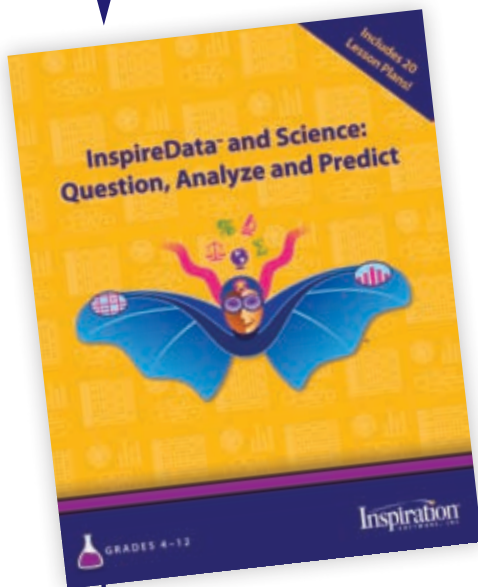


# Excerpts from *InspireData™ and Science: Question, Analyze and Predict*

*InspireData™ and Science: Question, Analyze and Predict* supports teachers as they help students develop the skills necessary to collect and analyze data, and predict outcomes.

Created for grades 4-12, the book offers 20 lesson plans designed specifically to support science laboratory activities and science instruction using InspireData 1.5. Aligned to National Science Education Standards and McREL standards, the lessons focus on core content strands, including science as inquiry, nature of science, physical sciences, life sciences, and earth and space sciences, in contexts that develop the skills of data collection, analysis and prediction. Each easy-to-use lesson includes suggested grade levels, standards alignment, a lesson description, step-by-step instructions, ideas for assessment, and adaptations for differentiating instruction and extending the lesson.



**This preview of *InspireData™ and Science: Question, Analyze and Predict* contains:**

- Introduction to *InspireData™ and Science: Question, Analyze and Predict*
- Complete Table of Contents for *InspireData™ and Science: Question, Analyze and Predict*
- Three lesson plans
- Ordering information

Publisher: Mona L. Westhaver

Author: Cathy Cuff

Contributors: Mary Beth Saddoris and Andrea Sutherland

Editors: Erin Antonius, Mary Beth Saddoris and Andrea Sutherland

Layout/Design: Kevin Jaquette

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# **Introduction to *InspireData™ and Science: Question, Analyze and Predict***

Inspiration Software®, Inc. strives to support improvements in education and make a positive difference in students' lives. This book is part of our family of K-12 visual learning software tools and curriculum materials that help students learn to think and master key concepts. We value teachers, their time, and their commitment, and we strive to partner in their success.

*InspireData™ and Science: Question, Analyze and Predict* supports teachers as they help students develop the skills necessary to collect and analyze data, draw conclusions and report results. Covering grades 4-12, *InspireData and Science: Question, Analyze and Predict* offers 20 lesson plans aligned to National Science Education Standards and McREL standards and designed specifically to support science laboratory activities and instruction using InspireData 1.5.

Lessons focus on core content strands, including science as inquiry, nature of science, physical sciences, life sciences, and earth and space sciences, in contexts that develop the skills of data collection, analysis and prediction. Utilizing Table View and Plot View for each activity helps students to visualize data and communicate their questions and thinking with slides and notes.

Each easy-to-use lesson includes suggested grade levels, standards alignment, a lesson description, step-by-step instructions, ideas for assessment, and adaptations for differentiating instruction and extending the lesson.


## **InspireData and Science Resources:**

The National Science Education Standards (NSES). 1996. *Observe, Interact, Change and Learn*. Washington DC: National Academic Press.

McREL: Mid-continent Research for Education and Learning. Science standards at <http://www.mcrel.org/compendium/SubjectTopics.asp?SubjectID=2>.

# InspireData™ and Science: Question, Analyze and Predict

The complete table of contents from *InspireData™ and Science: Question, Analyze and Predict* is included below and on the following page. Lesson plans with gold stars are featured in this excerpt.

