In Search of GLOBE Data Lesson Plan

Purpose:
1. Encourage the use of on-line GLOBE visualization tools.
2. Understand the value of GLOBE data in science and technology instruction.

Overview:
Students use on-line GLOBE search tools to locate and display data from schools and use the data to answer questions regarding weather and climate.

Science Standards:
This activity addresses the following content and cognitive domains according to the Trends in International Mathematics and Science Study (TIMSS), 2007:

Fourth-Grade Content Domains
- Earth Science
  - Earth's Processes, Cycles, and History

Eighth-Grade Content Domains
- Earth Science
  - Earth's Processes, Cycles, and History

Cognitive Domains
- Knowing
  - Illustrate with Examples
- Applying
  - Compare/Contrast/Classify
  - Relate
  - Interpret Information
  - Explain
- Reasoning
  - Analyze/Solve Problems
  - Hypothesize/Predict
  - Draw Conclusions
  - Generalize
  - Justify

This activity addresses the following content science standards according to the (U.S.) National Science Education Standards:

Science as inquiry
- An appreciation of "how we know" what we know in science,
- Skills necessary to become independent inquirers about the natural world.

Earth and space science (Content Standard D)
- Changes in the earth and sky (Grades K-4)
- Structure of the earth system (Grades 5-8)
- Energy in the earth system (Grades 9-12)

Note: For state specific alignment, visit <**www.aligntoachieve.com**>.

Level:
This activity is suitable for students who possess a beginning understanding of cause-and-effect relationships; the ability to read simple graphs and tables and are able to make simple data comparisons; know basic weather-related phenomena; and are able to create, interpret, and make predictions from charts, diagrams, and graphs based on information provided; principally grades 6 to 12. For younger students, or students who do not possess these skills, teachers may need to provide more input at various steps, while for students with more experience at looking at graphs of data, less teacher input would be necessary.

Time:
One to two class periods.

Materials included:
1. In Search of GLOBE Data – Student Worksheets for two projects:
   a. Creating graphs (Project #1: parts 1, 2, and 3)
   b. Creating maps (Project #2)
2. In Search of GLOBE Data – Teacher Answer Sheet.
3. In Search of GLOBE Data – Advanced Search.

Materials needed:
1. Computers with Internet connection.
2. One (1) large world map to display on the wall (optional).

Lesson Preparation:
1. Review Lesson Plan; make copies of appropriate student worksheets.
2. Assure that GLOBE Web site is accessible through firewall (if applicable).

Procedures:
1. Present the activity to the students – they will be following two self-paced projects on creating graphs and maps using on-line tools available on the GLOBE Web site <www.globe.gov>. The first project contains three parts.
2. Student worksheets include questions inquiring into what the students see or think about the data presented.

Further Assignments:
1. Teacher provides "In Search of GLOBE Data – Advanced Search".
2. Students work in pairs or teams search for science projects ideas.

Assessment:
1. Teacher can ask students to use their skills in finding GLOBE data to search for schools in certain countries or regions with Hydrology, Soil, or Land Cover data.
2. Good follow-up activities are "Where in the World" and "What is the Temperature in"

In Search of GLOBE Data – Student Worksheet

Project #1:
Part 1: Creating graphs using GLOBE data

Step 1: From the GLOBE Home Page, www.globe.gov, place your mouse cursor over *For Students*; move the cursor down to highlight *Maps and Graphs*; move the cursor over to highlight *Graphs*; click on *Graphs*.

Step 2: Choose *Benin* from the Country list under *SCHOOL LOCATION: Country Search* and click on *Go*.

Step 3: Place a checkmark by *Lycee Behanzin, in Porto-Novo*, by clicking in the square next to the school name and click on *Go* in the green box next to "Make a Graph" above the table of schools.

Step 4: The default graph will be for Maximum Air Temperature.

What do you notice about this graph? _____

_____

Step 5:   Scroll down until the *Other Options* box is visible. Click on *Select Option* and move the cursor so that *Add or change schools* is highlighted and click on *Go*.

Step 6: Choose *Argentina* from the Country list under *SCHOOL LOCATION: Country Search* and click on *Go*.

Step 7: Place a checkmark by the two schools: *Escuela Provincial No. 38 Julio Argentina Roca* and *Escuela de Ensenanza Media 7 "Nicolas Copernico", Buenos Aires* by clicking in the squares next to the school names.

Step 8: Click on *Go* in the green box next to "Make a Graph" above the table of schools.

The graph that appears should contain 3 schools' data (the graph from *Lycee Behanzin* and the two that were just added).

What do you notice about this graph? (Note: Latitudes and Longitudes of the schools can be found below the graph in the list of Selected Schools under the *Other Options* box.)

_____

_____

Step 9: Scroll down so that the *Other Options* box is visible at the top of the screen and the information about the three selected schools is near the center of the screen. Notice that there are small squares under each school's information with a checkmark in the squares. Click in the squares for the two schools, *Escuela Provincial No. 38* and *Escuela de Ensenanza Media 7 "Nicolas Copernico"*, to remove the checkmarks in the boxes and click on *Redraw* above the list of schools. The graph will return containing only the *Lycee Behanzin* school.

