Name: Suzi Ring and Nancy Burnette Date: 4/29/11

Unit Title: Google Earth/Data Lessons

Grade Level: 5-8
Subject: Science
Unit Length: two to three weeks

Brief Summary of Unit

This unit is designed to expose students to Google Earth to use as a tool and to see whether students can make sense of data by recognizing seasonal cycles and trends.

Stage One – Desired Results

Establish Goals: Science

A. Unifying Themes

A1. Systems

Students apply the principles of systems, models, constancy and change, and scale in science and technology.

a. Explain how individual parts working together in a system (including organisms, Earth systems, solar systems, or man-made structures) can do more than each part individually.

c. Describe how systems are nested and that systems may be thought of as containing subsystems (as well as being a subsystem of a larger system) and apply the understanding to analyze systems.

A3. Constancy and Change

Students describe how patterns of change vary in physical, biological, and technological systems.

a. Describe systems that are changing including ecosystems, Earth systems, and technologies.

b. Give examples of systems including ecosystems, Earth systems, and technologies that appear to be unchanging (even though things may be changing within the system and identify any feedback mechanisms that may be modifying the changes.

c. Describe the rates of change and cyclic patterns using appropriate grade-level mathematics.

C. The Scientific and Technological Enterprise

C3. Science, Technology, and Society

Students identify and describe the role of science and technology in addressing personal and societal challenges.

a. Describe how science and technology can help address societal challenges including population, natural hazards, sustainability, personal health and safety, and environmental quality.

Identify personal choices that can either positively or negatively impact society including population, ecosystem sustainability, personal health, and environmental quality.

D. The Physical Setting

D2. Earth

Students describe various cycles, physical and biological forces and processes, position in space, energy transformations, and human actions that affect the short-term and long-term changes to the earth.

b. Describe Earth's Systems – biosphere, atmosphere, hydrosphere, lithosphere- and cycles and interactions within them (including water moving among and between them, rocks forming and transforming, and weather formation.)

f. Give examples of abrupt changes and slow changes in Earth Systems.

E. The Living Environment

E1. Biodiversity

Students differentiate among organisms based on biological characteristics and identify patterns of similarity.

a. Compare physical characteristics that differentiate organisms into groups (including plants that use sunlight to make their own food, animals that consume energy-rich food, and organisms that cannot easily be classified as either.)

E2. Ecosystems

Students examine how the characteristics of the physical, non-living (abiotic) environment, the types of behaviors of living (biotic) organisms, and the flow of matter and energy affect organisms and the ecosystem of which they are part.

a. List various kinds of resources within different biomes for which organisms compete.

b. Describe ways in which two types of organisms may interact (including competition, predator/prey, producer/consumer/decomposer, parasitism, and mutualism) and describe the positive and negative consequences of such interactions.

c. Describe the source and flow of energy in the two major food webs, terrestrial and marine.

Describe how matter and energy change from one form to another in living things and in the physical environment.

Understandings: What will students understand (about what big ideas) as a result of the unit? "Students will understand that…" *their school is part of a watershed. *climate has seasonal cycles and trends. *data can be gathered to demonstrate these cycles and trends. *the importance of phytoplankton in any food chain. *the affects of climate and weather on plankton. *the difference between weather and climate. *the difference between a cycle and a trend.	Essential Questions: What arguable, recurring, and thought-provoking questions will guide inquiry and point toward the big ideas of the unit? *How can maps be used to show watersheds? *What kind of data can be used to show climate? *How can data be used to show cycles and trends in climate? *What is phytoplankton and why is it important? *What factors influence the growth of phytoplankton? *What is the difference between weather and climate? *What is the difference between a cycle and a trend? *What are the boundaries of this system we are studying? (Inputs/Outputs, Interactions)

Students will know:
their school is part of a watershed.
climate is different than weather.
data can be gathered over a period of time, to demonstrate cycles and trends in climate.
phytoplankton is an important component to the Earth food system and can be used as an indicator for climate change.
there are many factors, some naturally occurring and some occurring because of human influence, that affect the growth of plankton.

Students will be able to:
collect data, from GoMOOS and other sources, and use it to find the answer to pre-developed questions.
after analyzing the data collected, determine if more data is needed, or different data.
use Google Earth to find their house, their school, and their proximity to the ocean.
find what watershed their school is part of.

Stage Two – Assessment

Formative assessment-graph several sets of data
-Graph interpretation (Write a summary. Can students identify a cycle? Can students identify the cycles that are represented by the graph data?)
-Compare different cycles (resource: Earthobservatory site)

Culminating Assessment:

(Discussion)-Preparation for the assessment

Discuss what creates the growth in chlorophyll/phytoplankton, the temperature or rainfall?

Students are given seasonal maps and graphs to refer to.

Prompt: If the temperature were to rise 10 degrees, what affect would this have on the phytoplankton population and why? Justify the response using data from the maps, graphs, and other materials provided.

At the 6th grade level, students will complete a graphic organizer. The response will include two outcomes, each with two supporting pieces of evidence from the materials provided.