		Grade									
Lesson Name	Page	4	5	6	7	8	9	10	11	12	
<b>Animal Longevity:</b> <i>How Long Do My Favorite Animals Live?</i>	8	✓	✓	✓							
<b>Are You a Square?</b> <i>Using an e-Survey to Help Compare Measurements</i>	12	✓	✓	✓	✓						
<b>Body Proportions:</b> <i>Precise Measurements Matter!</i>	16	✓	✓	✓	✓	✓					
<b>Characteristics of Stars:</b> <i>What's in a Name?</i>	22		✓	✓	✓	✓					
 <b>Clay Boat Experiment:</b> <i>How Many Pennies Will It Hold?</i>	26		✓	✓	✓	✓					
<b>Geography and Climate:</b> <i>What's the Connection?</i>	32		✓	✓	✓	✓					
<b>Clouds:</b> <i>Their Characteristics and How They Affect the Weather</i>	36		✓	✓	✓	✓					
<b>Soap Bubble Experiment:</b> <i>How Big Do the Bubbles Get?</i>	40		✓	✓	✓	✓					
<b>Pendulum Experiment:</b> <i>What's Important About Data Collection?</i>	46			✓	✓	✓					
<b>Classification:</b> <i>Comparison of Organisms</i>	52			✓	✓	✓					

# Lesson Grid and Table of Contents

The complete table of contents from *InspireData™ and Science: Question, Analyze and Predict* is included below and on the following page. Lesson plans with gold stars are featured in this excerpt.

McREL and National Science Education Content Standards				
Science as Inquiry	Physical Sciences	Life Sciences	Earth and Space Sciences	Nature of Science
✓		✓		✓
✓		✓		✓
✓		✓		✓
✓			✓	✓
✓	✓			✓
✓			✓	✓
✓			✓	✓
✓	✓			✓
✓	✓			✓
✓		✓		✓

## InspireData™ and Science: Question, Analyze and Predict

		Grade									
Lesson Name	Page	4	5	6	7	8	9	10	11	12	
<b>Elements:</b> <i>Know Your Periodic Table Groups</i>	58			✓	✓	✓	✓				
<b>Black Death:</b> <i>How Did It Impact Population?</i>	62				✓	✓	✓				
<b>Compounds:</b> <i>How Do Elements Behave Differently When Combined?</i>	66				✓	✓	✓				
<b>Endangered Species:</b> <i>Growing or Shrinking Over the Past 25 Years?</i>	70				✓	✓	✓				
<b>Human Space Flights:</b> <i>How Do Different Flights Compare?</i>	74				✓	✓	✓				
<b>Population Growth:</b> <i>Understanding Its Worldwide Impact</i>	78				✓	✓	✓	✓			
<b>Volcanic Eruptions:</b> <i>Exploring the Sixteen Current Decade Volcanoes</i>	84				✓	✓	✓	✓			
<b>Hurricanes:</b> <i>Comparing Their Features</i>	88					✓	✓	✓			
<b>Planetary Features:</b> <i>Plotting Data to Define and Explain Their Relationships</i>	94					✓	✓	✓	✓		
<b>Air Quality:</b> <i>How Clean Is the Air in Your County?</i>	100					✓	✓	✓	✓	✓	

## Lesson Grid and Table of Contents (continued)

<b>McREL and National Science Education Content Standards</b>				
<b>Science as Inquiry</b>	<b>Physical Sciences</b>	<b>Life Sciences</b>	<b>Earth and Space Sciences</b>	<b>Nature of Science</b>
✓	✓			✓
✓		✓		✓
✓	✓			✓
✓		✓		✓
✓			✓	✓
✓		✓		✓
✓			✓	✓
✓			✓	✓
✓			✓	✓
✓			✓	✓
✓			✓	✓



## Clay Boat Experiment

### *How Many Pennies Will It Hold?*

**Grades: 5-8** (ages 10-14)

**National Science Education Standards:**

- Understands how to use appropriate tools and techniques to gather, analyze and interpret data

**McREL Standards – Science and Health:**

- Uses appropriate tools (including computer hardware and software) and techniques to gather, analyze, and interpret scientific data
- Knows that scientific inquiry includes evaluating results of scientific investigations, experiments, and observations

### **Description**

Conducting a scientific investigation from beginning to end is a very important part of a student's journey through the scientific process. Students become more familiar with the different components of scientific inquiry as they carry out each stage, from asking questions through drawing conclusions.

