

USU 4-H Fish Printing Tote



BIG IDEA:

An organism's adaptations help it survive in its particular habitat.

UNDERSTANDINGS:

Observing animals' specializations and adaptations can help us make inferences about their environment.

Human actions can impact animal and habitat health.

ESSENTIAL QUESTIONS:

How do external and internal structures function to help organisms survive?

How can humans have a positive impact on the environment around them?

THREE DIMENSIONS, UTAH SCIENCE STANDARDS, AND INTENDED LEARNING OUTCOMES:

See pg. 12-17

Supplies

- Paper and Pencils*

Fish Anatomy and Habitats

- Plastic rainbow trout
- *Fish Printing Discovery Kit*
- Poster board and markers*
- Rubber fish

Fish Printing

- Gyotaku paragraph and examples (paper and fabric)
- 6 rubber rollers
- Rubber fish for printing
- Cookie sheets
- *Fish Printing Discovery Kit*
- Paper or fabric to print on*
- Block printing ink or paint*

Sink and Float

- 2 Containers to hold water*
- Assortment of floating and non-floating items*
- Salt*

Blubber Hands

- Shortening*
- 2 Rubber gloves or 2 large Ziploc bags*
- Container of ice water*

Oil Spill

- Cake pans *
- Newspaper*
- Vegetable cooking oil*
- Water*
- Feathers*
- Items for removing oil (see activity lesson plan)*

*Not included in tote

**Activity 1: Fish Anatomy and Habitat**

Time: 15 min

Grade Level: 3-6

Materials:

- Plastic rainbow trout
- *Fish Printing Discovery Kit*
- Poster board and markers
- Rubber fish

To Do:

1. Begin by having the students work together to label the parts of a fish. Use the plastic rainbow trout as a model. Encourage the students to thoroughly work to identify parts of the fish even when they do not know the names by counting the fins, identifying their position, purpose, etc. Give out the proper names of fish body parts as well as the functions of those parts. Use the diagram and information found in the Fish Printing Discover Kit.
2. Discuss how body shape and fin shape correlate with the type of environment the fish lives in. Again, this information can be found in the Fish Printing Discovery Kit.
3. Split students into groups. Give each group a poster board, markers, and a rubber fish (different for each group). Have groups assess what type of environment their fish might live in and have students draw that environment on their poster board.
4. Have students present their fish and habitats.

REFLECT:

- Why do fish have so many different types of fins?
- Do any of the fins remind you of human inventions? What inventions are they like?
- Why did you make your habitat the way you did? What about the fish's anatomy makes the environment you created ideal for that particular fish?

APPLY:

All the different types of fins fish have enable them to swim around better. Among other things, fins are used to propel, turn, lift, glide, stabilize, and walk. Humans have used fish fins to inspire many inventions such as paddles, flippers, turbines, and wind farms, just to name a few. Making connections between anatomy and habitat help people understand fish and to understand how their anatomy maximizes functions needed for their specific environments.

**Activity 2: Gyotaku Printing**

Time: 15+ min

Grade Level: 1-6

Materials:

- Gyotaku paragraph and examples
- 6 rubber rollers
- Rubber fish for printing
- Cookie sheets
- *Fish Printing Discover Kit*
- Paper or fabric to print on
- Block printing ink or paint

To Do:

1. Ask students how they would record information of fish they caught if they lived two hundred years ago. Introduce them to Gyotaku. Fisherman may have used this method to record their catches but it has primarily been used as an art form.
2. Talk about the different types of fish available for printing. Set up the materials needed for fish printing. Use the cookie sheets to contain the activity. You may want use a disposable tablecloth or paint sheets as well.
3. Have the students begin making their fish prints. It may take a few tries to get a feel for how much ink/paint to use and how best to transfer the rubbing.
4. Once students have been able to create their own rubbing consider making a fish print mural. You can create murals from a purely artistic approach or you may want to create habitat murals by researching which fish live in similar habitats. Paint or draw other aspects of their habitat like vegetation, landscape, and other animals.
5. Wash the rubber fish with soap and water.

