

LESSON 3: BEHAVIORAL PLASTICITY

OVERVIEW:

In the previous lessons, students learned about the importance of noise in the urban environment. In response to urban noise as well as other characteristics of urban ecosystems, organisms modify their existing behaviors to maximize their fitness and likelihood of survival. This lesson focuses on behavioral plasticity, which is the idea that organisms' behaviors are flexible and can be modified in response to their environment. Students complete an activity in which they investigate the plasticity of their own behaviors. The class then discusses how this analogy is similar and different compared to urban species as well as how the plasticity of a species behavior impacts its likelihood of survival in an urban environment.

SUB-QUESTION:

How do behaviors impact survival?

Ways of Knowing Urban Ecology:



Students will...

Understand

- Understand that behavioral plasticity is the ability to respond to an environment in different ways. (*ecosystem change, ecosystem state and structure*)
- Understand that urban ecosystems place a premium on a species' existing behavioral plasticity. (*ecosystem change, ecosystem state and structure*)

Talk

No specific goals connected with talking about urban ecology in this lesson.

Do

- Analyze data from their own behaviors to identify how flexible their behaviors are in response to a changing context.

Act

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

SAFETY GUIDELINES:

None

PREPARATION:

- Create one ziplock bag or cup of gumdrops for each pair of students. Each group should receive 5 gumdrops each of 4 different colors for a total of 20 gumdrops in the bag (e.g. 5 red, 5 orange, 5 green and 5 yellow).
- Place two cards with pictures of the gumdrop structures in an envelope for each pair.

Time:

1 class period

Materials:**Activity 3.1**

Student sheets

For each pair of students

One set of 20 gumdrops (5 each of 4 colors)

One envelope with two cards with the pictures of the gumdrop structures

Stopwatch or access to a clock where they can observe their time

Activity 3.2

Tokens to spread around the room (could be anything)

INSTRUCTIONAL SEQUENCE**Activity 3.1 – How do communication behaviors impact survival?**

Introducing the Activity – Structure #1

1. Tell students that in order to investigate how species behaviors both can and cannot change, they are going to complete an activity where they take a look at their own behaviors. Tell students they will explore different ways changing their behavior can help an organism survive in an urban environment.
 - They are going to work in pairs. One student will be the *Describer* and the other student will be the *Builder*. The *Describer* is going to have a picture of a structure made out of gumdrops. Without showing the other partner the picture, the *Describer* is going to describe the picture.
 - The goal is to have the *Builder* construct the structure as accurately and quickly as possible without ever looking at the card. Both students are able to talk to each other and able to see each other for structure #1.
 - Have the students gather the materials without opening the envelope.
 - You may want to have the whole class start building at the same time or have each pair start on the own. Remind the students to time themselves either using stopwatches or another clock in the room.
2. When the students are done, have them record the time, accuracy of the structure and building strategies on their student sheet. Wait to discuss different groups' strategies until after building Structure #2. This will increase the chances of different groups using different strategies.

Introducing Structure #2

3. Tell students that they are going to repeat the activity building a different structure. The difference is this time the two partners should not look at each other while they are building the structure. The *Describer* should turn around so their back is facing their partner. The two students can still talk to each other.
4. Again, you may want to have the whole class start building at the same time or have each pair start on the own. Remind the students to record how long it takes them.
5. After students have completed building both structure #1 and structure #2, have them share how long it took them to build the structures and the different

- strategies that they used. You may want to create a table on the board or an overhead and have each pair record their time and the different strategies that they used.
6. Ask students to share some strategies that worked well and some strategies that did not work well for building both structures.
 7. Have students complete the three conclusion questions on the student sheet. After they have recorded their responses, have them share their different ideas.

Activity 3.2: Behavioral Adaptations for the City- Foraging

1. Now that students have considered behavioral changes in communication they will consider animals' foraging behaviors. Tell students that foraging is the behavior of searching for food.
2. Students will simulate foraging in various conditions. Have 6-10 students volunteer. Have one or two students wait for further instructions, and divide the remaining students into two groups. One will be given the choice to forage during the day or night, whichever they would like on a day to day basis (the group does not need to do all the same thing). The other group must forage during the day only.
 - Using the lights on and off to represent day and night, or simply calling out when nights stop and days begin, have the students "forage" during their designated times. Their goal is to collect 5 tokens you have spread throughout the room. Each day and night should last about 10 seconds.
 - After doing this once, introduce the student (or two) who had previously been waiting as a new predator or other menace to the foragers. This menace, which could also represent something like a car, travels mainly during the day and, if touches one of the foragers, takes them out of the game. Let the day or night foragers choose which time they would like to forage in today, and repeat the activity.
 - Show that those with enough behavioral flexibility to forage when the danger is less, during the night, were better able to survive the new condition.

Concluding the Lesson

1. Discuss the results from the activities, some key ideas that should arise are:
 - Humans have a great deal of behavioral plasticity. We are able to change many of our behaviors in response to our environment in a variety of ways.
 - When a species is able to change its behavior, scientists refer to this as *behavioral plasticity*. Behavioral plasticity is the ability to respond to an environment in different ways. Some animals can engage in different activities when the environment changes in order to adjust to the new characteristics of the environment.
 - Urban ecosystems frequently change and introduce new environmental stresses on species. Consequently, behavioral plasticity is essential for a species survival in an urban ecosystem.