In this lesson, students will review sample data in InspireData™'s *Clay Boat Experiment* database to become familiar with the data and its arrangement. Next, each student team will construct a boat made from clay and attempt to have it hold as many pennies as possible without sinking. They will have four trials in which to progressively improve their design to hold more pennies. They will then analyze all team data to make discoveries and draw correlations about the data.



## Instructions

1. Start by asking students if they have ever built anything to support weight or survive a fall. Students may share experiences like building an egg-drop device or a toothpick/craft-stick bridge, etc. Use these example experiences to introduce the task of building a boat for this activity and recording and collecting data on the boat's characteristics. Also, discuss with students the involvement and creativity necessary as a team to not only build the boat, but to build it more than once as they continue to improve their boat design.
2. Open InspireData's *Clay Boat Experiment* database located here: **InspireData Starter>Databases>Science>Clay Boat Experiment**. Review the field headings in the *Sample Data* tab.

Sample Data

Notes for table "Sample Data":  
 This database represents the weight in pennies that clay boats can hold before sinking. The database contains student-collected data.  
 Possible Investigation:

Team Name	Trial Number	Weight in Pennies
Blue	1	8
Blue	2	12
Blue	3	21
Blue	4	30
Red	1	7
Red	2	14
Red	3	20
Red	4	32
Green	1	11
Green	2	15
Green	3	24
Green	4	35

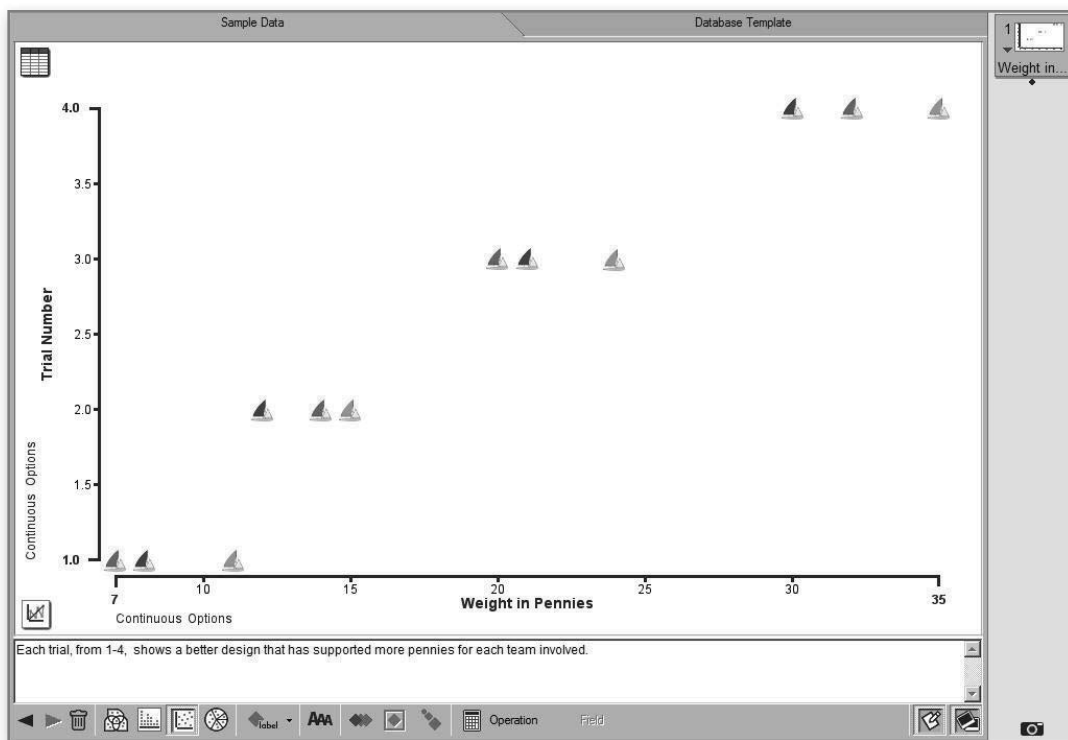
Divide the class into teams of 3 or 4 students each, and have them brainstorm a list of important design ideas that will help them to construct a boat out of clay that will hold the most pennies possible without sinking.



