

Curriculum Guide/Lesson Plan

How to Read a Fish with Aurelia

In this lesson, students will learn about fish form and function via the Aurelia app, then apply that knowledge to the activities listed below.

Subject Areas / Grade Levels / App Tie-In / Learning Standards

Subject Area: Fish Form and Function, Marine Science, Science

Grade Levels: 9-12

App Tie-In: Aurelia

NGSS Learning Standards:

HS-LS2-8 Ecosystems: Interactions, Energy, and Dynamics

Access

Access the Aurelia app via Verizon Innovative Learning HQ at:

<https://www.verizon.com/learning/ar-vr-apps/Aurelia/18>

Overview

This lesson will focus on fish form and function. After discussing basic fish anatomy, students will explore ecosystems in Aurelia and build their own fish. This lesson will expand on fish anatomy and how certain forms allow different fish to thrive in a given environment. At the end of the lesson, students will be able to look at a fish and explain how it uses its morphological adaptations to its advantage and how it interacts with other individuals in its environment.

- In Segment 1, we will learn about basic fish anatomy.
- In Segment 2, we will learn about fish body shape and how it relates to how the fish swims and the habitat that it lives in.
- In Segment 3, we will learn about how different fin shape and placement relates to different swimming styles.
- In Segment 4, we will learn about mouth shape, size, and placement and how it relates to a fish's diet.
- In Segment 5, we will apply what we know to building a proper fish in the Aurelia application.

Objectives

- In Segment 1, students will be able to identify the basic anatomy of a fish, including knowing what each body part does, and begin to explore building their own fish in the Aurelia application.
- In Segment 2, students will be able to define the different fish body shapes and how each one allows fish to be adapted to different environments and lifestyles.

- In Segment 3, students will be able to identify how fin shape and placement relates to how a fish swims, balances, and steers, as well as how different tail shapes lead to different life history traits (ex. sprinters vs. marathoners).
- In Segment 4, students will be able to identify the different fish mouth types and explain how different mouth shape, size, and placement relates to what a fish eats.
- In Segment 5, students will answer review questions to ensure that they are understanding the concepts and apply what they know to building a proper fish in the Aurelia application.

Essential Questions

- In Segment 1: What are the different parts of a fish and what does each part do?
- In Segment 2: How do the different fish body shapes give clues as to where a fish lives and how it moves within its environment?
- In Segment 3: How do different fin shapes and placements relate to different swimming styles?
- In Segment 4: How does mouth type affect what a fish consumes?
- In Segment 5: How do body, fin, and mouth types go together to create fish that can survive in different habitats?

Materials and Preparation

Student Workbook - Access the student workbook [here](#)

Teacher Handbook - Access the teacher handbook [here](#)

Program Set-Up

1. Have Aurelia ready to go and logged in for all students
2. Segment 4: Fish Dentition Activity
 - a. Set up trays with both “food” and “teeth type. Each tray will simulate how fish utilize given teeth types to consume different prey.
 - i. *Fused plates*- hammer and Nilla Wafer cookies
 - ii. *Sharp, pointed canines*- chopsticks, tongs, and any small object that you have a lot of, cotton balls or packing peanuts work well
 - iii. *Predominantly molars, few sharp canines*- use the same materials as above

Background

Fish make up the largest of the vertebrate groups with over 20,000 species. There is a wide variety of fish that live all the way from the deep, cold Arctic Circle to the shallow, warm waters at the equator. Fish are able to survive in such a wide variety of environments because they have adapted to have a diverse array of modifications. All fish have the same basic structure and anatomy, but each group of fishes has made their own variations to the basic fish blueprint, allowing them to thrive in either different habitats or in different parts of the same environment.

How does form equal function? This means that the overall shape or placement of a particular body part on a fish can indicate how that fish swims, finds food, or protects itself. By knowing some basic fish anatomy and exploring the advantages of certain shapes, you should be able to look at any fish species and be able to identify a few characteristics of its life history.

We will focus our learning about the different fish body, fin, and mouth styles and how these forms can tell us a little bit about the function of a fish. *What do all fish have in common? How have different fish modified basic body parts to their advantage?*

Step-by-Step Classroom Guide

Segment 1: Fish Anatomy

Access: Have Aurelia pulled up and ready to go for the Explore section of Segment 1.

Objective: Students will be able to identify the external anatomy of a fish and explain what each of the different parts do. They will also begin exploring building their own fish in the Aurelia application.

Pacing: Spend as much time as is needed to have the students work through labeling what they know. When you first introduce Aurelia, give the students a short amount of time to explore. We don't want them to figure out all of the answers on their own before going through the remaining three segments of the lesson.

Essential Question: What are the different parts of a fish and what does each part do?

1. Engage: 5 minutes

Introduce the concept of form equals function. Explain how by knowing a bit about fish anatomy, we will be able to 'read' any given fish and be able to deduce where it might live or what it might eat. Explain that all fish follow the same body plan, but have made their own modifications to be able to survive in their environment.

2. Explore: 15 minutes

Gauge existing knowledge with the external anatomy diagram on page 1 of the Student Workbook. Have students label the parts of a fish that they already know. Once the students have had a chance to fill out what they know, display the correct answers and have the students correct any mistakes that they may have made. Using the vocabulary terms found in the Teacher Handbook, explain to the students what each of the external anatomy parts do for a fish. *Thinking about the different types of freshwater and marine fish species, do they think that all fish have these same basic parts?*

Have students open up the Aurelia app and build a fish in a chosen environment. It does not matter which habitat they are building in, but the pelagic one is the easiest to understand the concepts presented during the remainder of the lesson.

