Hurricanes and the Interdependence of Scales

Note: This lesson is a great one for the first few days of the A.P. course, since in a typical August or early September there will be a hurricane event affecting the United States and widely reported in the media. This lesson could be modified to be used in conjunction with forest fires, blizzards, droughts, or other natural disasters.

Objectives

1. Students will learn to apply the concept of geographic scales to a current event which involves physical geographic and human geographic components.
2. Students will be able to describe how local-scale processes influence larger-scale processes even to the extent of the global scale.
3. Students will be able to demonstrate how human processes, trends, and practices that appear homogenous when visualized on larger scales display diversity when visualized on smaller scales such as the local scale.

Materials and Equipment Needed

1. Access to hard-copy and web-based news sources (in our case, the Washington Post, washingtonpost.com, weatherchannel.com, and archived maps from the Hurricane Katrina disaster and recovery effort of 2005; as well as U.S. Census data at census.gov.
2. Maps of the U.S. Gulf of Mexico coast (or East Coast if applicable) showing the locations of petrochemical plants, refineries, ports, and oil/gas platforms.
3. Ideally, the ability to search the Web in real time during class and view search results as a class.
4. A whiteboard or blackboard, and markers or chalk.

National Geography Standards applicable

1. How to use maps and other geographic representations, tools, and technologies to acquire, process, and report information.
3. How to analyze the spatial organization of people, places, and environments on Earth's surface.
7. The physical processes that shape the patterns of Earth's surface.
11. The patterns and networks of economic interdependence on Earth's surface.
14. How human actions modify the physical environment.
15. How physical systems affect human systems.
16. The changes that occur in the meaning, use, distribution, and importance of resources.
18. To apply geography to interpret the present and plan for the future.

Key Concepts Included in the Lesson

Scale: domicile, neighborhood, census tract, municipality, parish/county, state, region, national, international, global
Connectivity and transferability
Interdependence of scales
Globalization
Distance decay

Steps to Complete the Lesson

1. Introduction: In the news this week we are all hearing about Hurricane _____ [Gustav]. It is hard to pick up a newspaper, surf the Internet, listen to the radio, etc. without hearing the latest updates on this evolving story. Today as geographers we will investigate this event as an interaction between physical and human processes. In particular we will attune our ears and eyes to see how processes both physical and human occurring at very local scales end up affecting processes that happen at very large scales, even as large as the global scale. Then, working from the other end of the continuum, we will see how a kind of "feedback effect" causes global scale processes to affect smaller scale processes all the way down to the smallest scale – the domicile scale. I guarantee that this will change the way you think about this storm as well as about how you respond to the next storm that threatens you! When we've finished our investigation, you'll go home with the assignment to describe a domicile-scale process that is affected by larger scale processes and that in turn affects larger scale processes. If this all sounds obscure to you right now, don't worry. We are probably applying new terminology to things you've already thought about.

2. Informal student assessment: How much do you know about the current storm? [Take answers.] What decisions have individual people living in that area had to make in the past few days? [Take answers.] What policies and procedures have been put into action by towns, parishes/counties, states, and federal agencies in preparation for and in response to this storm? [Take answers.] Lastly, what kinds of economic effects are you aware of storms like this having, or potentially having? Is there any way this storm could affect you or your family indirectly? [Take answers.]

3. Let's take a moment to talk about the geographic concept of "scale." We already know what is meant by the scale of a map. For example, a map scale of 1:2,000 indicates that 1 inch on the map corresponds to – who can tell me? – inches on the ground. But the other sense in which geographers talk about scale refers to the size of the area within which a given process is being observed. For example, in a severe storm we could observe physical processes on a very small scale – that is, in a very small area. At the scale of the domicile, or individual house, we could measure, for example, how much water entered your basement – and then perhaps compare that with the basement next door which is slightly downhill from your house. We could observe, for example, at what time your family decided to heed an evacuation order, what means of transportation you chose to (or were able to) use, and what you took with you. One big decision: would you take or leave your pet? (Not everyone decides this question the same way!

At the opposite extreme from the domicile scale, what would be the largest scale we could consider? That's right: the global scale. Let's write out a continuum of scales running across the board from most local to most global, like this:

SCALE> PROCESS\/	Domicile	Neighborh'd	Census Trct.	City/Cty.	State	National	Global
Physical							
Cultural							
Economic							
Political							

Down the left-hand side we have written some general types of processes that could be observed at these different scales.

4. Let's see how we might fill in some of these rows.

The physical process in this case is the hurricane. What might we observe of the hurricane at the various scales?

Domicile scale: Storm surge floods first floor of house.
Neighborhood scale: All houses have their first floor flooded.
Census tract scale: Houses on the higher-elevation west side avoid getting flooded.
City/county scale: All of the city's levees break except the one furthest upstream by the wealthiest neighborhood.
State scale: South-central portion of state bears brunt of wind and water damage.
National scale: Heavy rains throughout the Mississippi Valley and tornadoes in south-central states.
Global scale: Eastern part of North Atlantic cools more quickly; winter comes sooner by two days to Northern Europe.

Now let's consider an economic process: the production and distribution of gasoline.

Domicile scale: This particular family had only enough gas in the tank to get halfway to Baton Rouge and had to abandon their car and hitchhike the rest of the way to a relative's home.
Neighborhood scale: Both local gas stations on the main drag experienced a run on their supplies and were completely out of fuel one hour after the evacuation order was officially issued.
Census tract scale: This is a poor census tract in which more of the people who do own cars had deferred maintenance or were buying a fraction of a tank at a time because of high prices, so most families had less than half a tank, or an unreliable car, when they realized they needed to evacuate.
City-county scale: This county (parish) has Interstate 10 running along its north side. Gasoline is cheaper there because there is more competition, but supplies were bought up sooner by people leaving New Orleans heading west.
State scale: The approaching storm led oil companies to shut down all offshore oil rigs and refinery facilities beginning five days before the storm. Deliveries of gasoline to outlets in the southern part of the state were delayed or cancelled beginning three days before the storm.
National scale: Oil-futures traders on Wall Street bid up the price of petroleum beginning seven days before the storm hit the U.S. coast when advanced weather-tracking systems began predicting a better-than 20% chance that the storm would affect Gulf of Mexico extraction and refining operations. The nationwide average price of a gallon of gasoline shot up 26 cents in one week.
Global scale: OPEC representatives held an emergency conference call to consider whether to ramp up production to offset the loss of supply from the Gulf of Mexico. Russian officials decided that this latest threat to world oil supply would increase U.S. designs on constructing a gas pipeline through Georgia from the Caspian Basin, and so reached the decision to make their occupation of Georgian Black Sea ports permanent. Rebels in the oil-producing region of coastal Nigeria seized the opportunity to take 15 Shell Oil workers hostage and to blow up three oil pipelines. Iraqi officials forced U.S. negotiators to move up the scheduled date of American troop withdrawal be three months in exchange for promises of guaranteed supplies from Iraqi oil fields.

5. [Teacher leads class in filling in the rows for "cultural process" and "political process." For example, with respect to political process, an individual voter might decide to change his/her party