Once students have had a few minutes to build their list, distribute equal portions of clay to each team and ask them to build their first boat. Next, have all teams test their boat for its floatability in the water. Have each team add pennies to their boat until it sinks. Next, have them choose a team name and symbol, and enter the number of pennies their boats held before sinking, for each trial of the experiment, into the database. If you want students to record their results via InspireData's **e-Survey** tool, you will need to publish an e-Survey ahead of time and share the e-Survey ID number and Internet address with them. After students have finished entering their data, have each team download the e-Survey results by clicking the **e-Survey** button on the **InspireData Starter** screen.

3. Students are now ready to look at the teams' results. Give all teams a few minutes to talk with the other teams about each other's boat designs, which held the most weight, and the discoveries that they made. Have each team come up with 3-5 conclusions about the class's data. Have each team use the **Capture Slide** button and the **Notes** area with each plot to build a slide show that will show their discoveries. Have students review the following questions to help them get started:
  - Which team's boat held the most pennies?
  - Did all teams' boats hold progressively more pennies from trial 1 through trial 4?
  - Which team had a boat that held more than 30 pennies?
  - Which trial was the best for each team?
  - Did any team have a boat that held less than 5 pennies?
  - What conclusion(s) can you draw between boat design and the ability to hold weight? What prediction would you make about design changes to a fifth boat to make it hold even more weight?
4. Each team can share their slide show with the class on an interactive whiteboard or overhead projector and lead a discussion about their findings.

# Question, Analyze and Predict





### Assessment

- A performance-based assessment may rely on the quality of data collection, plots, presentation and support for any conclusions.
- Students may be assessed on their cooperation and teamwork skills in building their boats and their ability to share ideas and improve on their design from trial 1 through trial 4.
- Students may also be assessed on their abilities to work together to analyze data while they compare data between student teams.



### Adaptations

- Complete the data analysis project using only the sample data and the questions if the boat building and data collection portions of the assignment are too complex, involved or time-consuming for the age or skill-level of the group.
- Have each student build their own boats (four trials), test their boats, record their data, conduct the data analysis and create a slide show on their own.
- Use the sample data to conduct a classroom data analysis project together for students who need an introduction to analyzing data or a reminder lesson.



## Endangered Species

### *Growing or Shrinking Over the Past 25 Years?*

**Grades: 7-9** (ages 12-15)

**National Science Education Standards:**

- Understands the diversity and adaptations of organisms
- Understands how to use appropriate tools and techniques to gather, analyze and interpret data
- Uses abilities necessary to do scientific inquiry

**McREL Standards – Science and Thinking and Reasoning:**

- Uses appropriate tools and techniques to gather, analyze, and interpret scientific data
- Understands and applies basic principles of logic and reasoning

### **Description**

Endangered species' totals change constantly due to the impact of human behaviors on other organisms. In this lesson, student teams will use InspireData™'s *Endangered Species* database to select and investigate a specific group of organisms, and look at the ways the organisms' total numbers have fluctuated over the past 25 years.

In addition, they will research and find totals for 2006 and 2007 and add them to the database. Next, they will create a series of plots to show and explain the fluctuations, and to predict the future numbers. Lastly, they will brainstorm three ways that we, as a world, can stabilize the number of endangered species in their organism group. Each team of students will present their plots and share their ideas on how to slow the rise of the endangered species number for their group.



## Instructions

1. Begin the lesson by discussing what it means when an organism is endangered. Have students use the Internet to lookup definitions for the word "endangered" and to investigate at what point a group of organisms enters into endangered status. The following resource from the U.S. Fish & Wildlife Service may be useful for students if their searches are not productive: <http://www.fws.gov/endangered/wildlife.html>.
2. Open InspireData's *Endangered Species* database located here: **InspireData Starter> Databases>Science>Endangered Species**. Go through the sample data together to familiarize students with the field headings and information about each group of organisms.