You are now ready to proceed to Project #1, Part 2.

In Search of GLOBE Data – Student Worksheet

Project #1:
Part 2: Creating graphs using GLOBE data

The graph of Maximum Air Temperature for the Lycee Behanzin school, in Benin, should be on your screen. (Note: If you are beginning anew, and not continuing directly from Project #1, Part 1, follow steps 1 through 6 of Project #1, Part 1, before proceeding.)

Step 1: Scroll down until the *Other Options* box is visible. Click on *Select Option* and move the cursor so that *Add or change schools* is highlighted then click on *Go*.
Step 2: Choose *United States of America* from the Country list under *SCHOOL LOCATION Country Search* and click on *State/Province Search*.
Step 3: Choose *USPA – Pennsylvania* and click on *Go*.
Step 4: Place a checkmark by *Waynesboro Senior High School, Waynesboro, PA*, by clicking in the square next to the school name and click on *Go* in the green box next to "Make a Graph" above the table of schools.

What do you notice about this graph?_____

_____

_____

Step 5: Scroll down until the *Other Options* box is visible. Click on *Select Option* and move the cursor so that *Add or change schools* is highlighted and click on *Go*.
Step 6: Highlight *Australia* from the Country list under *School Location Country Search*.
Step 7: Scroll down until you see the *NUMBER OF DATA REPORTS* section. Type 3000 in the first box under *Find schools that have submitted at least:*.
Step 8: Click on the *Total* box and select *All Atmospheric Data* and click on *Go*.
Step 9: Place a checkmark by *Serpentine Primary School, in Serpentine*, by clicking in the square next to the school name and click on *Go* in the green box next to "Make a Graph" above the table of schools.
Step 10: Scroll down until you see *Graph Data and Display Selection*. Change the *Dates* to *Year:* 1998; *Month:* 01; *Day:* 01 through *Year:* 2001; *Month:* 01; *Day:* 01. Click on *Redraw*.

What do you notice about this graph? _____

_____

_____

You are now ready to proceed to Project #1, Part 3.

In Search of GLOBE Data – Student Worksheet

Project #1:
Part 3: Creating graphs using GLOBE data

The graph of Maximum Air Temperature for _Lycee Behanzin_ in Porto Novo, Benin, _Waynesboro Senior High School_, in Waynesboro, PA USA, and _Serpentine Primary School_, in Serpentine, Australia, should be on your screen. (Note: If you are beginning anew, and not continuing directly from Project #1, Part 2, follow steps 1 through 6 of Project #1, Part 1, and steps 1 through 9 of Project #1, Part 2, before proceeding.)

Step 1: Scroll down below the graph. You will see a box entitled: _Graph Data and Display Selection_. Under the _Datasets (Choose a dataset)_ option, click on _Maximum Temperature_ (the current displayed dataset); this action will open the scroll menu of datasets. Click on _Mean Temperature_.
Step 2: Under the _Plot Type_ option, click on _Combined Graph_ (the current graph display). Click on _Stacked Graph_.
Step 3: Scroll down below the graph to the _Graph Data and Display Selection_. Below the "Dates" selections you will see _Or Select a pre-defined time period:_ Click on _SELECT DATES_ (the current display) and click on _2001_. Click on _Redraw_.

What is Mean Temperature? How is this temperature determined?_____

_____

What do you notice about the three graphs? Why are these three graphs of Mean Temperature different? (Note: Latitudes and Longitudes of the schools can be found below the graph in the list of Selected Schools under the _Other Options_ box.) _____

_____

Do the data in the three graphs seem reasonable? Why or why not?_____

_____

Step 4: Scroll down below the graphs until you see _Graph Data and Display Selection_. Change the _Dates_ to _Month:_ 03; _Day:_ 01 through _Month:_ 03; _Day:_ 31. Click on _Redraw_. (_Year:_ 2001 should remain the same.)
Step 5: Scroll down below _Graph Data and Display Selection_ and below the _Redraw_ button. You will see a box entitled _Other Options_. Click on _Select Option_, click on _Show Table_ and then click on _Go_.

The table of data is located below the graph and graphing tools. Scroll through the data. You'll notice that _Serpentine Primary School_ reported 0° C on March 17 and 18. Does that seem reasonable? If not, what might have happened? _____

_____

You are now ready to proceed to Project #2.

In Search of GLOBE Data – Student Worksheet

Project #2:
Creating maps using GLOBE data

If continuing from Project #1, Part 3, the Mean Air Temperature graph for _Lycee Behanzin_, _Waynesboro Senior High School_, and _Serpentine Primary School_ should be on the computer screen. Scroll to the top of the page until the Navigation Tabs (Home, Projects, etc) are visible. Place the mouse cursor over _For Students_; move the cursor down to highlight _Maps and Graphs_; move the cursor over to highlight _Maps_; click on _Maps_.

