentina has mineral resources and one of the world's most productive agricultural areas, the pampas (a large, fertile plain). The pampas were originally a grassland area, which now produces corn, wheat, soybeans and other crops, as well as beef.

7. The United States and Canada appear to have a higher standard of living than the Latin American countries. Among Latin American countries, Mexico, Venezuela, Brazil, Chile, and Argentina appear to have a higher standard of living than the rest, based on the information in the cartograms. However, a word of caution is in order: In many Latin American countries, there is a wide gap between the rich and the poor. If the wealth is shared by a small number of elite, there may be thousands of people living in poverty. Per capita GNP (GDP divided by population) can be a deceptive statistic.

Simplified notes on GDP

What is GDP?
GDP stands for Gross Domestic Product. It is the total value of goods and services produced in a country in one year.

How is GDP figured?
GDP (Gross Domestic Product) is a figured by adding personal consumer spending, business spending, government spending, and net exports (which can decrease GDP if net imports exceed net exports). GDP figures are estimates.

GDP figures you see usually are actually *real GDP*, which means they have been adjusted based on a base year's price index. This way, if the value of the peso falls to half of its previous level, Mexico's GDP will not double.

What is the difference between GDP and GNP?
GNP stands for Gross National Product, and was used by the U.S. Commerce Department until 1991, when they switched to GDP statistics.

While GDP measures the value of goods and services produced IN a country in one year, GNP measures the value of goods and services produced BY a country in one year. If General Motors, a U.S. company opens a factory in Mexico and the cars were sold in Germany, the value of the exported cars would count towards Mexico's GNP and towards the United States' GDP.

Who uses GDP figures, and what are they used for?

"GDP figures, though only estimates, are useful. Business people, economists, and government officials study them to determine how fast the economy is growing, and which countries are doing best. The figures also show how the economic progress of one country compares with that of other countries." (Taubman, Paul. World Book Encyclopedia, Vol. 8, 1994)

What is per capita GDP?

Per capita GDP is simply GDP divided by population. Per capita GNP is figured the same way. These figures give us an idea of the relative wealth of a nation. China's large GDP doesn't seem so impressive when divided by a billion people. Kuwait's GDP seems much more impressive when divided by its small population. As mentioned before, be very cautious about interpreting per capita GDP figures, because there may be an unequal distribution of wealth.

Gross Domestic Product of Western Hemisphere Nations (1993)

(1993 figures (estimated), Source: The 1994 World Almanac)

Argentina: 112 billion
Belize: 0.3 billion
Canada: 537 billion
Costa Rica: 6.4 billion
Ecuador: 11.8 billion
Guyana: 267 million
Mexico: 328 billion
Paraguay: 7.3 billion
Trinidad and Tobago: 5 billion
Venezuela: 57.8 billion

Bahamas: 2.6 billion
Bolivia: 4.9 billion
Chile: 34.7 billion
Cuba: 14.9 billion
El Salvador: 5.9 billion
Haiti: 2.2 billion
Nicaragua: 1.7 billion
Peru: 25 billion
United States: 5.95 trillion

Barbados: 1.8 billion
Brazil: 369 billion
Columbia: 51 billion
Dominican Republic: 8.4 billion
Guatemala: 12.6 billion
Honduras: 5.5 billion
Panama: 6 billion
Suriname: 1.3 billion
Uruguay: 9.8 billion

Population of Western Hemisphere Nations (1993)

(1993 figures (estimated), Source: The 1994 Information Please Almanac)

Argentina: 33,500,000
Belize: 200,000
Canada: 28,100,000
Costa Rica: 3,300,000
Ecuador: 10,300,000
Haiti: 6,500,000
Nicaragua: 4,100,000
Peru: 22,900,000
Uruguay: 3,200,000

Bahamas: 300,000
Bolivia: 8,000,000
Chile: 13,500,000
Cuba: 11,000,000
El Salvador: 5,200,000
Honduras: 5,600,00
Panama: 2,500,000
Suriname: 400,000
Venezuela: 20,700,000

Barbados: 300,000
Brazil: 152,000,000
Columbia: 34,900,000
Dominican Republic: 7,600,000
Guatemala: 10,000,000
Mexico: 90,000,000
Paraguay: 4,200,000
United States: 258,300,000
Trinidad and Tobago: 1,300,000

Bibliography

The Cambridge Factfinder. Ed. David Crystal. Cambridge, United Kingdom: Cambridge University Press, 1994.