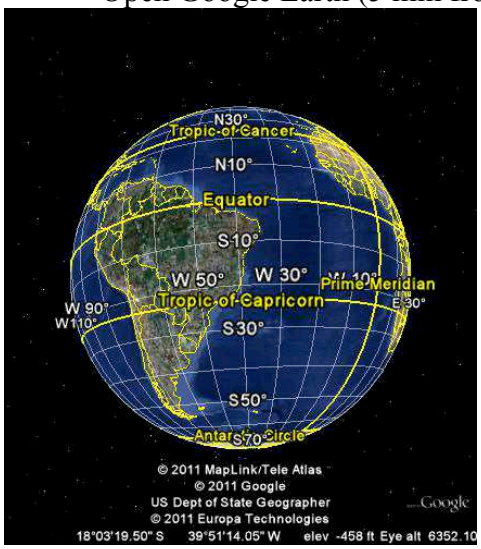
At the 8th grade level, students will write a constructed response, explaining what will happen to the phytoplankton population and why, and will justify the response with at least three reasons with three supporting details for each reason. Finally, a summary of all the points will be included.

Stage Three – Learning Plan
Learning Activities:

Introductory Google Earth Lesson

Environment: In the learning lab- each student at a computer- video projection screen up front for students to observe. (45 min class)

- Open Google Earth (5 min from log in to program open)



- Familiarize students with the window on the left of the screen- the search and the layers tabs.
- Have students use the toolbar clicking on the view tab, add and take away the grid, the atmosphere, the sun, and water surface. (5 minutes)
- Have students type in the school address and search for it. Ask them to discuss what happened when they hit the magnifying glass. (Talk about the way the world spun, focused, and then zeroed in.) Show them how to zoom in more and zoom out. Show them where to find the timeline in the toolbar that shows images from different years. What is the difference between the images? Some were taken in summer, winter, spring and fall (15 minutes)
- Have students type in their own home addresses. Use the layers and check the timeline and explore the program. (15 min)
- Shut down, log off and write down 3 things about the program that they found cool to be discussed in class the next day (5 min)

Follow up activities:

Find your home and mark it.
Use the "ruler" from "Tools" to plot your route to school.
Trace the river in your school's watershed to the nearest ocean.
Collect temperature data from local NOAA station for one year, ten years, compare to find cycles and trends (http://lwf.ncdc.noaa.gov/oa/climate/stationlocator.html).
Go to GOMOOS (http://gomoos.org/)
Go to EarthObservatory (http://earthobservatory.nasa.gov/GlobalMaps/) to compare local temperature data to global temperature map.
Integrate graphing into the lesson by using temperature data.

Phytoplankton Strand:

1. How is phytoplankton the base of the food chain?
2. Examine slides of plankton-what is plankton, what do they need to grow and thrive? What is their function in a food web? What happens to them in the months of low population?
3. Differentiate between phytoplankton and zooplankton
4. Different kinds of plankton/by patterns/level found in the ocean/form and function/adaptations
5. "Create a Plankton" Activity
   http://marinediscovery.arizona.edu/lessonsF00/sea_cucumbers/2.html
   Tie adaptations in for more sophistication with older students (have them create plankton with different adaptations). (Extension activities on www.bigelow.org/foodweb/microbe2.html)
   Phytoplankton Monitoring
http://www.ncddc.noaa.gov/files/PMN.pdf
6. Overlay overheads for seasonal phytoplankton to examine data

Climate Strand:

1. Pre-activity Ocean Density/Currents
2. What is one question that is answered by a comparison between two maps (Chlorophyll and Sea Surface Temperature) Earthobservatory.nasa.gov/GlobalMaps/
3. Innoculate two petri dishes, put one in refrigerator and one in a dark place in the classroom. (Run comparison to two plants at the same time) Idea: Growth is dependent on temperature. Compare back to the Chlorophyll/Sea Surface Temperature maps.
4. GOMOOS-Sea Surface Temperature comparison www.gomooos.org/buoy/satellite.html (sea surface temperature, by year, chlorophyll, by year)
5. Collect data/connect to GOMOOS/collect temperature and weather data
6. Build spreadsheet/create graphs
7. Look at trends/generate questions
8. Look at seasonal variations/overlay overheads to look at seasonal data

Resources:

*Sally's Seasons and the Sea lesson (See applicable below)
-Use all slides except 1,8, 10, 12, 14, 16, 18, 19

*Bigelow Labs (www.bigelow.org) has different strains of phytoplankton and where they can be found using maps. They show seasonal color changes due to amounts of chlorophyll, too.
http://www.absc.usgs.gov/research/seabird_foragefish/marinehabitat/home.html has a great overview of a marine habitat, complete with phytoplankton and zooplankton, and a very readable discussion of the parameters, temperature, salinity, etc.

Other possible activities/ideas:

Identify continents, using GoogleEarth
Find 5 cities on the same latitude, record longitude and latitude to also find on GoogleEarth
Find the average temperature for each month for each city above and average rainfall
*The EarthObservatory site is an excellent resource to examine cycles and trends (i.e. comparing the surface temperature map to the surface temperature anomaly map).

Adapted from the Understanding by Design Template available online, Understanding by Design: Professional Development Workbook, and the appendix of Understanding by Design (2005) text.

References
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