If you are beginning this activity and not continuing from Project #1, Part 3, enter the GLOBE Home Page <**www.globe.gov**>; place the mouse cursor over _For Students_; move the cursor down to highlight _Maps and Graphs_; move the cursor over to highlight _Maps_; click on _Maps_.

Note: an image of the Globe will be on the right. Notice that the dataset is for Maximum Temperature and the date is set for today. The zoom level (identified by the small magnifying glass) is set at 1x. These are the default settings.

Step 1: Click on Europe (or as close as possible) on the Globe on the right. You will notice that the new view of the Globe has changed. Look at the top left of the map box (left of the list of zoom levels). You will notice that the part of the Globe on the right that is currently not visible is now shadowed on the Globe to the left.

Step 2: Scroll down below the map. You will see a box entitled: _Map Data and Display Selection_. Change the _Date_ to _Year:_ 2004; _Month:_ 02; _Day:_ 15. Click the radio button for _medium_ under _Map size_. Click on _Redraw map_.

Step 3: Click on Europe (it should be easier to identify Europe this time). Notice that the image of the Globe has changed yet again. It is now a square. Notice that the magnification level is now 4x.

Step 4: Click on the _8x_ zoom level. Notice that the map zooms in more.

Step 5: Scroll down below the map to the box entitled: _Map Data and Display Selection_. Click the radio button for _Both_ under _Map type_. Click on _Redraw map_.

Looking at the map your queries produced, do the data look reasonable? _____ Why or why not? _____

How might the Contours help answer this question? _____

Step 6: Scroll down below the map and the box entitled: _Map Data and Display Selection_. You will see a box entitled _Other Options_. Click on _Select Option_ and move the cursor so that _Create Scatter Plot_ is highlighted. Click on _Go_.

This will generate an X, Y plot (or Horizontal, Vertical plot) of the data visible on the map. The X, or Horizontal, axis depicts Latitude and the Y, or Vertical, axis depicts Maximum Temperature. Do the data graphed in this manner help determine whether one or more data represent possible errors? Explain: _____

You are now ready to search for data from other GLOBE schools in other countries and in other investigation areas.

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In Search of GLOBE Data – Teacher Answer Sheet

These answer sheets provide a number of possible answers for the open questions within the "*In Search of GLOBE Data – Student Worksheets*". These answers are by no means the only possible answers but rather some possible answers. If the student does not provide answers to these questions, the teacher can use the answers provided here to help the student begin to see what story the data can tell.

Project #1, Part 1: Creating graphs using GLOBE data

Graph 1: Lycee Behanzin, in Porto-Novo, Benin.
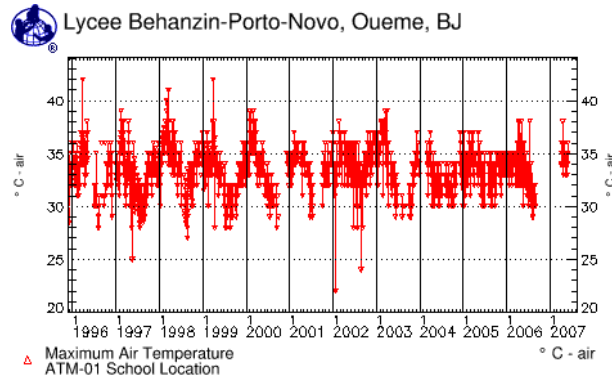
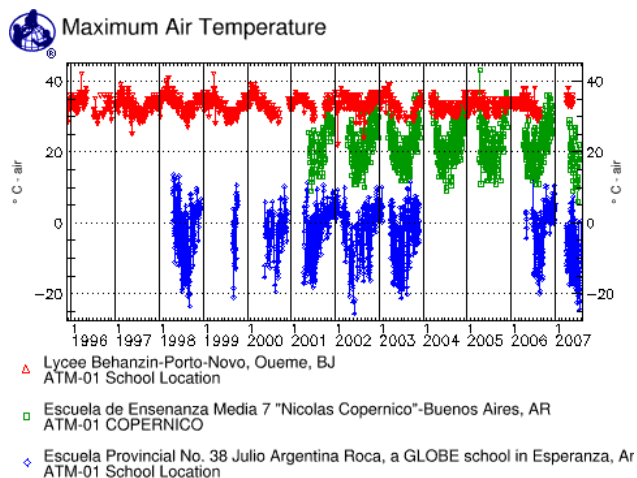

What do you notice about this graph? _____

Students may notice any of the following:
1) The temperature varies from (most often) 28 to 38° Celsius;
2) The temperature throughout the year does not vary much for this school;
3) The warmest months for this school are usually between February and April;
4) On several occasions, the temperature rises above 40° Celsius;
5) The coldest months for this school are usually between July and October;
6) On several occasions, the temperature falls below 25° Celsius.

