Lesson Title	GIS Day – Evacuation
Length of Lesson	1 day (90 minutes)
Created By	Calista Guthrie, Sean Owens, Hannah Box
Subject	Geosciences
Grade Level	7th grade/ 8th grade
State Standards	1c, 4c/ 4c, 4h
DOK Level	DOK 2
DOK Application	Cause/Effect, organize, collect and display, predict,, summarize, estimate, compare, interpret
National Standards	K-12: Unifying Concepts and Processes
Graduate Research Element	Science

Student Learning Goal:

Students will understand the risks associated with a specific natural disaster (hurricane). They will perform risk analysis when considering the hazard and estimate the number of people that will be affected. Based on this analysis, options for reducing or eliminating risks will be determined.

State Standards:

Seventh Grade:

Inquiry:
1c. Collect and display data using simple tools and resources to compare information (using standard, metric, and non-standard measurement). (DOK 2)

Earth and Space Science:
4c. Describe the causes and effects of heat transfer as it relates to the circulation of ocean currents, atmospheric movement, and global wind patterns (e.g., trade winds, the jet stream). Provide examples of how these global patterns can affect local weather. (DOK 2)

Eighth Grade:

Earth and Space Science:
4c. Examine weather forecasting and describe how meteorologists use atmospheric features and technology to predict the weather. (DOK 2)

4h. Justify why an imaginary hurricane might or might not hit a particular area, using important technological resources including (but not limited to) the following: (DOK 2)

National Standards 5-8:

National Science Education Standards of Content 5-8:

A: Science as Inquiry:

- IDENTIFY QUESTIONS THAT CAN BE ANSWERED THROUGH SCIENTIFIC INVESTIGATIONS. Students should develop the ability to refine and refocus broad and ill-defined questions. An important aspect of this ability consists of students' ability to clarify questions and inquiries and direct them toward objects and phenomena that can be described, explained, or predicted by scientific investigations. Students should develop the ability to identify their questions with scientific ideas, concepts, and quantitative relationships that guide investigation.
- USE APPROPRIATE TOOLS AND TECHNIQUES TO GATHER, ANALYZE, AND INTERPRET DATA. The use of tools and techniques, including mathematics, will be guided by the question asked and the investigations students design. The use of computers for the collection, summary, and display of evidence is part of this standard. Students should be able to access, gather, store, retrieve, and organize data, using hardware and software designed for these purposes.
- THINK CRITICALLY AND LOGICALLY TO MAKE THE RELATIONSHIPS BETWEEN EVIDENCE AND EXPLANATIONS. Thinking critically about evidence includes deciding what evidence should be used and accounting for anomalous data. Specifically, students should be able to review data from a simple experiment, summarize the data, and form a logical argument about the cause-and-effect relationships in the experiment.

D: Earth and Space Science:

- STRUCTURE OF THE EARTH SYSTEM. Global patterns of atmospheric movement influence local weather. Oceans have a major effect on climate, because water in the oceans holds a large amount of heat.

E: Science and Technology:

- DESIGN A SOLUTION OR PRODUCT. Students should make and compare different proposals in the light of the criteria they have selected. They must consider constraints – such as cost, time, trade-offs, and materials needed- and communicate ideas with drawings and simple models.
- UNDERSTANDINGS ABOUT SCIENCE AND TECHNOLOGY. Technological solutions have intended benefits and unintended consequences. Some consequences can be predicted, others cannot.

F: Science in Personal and Social Perspectives:

- NATURAL HAZARDS. Internal and external processes of the earth system cause natural hazards, events that change or destroy human and wildlife habitats, damage property, and harm or kill humans. Natural hazards include earthquakes,

landslides, wildfires, volcanic eruptions, floods, storms, and even possible impacts of asteroids.

- RISKS AND BENEFITS. Risk analysis considers the type of hazard and estimates the number of people that might be exposed and the number likely to suffer consequences. The results are used to determine the options for reducing or eliminating risks.
- RISKS AND BENEFITS. Students should understand the risk associated with natural hazards (fires, floods, tornadoes, hurricanes, earthquakes, and volcanic eruptions), with chemical hazards (pollutants in air, water, soil, and food), with biological hazards (pollen, viruses, bacterial, and parasites), social hazards (occupational safety and transportation), and with personal hazards (smoking, dieting, and drinking).

Materials Needed (supplies, hand-outs, resources):

1) Website: arcgis.com
    a. Map: MSU GK12 Inspire GIS Day 2012 - Evacuation http://www.arcgis.com/home/item.html?id=d99a8003af744f298b206fa70cba41c1

2) Worksheet: INSPIRE_LP_GIS_Evacuation_11_01_12_Worksheet (attached)
3) Power Point: INSPIRE_LP_GIS_Evacuation_11_01_12_ppt (attached)

Lesson Performance Task/Assessment:

1) Evaluate the relative risk posed to Mississippi residents by Hurricane Isaac.
2) Evaluate the counties at higher risk in Mississippi and plan for their evacuation.
3) Evaluate the route Columbus, MS residents would travel in the event of a natural hazard.

Lesson Relevance to Performance Task and Students:

Students will have an understanding of how science and technology affect the lives of the average Mississippian. They will use science and GIS technology to solve the real-world problem they are presented with. They will have to present their solutions keeping the general public in mind.

Anticipatory Set/Capture Interest:

Students will view a simulated news report about an impending hurricane as a large group before splitting into their specialty GIS day groups.

Guided Practice:

Students will be given a brief introduction to hurricanes covering the following topics:

- What is a hurricane, how do they happen, and where do they happen?
- What is an evacuation route and what goes into making these plans?
- What are watches/warnings and who issues watches/warnings?
- Discuss storm paths.
- How do hurricanes affect humans?
- Hurricane Katrina will be used as an example.

Independent Practice:

Students will plan the best route for evacuation of Columbus, MS in the event of a hurricane.

Remediation and/or Enrichment:

Remediation: Individual IEP. Give students a detailed tutorial of the online program.

Enrichment: Discuss the long-term effects on the city of Columbus from a devastating hurricane.

Check(s) for Understanding:

Students will complete the attached worksheet and make presentations to the entire group detailing their work. Review activity sheet with students and have students practice what they can report out to the Governor about what they have determined using GIS about their topic (Evacuation, Storm Track, Flooding). ALSO- select a couple of students who will do the reporting out to the whole group.

Closure:

Students will reconvene in the main room to report out to the Governor about their findings and to hear about what the other groups discovered using GIS.

Possible Alternate Subject Integrations:

Chemistry: There is a lot of chemistry in the science of hurricanes.

Teacher Notes:

http://www.nhc.noaa.gov/

http://www.nytimes.com/2005/09/06/opinion/06tierney.html?ei=5090&en=9673a9d11f3210a0&ex=1283659200&partner=rssuserland&emc=rss&pagewanted=print