The Bio/Diversity Project

Lesson 7
Calculating Biodiversity

Teacher: Lauren
Grade Level: 4th-6th
Lesson Length: 120 minutes

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

AZ Science Standard:	6.L2U1.13 Develop and use models to demonstrate the interdependence of organisms and their environment including biotic and abiotic factors 8.L4U1.11 Develop and use a model to explain how natural selection may lead to increases and decreases of specific traits in populations over time.
Learning Objectives:	Students will be able to use a transect technique to collect data on species diversity.
Scientist of the Week: 	**Wangari Maathai** **-**Founder of the Green Belt Movement -First women in East and Central Africa to earn a doctorate degree -Won the Nobel Peace Prize in 2004 for her contribution to 'sustainable development, democracy, and peace' -Wangari Maathai Institute -Wangari Maathai Foundation

Vocabulary	Materials
● Bioblitz	● Powerpoint ● Bird Seed ● Popsicle Sticks ● Glue ● String ● Tape ● Paper Plates ● Paper Bowls

● Biodiversity Citizen Science	● Paper Cups ● Worksheet ● Colored Pencils
Guiding Questions ● How do you calculate biodiversity? ● What is citizen science (aka: community science) and why is it important?	

Engagement Activity (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, a garden or a schoolyard?” 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). .
- 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:

- 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.

Extension Activity (40 minutes):

Promoting Biodiversity Activity (40 mins)

- Give students a list of materials they are able to use to construct bird feeders. Allow them to research to find a bird feeder that they can make with given materials.
- Give students 10 minutes to research, and 30 minutes to construct their bird feeder.
- Allow students to share with their class, and hang up their creations outside (need to check with ms camero)

Citizen Science Activity (20 mins)

- Play the citizen science video (0:00-0:37)
- Demonstrate an example of citizen science using INaturalist and looking at 1-2 species that we have learned about in past lessons
- Tell students that we will be doing our own observations of organisms we see (go outside if weather is good, if not use organisms in the classroom)
- Give students ideas on what could be in their observations, and give them 10 minutes to record their observations
- Allow students to share any observations they made
- Discussion : Why is citizen science an important tool for collecting data? What observations did you find? Could you think of any questions?

Evaluation Activity (5 minutes):

- Journal Reflection:
    - What is something that you learned today?
    - Which activity did you enjoy the most?
    - What was the most challenging?