Graph 2: Lycee Behanzin, in Porto-Novo, combined with Escuela Provincial No. 38 Julio Argentina Roca, in Esperanza, and Escuela de Ensenanza Media 7 "Nicolas Copernico", in Buenos Aires.
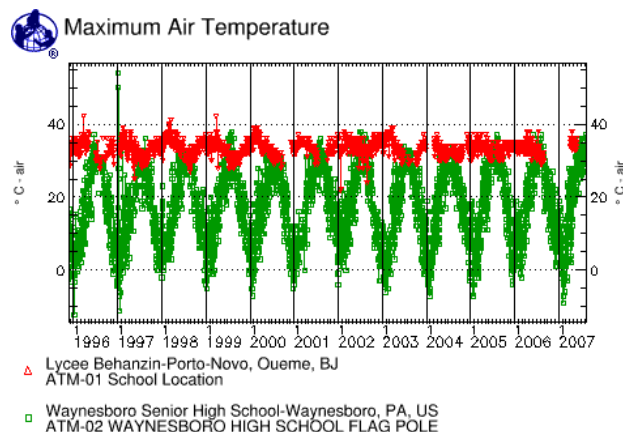
What do you notice about this graph? (Note: Latitudes and Longitudes of the schools can be found below the graph under the *Other Options* box.) _____

Students may notice any of the following:
1) The temperature graph for Benin (red line) doesn't change as much as the two from Argentina (blue and green lines);
2) Both Argentine schools report most of their data between March and December, while the Benin school reports almost every day;
3) The Argentine school, "Escuela Provincial No. 38," didn't enter data for 2004 or 2005;
4) Both Argentine schools have colder temperatures between June and August;
5) Both Argentine schools experience warmer temperature twice per year, between March and May and between October and December (note that peak temperatures for these 2 schools are at the points where they stop collecting data);
6) One Argentine school, Escuela Provincial No. 38, experiences much colder temperatures (barely over 0° Celsius) than the school from Buenos Aires;
7) Escuela Provincial No. 38 is much farther south than Escuela de Ensenanza Media 7 "Nicolas Copernico" (Latitude 63.4° S compared to 34.5° S);
8) Escuela Provincial No. 38 is an Argentine school located in Antarctica (by scrolling down to view Latitudes and Longitudes students may notice the long school name: "Escuela Provincial No. 38 Julio Argentina Roca, a GLOBE school in Esperanza, Antarctica, hosted by Argentina, AR").

Project #1, Part 2: Creating graphs using GLOBE data

Graph 1: Lycee Behanzin, in Porto-Novo, Benin combined with Waynesboro Senior High School, Waynesboro, Pennsylvania, U.S.A.

Maximum Air Temperature

△ Lycee Behanzin-Porto-Novo, Oueme, BJ
ATM-01 School Location

□ Waynesboro Senior High School-Waynesboro, PA, US
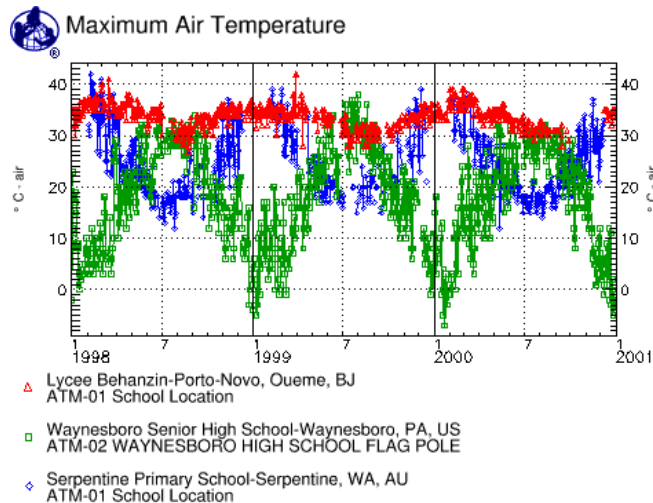ATM-02 WAYNESBORO HIGH SCHOOL FLAG POLE

What do you notice about this graph? _____

Students may notice any of the following:
1) Temperature at the U.S. school rarely rises above those at the Benin school;
2) The temperature varies greatly at the U.S. school, from below 0° Celsius to most often about 35° Celsius;
3) The warmest months for the U.S. school are usually between July and August;
4) The coldest months for the U.S. school are usually between December and February;
   a. On several occasions, the temperature falls to nearly, or below, −10° Celsius;

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5) The warmest months for the Benin school are usually between February and April;
    a. On several occasions, the temperature rises above 40° Celsius;
6) The coldest months for the Benin school are usually between July and October;
    a. On several occasions, the temperature falls below 25° Celsius;
7) When the U.S. school experiences the warmest temperatures, the Benin school is often experiencing the coldest temperatures.

Graph 2: Lycee Behanzin, in Porto-Novo, Benin, and Waynesboro Senior High School, Waynesboro, Pennsylvania, U.S., combined with Serpentine Primary School, in Serpentine, Australia.


