

Unit	Trout Biology
Lesson	3.1 Understanding trout physiology
Essential question	What are the physical structures on a trout and their function?
Objective	Students will be able to identify a trout's physical structures and their functions.
Key words	Dorsal fin, adipose fin, anal fin, caudal fin, pectoral fins, pelvic fins, nares, lateral line, gills, gill rakes, air bladder
Related Standards	
NGSS standard	HS-LS1-2
AP Env Sci topic	
IB Biology topic	C3.1
IB ESS topic	
Suggested sequence of learning activities	<ol style="list-style-type: none"> <li>1. Starter quiz/prior knowledge check</li> <li>2. Direct instruction (if traditional) or classroom discussion (if flipped). Slides <a href="#">here</a>.</li> <li>3. Dissection (if available). Student instruction sheet <a href="#">here</a>.</li> <li>4. Analysis questions (completed by individual or group) <a href="#">here</a>.</li> <li>5. Peer check of analysis questions. Answers <a href="#">by request</a>.</li> <li>6. Individual exit ticket/comprehension check</li> </ol>
Assessment	Exit ticket/comprehension check
Possible modifications	<ul style="list-style-type: none"> <li>• Give a keyword list (with or without definitions already included) to students before or during class</li> <li>• Be intentional about student groupings (eg. heterogeneous skill levels)</li> </ul>
Resources required	<p>Copies (or digital distribution) of <a href="#">analysis question sheet</a> to students</p> <p>For dissection (per group of 1-3):</p> <ul style="list-style-type: none"> <li>• Whole fish (any, but trout is preferred)</li> <li>• Dissecting tray</li> <li>• Dissecting tools (eg. scissors, scalpel, forceps, dissecting needles)</li> <li>• Gloves (if requested, not necessary)</li> <li>• Copies of student instruction sheet <a href="#">here</a>.</li> </ul>

<p>Starter questions</p>	<ol style="list-style-type: none"> <li>1. What are the most important senses for a fish and why?</li> <li>2. How many fins does a trout have?</li> </ol>
<p>Concepts covered in lesson</p>	<p>There are four species of trout in North America: brook trout, brown trout, rainbow trout and cutthroat trout. All four species have common physiological (body) characteristics.</p> <p>Trout bodies move through the water using the muscles that run all the way down their smooth, streamlined, torpedo-shaped bodies. They use the three single fins midline on their bodies to propel themselves forward: <b>dorsal</b>, <b>anal</b> and <b>caudal</b> (tail). They use two pairs of fins, <b>pectoral</b> and <b>pelvic</b>, to keep themselves stable in the water. There is an eighth single fin between the dorsal and caudal fins called the <b>adipose</b> fin which doesn't serve a purpose in movement.</p> <p>Trout have an advanced sensory system adapted for life in the water which includes two eyes on opposite sides of their head. They have good vision and can see objects below and above the water. They can also see color. They have a very sensitive sense of smell using two openings between their snout and eyes called <b>nares</b> which contain sensitive chemoreceptors allowing them to detect very small amounts of chemicals in the water. Like other fish, trout have a <b>lateral line</b> running down each side of their body which allow them to sense movement, changes in pressure and chemical signals. Because sound travels faster and farther in water than it does in air, trout have very keen senses of hearing. They have inner ear structures near their skulls similar to terrestrial animals, but do not need external ears to capture sounds.</p> <p>Like other fish and aquatic organisms, trout need to get oxygen dissolved in the water rather than using lungs to get oxygen from the air as terrestrial organisms do. <b>Gills</b> are structures that contain filaments through which blood runs, exchanging oxygen and carbon dioxide with the surrounding water passing across the gills. Some trout use structures called <b>gill rakes</b> to filter out small organisms from the water to eat like a whale.</p> <p>Trout have similar organs to other vertebrates. They have a two-chambered heart that is located behind the gills which pumps oxygenated blood to the body. They have a stomach and intestine to digest their food swallowed whole before it is excreted through the anus. They have a kidney, liver and spleen which serve the same purpose as in other animals: to filter waste and produce important proteins. Trout, like other fish, have an <b>air bladder</b> which is a sac filled with gas that runs the entire length of the internal cavity. The air</p>

	bladder is used to maintain buoyancy and stability in the water.
Slide presentation	Link <a href="#">here</a>
Activity	Analysis questions (link <a href="#">here</a> ) completed individually or in groups then checked by peers or teacher. Answers <a href="#">by request</a> .
Exit ticket questions	<ol style="list-style-type: none"> <li>1. Which fins help trout propel themselves through the water?</li> <li>2. What is the purpose of the air bladder?</li> </ol> <p><u>Answers:</u></p> <ol style="list-style-type: none"> <li>1. Dorsal, anal and caudal (tail)</li> <li>2. To maintain buoyancy and stability in the water</li> </ol>
Extension questions/activities/resources	<p>Video of trout dissection <a href="#">here</a>.</p> <p>Have students research more on the mechanism of how lateral lines can detect electrical impulses.</p> <p>Have students research how salmon use their senses to find their way back to the stream where they were born.</p>