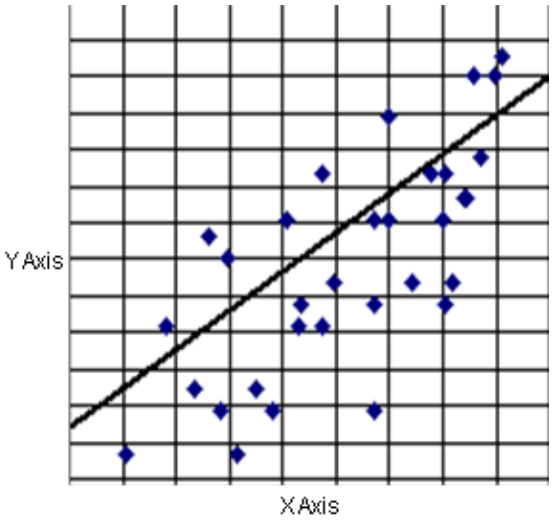
MY NASA DATA Lesson:

Correlation of Variables by Graphing



Purpose:
To guide students to an understanding of the appearance of graphed data, allowing them to determine how two parameters are correlated to one another

Grade Level: 6 – 10

Estimated Time for Completing Activity:
50 minutes

Learning Outcomes:

- Students will be able to determine if two variables are correlated by looking at the way they change over time.
- Students will be able to determine if two variables are correlated by graphing one versus the other.
- Students will be able to determine the type of relationship between variables by looking at a graph of one variable versus another.

Prerequisite

- Students should be familiar with a spreadsheet program and how it is used for graphing data.

Tools

- Spreadsheet program
- graph paper
- clear ruler
- pencils (colored or regular)

Vocabulary:

- correlation
- scatter plot
- slope
- time plot
- variable

Lesson Links:

- Powerpoint Introduction
- Excel spreadsheet containing data for Handouts 1-3
- Handouts 1 – 3
- Handout 4 (LAS procedure)
- Handouts 5 – 16
- Live Access Server
- How to Import Data into Excel

Background:

One way to determine if two different variables are related to one another is to graph the two variables against each other. For example, the type of pattern that appears when a scatter plot is examined can describe the relationship between the variables. In this exercise, the teacher and students will discuss some NASA satellite data sets, look at the graphs these data sets produce when plotted, and finally look at other variables to determine relationships. This can also provide an opportunity for predicting and testing hypotheses, an important step in the scientific process.

It is important to realize that data do not often produce clean, neat graphs. Many times, the error or uncertainty in measurement will mean that the graphs generated will be quite messy. This will be the case in this activity. Students and teachers are encouraged to accept this messiness and to realize that the relationships may be much more complicated than simple linear relationships. For the purpose of this exploration, it will be sufficient to determine if there is any kind of relationship at all.

Procedure:

1. Examine Handouts 1, 2, and 3 found in the Lesson Links. Determine if the two variables or parameters shown in each time plot are related to one another. If there is some relationship, write a sentence or two describing the correlation between the two variables shown in each handout.

2. Open the Excel spreadsheet file found in the Lesson Links containing the information from the first three handouts. Use the Excel program to produce a graph of each of the three data sets, using Handout 4 in the Lesson Links as a guide. Note: as an alternative, use scaled graph paper to graph the points by hand. If this option is chosen, you may choose to reduce the number of points to be graphed for each plot.

3. Discuss the appearance of each graph. Write a sentence for each graph explaining whether there is a straight line with a positive slope, a straight line with a negative slope, or no line at all. Note: sometimes a relationship reaches a maximum or minimum value, at which time the slope suddenly changes, often to a horizontal or vertical line.

4. Use the MY NASA DATA Live Access Server to choose two more variables and produce a time series overlay plot of the two variables for a time period of approximately one full year (see instructions in Handout 4). Also produce a table of values (text) for the same variables. Note: as an alternative, chose two of the variables delineated in handouts 5-16 and use the two variables for steps 5 – 7 below.

5. Predict the appearance of the graph you would make comparing the two variables you have chosen.

6. Import the text values into a spreadsheet file and make a graph of one variable versus the other, either using the spreadsheet graphing functions or on a piece of graph paper.

7. Make a conclusion by writing a statement about the validity of your prediction about the appearance of the graph.

Questions:

1. If you have found a relationship between the two variables you have graphed, does this mean that there is a cause and effect relationship? If so, which parameter seems to drive the other?

2. If you have NOT found two variables that seem to be correlated, why do you think these parameters do not affect each other?

3. Can you make a prediction about what would happen if you increase one of the parameter values?

Extensions:

Develop an equation describing the relationship between two variables. Does this equation describe a known physical law?

Lesson plan contributed by Susan Batson, Pittsburgh, Pennsylvania

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