Maximum Air Temperature

△ Lycee Behanzin-Porto-Novo, Oueme, BJ
ATM-01 School Location

□ Waynesboro Senior High School-Waynesboro, PA, US
ATM-02 WAYNESBORO HIGH SCHOOL FLAG POLE

◇ Serpentine Primary School-Serpentine, WA, AU
ATM-01 School Location

What do you notice about this graph? _____

Students may notice any of the following:
1) Temperature at the Australian school ranges from 15 to about 40° Celsius;
2) Temperature at the Australian school varies more than at the Benin school but not as much as at the Pennsylvania school;
3) The warmest months for the Australian school are usually February and December;
    a. Data are not available during late December through January;
4) The coldest months for the Australian school are usually between July and August;
    a. On several occasions, the temperature falls to nearly 10° Celsius;
5) The warmest months for the U.S. school are usually between July and August;
    a. On several occasions, the temperature rises to nearly 40° Celsius;
6) The coldest months for the U.S. school are usually between December and February;
    a. On several occasions, the temperature falls to nearly, or below, −10° Celsius;
7) The warmest months for the Benin school are usually between February and April;
    a. On several occasions, the temperature rises above 40° Celsius;
8) The coldest months for the Benin school are usually between July and October;
    a. On several occasions, the temperature falls below 25° Celsius;
9) When the Australian school experiences the warmest temperature, the U.S. school is often experiencing the coldest temperature;
10) The schools in Benin and Australia experience the coldest and warmest temperatures during (nearly) the same months.

Project #1, Part 3: Creating graphs using GLOBE data

Graph 1: Lycee Behanzin, in Porto-Novo, Benin; Waynesboro Senior High School, Waynesboro, Pennsylvania, U.S.; and Serpentine Primary School, in Serpentine, Australia (stacked graph).
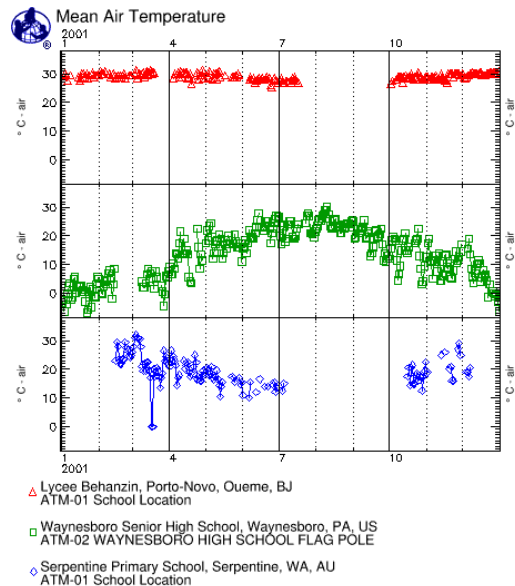
What is Mean Temperature? How is this temperature determined? _____

Mean temperature is defined as the average of a series of temperatures taken over a period of time, such as a day or a month; within GLOBE that period of time is one 24-hour period (Solar Noon to Solar Noon).

Mean temperature is calculated by averaging the Maximum and Minimum daily temperatures, which is dividing the sum of these by 2 [(maximum daily temperature + minimum daily temperature)/2].

What do you notice about the three graphs? Why are these three graphs of Mean Temperature different? Note: Latitudes and Longitudes of the schools can be found below the graph in the list of Selected Schools under the "*Other Options*" box. _____

Students may notice any of the observations noted under Project #1, Graph 2.
They may also notice:
1) A datum (or several data) in the Australian graph seem to approach zero, not conforming to the pattern of the graph.
2) The Australian and Benin schools did not collect temperature data during the entire year. Both schools have a gap in their data from sometime in July until sometime in October.

Do the data in the three graphs seem reasonable? Why or why not? _____

Students should question the reliability of the data associated with the strange line coming down out of the graph of the Australian school's data, not conforming to the pattern. This day (or these days), the school reported 0° Celsius (or nearly 0°) which does not fit the pattern of the data at all. This datum (or these data if there are more than 1 day associated with this anomaly) should be considered suspect.