Endangered Species

Endangered Species Over Time

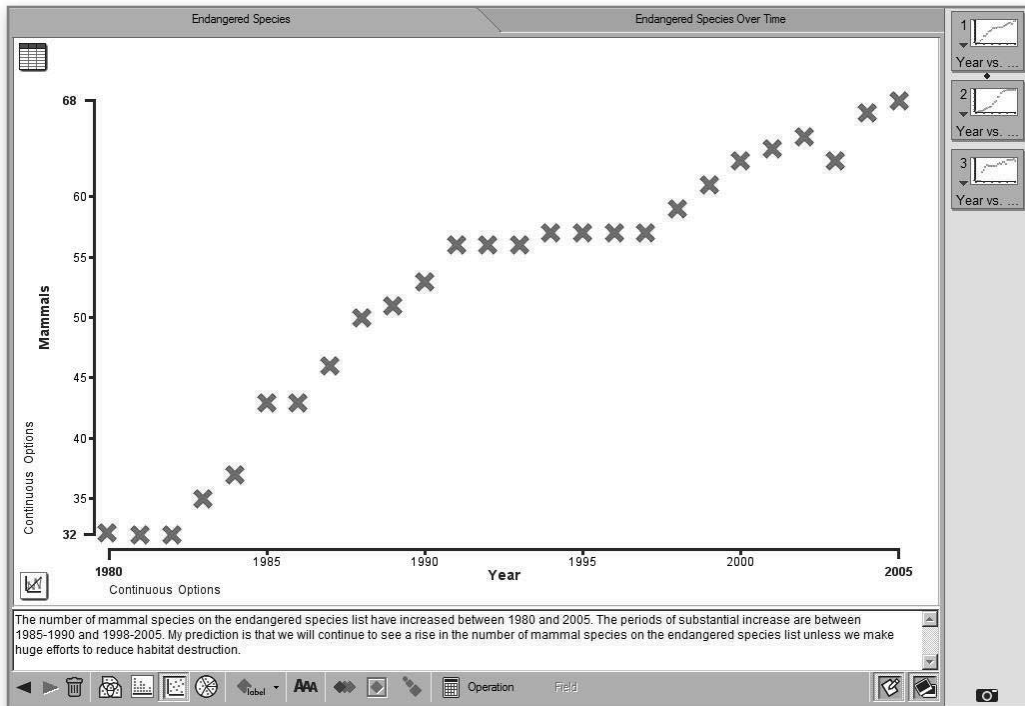
Notes for table "Endangered Species":  
 This database represents the number of endangered species per calendar year from 1980-2005.  
 The other table that is included shows the endangered species over time from 1980-2005.  
 Possible Investigations:

Year	Mammals	Birds	Reptiles	Amphibians	Fish	Crustaceans	Snails	Insects	Arachnids	Clams	Plants	Calendar Year Total
1980	32	58	13	5	33	1	2	7	0	23	50	224
1981	32	58	13	5	33	1	3	7	0	23	51	226
1982	32	58	14	5	35	2	3	7	0	23	57	236
1983	35	58	14	5	34	3	3	7	0	23	58	240
1984	37	66	14	5	33	3	3	8	0	23	71	263
1985	43	68	14	5	40	3	3	8	0	23	93	300
1986	43	71	14	5	42	4	3	8	0	23	114	327
1987	46	73	15	5	42	5	3	8	0	28	139	364
1988	50	72	15	5	46	8	3	11	4	31	153	398
1989	51	72	15	6	50	8	3	12	4	34	166	421
1990	53	72	15	6	53	8	3	12	4	37	179	442
1991	56	72	15	6	54	8	7	14	4	40	238	514
1992	56	72	15	6	55	9	11	16	4	40	295	579
1993	56	72	14	6	61	11	12	17	4	50	323	626
1994	57	74	14	7	66	14	15	19	4	51	420	741
1995	57	75	14	7	66	14	15	20	5	51	432	756
1996	57	74	14	7	67	14	15	20	5	51	513	837
1997	57	76	14	9	67	16	15	28	5	56	553	896
1998	59	76	14	9	70	17	18	28	5	61	567	924
1999	61	74	16	9	69	17	18	28	5	61	581	939
2000	63	78	14	10	70	18	20	33	12	61	592	971
2001	64	78	14	11	71	18	21	35	12	62	595	981
2002	65	78	14	13	71	18	21	35	12	62	599	988
2003	63	78	14	13	71	18	21	35	12	62	599	986
2004	67	79	14	13	71	18	21	35	12	62	601	993
2005	68	77	14	12	74	19	25	36	12	62	599	998

