

## Biodiversity Lesson 2: *The Make* Educator's Lesson Plan

### Objective

In *The Make*, students will:

1. Participate in a Biodiversity Nature Walk in order to identify organisms inhabiting the schoolyard ecosystem.
2. Diagram how organisms are connected to one another within the schoolyard ecosystem.
3. Roll the “Dice of Destiny” to encounter an environmental stressor and predict how the environmental stressor could impact on the biodiversity within the schoolyard ecosystem.
4. Create a final split-poster to show schoolyard biodiversity and organism connections before and after the environmental stressor.

**Time Required:** 200 minutes

Materials Required	
<ul style="list-style-type: none"> <li>● Biodiversity Species Cards (located in Student Guide)</li> <li>● Clipboards for hike</li> <li>● Pen/pencil</li> <li>● Dice 1/group (Referred to as the “Dice of Destiny”)</li> <li>● Poster paper</li> <li>● Colored pencils/markers</li> <li>● Digital camera for photographing organisms*</li> <li>● Field Guides for plants, animals, and insects (optional)</li> <li>● Computers for online field guides (optional) <i>Suggested Resources Include:</i> <ul style="list-style-type: none"> <li>○ Discover Life: <a href="https://www.discoverlife.org/">https://www.discoverlife.org/</a></li> <li>○ Go Botany: <a href="https://gobotany.newenglandwild.org/simple/">https://gobotany.newenglandwild.org/simple/</a></li> <li>○ eBird: <a href="https://ebird.org/media/catalog">https://ebird.org/media/catalog</a></li> <li>○ BugGuide: <a href="https://bugguide.net/node/view/3/bqpage">https://bugguide.net/node/view/3/bqpage</a></li> </ul> </li> </ul> <p><i>*Depending on your school's policy on devices, an iPhone or digital camera is suggested for photography. If these devices are not permitted while on the hike, have students sketch the organisms observed.</i></p>	
Safety Considerations	Science & Engineering Practices
None	<ul style="list-style-type: none"> <li>● Developing and Using Models</li> <li>● Constructing Explanations or Arguments From Evidence</li> <li>● Communicating Findings/Design (Oral Presentation)</li> </ul>

## **Inquiry Scale: Leveling Information**

### **Level 1: most teacher-driven** *(recommended for grades 4-5)*

Lead a schoolyard nature walk with students, having students independently sketch or photograph species observed along the walk. The following day, have students add Biodiversity Species Cards to a collective Schoolyard Biodiversity Chart in order to display all plant and animal species that were encountered during the nature walk. Lead a class discussion/brainstorming session with students in order to discuss connections that exist between plants and animals within the ecosystem. Next, complete the Schoolyard Biodiversity Diagram as a class activity, working with students to diagram the connections that can exist between plants and animals. Once the Schoolyard Biodiversity Diagram has been complete, have each student team roll the “Dice of Destiny” in order to determine which environmental stressor they’ll be addressing. In order to effectively coach and monitor younger students, limit the “Dice of Destiny” variables by choosing only three of the six variables to focus on. Recommended variables include (1: New Predator Introduced, 4: Water Pollution, 5 : Removal of Trees). Allow student teams to work together in order to discuss the impacts of this environmental stressor. Review the “Before” and “After” poster directions with students as a class-wide activity and allow student teams to complete their team posters independently. As the facilitator, check in on group progress. Provide suggestions and support to individuals or specific groups.

### **Level 2** *(recommended for grades 5-6)*

Lead a schoolyard nature walk with students, having students independently sketch or photograph species observed along the walk. The following day, have students add Biodiversity Species Cards to a collective Schoolyard Biodiversity Chart in order to display all plant and animal species that were encountered during the nature walk. Lead a class discussion/brainstorming session with students in order to discuss connections that exist between plants and animals within the ecosystem. Next, complete the Schoolyard Biodiversity Diagram as a class activity, working with students to diagram the connections that can exist between plants and animals. Once the Schoolyard Biodiversity Diagram has been completed, have each student team roll the “Dice of Destiny” in order to determine which environmental stressor they’ll be addressing. Allow student teams to work together in order to discuss the impacts of this environmental stressor. Review the “Before” and “After” poster directions with students as a class-wide activity and allow student teams to complete their team posters independently. As the facilitator, check in on group progress. Provide suggestions and support to individuals or specific groups.