The table of data is located below the graph and graphing tools. Scroll through the data. Students should notice that *Serpentine Primary School* reported 0° Celsius on March 17 and 18 (see data and arrow below). Does that seem reasonable? If not, what might have happened? _____
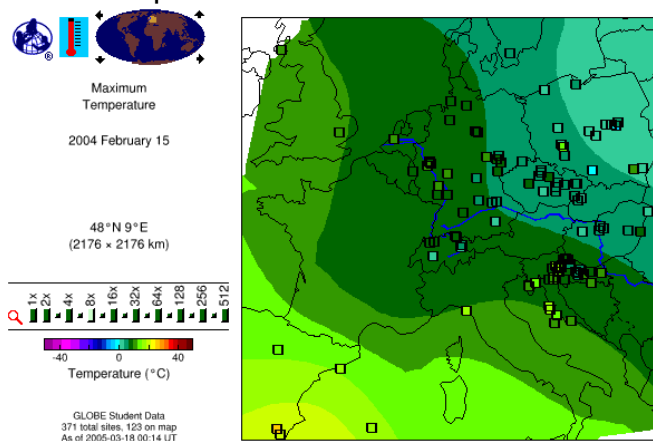
Date[+]	Porto- AvTmp ATM-01	Porto- ATYP ATM-01	Waynes AvTmp ATM-02	Waynes ATYP ATM-02	Serpen AvTmp ATM-01	Serpen ATYP ATM-01
20010301	--	--	--	--	26.0	4
20010302	--	--	--	--	28.0	4
20010303	30.5	4	--	--	31.0	4
20010304	31.5	4	--	--	32.0	4
20010305	28.5	4	--	--	31.0	4
20010306	29.5	4	--	--	31.0	4
20010307	30.0	4	--	--	30.5	4
20010308	29.5	4	--	--	28.0	4
20010309	30.0	4	4.0	4	21.0	4
20010310	30.5	4	2.0	4	19.5	4
20010311	29.0	4	2.0	4	22.0	4
20010312	30.8	4	3.5	4	19.5	4
20010313	31.0	4	6.5	4	22.5	4
20010314	29.5	4	8.5	4	22.5	4
20010315	30.0	4	5.0	4	19.5	4
20010316	31.5	4	7.0	4	17.0	4
20010317	30.0	4	7.5	4	0.0	4
20010318	30.8	4	5.0	4	0.0	4
20010319	30.5	4	1.5	4	20.0	4
20010320	--	--	7.5	4	17.5	4
20010321	--	--	5.5	4	20.5	4
20010322	--	--	--	--	19.5	4
20010323	--	--	--	--	17.5	4
20010324	--	--	--	--	13.5	4
20010325	--	--	2.5	4	17.0	4
20010326	--	--	0.5		18.5	4
20010327	--	--	-4.5	4	26.5	4
20010328	--	--	-0.5	4	23.0	4
20010329	--	--	6.0	4	24.5	4
20010330	--	--	5.5	4	24.0	4
20010331	--	--	7.5	4	22.0	4

31 dates in this time series

When looking at the table of data (shown above), students should clearly see that the Australian school entered 0° Celsius for two days during March 2001. Days prior and following these two measurements the school reported temperatures in the upper teens and low 20s. The temperatures do not seem reasonable when comparing them to all the data entered by this school. It is entirely possible that the students entered 0, not as a temperature value but rather meaning the absence of data or no data. However, this could cause confusion in data interpretation since zero is a number on thermometers and in many parts of the world is a very reasonable temperature reading.

Project #2: Creating maps using GLOBE data

Map 1: Europe, Maximum Temperature

Maximum Temperature

2004 February 15

48°N 9°E
(2176 × 2176 km)

Temperature (°C)

GLOBE Student Data
371 total sites, 123 on map
As of 2005-03-18 00:14 UT

Looking at the map your queries produced, do the data look reasonable? Why or why not?
_____

How might the Contours help answer this question? _____

Students may not know how to interpret map data at first. Provide hints such as describing how temperature contours, or Isotherms (lines connecting points of equal temperature, commonly seen on weather maps to show large-scale temperature distributions), connect points of equal temperature within an area. Data within close proximity to each other should be the same or similar color as well as that of the surrounding isotherm. Individual data points that are not the same or of similar color as those points near it or to the surrounding isotherm may show this difference due to a change in elevation, proximity to a large water body, or other geological or geographical differences. Students should look for those points that are not similar and ask "why" and/or "how do they differ?" If temperatures are greater than or less than 10° Celsius from surrounding points they may be worth investigating.

Step 7 will generate an X, Y plot (or Horizontal, Vertical plot) of the data visible on the map. On the Horizontal, or X, axis is Latitude and on the Vertical, or Y, axis is Maximum Temperature. Do the data graphed in this manner help determine whether one or more data represent possible errors? Explain: _____

Graph 1: Scatter Plot
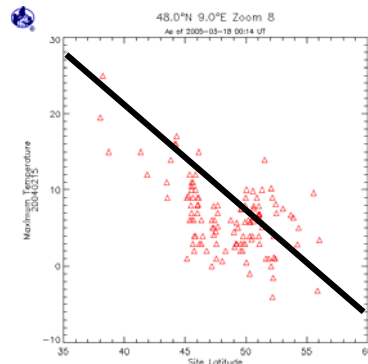
When looking at scatter plots students should look for "outliers." Outliers are those data that do not fit the shape of the graph or the flow of the data. If the data are expected to have a linear relationship then placing an imaginary line or a pencil on the scatter plot through the data as they seem to flow may help students visualize possible outliers.

Graph 2 shows a scatter plot containing two outliers. Why do outliers occur? Often incorrect dates are recorded but most often digits are transposed (entering 32 instead of 23) or using an incorrect measurement (for example, recording Fahrenheit instead of Celsius) or using a non-calibrated instrument. Calibration is the process of comparing an instrument's measuring accuracy to a known standard (for example, ensuring that a thermometer reads 0° Celsius in an ice water bath).