3. Divide students into teams of 2-3 each, depending on the number of students in the class, and have each team select a different organism group. Next, tell them to switch to **Plot View** and create axis, stack, double stack and Venn plots to do some analysis of their group of endangered species. Ask them to use the **Capture Slide** button in the **Slide Sorter** to build a slide show that shows the endangered species numbers as well as the years where there was a significant change in their organism's groups' numbers. Tell



students to use the **Color by field** and **Label** buttons to show more detail in the plots. Have students use the **Notes** area to make predictions about the future numbers for their group's endangered species.



- Next, have student teams use the Internet to find current endangered species numbers for their organism group for 2006 and 2007. Remind them to look for well-known, reputable sites in their research. Once each team has found its updated numbers, have them enter them using an **e-Survey** you've created and published in advance. Give students the unique e-Survey ID number and Internet address, and instruct them to enter their data

After all teams have completed the e-Survey, have students download the updated database and explore the new data to see if their predictions were accurate. Have students create new plots using the updated data, discuss the plots in the **Notes** area and capture slides. Finally, have student teams brainstorm ways to reduce or stabilize the number of endangered species for their group and record these ideas in the **Notes** area of their new slides. Ask students to also cite the Internet references they used for their research.



5. Have students save both databases to a location of your choosing and present their findings to the class.



### Assessment

- A performance-based assessment may rely on the quality of research, plots, presentation and support for any conclusions.
- Students may be assessed on their research, cooperation and teamwork skills in analyzing the database.
- Students may be assessed on their ability to make accurate predictions using current data and available research.



### Adaptations

- If the research component of the assignment is too complex, involved or time-consuming for the age or skill-level of the group, have students complete only the first portion of the data analysis project using just the current endangered species data through 2005.
- Have each student choose an endangered group and complete the project on their own.
- Have the students or student teams create a series of questions about the *Endangered Species* database, and answer them by creating plots and building a slide show. Examine and discuss the slide shows as a whole-group activity if small-team or individual data analysis is too difficult.
- If Internet is not available, have students research their specific organism species current data in available up-to-date Biology or Life Science books or available science resources in the classroom or library. Have students use their data to build a single database using the **Launch Survey**... option on the **Table** menu on one computer station in the classroom.



## Air Quality

### *How Clean Is the Air in Your County?*

**Grades: 8-12** (ages 13-18)

**National Science Education Standards:**

- Asks questions that can be answered with scientific knowledge and/or their own observations and investigations
- Understands how to formulate explanations using data with supporting evidence

**McREL Standards – Science and Thinking and Reasoning:**

- Understands more than one conclusion can be drawn from the same data
- Uses appropriate tools and techniques to gather, analyze, and interpret scientific data
- Finds relationships between various categories of information

### **Description**

Knowing how to use the Internet to gather reliable and important statistical information is important for middle and high school students. Students need to be able to find relevant data in order to build databases and do analysis, looking for trends, correlations and interesting discoveries.

In this lesson, students will gather air quality data about their county and state from the Internet and use it to create a database in InspireData™. They will then create plots to analyze the data, making discoveries and finding correlations about the quality of the air they breathe, specific locations of diminished air quality, and the best and worst air quality statewide.



## Instructions

1. Begin the lesson by asking students, "How do you think the air quality in your home county compares to the air quality around the state?" List students' answers on the board and ask them to justify their answers with possible explanations for their opinions (hypotheses).
2. Tell students that they will be finding air quality data on the Internet and creating a new InspireData database with it to look for trends and correlations. Have students open a new InspireData database. If students have never used InspireData before, spend some time exploring various built-in databases, pointing out the **Table View** and **Plot View** functionality. Students need to be familiar with how InspireData works before they continue with this lesson.
3. Divide the class into teams of 2-3 students, depending on the availability of computers. Ask students to go to the following web site: <http://www.epa.gov/air/data/geosel.html>. Tell them scroll halfway down the page to the area below "Select From List." Ask them to click the radio button next to "Select State" and then use the menu to select their home state. When they have done this, they should click "Go" at the bottom of the screen. Next, have students choose the "Air Quality Index" report under the "Monitoring" column. Tell students to select "2007" from the menu, select the "County" radio button and click "Generate Report."