REFLECT:

- Was it easy making the fish prints? What was difficult? What worked well?
- What can you learn about animals and habitats by studying them together?
- What do you think might happen if you were to put a fish in a habitat different from its own? What good things could happen? What bad things could happen?

APPLY:

It often takes a number of tries or a lot of practice to do a new thing successfully. New discoveries often come about through encountering difficulties. Many discoveries have come from good mistakes.



Gyotaku Printing Continued

We can guess a lot about habitats based on animals and on animals based on habitats. By looking at a fish you may be able to tell it could fit into crevices and that it can move fast. Maybe it has a mouth equipped for catching and eating other fish. Maybe it is built to swim in open water or maybe to swim in shallow weedy water. By observing an environment you can learn about what type of diet an animal might have, or what dangers the fish would need to be able to avoid in order to survive. You may be able to make good inferences on shelter and disguises that are used. Studying both animal and habitat can give you a much more thorough understanding than studying only one.

Animals, including fish, sometimes get placed in new environments either on purpose or by accident. Sometimes the animal simply dies in the new environment. Sometimes the introduced specie's presence is beneficial to its new habitat. And other times the new species is detrimental. All living things require food and water to live and when that is put out of balance the effects can be far reaching.

**Activity 3: Sink and Float**

Time: 15 min

Grade Level: 2-6

Materials:

- Pencil and paper
- 2 Containers to hold water (big enough to hold at least 2 to 4 cups of water)
- Assortment of floating and non-floating items (raw egg, popcorn kernels, different fruits and vegetables, soda and diet soda, sponge, wood, toys, etc.)
- Salt (1/4 cup for every 2 cups of water)

To Do:

1. Ask students if they have been to the ocean. Was it easier or harder to float than in a regular swimming pool? Tell students they will be exploring sinking and floating in freshwater and saltwater.
2. Fill containers with water. Stir salt into one of the containers until dissolved.
3. Ask students what makes things float. Have them write down their hypothesis and what items they think might sink and float.
4. Place various items in the containers of freshwater and saltwater. Observe what sinks and floats and what seems to affect whether it sinks or floats.
5. Density is what makes things sink and float. Discuss what density is. You can look up videos that explain density online. Here are two possible videos to use: <http://www.youtube.com/watch?v=SimFy9wOMXY>
<http://www.youtube.com/watch?v=H2Rlt3YM1To>
*After discussing density, you may want to continue to experiment with saltwater by making various concentrations of saltwater and seeing if that affects what sinks and floats and if it changes how buoyant items are. Record what you do and what you observe.
6. The oceans have lots of plant and animal life but for life on land, humans and animals and plants rely on freshwater to live. Make estimates of how much of the earth's water is freshwater and saltwater. As a class, come up with a list of different types of freshwater. Research through books or the internet how the water on earth is distributed.

REFLECT:

- What did you think would sink and float? Why?



Sink and Float Continued

- How does swimming in saltwater feel different than swimming in freshwater?
- What items floated in saltwater but not freshwater? Why do you think that happens?
- What is density? What is weight? How is it different from density?

APPLY:

Density is what determines what floats and what sinks. If something is less dense than water or whatever the liquid may be it will float. If it is denser it will sink. Salt water is denser than freshwater so something that cannot float in freshwater, like an egg, does float in saltwater. Density and weight often get paired together but weight does not affect if something sinks or floats. Weight depends on the strength of the gravity so weight changes if you go into space or were to be on another planet than earth. Density, however, does not change.

The Earth surface is covered 70% by water. 96.5% of all the water on earth is in the oceans and only 2.5% of the earth's water is fresh water (about 1% is non-ocean saltwater). Of the freshwater, 68.7% is found in glaciers and ice caps, 30.1% is ground water and 1.2% is surface water (like lakes and ground ice) and other freshwater (like atmosphere and living things).