Give the students a few minutes to explore and build their own fish now that they know about fish external anatomy.

3. Wrap Up: 5 minutes

Have students reflect on their experience building a fish using Aurelia. *What went well? What went poorly?* Tell them that they are now going to explore fish body, fin, and mouth types to be able to understand what types of fish will be best suited for each aquatic environment.

Segment 2: Body Shape

Access: N/A

Objective: Students will be able to define different body shapes and explain how different body types fit certain environments and lifestyles.

Pacing: N/A

Essential Question: How do the different fish body shapes give clues as to where a fish lives and how it moves within its environment?

1. Engage: 5 minutes

Have students share examples of fish with different body types and choose a descriptive name for the body shape. *Ex. Eel - snakelike, pufferfish - round, flounder - flat, tuna - streamlined, etc.* Introduce the five different fish body types (*fusiform, laterally compressed, ribbon-like, flattened, globular*).

*Should you wish to include outside materials, note that there are different names that can be used to describe these five body types.

2. Explore: 10 minutes

Have students complete the body type activities on pages 2 and 3 of the Student Workbook.

3. Wrap Up: 5 minutes

Go over the correct answers with the class. Reflect on how body type correlates with the environment that the fish can be found in. Next we will look at how the different types of fins can influence a fish's lifestyle.

Segment 3: Fin Type

Access: N/A

Objective: Students will be able to identify how fin shape and placement relates to how a fish swims, balances, and steers, as well as how different tail shapes lead to different life history traits (ex. sprinters vs. marathoners).

Pacing: N/A

Essential Question: How do different fin shapes and placements relate to different swimming styles?

1. Engage: 10 minutes

Start by having each student take out a blank piece of paper and draw an outline of a fish. Have them label the fins that they drew to the best of their ability without looking at the first page of their workbook. Explain that fins help a fish balance and steer, and in some cases can provide protection (ex. venomous spines on a scorpionfish). There are two different types of fins: median and paired. Median fins are single fins that run down the midline of the body. Paired fins are on the underside of the body and are exactly like they sound, pairs of fins!

2. Explore and Wrap Up: 10 minutes

Have students read through the information about the different types of fins in their workbook.

Segment 4: Mouth Type

Access: N/A

Objective: Students will be able to identify the different fish mouth types and explain how different mouth shape, size, and placement relates to what a fish eats.

Pacing: N/A

Essential Question: How does mouth type affect what a fish consumes?

1. Engage: 5 minutes

Fish mouths come in a variety of different positions and sizes, and there are even different types of teeth that can be found amongst different species. Similar to body and fin type, knowing a bit about the particular mouth that a fish has can tell you a lot about a fish's ecology. Predatory fish often have a larger mouth, whereas prey species have smaller mouths.

Additionally, there are fish that have adapted specialized mouths that are used for capturing unique prey. One example is a pipefish, which has an elongated tube-like mouth that is used to suck in small crustaceans and plankton. In this segment,

students will have a chance to read about some of the different mouth types and then be able to do an activity that will demonstrate how different teeth are used to catch different prey types.

2. Explore: 15 minutes

Have the students read through the information about different mouth types in their workbook. Once they have completed the reading, have the students go through the dentition activity. *Instructions for set-up can be found above.* Students will break up into smaller groups and will explore the advantages of different dentition by going through the actions at each feeding station.

*It can be beneficial to have a couple of the sets of feeding demonstrations, depending on the size of your class

1. *Fused plates*- To simulate grinding, have the students grind their food (Nilla Wafers) with a hammer. Rather than having them hit the cookies with the hammer, tell the students to use the hammer in a grinding motion to break up the cookies. This simulates how animals with fused plates, such as stingrays, grind up prey that has hard outer shells.
2. *Sharp, pointed canines*- Have students grab smaller objects with chopsticks. If chopsticks aren't available, you can use a pair of kitchen tongs. This simulates how attackers with sharp, pointed teeth, such as a white shark, are able to pierce their food well, but they aren't able to chew it and have to swallow their prey whole.
3. *Predominantly molars, few sharp canines*- Talk about how some fish (such as a parrotfish) will use their canine or incisor front teeth (the tongs or chopsticks) to break off or capture their prey. They will then use their molars (hammer) in the back part of their mouth to grind their food up.

3. Wrap Up: 5-10 minutes

Once all of the students have had the opportunity to explore each feeding station, gather back up as a whole class and ask students to reflect on the activity. *Which teeth types are best for certain prey?* Have students answer the mouth type questions in their workbook and discuss the answers afterwards.

Segment 5: Practice What You Know!

Access: N/A

Objective: Students will answer review questions to ensure that they are understanding the concepts and apply what they know to building a proper fish in the Aurelia application.

Pacing: N/A

Essential Question: How do body, fin, and mouth types go together to create fish that can survive in different habitats?

1. Engage: 5 minutes

Have the students break into smaller groups and assign each of the groups a different fish. These can be any fish that you would like. Have the students answer the questions about their assigned fish on page 7 of their workbook. This will test their knowledge of the subject and make sure that they are ready to return to the Aurelia application.

2. Explore: 10 minutes

Students will now return to the Aurelia application and build a fish, in any of the 3 ecosystems that they wish to. They should hopefully now be able to build the correct fish for their habitat after going through the lesson.

3. Wrap Up: 5 minutes

To wrap up the lesson, ask students how their fish building went the second time around. *Was it easier to know what features to place on your fish to allow it to survive in a given habitat? Do you think that this notion of form equals function is only applicable to fish or may it also be useful for other groups of plants and animals?*