



Discover Plankton Curriculum

Museum STEAM Program

Grades: 3rd-12th

Advertised Description:

Experiments begin on our dock, where students try a plankton tow. Using scopes, explore different types of plankton, how they survive, and why they're important.

Outline:

Four lessons/activities taught in rotations

- Plankton Prototypes
- Plankton Tow
- Microscope Plankton Viewing
- Museum Highlights

Overall Learning Outcomes:

- Students will have a basic understanding of plankton
- Students will be able to explain the difference between phytoplankton and zooplankton
- Students will understand there is diversity in plankton

Background Information: Plankton are drifters in the water that are too small or too weak to fight against a current. They are split into two types: phytoplankton and zooplankton. Both types form the base of the Puget Sound food web as primary producers and primary consumers.

Phytoplankton (plant plankton) are microscopic plants that float near the surface in both marine and freshwater ecosystems. They produce their own food through photosynthesis and release oxygen as a byproduct, just like plants on land. 2 out of every 3 breaths you take uses oxygen produced by phytoplankton.

Zooplankton are drifting animals. They can be organisms that stay small throughout their lifecycle, such as copepods, or ones that start life in a planktonic stage and become much larger (crab, urchin, and fish larvae, etc). Zooplankton also stay near the surface and feed on phytoplankton and other zooplankton.

Plankton Prototypes Lesson Plan

Learning outcomes:

- Students will have a basic understanding of plankton
- Students will have an understanding of neutral buoyancy
- Students will have an understanding of how plankton benefit from neutral buoyancy

Materials needed:

- 2 tables per 6 people
- 1 large, see-through plastic tote or 10+ gallon aquarium per 6 people
- Blue tarps or other waterproof protective materials
- Paper towels
- Zooplankton matching sheets
- Various size washers/nuts
- Pennies
- Pipe cleaners
- Foam shapes/sheets
- Beads
- Craft sticks/chopsticks
- Paper clips
- Toothpicks
- Any other materials

Lesson Outline:

1. Introduce plankton
 - a. Definition = Organisms that **drift** in the water, usually microscopic
 - i. Some have the ability to move and “swim” but are too small/weak to fight the movement of water
 - b. Two types- **phytoplankton** and **zooplankton**
 - i. **Phyto** = photo; light; **plant plankton**
 - ii. **Zoo** = when you go to a zoo you see **animals**
 - c. Handout of the two types of plankton
 - d. How can we tell them apart?
 - i. What shapes/colors are **phytoplankton**?
 1. Geometric shapes
 2. Shades of green, brown, yellow, or red
 - ii. What shapes/features do **zooplankton** have?
 1. Antennae, legs, long tails, eyes, etc.
 2. Zooplankton move fast!
2. Plankton based on life habitat (*good for middle school and up*)
 - a. HOLOPLANKTON stays a drifter its whole life
 - i. All **phytoplankton**
 - ii. Some **zooplankton** (example: jellies)
 - b. MEROPLANKTON grows up to be bigger and undergoes metamorphosis
 - i. Most **zooplankton**
 - ii. Examples: crabs, fish, urchins, sea stars, etc.
 - c. Sorting game- who grows up to be who?
3. Floating Features
 - a. Why do plankton need to float?
 - i. **Phytoplankton** need to stay near sunlight to produce food (photosynthesis)
 - ii. **Zooplankton** stay near surface to eat (they eat other zooplankton or phytoplankton)

- b. *Neutral buoyancy*- not floating or sinking
- c. What would help plankton float?
 - i. Use pictures of plankton to assist in this discussion - there is no right or wrong answer
 - 1. Long and thin floats better than compact
 - 2. Increased surface area in any way helps - spines, etc.
 - 3. Phytoplankton have geometric shapes that float well
 - 4. Capturing a “bubble” of air
- 4. Make-a-Plankton/Plankton Race
 - a. Students team up in pairs to “create” a plankton that will float in the “ZONE” (a region in the testing tub or aquarium marked out 2” above the bottom and 1” below the top)
 - b. Students have a bunch of materials (see above) that they can choose from to create their plankton
 - c. ALL students MUST start with a nut/washer/penny - this represents the denser reproductive portions of all living things that MUST be present for the organism to survive
 - d. Students use their imagination and the resources at hand to “modify” the nut/washer/penny to create a plankton that will be neutrally buoyant
 - i. Neutral buoyancy is achieved if their plankton can float in the “ZONE” for 3-5 seconds before sinking or floating to the surface
 - e. Students “check” their plankton in the testing tubs and modify as needed until neutral buoyancy is achieved or time runs out.

This can be set up as a “contest” to test pairs of plankton against each other with the winner going on to compete with other plankton.

Age Differentiation: For younger students, instead of having their goal be neutral buoyancy, their goal can be for the plankton to sink slowly

Plankton Tow Lesson Plan

Learning Outcomes:

- Students will have an understanding of how plankton are collected
- Students will have an understanding of the relative size of plankton
- Students will have an understanding of where in the water column plankton are found

Materials needed:

- Life jackets
- Student plankton nets w/ sampling bottles
- Pool net poles
- Secchi Disk

Lesson Outline:

