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Another Tremendous Short Course

some of the skills that are emphasized in the newer high school science courses: ordering and interpreting data; using mathematical procedures as a part of science; making and interpreting graphs; interpolation and extrapolation; making inferences; generalizing; identifying variables and assumptions; making decisions concerning cause and effect relationships. This activity is followed by the formulation of hypotheses which are then tested through controlled experimentation. Through activities such as the one described below, the student should obtain a better understanding of the extent to which generalizations based upon graphed data are justified, and the degree of caution that must be used in interpreting data.

The student is first provided with the data in Table No. 1, data relating to seasonal variation in daylength and in temperature at: Miami, Florida; New York City, New York; and Anchorage, Alaska. The meaning of each term is discussed: "mean", "sunrise", "sunset", "monthly", "normal", "temperature". The meanings of the abbreviations and the numbers are elicited. What does 17:22 mean, for example?

Miami, New York City and Anchorage are then located on the globe. What are the geographical features of these three cities? How are they alike? How do they differ?

The next questions raised are, "Do these numbers have any significance?" "How can we interpret these data?" What can we do with these figures in order that we may be better able to interpret them?"

The students must first work out a mathematical method for translating the "sunrise" and "sunset" information into daylength. Working in groups, the students compute the daylength data from the original information. Next, each student constructs two graphs, as shown in Figures No. 1 and No. 2. In this part of the exercise, they learn how to plan the graphs, how to give them appropriate titles and how to label the coordinates in meaningful fashion.

Next, the students are asked to formulate generalizations based upon the graphs. An example of such a generalization might be: "the greater the latitude, the greater the variation in daylength."

In searching for cause and effect relationships, the students identify variables reflected in the data, such as daylength, as well as variables that are **not** reflected in the data, such as the angle of the sun's rays at different latitudes in different seasons.

Hypotheses are then formulated and tested in the laboratory. For example, the hypothesis, "the longer the period of illumination, the greater the heating of an illuminated surface", is tested in various ways by different groups of students; and the hypothesis "the more oblique the angle of illumination, the less the heating of an illuminated surface" may be tested with different materials and methods by other groups of students. Precise measurement and controls, of course, are taken for granted.

Another Tremendous Short Course

If you missed the 8th Annual ISTA Short Course at Ames March 4-5 you **really missed something.** It was well attended (over 300) by teachers throughout the state. Every year it is hard to see how the Short Course can be better than before—but it keeps improving. Our thanks to all ISU and ISTA people who helped.