

LABS 2001: Science by Inquiry Lesson
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I. Title: Biodiversity

II. Lesson Summary: Students will select outdoor sites and measure the number of plant species, animal species and relate the results to human disturbance.

III. General Goal: To give students experience in collecting and interpreting field data; to provide hands-on work showing the concept of species diversity and to correlate the affect of human disturbance on each site.

IV. Duration: This exercise will require 3, 48 minute class periods and one, 1/12 hour class period. Fifteen to twenty minutes of an additional class period will be needed for assessment.

V. Specific Learning Objectives:

A. Content Objectives:

1. Biodiversity is a measurement of the variety of species in a habitat.
2. Overall, a small amount of human disturbance to a site may actually increase biodiversity since the amount of natural resources may be greater.
3. Generally, the more human disturbance seen by an ecosystem, the biodiversity of that area decreases.

B. Process Objectives

1. To use observation and recording skills: keep an organized notebook, including making charts to record data, utilize listening skills,
2. State a hypothesis, and be able to relate results to hypothesis
3. Identify conditions that would influence data collection
4. Interpret results to make a statement on how human disturbance affects species diversity

C. Standards

1. To be determined

VI. Prerequisite Knowledge/Skills for Students:

- Basic understanding of the classification of living things
- Experience in carrying out the scientific method
- Ability to use common measuring devices (tape measure, meter stick)
- Basic understanding of the terms species, habitat, ecosystem, taxonomy, classification, diversity
- Ability to work independently in small groups

VII. Background Information:

- The phenomenon being explored is the affect of humans on ecosystem diversity
- The question asked will be: How can one determine ecosystem diversity?
- Students will be assigned groups and asked to find an area in the parking lot, courtyard, grassy area in front of the school building, the strip of grass between the bus lot and the fence line or other suggested sites. Sites will be posted on the chalk board.
- Students will be asked to form a hypothesis as to which site will have the most ecosystem diversity. The sites will be ranked from most diverse to least diverse. This will be recorded in their notebooks
- Students will decide how to measure ecosystem diversity. Students will return to the classroom and record all data on chalkboard. Students will record all procedures and data in their notebooks. Each group will provide a brief description of their procedure with peer review analyzing the validity of their procedure.
- Students will determine if their hypothesis was accepted or rejected and to justify their answer.
- Students will then be asked to go out to an off-site area and conduct similar measurements and counts for diversity. The off-site areas would be more wooded or forested areas such as Keehner Park, the woods off of the LeSourdsville –West Chester Road bike bath, Metalex Park. Students will be asked to put their chosen sites on the board ahead of time.
- Students again will form a hypothesis indicating which site will contain more diversity.
- After data has been recorded and brought back to the classroom, students will provide reasons justifying their results. A discussion will follow, that will hopefully include human disturbance.
- A graph will be made plotting the total number of species versus the degree of human disturbance.
- Students will provide an explanation of the graph

VIII. Preparation for Lesson:

- A. Materials: Tape measures or meter sticks, notebooks, various ecosystems

IX. Instructional Strategy

A. Engagement:

- We will have a brief discussion about ecosystems (what they are) and diversity. Diversity will be defined from a regular dictionary.
- I will ask the question “ How can one determine ecosystem diversity?”
- Later in the procedure I will ask them to determine reasons why diversity is seen at different levels

B. Explore:

- Students will need to use the scientific method and come up with a procedure and data to provide an answer and an explanation to the question.
- Students will record all information in their notebooks using the following headings: Question, Hypothesis, Procedure, Data, Results, Conclusion (did the data support the hypothesis and explain why or why not)
- A time limit will be given to carry out the activity on campus.
- Students will need to construct a graph showing a relationship between diversity and human disturbance and determine its meaning

B. Discussion/Explanation:

- Students will share procedure and results. We will discuss pros and cons of each procedure. We will also check on the rankings of the ecosystems in the hypothesis.
- A sample graph will be drawn on the board and discussed.
- Throughout our discussions it will be important that at least one group chooses to measure diversity by counting plant or animal species. If this doesn't happen, I will ask if this would have been a valid procedure.
- It is also important that the idea of human disturbance comes up as an explanation as to why diversity is seen at different levels.
- Ultimately I'd like a graph showing the number of total species vs. the level of human disturbance. If this doesn't come up, then I will make a suggestion and ask, if this would be a valid graph to measure diversity and human disturbance.

X. Assessment:

- I will have evaluation sheets for each group, recording information such as: were they on task, was the procedure a valid one, execution of the scientific method, did they reach a valid conclusion based upon their results, completeness and neatness of lab notebooks

- A short test following the activity will follow. The test would contain data and students asked to interpret the meaning of the data. I may also have them propose a hypothesis based on the data. I would pose the question “ why is diversity important?”

- I will be sure to record any pitfalls and successes of this activity.

NOTE: This exercise was carried out with one of my classes. In the introductory piece, we discussed what biodiversity is, why it is important, and what is conservation biology. I showed the overheads of the distribution of organisms, the graph of human population and the graph of organism extinction. The students really focused on those overheads, and I think that was a key on them developing the procedure on how to measure biodiversity.

The one pitfall of this exercise was that it was pretty chilly out the day we did data collecting and the students were not too focused on indirect evidence of organisms. I think they could have generated a longer list if the weather had been more agreeable.

The graph they generated did not have a curve, so we discussed the interpretation of that.