Lesson Plan: A Walk in the Woods

**General Description**
This activity is designed to engage students in topics in ecology by observing a campus environment, asking questions about what they observe, and designing experiments to answer one question they find intriguing.

**Objectives**
The students will be able to:
1. ask questions about phenomena they observe
2. identify the ecological concepts underlying those questions
3. identify questions that are both interesting and possible to answer
4. design basic experiments to answer their questions

**Key Concepts**
making observations and asking questions

**Time**
50 minutes

**Materials**
Experiment worksheet (one per group)
Forest or other ecosystem
**UTI Instructions: A Walk in the Woods**

Students will spend the first portion of the discussion section alone, observing what is going on in the environment around them and asking questions about what they see. Be sure to let them know that they should not worry about their questions being wrong or stupid—there is no right and wrong in this activity as long as they are asking questions. The students should be sure to write down every question they think of, because any of these could be the basis for a research project. Writing down something they think might be silly may even prompt them to think of something they like better. They should, however, avoid questions such as “What kind of tree is that?” because this can be easily answered by looking in a field guide. In this activity, we are looking for students to make observations about interactions in the environment—interactions between plants and animals, between different species of animals, or within the same species, interactions between organisms and the human environment, behavior, predation, herbivory, whatever catches their attention. While this activity may seem fairly simple, it is an excellent way of stimulating ideas for research projects and similar activities are used even in graduate-level courses. By questioning what they observe in the world around them, then attempting to answer those questions, students should gain deeper insight into the process of science.

1. The week prior to this discussion, announce to the class that they will meet in the Atrium of Jordan Hall rather than the normal meeting room. They should also review the section of their textbook on experimental design (pages 16-20 in Campbell 6th edition). Remind them of this the day before discussion.

2. When the class has assembled in the Atrium, explain to them the activity for the day. Be sure to give them examples of the types of questions they should try to think of—some are listed at the end of the activity, but it would be good if you came up with some on your own before class. They should have at least 3 questions written down by the end of 10 minutes. (5 minutes)

3. Give the students 10 minutes to walk around outside in the woods between Jordan Hall and Chemistry. They should write down all the questions they think of while observing their environment. They should not talk to each other during the activity, but should be making their own observations and becoming involved in their surroundings. You should also walk around and write down any questions you come up with. Also, monitor your students to make sure they are not talking to each other, using cell phones, doing Chemistry homework, etc. (10 minutes)

4. After 10 minutes, reassemble the class outside Jordan Hall (perhaps blow a whistle to get everyone’s attention?). Have each student show you that they have questions written down before you break them into groups (make sure they did it!).

5. Break the students into groups of four or five. Hand out worksheets. Each student should choose two of their questions that they like the most to present to their group, and each group should discuss the questions presented by the group members. As a group, they should decide on the one question that they find most interesting and would like to design an experiment to answer. (5 minutes)

6. As students are choosing their question, you should be checking up on the groups. Make sure they are not choosing questions that they will have a hard time designing experiments to test.
7. Once a question is chosen, each group should begin filling out the worksheet and designing an experiment to answer the question. You should circulate among the groups, providing advice on their experimental design. (15 minutes)

8. Have each group present their question and a brief synopsis of their experimental design to the rest of the class, about two minutes per group. (10 minutes)

9. In the last 5 minutes of class, discuss the process of science. They just did it. They observed phenomena, asked questions about it, came up with possible explanations and designed ways to test their explanations. Their experiments will answer questions that relate to the basic principles of ecology they have discussed in lecture. Ask for any questions student’s have about this activity and experimental design in general.

10. Collect each student’s list of questions and each group’s worksheet at the end of the session. Make positive comments on the questions students came up with.

Example Questions
I see squirrels on both the patio and in the woods, but where do they hide their nuts?
Do chipmunks or squirrels eat more of the acorns that fall on the ground?
Are trees taller if they are further from buildings?
Does this caterpillar eat only one type of plant?
**Pre-Activity Worksheet: A Walk In The Woods**

**General Description**  
In the activity you will do this week during your learning/discussion group, you will be examining the IU environment and learning about experimental design. In order to be prepared for this activity, complete this worksheet.

**Reading**  
Browse the Ecology chapters in your text (chapters 53-54). Carefully read the section on How Science is Done on pages 5-7. Carefully study Figure 1.4 and read the box “How biologists do their work” on page 7.

**Definitions**  
Write a definition of the following words. Use your text, textbook glossary, and your previous knowledge to create the best definition possible. Remember to connect your definitions to experimentation.

1) hypothesis

2) control

3) observations

4) case studies

5) deduction

**Questions**  
Answer the following questions. You will explore your answers to these questions in-depth during learning/discussion group.

1) What is the difference between observational studies and manipulative studies? Do you think one type of investigation is better than the other? Defend your answer.

2) Describe several ways in which population, community and ecosystem level ecological studies might differ. For example, population studies might be manipulative more often than ecosystem studies.

3) Scientific hypotheses must be testable. What kind of ideas are untestable? Provide both general descriptions and examples for two types of ideas that are untestable.
Our question is:

What is the basic biological concept that underlies this question (e.g., competition, predation)? What makes you think this?

What are possible answers to this question that you would like to test in your experiment (what are your hypotheses)?

Which of your possible answers do you think is most likely to be correct (what is your prediction)? Why (what do you know already that supports this)?

Describe the experiment you propose to address this question. Use the back of this sheet and other pages as necessary. Be as specific as possible. Remember to include the different treatments or groups you will examine. Describe how this experiment will answer your question—what data will you collect, what comparisons will you make, and how will you determine which of your possible answers is correct?
Demonstrate your new understanding of experimental ecology by answering the following question:
In class today you observed phenomena, asked questions about these phenomena, came up with possible explanations and designed ways to test those explanations. In terms of advancing scientific knowledge about the natural world, which of these steps do you think is the most important? Defend your answer in four or five sentences.