**Select From List**

1. Click the radio button beside the type of geographic area you want to select.  
2. Choose one of the geographic area names listed (see [How to...](#)), or type in a ZIP code.  
3. Click the Go button below.  
Or, you may use the [map above](#) to select an area.

Select United States

Select EPA Region

Region 1 (CT ME MA NH RI VT) ▲  
Region 2 (NJ NY PR VI) ▲  
Region 3 (DC DE MD PA VA WV) ▼

Select State

North Dakota ▲  
Ohio ▲  
Oklahoma ▲  
Oregon ▲  
Pennsylvania ▲  
Puerto Rico ▼

Select County (Choose a state and click [Go](#) to get a list of counties to select.)

Select MSA

Abilene, TX ▼

Select CMSA

Boston-Worcester-Lawrence, MA-NH-ME-CT ▼

Amend selection: Add/drop counties around/in selected MSA or CMSA ([More...](#))

Enter ZIP Code (5 digits)



- Ask them to copy all of the air quality data about their state from the site and paste it into a new InspireData database. Have them label each field heading for their new database to match the field headings from the web site.

21 Rows  
See Disclaimer

Row #	AQI Daily Values	# Days with AQI	Number of Days when Air Quality was...				AQI Statistics			Number of Days when AQI pollutant was...						County	County Code
			Good	Moderate	Unhealthy for Sensitive Groups	Unhealthy	Maximum	90th percentile	Median	CO	NO2	O3	SO2	PM2.5	PM10		
1	See Chart	368	298	64	1	0	142	68	37		0	242	0	120	1	Umatilla Co	41059
2	See Chart	365	276	88	1	0	106	68	36	8		146		208	8	Jackson Co	41029
3	See Chart	365	287	62	16	0	135	75	32	0		148		220	2	Lane Co	41039
4	See Chart	365	308	51	6	0	132	62	29	5	0	146	0	211	3	Multnomah Co	41051
5	See Chart	154	148	5	0	0	84	42	29			140		14		Clackamas Co	41008
6	See Chart	368	258	88	17	0	138	84	28					358	5	Klamath Co	41035
7	See Chart	365	325	39	1	0	102	52	26			151		214		Marion Co	41047
8	See Chart	358	331	27	0	0	85	44	24			147		210	1	Columbia Co	41009
9	See Chart	365	310	55	0	0	87	52	22					362	8	Josephine Co	41038
10	See Chart	344	269	72	2	1	160	64	21					344		Harney Co	41025

