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GRADE LEVEL:
Upper Elementary

DURATION:
2 - 3 Lessons

SUBJECTS:
Science

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Underwater World

Lesson Objective & Summary

Objective: Students will identify the major anatomical parts of a fish and examine how different features help fish survive in their aquatic environment. Students will also compare and contrast fish with humans, and discuss why each is better suited for their environment.

Summary: Lesson 1: Fish Anatomy 101

Students will consider what parts of the human body help us in our daily life. Students will examine and identify the different parts of a fish on a fish drawing. Students will then think about the body parts of a fish that help it to survive in the water. Students will compare and contrast fish anatomy with familiar parts of the human body using a Venn Diagram and discuss what parts of a fish's body make it better suited to live in the water.

Lesson 2: Fish Shape, Scales, and Skin

Students will explore how a fish's shape helps it to move efficiently in water. Students will also explore how scales are similar to fingernails, in that they protect fish's sensitive bodies.

Lesson 3: Gills, Lungs, and More

Students will conduct a simple experiment to see how fish breathe air from water. Students will examine how fish are able to breathe in water while humans cannot. Students will also discuss what other factors (i.e.: pollution) might affect fish's ability to breathe.

Standards & Benchmarks

From National Science Education Standards, Life Science:

- Millions of species of animals, plants, and microorganisms are alive today. Although different species might look dissimilar, the unity among organisms becomes apparent from an analysis of internal structures, the similarity of their chemical processes, and the evidence of common ancestry.
- Species acquire many of their unique characteristics through biological adaptation, which involves the selection of naturally occurring variations in populations.

Background Information for Educators

Mauritius is home to hundreds of fish species, many whom are native to the waters of the Indian Ocean. Wrasses, trevally, bannerfish, and grouper are some of the more common fishes of Mauritius's tropical waters. Mauritius is also

home to many different species of sharks; however, some of these sharks (including the Great Hammerhead) are endangered due to illegal fishing for their valuable fins.

Although each fish has unique characteristics, all fish have four things in common: a flexible back bone, cold blood, fins, and gills. Most fish are torpedo shaped, which makes it easy for them to move through water efficiently. Fish are able to take in dissolved oxygen through their mouths to breathe, and then they exhale through their gills, thus enabling them to breathe underwater.

Mauritius's colorful marine life attracts tourists from all over the globe each year. However, increased boat traffic and economic development has brought pollution to Mauritius's once pristine waters. These external factors have had noticeable impact on Mauritius's aquatic environments, therefore sparking increased fervor among marine conservationists.

Guiding Questions	Key Vocabulary
What are the major parts of a fish that help it to live in water? What are some of the similar anatomical features of a fish when compared with a human being? How are they different? Why are they different?	Dorsal Pectoral Anal Lateral Line Pelvic Gills Scales

Lesson Plan 1: Fish Anatomy 101

1. Begin by watching the episode entitled How Fish Breathe.

2. Ask students to consider what parts of their bodies they use each day. Make a list of these body parts and their functions.

3. Ask students to consider what parts of a fish they are familiar with. How do these parts work to help fish live in the water?

4. Display a fish drawing (you may choose to download the Salmon Unit from Fisheries and Oceans Canada). Work with students to identify each of the major parts of a fish (External: fins: dorsal, pectoral, pelvic, anal; scales; scales; lateral line; Internal: stomach, intestine, gill rakers). Ask students to consider what body parts help them to survive in the water (e.g.: gills enable fish to breathe underwater; scales help to protect fish)

5. Have students create a Venn Diagram and/or Table to compare and contrast some of the body parts and functions of humans and fish. Ask students to consider what anatomical parts help fish survive in water.

Lesson Plan 2: Shape, Scales, and Skin

1. Review fish anatomy with students from previous lesson.

2. Have students think about different types of fish they know. Ask students to consider the different shapes of fish and why fish are shaped certain ways. Have them notice that the same species of fish will be the same shape. Point out to students that most fish have narrow noses, wider bodies, and narrow tails, shaped similar to torpedoes.

TEACHER PREP

Modeling Clay
(enough for each student)

Skewers

Basin(s) of water

Pencils or pointed objects

3. Using modeling clay, have students make different fish shapes, about 10-15cm long. Have students place a skewer through their fish shapes length-wise.

4. Have students move their fish shapes through basins of water and record their observations of how each fish moved.

5. Have students make other shapes with their clay (i.e.: balls, human beings, square) and test their shapes in the water as they did the fish, recording their observations. Have students consider which shapes moved easiest through the water. Point out to students that fish's torpedo-shaped bodies help them to move easily through water.