**Activity 4: Blubber Hands**

Time: 20 min

Grade Level: K-6

Materials:

- Shortening
- 2 rubber gloves or 2 Ziploc bags
- Shortening

To Do:

1. Fill up a container with ice water.
2. Talk to students about fish in cold, cold water, particularly whales. How are they able to survive in water that is extremely cold? Discuss insulation and blubber.
3. You are going to simulate blubber by making a blubber hand. Put shortening in a large glove or large Ziploc. Place a smaller glove/bag inside the larger one so that the shortening is in between the two layers and you can put your hand it without touching the shortening. Tape the bottoms of the gloves/bags together enclosing the shortening but keeping an opening for your hand. Squish the shortening around to distribute it throughout the glove or Ziploc. Here is an instruction video for this project: <http://www.howcast.com/videos/510860-How-to-Demonstrate-Insulation-Principles-Science-Projects>
4. Have the students feel the difference between putting their hand directly in the water and putting the glove on and then putting your hand in the water. You could have students wear a glove without shortening to compare it to the shortening glove.

REFLECT:

- What do humans do to protect themselves from the cold? How is that like whale blubber?
- Do you think the amount of shortening in the glove makes a difference? What if you put more in? What if you used less?
- What is different with the blubber hand than without the blubber? Can you feel that the glove wants to float?

What animals live where it is cold? Do they have blubber? If not, how do they protect themselves from the cold?

APPLY:

Many animals, including humans, live in cold climates where they need a way of staying



Blubber Hands Continued

warm. Whales, sea lions, polar bears, and other animals have blubber that helps them stay warm. Humans wear coats that use air to insulate them in the cold weather. Fur and feathers also provide insulation to keep animals warm.

As you tested your blubber hand you may also have noticed it felt like your hand wanted to float. Blubber is quite buoyant and so it makes it so that whales can stay near the surface of the water where they can easily come to the surface to get air.

**Activity 5: Oil Spill**

Time: 30 min

Grade Level: 4-6

Materials:

- Cake pans
- Newspaper
- Cooking oil
- Water
- Feathers
- Items for removing oil (cotton swabs, spoons, dish soap, and other household items).

To Do:

1. Cover your working surfaces with newspaper. You may choose to work outside for this activity if you would like.
2. Explain to the students that there are sometimes oil spills in lakes and oceans and rivers and that people have to clean up after.
3. Pour some oil on top of the cake pans of water. What happens to the oil in the water?
4. Talk about how the oil hurts the wildlife in the water. Use feathers to show what happens to the birds in oil spills.
5. Ask students to brainstorm ways they can remove the oil from the water. Provide some items (cotton swabs, spoons, dish soap, and other household items) for the students to use to remove the oil.
6. Assess what worked best for removing the oil.

REFLECT:

- Why do you think oil spills are a problem?
- Scientists don't only clean up the oil, they work to save animals that were affected too. How might you take care of and clean up the wildlife?
- What worked best for cleaning up? How would you clean up on a big scale in a river or on the ocean?
- What can people do to prevent oil spills and impacting the environment around them negatively?

APPLY:

Oil gets into the fur of mammals and into birds' plumage decreasing the insulation ability of the fur or feathers. Animals covered in oil are more susceptible to temperature fluctuations. Oil can make it impossible for birds to fly and escape and can blind animals,



Oil Spill Continued

putting them in danger. Animals can be poisoned from ingesting the oil. Babies and moms that communicate by smell lose their ability to identify one another, causing the babies to die. Without human help, animals often die from complications of oil spills. Cleaning animals affected by oil spills is a long process. Animals are taken in and warmed and fed and examined. After about two days the animals are washed in various tubs with diluted cleaning solutions. The animals are then placed in a recovery type habitat for a few days to a few months before being examined and released back into the wild.

There are numerous ways to clean up oil spills. Chemicals may be used to break down the oil. Oil can also be skimmed, absorbed, and vacuumed off the water. On land, shovels may be used to clean up the oil. While oil is harmful to the environment, cleaning can also be invasive and harmful to the environment.

People can work to prevent oil spills. People can build to prevent breakage and leaks. They can also build confinement type areas that will hold the oil in the event that there is a leak. Organizing fast and effective response procedures will also help lessen the damage that can occur through oil spills.