The Cambridge Factfinder has a synopsis of each world nation, including population and GDP data. It also has a list of the 186 largest nations of the world by population, which are ranked in order from most to least populous. The data is somewhat inconsistent, since a particular nation might have 1990, 1991, or 1992 estimates.

Countries of the World and Their Leaders Yearbook 1995. Ed Nelia Dunbar. NY: Eastworld Publications, 1995.

The main portion of this two volume reference work is a compilation of U.S. State Department reports on specific world countries. The "geography" and "economy" sections of the State Department reports were useful in preparing the worksheet and teacher's answer sheet included in this lesson.

The 1994 Information Please Almanac, 47th Ed. Ex. Ed. Otto Johnson. NY: Houghton Mifflin Co., 1994.

This Almanac has a synopsis of each world nation, including figures for GDP and population (1993 estimates). These were the figures used in compiling the data sheets included with this lesson. Figures for production and consumption of "Energy, Petroleum, and Coal" by country are also available if one wishes to use that data in extending the lesson. Data on values of imports and exports is also available. This Almanac is also available on computer diskette.

Geodata, The World Geographic Encyclopedia. Ed. George Thomas Kurian. Detroit: Gale Research Co., 1989.

This is a descriptive encyclopedia with articles on each world country. Statistics are limited and descriptions are brief.

Goode's World Atlas, 18th Ed. Ed. Edward B. Espenshade, Jr. Chicago: Rand McNally, 1994.

The first page of the Goode's World Atlas describes cartograms and their use. It also contains a number of special purpose maps, including cartograms, which may be used to illustrate to students what a cartogram looks like. There is a world population cartogram which may be used to compare with students' work to check for accuracy.

Latin American Political Database, Georgetown University—OAS Resource Unit on Democratic Governability. World Wide Web: http://georgetown.edu.LatAmer/Political/summary.htm

This web site contains the same data as the CIA World Fact Book, but it is a little handier for the purposes of this lesson in that it contains data for Latin American nations only. A map of each country is also available.

The 1994 World Fact Book. Central Intelligence Agency. Washington, 1994.
URL: http://www.odci.gov/cia/publications/94fact/fb94toc/fb94toc/html/

This is an excellent resource, with alphabetically arranged articles on all world nations. Figures are given for population, GDP, labor force, irrigated land, imports, exports, electricity, railroads, highways, airports, and

telephones. <u>The CIA World Fact Book</u> is also available on the internet through numerous gopher sites (one path is through the University of Minnesota gopher: gopher.micro.umn.edu path: libraries/reference books/CIA World Fact Book) and world wide web

Showers, Victor. <u>World Facts and Figures, 3rd Ed.</u> New York: John Wiley and Sons, 1989.

This reference book provides lists of statistics on population, GDP, energy production, exports, imports, length of railroads, motor vehicles in use, air traffic, telephones, TV's, and number of students. They are conveniently listed by continents, but this particular edition (1989) is not as current as one would like.

Taubman, Paul. "Gross Domestic Product (GDP)". <u>World Book Encyclopedia</u>, Vol. 8. 1994.

This encyclopedia article contains a simple and concise explanation of GDP, GNP, and per capita GDP, as well as how each is figured, who uses these figures, and what they are used for.

<u>USAID Latin America and Caribbean Economic and Social Data</u>. World Wide Web: *http://lanic.utexas.edu:80//lodregion/aid/aid94/Country/*

This web site contains "country tables" for Latin American countries, with population and economic statistics for each year from 1984-93.

<u>World Geographic Encyclopedia, Volume 2, Americas</u>. English Ed. Ed. Sybil P. Parker. Milan: Federico Motta Editorre, 1994.

This is a very valuable reference for the worksheet and answers sheet in this lesson. It contains an excellent and fairly detailed article on each American country. The "economic summary" section of each article gives a good explanation of that country's relative wealth. A unique perspective is presented, since this is an English translation of an Italian work, so there is no United States bias. "Socioeconomic data" figures are found in a yellow box in each article. This section contains population and per capita GDP figures, as well as hard-to-find figures on energy consumption and available nutrition, measured in calories.

<u>Worldmark Encyclopedia of the Nations: Americas</u>. Developmental Ed. Jane Hoehner. New York: Gale Research Co., 1995.

More articles on each country of the Western Hemisphere are contained here, along with some statistics.