6. Ask students to consider what dangers fish may have in their environment (e.g.: sharp coral, stinging animals) and what body parts they have to protect themselves.

7. Have students touch their fingernail gently with a pencil or other pointed object. Then have students touch their skin gently with the same object.

8. Ask students to answer the following questions: Which surface was hardest? Which surface was most sensitive? Which surface is most flexible? Which surface best protects from cuts and scrapes? What would happen if a human body was covered with fingernail material.

9. Point out to students that fish are covered with scales, which are clear, almost round platelets that are very similar to human fingernails. These scales protect fish from dangers in their external environment, such as sharp coral or stinging animals. Fish are covered with hundreds or thousands of tiny scales which move when the fish moves, making it easy for the fish to swim through water. Scales are clear, but fish skin beneath the scales is usually colorful and visible through the scales.

10. Ask students to record 3-5 facts they learned about fish and their body shape, scales, and skin. Then, have them add to their Venn Diagrams or tables anything else they noticed that enable fish to live in their aquatic environments.

Lesson Plan 3: Gills, Lungs, and More

TEACHER PREP

Paper Towels

Clear jar with lid

Water

Eye dropper

Blue food coloring / dye

1. Review with students what they have learned about fish anatomy. If needed, have students re-watch the How Fish Breathe episode.

2. Ask students to describe how they breathe. Ask students if they have ever tried to breathe underwater. What happens? Why can't humans breathe underwater? Why can fish breathe underwater?

3. Explain to students that fish also breathe oxygen, but that they breathe oxygen that has been dissolved in water?

4. Show students a jar filled with water. Seal the jar and shake the jar up. Point out to students that air bubbles float to the water's surface. Explain that even after the bubbles have popped, there are still tiny bubbles of air in the water.

5. Ask students to describe the color of air. Because it would be difficult to see air, explain that you will use blue food coloring/dye to represent the air in water. Add a few drops of blue dye to the water and shake it gently to mix.

6. Lay out a paper towel on a flat surface. Use the water dropper to drop the blue-dyed water onto the paper towel. Ask students to explain what they notice about the water (some water passes through the paper towel with the dye, while some remains on the paper towel). Explain that this is similar to what happens when fish breathe in water.

7. Explain that fish "inhale" water by opening their mouths. When they close their mouths, water is pushed into their gills, where oxygen from the water is absorbed into the fish's blood stream. Water is then exhaled through fish's gills back out into the surrounding water.

8. Have students add any additional information to their Venn Diagrams or charts, comparing and contrasting human anatomy with fish anatomy.

9. Have students write or share what they have learned about fish through these lessons.

Challenge Questions

What are some environmental factors that may affect aquatic environments? (i.e. pollution due to boat tourism and economic development)

What are some of the ways marine conservation is happening? How effective are these in addressing some of the issues affecting marine life?

Assessment Rubric	Below Expectations	Meets Expectations	Exceeds Expectations
Oral Discussion and Student Reflection (written)	Student identifies most parts of fish anatomy but may not be able to identify all parts, or be able to explain each part's specific function. Student may not have clear understanding of how fish breathe in the water.	Student accurately identifies fish anatomy and shares observations about fish shape, movement, and anatomy. Student expresses clear understanding of how fish breathe in the water.	Student accurately identifies fish anatomy and shares observations and insights about fish shape, breathing, movement, and anatomy that reflect higher-level thinking and analysis.
Fish Facts	Student identifies 3-5 general facts about fish learned through exploration. Facts may be generalized observations but lack specific details that reflect a deeper understanding of fish anatomy.	Student identifies 3-5 specific facts about fish learned through exploration. Facts may include information about fish body shape, anatomy, function, and adaptation.	Student identifies five or more specific facts about fish learned through exploration. Facts include detailed information about fish body shape, anatomy, function, and/or adaptation. May also show some understanding of how different fish shapes or types of fish are specific within an environment. (i.e.: larger fish are found in deeper waters).
Venn Diagram	Student identifies some of the similarities and differences between human beings and fish but may be more generalized (i.e.: both humans and fish have eyes)	Student clearly identifies similarities and differences between human beings and fish. Differences listed reflect a basic understanding of how each is better suited to their particular environment.	Student clearly identifies similarities and differences between human beings and fish and includes information that reflects an understanding of why each is better suited for their particular environment.

Additional Resources

Fish Species of Mauritius
http://www.arkive.org/explore/species?geographicLocation=Mauritius

Mauritius Marine Protection
http://www.conservationafrica.net/projects/mauritius-marine-project