### **Level 3** *(recommended for grades 6-7)*

Lead a schoolyard nature walk with students, having students independently sketch or photograph species observed along the walk. The following day, have students add Biodiversity Species Cards to a collective Schoolyard Biodiversity Chart in order to display all plant and animal species that were encountered during the nature walk. Encourage students to use classroom field guides or online field guide resources to identify the scientific name for each type of species observed in the local ecosystem. Next, review directions for the Schoolyard Biodiversity Diagram and allow student teams to complete this diagram independently, diagramming connections that exist between species in their ecosystem. Once completed, conduct a class-wide discussion in order to share student insight as to how species are connected to one another in their ecosystem in order to allow student teams to further elaborate on their diagrams. Following the class-wide discussion, allow student teams to move forward to rolling the “Dice of Destiny” in order to determine which environmental stressor will influence their ecosystem. Allow student teams to complete the remainder of *The Make* activity and create the “Before” and “After” poster independently. As the facilitator, check in on group progress. Provide suggestions and support to individuals or specific groups, as needed.

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## Level 4: most student-driven (recommended for grades 7-8)

Lead a schoolyard nature walk with students, having students independently sketch or photograph species observed along the walk. The following day, have students add Biodiversity Species Cards to a collective Schoolyard Biodiversity Chart in order to display all plant and animal species that were encountered during the nature walk.

In the following sessions, students will independently complete all aspects of *The Make* process, including identification of species, analyzing connections between species, choice of an environmental stressor, and completion of team “Before” and “After” posters. As the facilitator, check in on group progress. Provide suggestions and support to individuals or specific groups, as needed.

## Agenda

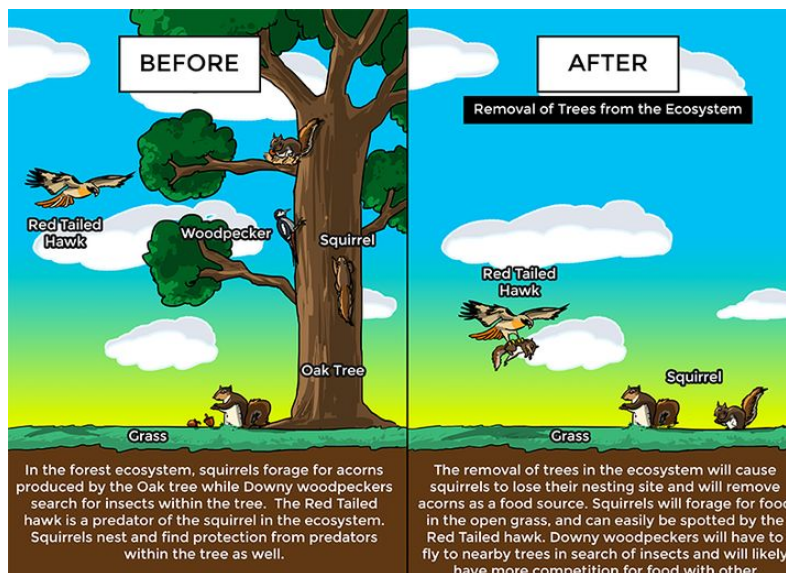
### I. Show PowerPoint to introduce *The Make* Activity (15 minutes)

The PowerPoint will review essential concepts learned in *The Solve* and provide context for the students’ upcoming *Make* challenge.

### II. *The Make* Activity (160 minutes)

As guided by the organizer, students will:

1. Explore the biodiversity of their schoolyard by participating in a nature walk and creating a field journal of organisms observed while on the walk.
2. Create a Schoolyard Biodiversity diagram that shows connections between organisms in the schoolyard ecosystem.
3. Roll the “Dice of Destiny” to encounter an environmental stressor and predict how this environmental stressor would impact on the biodiversity within the schoolyard ecosystem.
4. Create a BEFORE and AFTER poster to show the biodiversity that exists in the schoolyard and how the environmental stressor could impact on the biodiversity within the schoolyard ecosystem. An example diagram is shown here:



### III. Presentation (15 minutes)

Students will present their final poster to their classmates, discussing the biodiversity before and after the environmental stressor has been introduced to the schoolyard ecosystem.

### IV. Exit Ticket (10 minutes)

Students complete the exit ticket that summarizes their understanding of *The Make* and connects students to the upcoming *Engineering* challenge.

