# The Bio/Diversity Project

## Lesson 7
## Calculating Biodiversity

Teacher: Akira, Mercedes
Grade Level: Highschool
Lesson Length: 50 minutes

This lesson has been adapted from: Taking a Count of Biodiversity & Measuring Biodiversity

| AZ Science Standard: | 6.L2U1.13<br> Develop and use models to demonstrate the interdependence of organisms and their<br>environment including biotic and abiotic factors<br><br>8.L4U1.11<br> Develop and use a model to explain how natural selection may lead to increases and decreases of specific traits in populations over time. |
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| Learning Objectives: | Students will be able to use a transect technique to collect data on species diversity. |
| **Scientist of the Week:** | |

| Vocabulary | Materials |
|---|---|
| ● Bioblitz<br>● Biodiversity<br>● Transect | Powerpoint<br>Calculation Handouts (print double-sided, one per student)<br>Dataset Handouts |
| **Guiding Questions**<br>● How do you calculate biodiversity?<br>● What is citizen science (aka: community science) and why is it important?<br>● What is a bioblitz? ||

**Engagement Activity (5-10 minutes):**

- Ask students, "What is the biggest single cause of species becoming endangered or threatened in our area?" (habitat loss).
- Review the meaning of the term biodiversity. You may do this by simply asking students to discuss among themselves what it means for an ecosystem to be biodiverse.
  - Have some individuals share their responses verbally.
- Ask the students, "Which do you think would have more species diversity, a desert or a garden? They would likely assume that the desert lot would be more diverse.
  - Tell them today we are going to prove it! (These questions should all be presented on a slide so that students may reference them).
- Explain that to prove this, they must work in groups as field scientists to calculate diversity using a formula
- Show the following video(0:00-3:45):Simpson's Diversity Index Explained
- Have students take careful notes, pausing the video whenever necessary as they will be practicing the contents of the clip.

**Exploratory Activity (30 minutes)**

1. **Dataset Introduction and Explanation:**
   - Explain that each group will analyze data representing species found along a transect in either a **desert ecosystem** or a **garden ecosystem**.
2. **Dataset Access:**
   - If using Google Sheets, share the links to each dataset with each group. If using printed sheets, distribute the handouts.
3. **Calculate Simpson's Diversity Index (Step-by-Step):**

## Simpson's Diversity Index

$$D = 1 - (\sum n(n - 1)/N(N - 1))$$

D= Index
n= # of individuals of a single species
N=# of individuals in total population

   - **Formula Review**: Simpson's Diversity Index
     - Where:
       1. n = number of individuals of a particular species.
       2. N = total number of individuals across all species.
   - **Step 1:** Find the total number of individuals (N) by summing all species counts.
   - **Step 2:** For each species, calculate n(n−1).
   - **Step 3:** Sum the values from Step 2 across all species.
   - **Step 4:** Divide this sum by N(N−1).
   - **Step 5:** Subtract the result from 1 to get Simpson's Diversity Index.
4. **Guided Calculation Example:**
   - Guide the class through one calculation as a model before allowing groups to work on their own

datasets.

**Discussion (15 minutes):**

- Discuss which ecosystem has a higher Simpson's Diversity Index and what this tells us about biodiversity.
- Connect to the idea that high biodiversity often means healthier, more resilient ecosystems.