# Question, Analyze and Predict

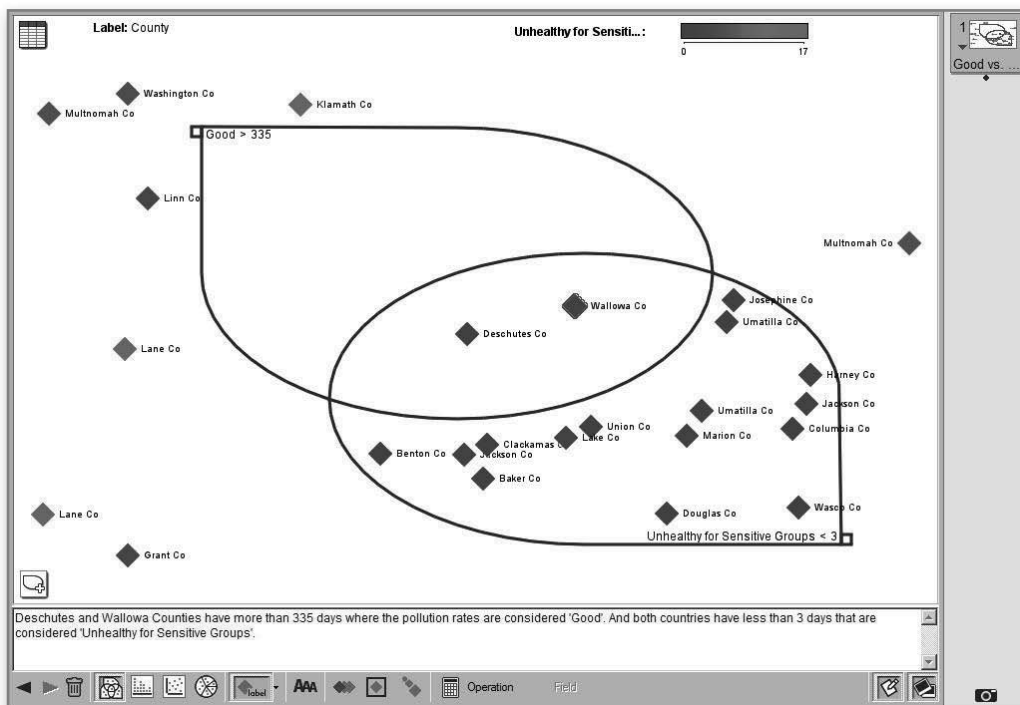


- Next, have students click on the second field in InspireData, "AQI Daily Values," and delete it (the information in this field contains links they won't be using). Students will now have a complete InspireData database containing air quality data for the counties throughout their state.

Row #	#Days with AQI	Good	Moderate	Unhealthy for Sensitive Groups	Unhealthy	Maximum: Highest Daily Value AQI in the Year	90th percentile	Median	C
1	363	298	64	1	0	142	60	37	
2	365	276	88	1	0	106	68	36	
3	365	287	62	16	0	135	75	32	
4	365	308	51	6	0	132	62	29	
5	154	149	5	0	0	84	42	29	
6	363	258	88	17	0	138	84	28	
7	365	325	39	1	0	102	52	26	
8	358	331	27	0	0	86	44	24	
9	365	310	55	0	0	87	62	22	
10	344	269	72	2	1	160	64	21	
11	363	320	39	3	1	186	55	20	
12	355	311	40	3	1	163	54	20	
13	363	327	36	0	0	73	50	20	
14	360	332	28	0	0	82	47	19	
15	365	302	58	5	0	150	65	18	
16	345	326	19	0	0	78	41	17	
17	363	340	21	2	0	119	43	16	
18	362	318	42	2	0	108	57	16	
19	362	325	37	0	0	84	51	16	
20	362	350	12	0	0	70	33	13	
21	359	322	37	0	0	94	52	12	
1	363	298	64	1	0	142	60	37	
2	365	276	88	1	0	106	68	36	
3	365	287	62	16	0	135	75	32	
4	365	308	51	6	0	132	62	29	



6. Tell students to use the following questions to begin creating plots using any of the four plot types. As students become more acquainted with the database, have them create three of their own questions about the air quality data in their state that they also answer using any of the four plot types.
- Which county or counties has the best air quality in your state? Hypothesize why the air quality is better in this county or counties.
  - Before you create a plot or analyze the data, make a prediction about which county or counties has the most diminished air quality. Were you correct? What did you base your prediction on? What do you think makes the air quality in this county or counties so bad?
  - How many days of the rating “Unhealthy for Sensitive Groups” does your county have? Is this better or worse compared to the other counties in your state?





7. Ask students to save their databases in a location of your choosing. Have each team present their slide show to the class.



### Assessment

- A performance-based assessment may rely on the quality of plots, presentation and support for any conclusions.
- Students may also be assessed on their cooperation and teamwork skills to create an InspireData database using data from the Internet.
- Students' completed slides and notes can be assessed to make sure they are showing applicable plots and have valid answers to questions.



### Adaptations

- Build the database project together as a class if copying and pasting from the Internet and creating field headings is too complex, involved or time-consuming for students to complete in small groups.
- Create a series of questions for each student to answer using plot types. Have them build a slide show of their plots with notes to answer each question.
- Data analysis can be done as a group activity if individual data analysis is too difficult or time-consuming.
- An advanced data analysis project for students would be to have them collect other data about air quality using other reports from the web site or information from other web sites, and then to construct other databases in InspireData.

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