Additional Activities

Additional Activities

- Cleaver catch Fish
- Learn about recycling and keeping our water clean

Contents of Fish Tote

Contents of Fish Tote

- Colored Rubber Rainbow Trout
- Clever Catch Fish
- Fish Printing Discovery kit guide
- Gyotatu laminated info paragraph
- 1 Gyotatu example on paper
- Large pillowcase with fish prints and paint on it
- 2 Cookie sheets
- 6 rubber rollers
- Rubber Fish for printing (some are getting fairly sticky)
 - 23 Fish
 - 1 Sting Ray
 - 1 Starfish



Three Dimensions, Utah Science Standards, and Intended Learning Outcomes

Note: These applications of National and State Science Standards are not comprehensive. They are meant to serve as suggestions. While only standards for elementary levels have been listed, standards for more advanced grade levels can also be applied. Additionally, this tote is an excellent tool to facilitate inquiry for any age group.

THREE DIMENSIONS

K-LS1-1. Interdependent Relationships in Ecosystems: Animals, Plants, and their Environment
(Activity 1: Fish Anatomy and Habitats, Activity 2: Fish Printing)

Use observations to describe patterns of what plants and animals (including humans) need to survive.

Science and Engineering Practices:

- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions.
- Scientists look for patterns and order when making observations about the world.

Disciplinary Core Ideas:

- All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow.

Crosscutting Concepts:

- Patterns in the natural and human designed world can be observed and used as evidence.

K-ESS3-1. Interdependent Relationships in Ecosystems: Animals, Plants, and their Environment
(Activity 1: Fish Anatomy and Habitats, Activity 2: Fish Printing, Activity 5: Oil Spill Activity)

Use a model to represent the relationship between the needs of different plants and animals (including Humans) and the places they live.

Science and Engineering Practices:

- Use a model to represent relationships in the natural world.

Disciplinary Core Ideas:

- Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do.

Crosscutting Concepts:

- Systems in the natural and designed world have parts that work together



K-ESS3-3. Interdependent Relationships in Ecosystems: Animals, Plants, and Their Environment (Activity 5: Oil Spill)

Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.

Science and Engineering Practices:

- Communicate solutions with others in oral and/or written forms using models and/or drawings that provide detail about scientific ideas.

Disciplinary Core Ideas:

- Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things.
- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.

Crosscutting Concepts:

- Events have causes that generate observable patterns.

1-LS1-1 Structure, Function, and Information Processing (Activity 1: Fish Anatomy and Habitats, Activity 4: Blubber Hands)

Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

Science and Engineering Practices:

- Use materials to design a device that solves a specific problem or a solution to a specific problem.

Disciplinary Core Ideas:

- All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow.
- Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs.

Crosscutting Concepts:

- The shape and stability of structures of natural and designed objects are related to their function(s).
- Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world.

2-LS4-1 Interdependent Relationships in Ecosystems (Activity 1: Fish Anatomy and Habitats,



Activity 2: Fish Printing)

Make observations of plants and animals to compare the diversity of life in different habitats.

Science and Engineering Practices:

- Make observations (firsthand or from media) to collect data which can be used to make comparisons
- Scientists look for patterns and order when making observations about the world.

Disciplinary Core Ideas:

- There are many different kinds of living things in any area, and they exist in different places on land and in water.

K-PS2-1. Matter and Stability: Forces and Interactions (Activity 3: Sink and Float)

Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.

Science and Engineering Practices:

Planning and Carrying Out Investigations

- With guidance, plan and conduct an investigation in collaboration with peers

Disciplinary Core Ideas:

PS2.A: Forces and Motion:

- Pushes and pulls can have different strengths and directions
- Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it.

Crosscutting Concepts:

Cause and Effect:

- Simple tests can be designed to gather evidence to support or refute student ideas about causes.

3-PS2-1 Forces and Interactions (Activity 3: Sink and Float)

Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.

Science and Engineering Practices:

- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.
- Science investigations use a variety of methods, tools, and techniques.

Disciplinary Core Ideas:

- Each force acts on one particular object and has both strength and direction. An object at rest typically has multiple forces acting on it. But they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion.



- Objects in contact exert forces on each other.

Crosscutting Concepts:

- Cause and effect relationships are routinely identified, tested, and used to explain change.