Graph 2: Scatter Plot Showing outliers

Outliers
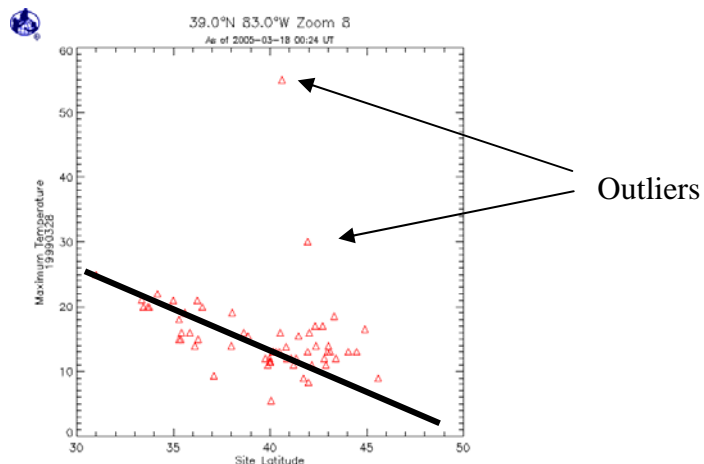
In Search of GLOBE Data – Advanced Search

Searching for GLOBE data can be monotonous and frustrating without the proper tools. The "In Search of GLOBE Data" series can be used as an introduction to searching and using GLOBE data. Project #1, parts 1 through 3, and Project #2 of "In Search of GLOBE Data – Student Worksheets," offered step-by-step instructions on searching for schools by selecting Country, by entering a specific school name, and by entering values for data entered for the investigation under study.   However, other methods of searching for GLOBE data exist. Try the following:

If continuing from Project #2, the scatter plot of GLOBE Data should be on the computer screen. Scroll to the top of the page until the Navigation Tabs (Home, Projects, etc) are visible. Place the mouse cursor over *For Students*; move the cursor down to highlight *Finding Data*; move the cursor over to highlight *Advanced School Search*; click on *Advanced School Search*.

If you are beginning anew, and not continuing directly from Project #2, enter the GLOBE Home Page <www.globe.gov>; place the mouse cursor over *For Students*; move the cursor down to highlight *Finding Data*; move the cursor over to highlight *Advanced School Search*; click on *Advanced School Search*.

Below the "SCHOOL LOCATION: Country Search" box, are five (5) gray buttons entitled, "State/Province Search" (this was introduced in Project #1, Part 2), "Lat/Lon Point Search," "Lat/Lon Regional Search," "Display Map of Selected Region," and "Choose selected location(s) for Data Access." These will be examined (except for "State/Province Search") in the order listed above:

Latitude/Longitude Point Search

Click on *Lat/Lon Point Search*. Notice that you still have the option to search by "School, City or Teacher Name." Under "SCHOOL LOCATION: Point Search", you will see "Find schools within" followed by a pull-down box. This lists the following possibilities: 1 km, 5 km, 10 km, 20 km, 50 km, 100 km, 500 km, and 1000 km. Following the pull down box you will notice: "Lat" (Latitude) and "Lon" (Longitude). Note: Positive values entered in the "Lat" box will search for schools north of the Equator, negative values will search for schools south of the Equator; positive values entered in the "Lon" box will search for schools east of the Prime Meridian, negative values will search for schools west of the Prime Meridian.

Try this example to familiarize yourself with the system: Enter 1000 km in the "*Find schools within*" box, 30 in the "*Lat*" box and 130 in the "*Lon*" box and click on *Go*. This will bring up schools in China (CN), Japan (JP) and South Korea (KR). There are actually more than 100 schools within this range, so the Web site database will display only the first 50 schools. If you wish to see all of the schools within this area, click on "Follow this link to view all table entries."

Click the "Back" button on your browser to return to the *Advanced Search* page. Change the "*Lat*" to –30 (keep the "*Lon*" at 130) and click on *Go*. This will bring up schools in Australia (AU). A quick look at a World map will confirm that these regions are on opposite

sides of the Equator. Similarly, entering 30 in the "*Lat*" box and –130 in the "*Lon*" box will bring up California (US) while –30 in the "*Lat*" box and –130 in the "*Lon*" box will return you to the search page with the note: "Warnings and error messages: No schools were found using your search parameters. Please modify your values and try again." A quick look at a World map will confirm that the latter location is in the South Pacific, Southeast of French Polynesia – just open ocean.

This type of search is useful when you want to start from a known point (for example, your school) and locate all schools within a certain distance (1 km, 5 km, 10 km, 20 km, 50 km, 100 km, 500 km, or 1000 km) from it.

Latitude/Longitude Regional Search

Scroll to the top of the page until the Navigation Tabs (Home, Projects, etc) are visible. Place the mouse cursor over *For Students*; move the cursor down to highlight Finding Data; move the cursor over to highlight Advanced School Search; click on Advanced School Search.

