Leaves and Light

If you look at the leaves that fall off of the trees in autumn, you will notice that not all leaves of the same kind are alike. Some are larger than others, some are longer or wider, some have different stem lengths, and some may have slightly different shapes. This is not surprising if you consider that they may be from different trees. Just as two people have hands or feet of different sizes, so different trees may have leaves of different sizes. If you do further observations, however, separating out leaves found under one tree from leaves found under another tree, you find both sets are similar in having larger and smaller leaves. This suggests that leaf size is not simply a function of being from different trees, since it seems that leaves from the same tree differ in size.

Consider what other factors may affect leaf size. One obvious factor is the amount of sunlight that leaves receive. Sunlight is required for photosynthesis, and photosynthesis produces the food that trees and leaves need to grow. In your lab book, write a hypothesis about the effect that different amounts of sunlight will have on the size of leaves. Now think about how this hypothesis might be tested. There are two questions. The first is how to obtain a set of leaves that have been exposed to more light than another set of leaves. One way to do this would be to pick leaves from a part of the tree that gets a lot of light (such as the outer branches) and compare them to leaves from a part of the tree that gets little light (such as near the trunk). How do you think the two sets of leaves would differ? The second question is how to assess the size of the leaves.

Two assumptions being made for this test are:
(1.) The nutrients that the tree absorbs from the soil are distributed evenly to all leaves.
(2.) The composition of the air is similar near the trunk of the tree and on the outside of the tree.

At Station 3, you will find two sets of leaves. Set A has been collected from the outer branches of trees (high light), and Set B was collected from within two feet of the trunk (low light) of the same trees. Using the same trees for both samples eliminates differences between the two groups of leaves that might also have affected their size -- differences such as their genetic background or the kinds of nutrients available to them in the soil. All leaves were collected at the same time and have been treated in the same way.

Leaves and Light:
1. Examine the leaves, and choose a method for measuring the size of the leaves (such as length or width) that you think would be the most appropriate.
2. Construct a data table for your experiment on the Capstone Activity Sheet.
3. Pick at least 10 leaves randomly from each set of leaves and do your measurements, recording your data on the data table you have constructed.
4. Complete the Capstone Activity Sheet as directed.

ESA 21: Environmental Science Activities

Capstone Activity
Basic Science

Name:

Lecture Professor:

Experimental Design:
List the null hypothesis, independent variable, and dependent variable for the study.

H_o:
Independent variable:
Dependent variable:

Explain how you chose to measure the size of the leaves/needles, along with your rationale.

Data:
Create a table for your data in the space below. Include a title and follow all formatting requirements.

Table 1:

Descriptive Statistics:
Provide the statistics below for your two groups.

Table 2:

	Mode	Median	Mean	Std. Dev.

Inferential statistics:
Refer back to your null hypothesis, and complete the t-test table for your data set.

t-statistic	p-value	*Do you reject the H_o?*

Data presentation:
Graph your data below, following all formatting requirements. It is advisable that you review the sections on graphing, particularly the one on *what* to graph, prior to creating the graph.

Figure 1:

Conclusion:
Summarize the results of the study in your own words, referencing the descriptive statistics and Figure 1. Restate your null hypothesis, and evaluate it based upon the results of the t-test. Address the assumptions of the study and comment on any facet of the experimental design you deem appropriate.