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Lesson Plan: Analysis and Interpretation Bird Biodiversity Data

Center for Urban Resilience

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LESSON 11: ANALYZE AND INTERPRET BIRD BIODIVERSITY DATA

OVERVIEW:

This lesson is the culminating field site-based lesson in which students analyze the data they have been collecting over the last couple of weeks. Students apply the various scientific concepts they have been learning about biodiversity to make sense of their own data. After analyzing their own data in groups, students present their findings to the entire class. As part of these presentations, the class will discuss the validity of the different groups' claims and whether they are supported by the data collected from the field as well as the various science concepts they have been learning in class.

Ways of Knowing Urban Ecology:



Students will...

Understand

- Understand the importance of linking research questions, data analysis methods, claims, and evidence in scientific argumentation.

Talk

- Write scientific arguments in which they write a claim in response to their original research question about biodiversity and support that claim with appropriate evidence and reasoning.
- Present their scientific arguments to the class in order to persuade the class about their particular claim.
- Ask questions about other groups' arguments, suggest counter claims, and debate multiple ways to interpret the data.

Do

- Analyze their bird biodiversity data including calculating richness, abundance, Shannon-Weaver Biodiversity Index, and Simpson Biodiversity Index.

Act

No specific goals connected with acting on urban ecology in this lesson.

SAFETY GUIDELINES:

There are no specific safety concerns associated with this activity.

PREPARATION:

Time:

2 class periods

Day 1: Activity 11.1

Day 2: Activity 11.2

Materials:

Activity 11.1

- Laptop with spreadsheet software (such as Microsoft Excel) and presentation software (such as Microsoft PowerPoint) and projector (optional)
- Student sheets for each student

Activity 11.2

- Laptops for each group with spreadsheet software (such as Microsoft Excel), presentation software (such as Microsoft PowerPoint), or video production software (optional)

- Poster-making materials such as poster boards and markers (optional)

INSTRUCTIONAL SEQUENCE

Activity 11.1: Analyzing Data

1. Using the biodiversity spreadsheet that contains the formulas for the two indices, students should analyze each set of their data and calculate the following:
 - Species richness
 - Abundance
 - Shannon-Weaver Biodiversity Index
 - Simpson's Biodiversity Index

Note: If you don't have access to computers, students can calculate Simpson's index using calculators (see equation in Lesson 2) or you can just have students graph and compare species richness and abundance.

2. Students should then create a graph for each of the measures above based on the students' comparisons (comparing site 1 and site 2 or different times of the day) over the three days of their observations. See the student handouts for examples of the graphs. These graphs can be made in either Excel or by hand. If the graphs were created using Excel, student can paste these into PowerPoint or print them, making sharing data easier.
3. Once students have made their graphs, the research groups should refer back to their original research question. Drawing upon the observations and their analysis through calculations and graphs, to the groups should be encouraged to draw a conclusion which addresses their question.
 - Students should support their conclusion by writing their arguments on the student investigation sheet. Encourage students to justify the claims that they are making with evidence from the data they collected in their field studies. Students should also explain their reasoning for why that evidence supports their claim. Their reasoning should draw from the various concepts they have learned about biodiversity during the unit.
 - Remind students they are going to present their arguments to the class so they need to consider how they are going to present their justifications or proofs for the claims that they are making.
4. Students should also consider the original predictions they made for their research study. Does their graph support their initial prediction? Why or why not? Ask students to share their thoughts.

Activity 11.2: Presentations of their Findings

1. Students should present their findings to the class. Even if the field study was completed as a full class the "messiness" of the data could result in different groups coming up with different conclusions from the same data. The purpose of the presentation is to have students share their conclusions as well as debate why different groups came up with their varying conclusions.
2. Depending on time, and whether or not these were class or group projects, students could put together a PowerPoint presentation, poster or just orally explain their data to the class.
 - When students are explaining, it may be important to refer student back to their original data

- What differences did they notice between the two sites? Could this explain differences in their data?
 - Was their data low overall for one day at both sites? Was something different (weather perhaps? Or more students outside disturbing the birds)
 - Have students consider observer effects, such as their improving ability to see and identify birds over time.
3. After all the groups have presented their scientific arguments, discuss the similarities and differences between the conclusions that they made from their data. You may also want to give students an opportunity to revise their written scientific arguments based on the discussion in class.

Concluding the Lesson

1. Ask students if they were surprised by their results. What level of biodiversity do you think your field site has (high, medium, low)?
 - Time permitting, encourage students to start thinking about ways to improve biodiversity at their field sites.