



The Bio/Diversity Project
Lesson Title: Calculating Biodiversity

Teacher: Emma Turpin & Zabrina Duran

Grade Level: 6th Grade

Lesson Length: 55 minutes

This lesson has been adapted from: <https://www.mdsci.org/wp-content/uploads/2020/06/CalculatingBiodiversity.pdf>

AZ Science Standard:	<i>6.L2U1.13</i> • <i>Develop and use models to demonstrate the interdependence of organisms and their environment including biotic and abiotic factors.</i>
Learning Objective:	• <i>Students will be able to calculate the biodiversity index of their surrounding neighborhood/environment.</i> • <i>Students will be able to explain what it means to them to be a citizen scientist.</i>
Scientist of the Week:	• Juan Pablo Jordán • He is from Quito, Ecuador. He is currently a PhD student at Cornell University in Ithaca, NY. • PhD student. • He is helping document Ecuador's wide variety of spiders before they all disappear. 

Vocabulary	Materials
• <i>Biodiversity Index</i> • <i>Citizen Science</i> • <i>Data</i>	• <i>Powerpoint</i> • <i>5 boxes with open top</i> • <i>20 6-sided dice</i>



• <i>Observations</i>	• <i>50 beans</i> • <i>10 fake bugs</i> • <i>35 jumbo cotton balls</i> • <i>40 mini pompom balls</i> • <i>25 googly eyes</i>			
Seasonality:				
<i>Monsoons</i> July-Sept.	<i>Autumn</i> Oct.-Nov.	<i>Winter</i> Dec.- Feb.	<i>Spring</i> Mar.-Apr.	<i>Dry Summer</i> May-June
Guiding Questions: • How do you calculate biodiversity? • What is citizen science and why is it important? • How do you go about conducting a bioblitz?				

Engagement/Introductory Activity:

- Students will come in and we will display [this map](#) that will show a general idea of biodiversity across the state of AZ.
 - Ask students what they can infer from the map. Ask them to be as specific as possible.
 - What do they think the map is representing? Why are some areas of the map more densely colored than others? Why is the map limited to Arizona?
- Transition to explaining how this data was collected by people being citizen scientists and sharing 1.7 million observations of how the frequency they observed these birds in Arizona.

Exploratory Activity:

- Introduce this activity by discussing what citizen science is and what it means to be a citizen scientist. Make sure students have a good understanding of this concept.
- Show students 2-3 examples of citizen science projects from [this website](#).
- Students will then visit: <https://scistarter.org/finder?active=true> and do some research to find a project that they are interested in (they may pick a project individually or in partners)
- Ask students to take notes on the following information and be ready to share it out loud.
 - Their notes should include:
 - Project title/name
 - Goal of the project
 - Project task
 - Why they are interested in this project

Explain:

- Have students pull out their chromebooks for a kahoot! We decided to do it earlier in the class because it is a review Kahoot that includes questions from the past three weeks of lessons.
- Review kahoot: <https://create.kahoot.it/share/pollination-review/bcd6fd12-94c8-4841-a8b0-867ea20b044f>
 1. Monarch butterflies migrate north in search of a plant called _____.



- Milkweed.
- 2. What has monarch butterfly's population decline been impacted by?
 - a. All of the above. (Habitat loss, Climate change, Pesticides & Herbicide.
- 3. What environmental factor(s) might encourage and/or inhibit the process of pollination?
 - a. All of the above (Sunlight, air quality, mineral, natural disasters)
- 4. Why is migration important for pollinators?
 - a. Food and reproduction
- 5. What part(s) of a flower are important for pollination?
 - a. Anthers or Stigma
- 6. Plants need pollinators for _____.
 - a. Reproduction

Extension Activity/Questions:

- Introduce the activity by explaining how when ecologists want to find out how diverse an area of land is with organisms, they calculate biodiversity by sectioning off a small area and surveying the number of organisms in that specific area.
- We will pass out 5 boxes with various items in them (Each box will have: 4 dice, 10 beans, 2 fake bugs, 7 jumbo cotton balls, 8 mini pompom balls, and 5 googly eyes) to the different areas in the room and have students work in groups.
- Explain how the students will practice those same practices by observing and calculating the 'biodiversity' in class.
 - We will then ask students to count and write down how many different items they see in the box. They are documenting the 'species richness' of the box by doing this. **The species richness for this activity should be 6.** Next, students count and write down the number of each object to represent the abundance of each object. Ecologists call this data species evenness. **The species evenness should be 36 .**
 - With the species richness and species evenness, we will have students can now calculate the biodiversity index.
 - $\text{number of different objects (richness)} \div \text{total number of objects (evenness)} = \text{Biodiversity index.}$
 - Students should get **0.16** ($6/36=0.16$) as the biodiversity index.
- Ask students whether or not they think these boxes are biodiverse or not? Why or why not?
 - **0 indicate a low biodiversity while numbers closer to 1 indicate a high biodiversity.**

Evaluation Activity:

- Ask discussion questions about calculating biodiversity, a bioblitz, and what it means to be a citizen scientist.
 - What does it mean to be a **citizen scientist**? How did the project you chose to participate in qualify as citizen science?
 - What is a **bioblitz**? How can we conduct a bioblitz here in Tucson?
 - How do you calculate **biodiversity**? What information do you need to know and what **formula** should you use?
 - Biodiversity Index formula: Number of different species (richness)/ total number of species in that area (evenness)
- Introduce what the next 4 lessons will look like with the inclusion of the action project.