*Note: In collaborative classrooms, this serves as the individual accountability in an otherwise group project.*

#### **Exit Ticket Answer Key**

1. What are we studying when we explore the biodiversity of an ecosystem? *We are studying the variety of species found within the ecosystem.*
2. Explain how species can be connected to one another within an ecosystem. *Answers will vary. Potential answers include: species can be connected in an ecosystem in a number of ways. Species can rely on one another for food, as in the case of a predator-prey relationship. Animals and plants have interdependent relationships with one another. Animals help to pollinate plants and disperse seeds for plants (burrs stick to animal fur to be transported miles away to begin a new plant). Animals find food and shelter within plants. For example, within a tree, an owl or squirrel may nest and establish a home.*
3. Give three examples of how humans have negatively impacted on the biodiversity of ecosystems. *Answers will vary. Potential answers include: overfishing, introducing invasive species, deforestation, and mining and burning of fossil fuels.*
4. How can the removal or death of one species impact the biodiversity in an ecosystem? *Answers will vary. The removal or death of one species can impact the biodiversity of an ecosystem in a number of ways. If a top predator is removed from the ecosystem, animals lower in the food chain will reproduce and increase in number. This can impact on the ecosystem when omnivores/herbivores lower in the food chain increase in population size too rapidly and over-consume vegetation in the ecosystem, reducing the availability of food and shelter for other animals.*
5. Why is it important to maintain biodiversity on our planet? *It is important to maintain the biodiversity of our planet since every living organism is connected to one another in a unique way, whether it be for food or shelter, or impact on the environment. Additionally, a healthy and diverse ecosystem provides medicinal resources, and important ecosystem services, such as nutrient storage and recycling, pollution breakdown and absorption, and water filtration.*

**The Make Assessment:** Project Grade and Rubric Score Sheet – Biodiversity

\*Note that final teacher comments and grades are provided on the next page.

Project Submitted by \_\_\_\_\_

**Biodiversity The Make Checklist: Content Concepts and Practices**

Your Challenge: Analyze your schoolyard ecosystem in order to explore the biodiversity of the area as well as environmental stressors that could impact biodiversity within the schoolyard.

**Project Completion:**

- Field Journal
  - Environmental factors (date, temperature, time, weather, ecosystem type) are recorded
  - 5 species identified within nature walk
  - Sketch completed for each species
  - Description completed for each species
  - Location completed for each species
- Schoolyard Biodiversity Charts
  - Schoolyard Biodiversity Chart includes organism connections within the ecosystem
  - Dice of Destiny environmental stressor is chosen/circled
  - Impacts of environmental stressor described
- Final BEFORE and AFTER Biodiversity Poster
  - Illustrates current biodiversity and relationships that exist among organisms in schoolyard ecosystem
  - Illustrates biodiversity and relationships that could exist AFTER the environmental stressor impacts the ecosystem
  - Labels included for all organisms in both BEFORE and AFTER parts of the poster
  - Description of relationships that exist among organisms included below the BEFORE part of the poster
  - Environmental stressor labeled and illustrated in the AFTER side of the poster
  - Description of how the environmental stressor could impact the biodiversity and relationships among organisms included below the AFTER side of the poster
  - Poster design is well-organized, neat, and in color

**DCI Standards Checklist:**

- Accurate classification of species observed within the schoolyard ecosystem
- Accurate identification of relationships and connections that exist amongst organisms within the schoolyard ecosystem
- Ability to accurately analyze how environmental stressor would negatively impact the biodiversity within the schoolyard ecosystem

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Science & Engineering Practices Rubric				
	Emerging (1)	Developing (2)	Proficient (3)	Advanced (4)
<b>Developing and Using Models</b>	Drawings, diagrams, or visual models include major misconceptions or have missing parts. Explanation of the model is minimal or not present.	Drawings, diagrams, or visual models include minor misconceptions or have missing parts. Explanation of the model is minimal.	Drawings, diagrams, or visual models are complete, but contain a minor misconception. Explanation of the model is complete but lacking complexity.	Drawings, diagrams, or visual models have no misconceptions and contain all details. Explanation of the model is complete and complex.
<b>Constructing Explanations or Arguments From Evidence</b>	Constructs an explanation with no clear sources of evidence.	Uses scientific principles and/or data from at least one source to construct or evaluate an explanation, but explanation contains minor misconceptions.	Uses accurate but incomplete scientific principles and/or data from multiple sources to construct or evaluate an explanation.	Uses accurate and complete scientific principles and/or data from multiple sources to construct or evaluate an explanation.
<b>Communicating Findings/Design (Oral Presentation)</b>	Findings/design are incompletely and inaccurately communicated. Or no evidence of using appropriate eye contact, adequate volume, or clear pronunciation.	Findings/design are completely communicated with some misconceptions. Or uses minimal eye contact, inappropriate volume, or inconsistent pronunciation.	Findings/design are completely communicated but lacking depth and complexity. Or often uses eye contact and engaging and appropriate volume and pronunciation, but is inconsistent.	Findings/design are completely communicated with depth and complexity. Or mostly uses eye contact and engaging and appropriate volume and pronunciation.
Final Teacher Comments:				
Final Score:		Final Grade:		