1. Safety Preparation and Instructions

- a. All students **MUST** wear a life jacket to go down to the dock.
Chaperones/teachers are encouraged to wear PFD slings
 - b. Expectations for safe dock behavior
 - i. Walking only
 - ii. Watch your step
 - iii. Look out for your classmates
2. How deep are plankton in the water?
- a. Students will need to know how deep they need to go to catch both phyto- and zooplankton.
 - i. Where will phytoplankton be found in the water column? Near the top- they need sunlight to produce their own food
 - ii. Will zooplankton be in the same place or somewhere else? They will be deeper during the day- lots of things eat them so they stay where there's less light. At night, they come to the surface to eat.
 - iii. Secchi disk- two white and two black sections. Lowered down into the water until you can't see the white anymore- this is how far down the nets will need to go.
 - iv. During autumn/winter months, a long surface tow rather than a depth tow will likely be necessary.
3. Taking Samples
- a. Depth Tow (Spring/Summer)
 - i. Lower the disk and have students tell you when they can't see the white. However many meters you go down is how far you must lower the nets.
 - ii. Show students the nets- finer mesh with catch smaller things. Plankton is filtered down into bottle at the end
 - iii. Students work in pairs to lower the nets to the assigned depth. One person is in charge of lowering and one is in charge of the line. Both should keep track of depth (there are meter marks on the lines)
 - iv. Bring nets back up, take off sample bottles (be careful not to spill), make sure the line is wound up and nets are put back in tote
 - b. Surface Tow (Fall/Winter)
 - i. Show students the nets- finer mesh with catch smaller things. Plankton is filtered down into bottle at the end
 - ii. Students work in pairs to drag the nets along the surface of the water. One person is in charge of holding the net and walking along the dock and one makes sure their partner doesn't fall into the water by holding their partner's life jacket and warning them of hazards ahead. Halfway through partners should switch jobs.
 - iii. Bring nets back up, take off sample bottles (be careful not to spill), make sure the line is wound up and nets are put back in tote

Age Differentiation: Younger students will need more assistance handling the equipment. Older students should be encouraged to use it all on their own.

Microscope Plankton Viewing Lesson Plan

Learning Outcomes:

- Students will be able to identify distinguishing characteristics of phytoplankton and zooplankton
- Students will understand there is diversity in plankton structures
- Students will be able to use a microscope to see plankton

Materials needed:

- 3 - 4 tables
- Plankton sample from docks
- Brine shrimp
- Plankton matching cards
- Pipettes
- Petri dishes
- Zoomscope/Video scope
- Dissecting scopes, 1 per student
- Plankton Observation Worksheets
- Paper towels
- Pencils
- Colored Pencils
- Plankton ID pages
- Chalk/chalkboard

Lesson Outline:

1. Preparation
 - a. Set up and pre-focus scopes
 - b. Set up each petri dish, one per quadrant with:
 - i. Brine shrimp
 - ii. Phytoplankton
 - iii. Zooplankton
 - iv. Random Sample
 - c. Draw a diagram on the chalkboard matching the pattern of the plankton in the petri dishes
2. Introduction to microscopes
 - a. Students will be introduced to relevant microscope parts
 - b. Students will practice focusing microscopes
3. Observing plankton
 - a. Guided by the teacher, students will observe each quadrant of their petri dish, focusing on the different structures visible, starting with brine shrimp because everyone's will look basically the same
 - b. Students will sketch each quadrant of their petri dish in one of the circles on the Plankton Observations Worksheet
 - c. Characteristics of phytoplankton vs zooplankton
 - i. Phytoplankton
 1. Only move with motion of the water
 2. Geometric shaped structure: circles, rectangles, etc
 3. Oil droplets
 - ii. Zooplankton
 1. Can move themselves
 2. Structures that resemble animal body parts: legs, head, antennae, etc

Age Differentiation: Have older students make detailed drawings, labeling structures. Younger students can make fewer or less detailed drawings and simply identify either phyto- or zoo-plankton

Museum Highlights Lesson Plan

Learning outcomes:

- Students will appreciate the diversity of life in Puget Sound
- Students will understand the amount of effort in wooden boat making
- Students will connect one thing they see in the museum to the program material or personal experience

Instructor Preparation: Prior to student arrival on the day of the program, check-in with the Boat Shop volunteers to verify they have the materials needed for the number of students coming and to give them a copy of the schedule, noting the specific times the students will be in the Boat Shop

Materials needed:

- Student sailboat hulls
- Student sailboat masts (dowels)
- Student sailboat sails (paper cut into triangles with two holes punched for mast)
- Student sailboat lines (cut lengths of string)
- Sandpaper scraps
- Colored markers

Lesson Outline:

1. Touch Tanks
 - a. ~10 min
 - b. Students spend about 10 minutes visiting and touching the animals in the tanks, asking questions, and sometimes observing feeding time if the aquarist is in.
 - c. Encourage students to look for hidden animals, not just the easy to touch ones, but this time should mainly be student-led exploration
 - d. If the Touch Tanks are otherwise part of the program, substitute other museum exhibits
2. Boat Shop
 - a. ~15 min
 - b. Boat Shop safety rules
 - c. Guided by the Education instructor, students assemble a toy wooden sailboat
 - i. During sanding, introduce wooden boat construction
 - ii. During sail assembly, introduce sailboat movement
 - d. Boat Shop Walk-Thru
 - i. Opportunity for students to ask questions of Boat Shop staff about boats or boat building equipment
 - e. "Dock" finished boats in the "marina"
3. Other Exhibits

- a. As time allows
- b. Students are taken to one or more exhibits to round out this rotation. Exhibits can be relevant to the program or a fun exploration
- c. Exhibit examples include:
 - i. Faith Fishing Boat
 - ii. TYC Sailboat
 - iii. Lego Boat Building
 - iv. K'NEX Truss Building
 - v. Puyallup Exhibit

Age Differentiation: For younger students, the boats may be pre-assembled and the students may focus on just sanding the hull and decorating with markers instead. Any amount of pre-assembly can be used as appropriate for student age and rotation time. The amount of detail given during Boat Shop explanations should be age-appropriate