Elementary Institute of Science

Hands-on Marine Biology Activity 3

Topic and Learning Objective:

Marine plastics and pollution

Students will learn about how marine plastics impact the marine food web by making observations in a hands-on exploration activity and in a role-playing activity.

Alignment with NGSS Grades 3-5

Science and Engineering Practices

Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

- Apply scientific principles to design an object, tool, process or system.

Disciplinary Core Ideas

ESS3.C: Human Impacts on Earth Systems

- Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things.
- Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise.

Materials:

- Fishing line
- plastic bag
- Ziploc bags
- Tape
- index cards
- markers
- plastic tubs/buckets (3)

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Describe the activity in detail and how it will work toward an understanding of the learning objective:
Activity: Know Your Marine Plastics: Students will be split into three groups and each group will be given a tub full of water and a type of marine plastic. Using their eyes and their hands, they can play around with the plastic, making observations about size, color, and shape. With their group or partner, students will brainstorm a) What kind of ocean organism might be harmed or threatened by this plastic? b) How might the organism be harmed or threatened and what can they do to work around this threat? c) What can humans do to prevent this kind of plastic from accumulating in the oceans? This activity will be used to get students to begin thinking about how plastics can enter the marine food web.

Activity: Entangled in the Food Web: Students will be assigned roles in a simple marine food web and will be labeled with temporary name tags: 1 human, 1 shark, 3 fish, and 1 sea turtle. Four remaining students will be given the role of jellyfish **or** plastic net and plankton **or** plastic bead, but will be asked to keep their specific role a secret. The group will be asked to form a food chain while a timer is set, placing their right hand on the right shoulder of the classmate that they would eat in order to fulfill their role in the food chain. Shark → sea turtle → jellyfish → fish → plankton would be a possible successful chain, while a chain containing plastic, such as Human → shark → sea turtle → fish → plastic bead, would not be a successful chain. Under a time limit, the challenge posed will be in forming a successful food chain that does not contain either of the two plastics, even though the other students do not know which student is plastic and which student is prey.

How will you conclude the lesson to enforce the learning objective?

- Students will be asked to identify the top and the bottom of the food chains in the activity and why plastic entering the food chain would be harmful to the animals involved.
- Have students volunteer to explain how humans pollute the oceans with plastic and how they can help prevent pollution

What science process skills will this lesson exercise?

- Observation
- Inference
- Collaboration and problem solving

Safety precautions:

Handling water with objects that may pose choking hazard (small plastics, etc.); Being safe and gentle when putting their hands on other students' shoulders during food web activity

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Instructor: Erin Navarro **Class:** Marine Biology **Week #:** 2

Materials:

Cups, salt, food coloring, ice, hot water, cold water, room temperature water, baking dish, beakers, spoons

Topic and Learning Objective: Water Density and Adaptations

Students will learn about how salinity and temperature can affect water density and create zones in the ocean. They will also learn about why these factors can influence the types of organisms and adaptations found in each zone.

Describe the activity in detail and how it will work toward an understanding of the learning objective:

Using any preexisting knowledge they have about density and the behavior of water, students will be asked to make predictions about what they will observe in the following activities:

1. Students will make several solutions of varying densities by adding salt.
2. After making a highly saturated solution, they will half fill two of three cups.
3. To one of these, they will add blue food coloring and stir, representing ocean water.
4. They will then fill the third cup halfway with warm, fresh water, representing fresh/estuarine water.
5. They will be asked to slowly pour the warm, blue water into the fresh water and note any observations.
6. To the second cup of warm, saturated water, they will add additional warm water and red food coloring, mixing well.
7. They will then slowly pour some of this solution to the cup containing the other two solutions, noting any observations.

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After discussing observations of mixing and/or separation, we will move onto a second activity in which we use water of varying temperatures:

1. In a baking dish I will have room temperature water. To it, I pour red-dyed hot water and blue-dyed ice cold water at the same time and have students observe.
2. Students will note the separation that goes on and will be asked about why the two water temperatures separate in the dish. If any mixing is observed, students will be allowed time to hypothesize why that may be. Both activities highlight how water densities can differ, due to both temperature and salinity. This is the case in the ocean where stratification arises when cool, dense water sinks while warm, less dense water is allowed to float on top.

How will you conclude the lesson to enforce the learning objective:

1. Using their observations from the salinity and temperature experiments, they will be encouraged to discuss what happens when you have **both** temperature and salinity affecting the density of water in the oceans.
2. We will also discuss how the water density, temperature, and salinity of oceans zones can influence the types of sea organisms found in each zone.

What science process skills will this lesson exercise?

- Observation
- Collaborative discussion
- Making predictions and hypotheses
- Drawing conclusions

Safety precautions:
Caution should be taken when handling with hot water (will only be poured by instructor);
Caution should be taken to not stain any clothes with the dye