Click on *Lat/Lon Regional Search*. This search tool looks similar to the Lat/Lon Point Search tool. However, rather than having the function of distance (1 km to 1000 km) there are four (4) boxes, "Northern Lat," "Western Lon," "Eastern Lon," and "Southern Lat." This will search within a geographic box defined by the user. Let's look at an interesting example: enter 10 in "Northern Lat," -10 in "Western Lon," 10 in "Eastern Lon" and –10 in "Southern Lat" and click on *Go*. This will bring up schools in Western Africa (for example: Benin (BJ), Cameroon (CM), Ghana (GH), and Nigeria (NG)). What you have just done is asked the database to look for GLOBE schools within a box 10° north of the Equator, 10° south of the Equator, 10° east of the prime meridian and 10° west of the prime meridian.

This search tool can be very useful for searching for schools in a specific region. However, if the area you're searching is somewhat densely populated with GLOBE schools, your search may bring up hundreds of schools (for example, the search above brought up over 100 schools). You can narrow the search criteria by adding a tool you are already familiar with: Number of Data Reports (see "In Search of GLOBE Data – Student Worksheet, Project #1, Part 2: Creating graphs using GLOBE data" Step 7). Try the example search above (10 in "Northern Lat," -10 in "Western Lon," 10 in "Eastern Lon" and –10 in "Southern Lat") but this time, under "Number of Data Reports," enter 5000 in the "Find schools that have submitted at least ☐ data reports for ☐ Total ☐ " and click on *Go*. The number of schools the computer will find will decrease to a more manageable number.

Choose an area on Earth that you would like to search for GLOBE schools. Refine the search by entering how many data schools should have (either "Total" data or select an investigation) to make your list. If you receive a message "No schools were found using your search parameters. Please modify your values and try again," you should either change the geographic area of your search using a World map to make sure that you're not selecting an area over the open ocean or over a country that has not yet joined GLOBE, or reduce the number of data in your search.

Display Map of Selected Region

Scroll to the top of the page until the Navigation Tabs (Home, Projects, etc) are visible. Place the mouse cursor over *For Students*; move the cursor down to highlight *Finding Data*; move the cursor over to highlight *Advanced School Search*; click on *Advanced School Search*. The "Display Map of Selected Region" tool will create a map of a selected geographic area (country or countries) based on the selections made in the "SCHOOL LOCATION: Country Search" box.

Try the following example: scroll down in the "SCHOOL LOCATION: Country Search" box until you see Hungary (HU). Click on Hungary and then click on "*Display Map of Selected Region*." Change *Map Size* to *Medium* and click on *Redraw map*. A map will be generated showing Hungary and all Hungarian schools – as well as schools in neighboring countries that are within the area displayed on the map. Notice that the schools within the Hungarian border are triangular in shape while all others (outside of Hungary) are small squares. This will help you identify where Hungarian schools are located. Notice also that the default display is "How Many Data Are There?" If you wish to view actual student data, click on the pull down menu currently entitled "How Many Data Are There" and highlight "Measurements" under "STUDENT DATA" and click on *Redraw map*. Notice that the default date for the map is today.

Choose selected location(s) for Data Access

Scroll to the top of the page until the Navigation Tabs (Home, Projects, etc) are visible. Place the mouse cursor over *For Students*; move the cursor down to highlight *Finding Data*; move the cursor over to highlight *Advanced School Search*; click on *Advanced School Search*. The "Choose selected location(s) for Data Access" tool is useful for pulling the raw data out of the database of a selected geographic area (country or countries) based on the selections made in the "SCHOOL LOCATION: Country Search" box. These data can then be placed in a spreadsheet or GIS program. Try the following example: scroll down in the "SCHOOL LOCATION: Country Search" box until you see Saudi Arabia (SA). Highlight Saudi Arabia and click on "Choose selected location(s) for Data Access." You can click on one round button (investigations: Atmosphere, Surface Water, etc.) choosing all protocols within that investigation or you can click on one or more square buttons within an investigation. Experiment by clicking the different round buttons and square buttons to become familiar with the selection process.

Click on "Air Temperature" under the "Atmosphere" investigation. Next scroll down below the table of investigations and protocols. You will see "Start date (YYYYMMDD)"; "End date (YYYYMMDD)"; and "Output format." Defaults are: Start Date = the first date of measurement; End Date = the last date of measurement; Output format = "View results in browser." Other options for Output format are: "Download tab-delimited results to disk," "Download comma-delimited results to disk," and "Download shapefile (zipped)." When you have selected the format you want, click on "Get the data now!" Follow the instructions of your spreadsheet or GIS program for displaying these data.

This is not meant to be an exhaustive collection of search tools available on the GLOBE Web site, but rather just enough to whet your appetite. GLOBE data await – enjoy!

For the complete set of activities, visit: http://viz.globe.gov/globe/en/docs/UnderstandingGLOBEStudentData.pdf