THE DALLAS WORLD AQUARIUM

# Pre-Field Trip Lesson Plan: Adapting to Major Environmental Changes

Goal: Students will gain an understanding of how climate and environmental changes can necessitate changes in a species and ultimately the ecosystem in which it lives.

Objectives:

1. Students will select an aquatic animal and describe and draw how this animal might change if it had to evolve to live on land.

2. Students will provide accurate explanations of the changes that could happen to an animal and to an ecosystem in response to major climate or environmental change.

Science TEKS: High School Aquatic Science/High School Biology – 3.A, 3.B
High School Biology – 13.A, 13.D

(3) Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to:

(A) develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;

(B) communicate explanations and solutions individually and collaboratively in a variety of settings and formats.

(13) Science concepts--interdependence within environmental systems. The student knows that interactions at various levels of organization occur within an ecosystem to maintain stability. The student is expected to:

(A) investigate and evaluate how ecological relationships, including predation, parasitism, commensalism, mutualism, and competition, influence ecosystem stability;

(D) explain how environmental change, including change due to human activity, affects biodiversity and analyze how changes in biodiversity impact ecosystem stability.

Materials:

- "Adapting to Major Environmental Changes" packet
- Computer/tablet access
- Colored pencils and/or markers

Introduction/ Background:

1. In preparation for our field trip to the Dallas World Aquarium, we are going to discuss animal adaptations. Specifically, we will talk about how animals adapt over time to be able to survive climate and environmental changes.

2. Begin a discussion about adaptations. Mention that there are many animals who evolved interesting and unusual adaptations that allow them to live in many different climates and environments.

3. Ask the students to think about adaptations that allow the following animals to live in their very different habitats:

Three-toed sloth in a Costa Rican rainforest.

*Example responses: Slow movement to "fly under the radar" from predators, algae growth on hair for camouflage, claws that allow them to live in trees with minimal energy expenditure, specialized digestive system that allows them to get the most out of low nutritive leaves.*

Hummingbird in a meadow in Iowa.

*Example responses: Wings that allow them to migrate seasonally and position themselves to drink nectar, long, thin beak and tongue to extract nectar and build nests, the ability to achieve a torpor state in cold weather (like a mini-hibernation).*

Blue penguin on the shoreline in Tasmania.

*Example responses: Streamlined shape for swimming, wings shaped for steering, short feathers to minimize drag, down feathers for warmth, beak shaped for grasping and eating prey.*

Directions:

1. Distribute one "Adapting to Major Environmental Changes" packet to each student.

2. Explain that each student will choose one of the five exclusively aquatic Dallas World Aquarium animals shown in the left column of the first page

of the packet. They will then conduct research on adaptations their selected animals have to survive where they live.

3. For the research, students can use the Dallas World Aquarium website (www.dwazoo.com) or other means to obtain information. They should take notes on the adaptations their animal has for living where it does.

4. After completing their research, have the students fill out the chart on the first page of the packet with information about the adaptations their selected animal currently has for living in an exclusively aquatic environment.

5. Move on to the second page of the packet. Have the students think about what might occur if the aquatic environment in which their animals live became inhospitable. Have the students imagine that their animals must adapt over time to a terrestrial existence so the species can survive long-term.

6. Explain to the students that they will be making two sketches. The first will be how the student imagines their animal to look during the process of evolving to a terrestrial existence. It should be of the animal as it is just starting to move onto land. The second sketch will be how the student imagines their animal to look once it is fully adapted to life as a terrestrial animal.

7. When the students are finished with their sketches, ask them to fill in the chart on the third page of the packet. This chart involves describing the adaptations their selected animal now has for living in an exclusively terrestrial environment.

8. To finish the activity, ask the students to answer the critical thinking questions on the fourth page of the packet.

Wrap-Up/ Discussion:

1. Select one of the five animals. Ask the students who selected that animal to describe their new land-adapted animal to the class. Ask other students who selected that animal to share whether their adaptations resulted in a similar or a different terrestrial animal.

2. If students with the same animal had different interpretations, discuss why this may be the case. Perhaps it has to do with the type of terrestrial environment the student envisioned. Perhaps the student envisioned the animal utilizing a different food source than another student did.

3. Repeat the exercise for each of the five animals.

Assessment: Comprehension of concepts will be evaluated through student participation in lesson discussions as well as the sketches and answers to the questions on the Adapting to Major Environmental Changes worksheet packet.

Modifications:

- For students with visual or motor impairment, you could replace the drawing portion of the activity with a written or oral description.

Extension Activity: "Fish Body Shapes" activity

Students learn about different fish body shapes, and work to invent their own fish species with each of the different body shapes. *Worksheet included.*