Teacher:	Subject and Grade Level: Microplastics 5-8	Date

Lesson objectives: Students will simulate restricted action using a rubber band to model the entanglement of marine wildlife. Students will use a feeding simulation to mimic how easily marine debris is mistaken for food and ingested by marine wildlife.

MS-CCRS or NGSS Standards:
L.5.3B Students will demonstrate an understanding of a healthy ecosystem with a stable web of life and the roles of living things within a food chain and/or food web, including producers, primary and secondary consumers, and decomposers.

E.5.10 Students will demonstrate an understanding of the effects of human interact

L.6.3 Students will demonstrate an understanding of the relationships among survival, environmental changes, and diversity as they relate to the interactions of organisms, populations, and the environment.

L.7.3 Students will demonstrate an understanding of the importance that matter cycles between living and nonliving parts of the ecosystem to sustain life on Earth.

E.8.10 Students will demonstrate an understanding that a decrease in natural resources is directly related to the increase in human population on Earth and must be conserved.

Safety: Ensure that rubber bands are not tied too tightly around hands.

Materials (per table):

- 4 rubber bands (one per person)
- 3 paper boats filled ¾ with beans
- 3 medicine cups filled with tan beads
- 3 medicine cups filled with popcorn kernels
- 3 spoons (one per student)
- 3 small cups (one per student
- 3 coffee filters (one per student)

ENGAGEMENT
Each student should hang the rubber band around his/her pinky finger in one hand, then stretch the rubber band across the back of their hand and hook onto their thumb. Have students place their other hand (without the rubber band) behind their back. Students should attempt to free the “entangled” hand without using their opposite hand, teeth, or any other body part. Allow students 15 second to attempt to free their hands from the rubber band.

EXPLORATION
Ask: Were you able to free your hand from the rubber band? How did you feel while trying to remove the rubber band? Students can journal feelings or have a class discussion.

Explain that this activity mimics what it may be like for many marine animals when they become entangled in pieces of marine debris. Two common examples include seabirds becoming entangled in fishing lines and sea turtles becoming wrapped in line, rope, or other fishing gear. Explain that these animals, unlike us, do not have fingers or opposable thumbs that easily allow them to remove items.

Ask: Is there another way marine debris can hurt the ocean ecosystem or the animals living within the ocean ecosystem?

Engage students in Discussion. This is where participants should be eager to describe the potential for animals to ingest (eat) debris.

Ask: What items could we collect on our cleanup that might be mistaken for food and be ingested by marine wildlife if left in the marine environment? Have students list items, and write on board. Can extend to say what these items may resemble (like plastic bags resemble jelly fish).

EXPLANATION

Ingestion is another negative impact of marine debris on animals. Ingestion is when something, such as food, is taken into the body. It is essentially the same thing as eating something. Many marine animals, such as mammals, birds, and sea turtles have been known to ingest marine debris by accident. Marine debris is often mistaken as a food source or is attached to a food source and ingested by an animal. Debris ingestion poses a serious health hazard and can lead to "loss of nutrition, internal injury, intestinal blockage, starvation, and death. Plastics are the most commonly ingested form of debris." (NOAA)

ELABORATION

Assign tables: 2 tables are baby fish, 2 baby turtles, and 2 baby seabirds.

Tell students that they are hungry, and their food is the tan beads "floating" in the ocean (paper boat). Unfortunately, their food is contaminated by plastic (beans). Their job us to use their mouths (spoons) to put their food (tan beads) in their stomachs (cups), trying to avoid the plastic as they do so.

1. Students should pour one cup of tan beads in the boat of beans and mix with fingers or spoon.
2. Each student has 30 seconds to feed. This forces the students to eat fast and ensures they get some plastic. Students will then pour their stomach contents into a coffee filter. Then, they should count how many pieces of plastic and how many pieces of food they had. They should then calculate the percent plastic in their diet. If it is over 20%, it is mortality.
3. Students should then pour the popcorn kernels in the boat and again mix with fingers or spoon. This mimics microplastics. Each student has 30 seconds again to feed. Students will then pour their stomach contents into a coffee filter. Then, they should count how many pieces of plastic, microplastic, and how many pieces of food they had. They should then calculate the percent plastic and microplastic in their diet.

EVALUATION

Journal about the following prompts:

Many marine animals are unable to tell the difference between food and marine debris. They often unknowingly ingest both large and small items (macro and microplastics) among other marine debris items. Why is this a problem for animals? Does this matter in the community you live, or is this only a problem on the coast? Explain your answer.

REFERENCES