3-LS4-3 Interdependent Relationships in Ecosystems: Environmental Impacts on Organisms
(Activity 1: Fish Anatomy and Habitats, Activity 2: Fish Printing, Activity 4: Blubber Hands, Activity 5: Oil Spill)

Construct and argument with evidence that in a particular habitat some organisms can survive will, some survive less well, and some cannot survive at all.

Science and Engineering Practices:

- Construct and argument with evidence.

Disciplinary Core Ideas:

- For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.

Crosscutting Concepts:

- Cause and effect relationships are routinely identified and used to explain change.

3-LS4-4 Interdependent Relationships in Ecosystems: Environmental Impacts on Organisms
(Activity 1: Fish Anatomy and Habitats, Activity 2: Fish Printing, Activity 5: Oil Spill)

Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

Science and Engineering Practices:

- Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.

Disciplinary Core Ideas:

- When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die.
- Populations live in a variety of habitats, and change in those habitats affects the organisms living there.

Crosscutting Concepts:

- A system can be described in terms of its components and their interactions
- Knowledge of relevant scientific concepts and research finding is important in engineering.

4-ESS3-1 Energy (Activity 5: Oil Spill)

Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

**Science and Engineering Practices:**

- Obtain and combine information from books and other reliable media to explain phenomena.

Disciplinary Core Ideas:

- Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not.

Crosscutting Concepts:

- Cause and effect relationships are routinely identified and used to explain change.
- Knowledge of relevant scientific concepts and research findings is important in engineering
- Over time, people's needs and wants change, as do their demands for new and improved technologies
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4-LS1-1 Structure, Function, and Information Processing (Activity 4: Blubber hands)

Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

Science and Engineering Practices:

- Construct an argument with evidence, data, and/or a model.

Disciplinary Core Ideas:

- Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.

Crosscutting Concepts:

- A system can be described in terms of its components and their interactions

5-ESS3-1 Earth's Systems (Activity 3: Sink and Float)

Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.

Science and Engineering Practices:

- Describe and graph quantities such as area and volume to address scientific questions.

Disciplinary Core Ideas:

- Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground: only a tiny fraction is in streams, lakes, wetlands, and the atmosphere.

Crosscutting Concepts:

- Standard units are used to measure and describe physical quantities such as weight and volume.

5-ESS3-1 Earth's Systems (Activity 5: Oil Spill)



Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Science and Engineering Practices:

- Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to design problem.

Disciplinary Core Ideas:

- Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments.

Crosscutting Concepts:

- A system can be described in terms of its components and their interactions
- Science findings are limited to questions that can be answered with empirical evidence.

UTAH SCIENCE STANDARDS

K-Grade 2

Standard 1 (Activity 1: Fish Anatomy and Habitats, Activity 2: Fish Printing, Activity 3: Sink and Float, Activity 4: Blubber Hands, Activity 5: Oil Spill):

- The Processes of Science, Communication of Science, and the Nature of Science. Students will be able to apply scientific processes, communicate scientific ideas effectively, and understand the nature of science.

Standard 3 (Activity 3: Sink and Float):

- Physical Science. Students will gain an understanding of Physical Science through the study of the forces of motion and the properties of materials.

Standard 4 (Activity 1: Fish Anatomy and Habitats, Activity 2: Fish Printing, Activity 4: Blubber Hands, Activity 5: Oil Spill):

- Life Science. Students will gain an understanding of Life Science through the study of changes in organisms over time and the nature of living things.

Grade 3

Standard 2 (Activity 1: Fish Anatomy and Habitats, Activity 2: Fish Printing, Activity 4: Blubber Hands, Activity 5: Oil Spill):

- Students will understand that organisms depend on living and nonliving things within their environment.

Standard 3 (Activity 3: Sink and Float):

- Students will understand the relationship between the force applied to an object and resulting motion of the object.

**INTENDED LEARNING OUTCOMES (ILO'S):**

1. Use science process and thinking skills.
2. Manifest science interests and attitudes.
3. Understand important science concepts and principles.
4. Communicate effectively using science language and reasoning.
5. Demonstrate awareness of the social and historical aspects of science.
6. Understand the nature of science.