
TABLE OF CONTENTS

INTRODUCTION

PROCESS-ORIENTED SCIENCE IN THE CLASSROOM

The Hands-on Approach: What Research Says
Science process skills used in this curriculum
Teaching hands-on science

SECTION I: SUBSTANCES THAT DISSOLVE IN WATER

Do substances dissolve in water? If so, how do they affect the plants and animals in aquatic habitats?

SALTS

Activity 1: The disappearing act

What happens when different substances are added to water? Experiments that test the conditions that affect rates at which salts and other substances dissolve.

Activity 2: Water, water everywhere

A classification exercise that defines water environments by saltiness (salinity) as it teaches the use of keys and the characteristics of common water habitats.

Activity 3: Salty or fresh?

Which is heavier, fresh water or salt water? Experiments which ask questions about the relationship of salinity and heaviness (density) of water.

Activity 4: The layered look

A demonstration of the distribution of fresh and salt water where fresh- and saltwater environments meet in estuaries.

Activity 5: Some like it salty-some do not!

A demonstration of how salinity affects the distribution of some aquatic animals, relating salinity to animal distribution within estuaries.

Activity 6: The great salinity contest!

A contest in which students test their understanding of salinity using experimental techniques to find the winners.

OXYGEN

Activity 7: Oxygen for life

What is the source of the oxygen that is dissolved in water?

MINERALS

Activity 8: Soil in water

What happens when soil erodes from the land and enters aquatic habitats? A long-term experiment.

POLLUTANTS

Activity 9: What's in the water?

What is water pollution? What are the effects of several kinds of pollution on aquatic habitats? A long-term experiment.

SECTION II: TEMPERATURE CHANGES IN AQUATIC HABITATS

What are the characteristics of water with regard to temperature changes? What are the consequences of temperature changes for the plants and animals living in aquatic habitats?

RATES OF CHANGE

Activity 10: A change in the weather?

Which changes temperature faster: water or air? Does the volume of water make a difference in how fast the temperature changes?

TEMPERATURE AND RESPIRATION

Activity 11: Plants use oxygen?

Do the plants and animals that live in water use oxygen?

Activity 12: When the heats on

What is the effect of temperature on the rate at which "cold-blooded" organisms that live in water use oxygen?

TEMPERATURE AND DISSOLVED OXYGEN

Activity 13: When the oxygen goes

What happens to the dissolved oxygen when water temperature increases?

Activity 14: When the oxygen is gone

How do animals respond to low oxygen environments?

TEMPERATURE AND SEASONAL CHANGES

Activity 15: In hot water?

Which weighs more: hot or cold water?

Activity 16: The great anadromous fish game

What are some of the factors that determine the reproductive success of fish during the seasonal migrations of river-spawning, ocean-living species? A life cycle game.

Activity 17: A change in the weather

Predicting on seasonal changes in aquatic habitats.

SECTION III: MOVING OR STAYING PUT: MAINTAINING POSITION WITHIN AQUATIC HABITATS

What are the physical characteristics of water that determine the kinds of places that aquatic plants and animals live?

PLACES TO LIVE

Activity 18: To each its home

Where do animals and plants live and what makes them suited to their homes? A classification activity that introduces different parts of aquatic habitats

SINKING OR FLOATING

Activity 19: Keeping your head above water

Do things that float or sink behave differently in salt and fresh water? What lets them float? Why do they sink?

Activity 20: Sinking slowly

How do plants, which need light, maintain their position in the water column if they are heavier than water? How do tiny drifting animals keep from sinking to the bottom? A contest to design an organism that sinks slowest.

Activity 21: Sink or swim

What are some of the special structures that allow fish to stay up in and move through the water? A fish dissection.

Activity 22: Grace under pressure

Does water pressure vary with depth?

LIVING ON SURFACE TENSION

Activity 23: Life at the surface

What is the surface of the water like? How can animals take advantage of the water surface as a place to live? A contest to design a model organism that rides on surface tension .

MOVING THROUGH WATER

Activity 24: At the races

How do fish swim? What are the correlations between body shape, swimming technique and speed? To be done on a trip to a public aquarium or science center which displays fish.

SECTION IV: LIGHT AND WATER

What happens to light in water, and what are the consequences for plants and animals that live there?

LIGHT AND WATER

Activity 25: Light to sea by

What happens to light when it shines through water?

Activity 26: Hide and seek

What does it look like under water? What do animals see?

Is camouflage the same below water as above?

LIGHT AND PLANTS

Activity 27: A light snack

What is the relationship between light availability and photosynthesis in aquatic plants?

AQUATIC FOOD CHAINS

Activity 28: Competing for food

What is the relationship of food availability to the number of herbivores an area can support? A simulation game.

Activity 29: Eating and being eaten

What are the feeding relationships among the plants and animals that live in a pond? A simulation of carrying capacity and predator-prey relationships.

Activity 30: Getting caught

Do some human activities change the feeding relationships, and thus, the ecological balance, of a food web? A simulation.

SECTION V: EXPLORATION, RESEARCH AND COMMUNICATION

EXPLORATION AND RESEARCH

Activity 31: Getting to the bottom of things

Can scientists map the bottom of a lake or ocean when they cannot see it? Mapping and sampling a model ocean.

Activity 32: Underwater exploration

How is modern technology being used to study the physical, geological, chemical and biological nature of the oceans?

Research project on technology and its applications.

Activity 33: Getting wet!

An aquatic field investigation.

COMMUNICATION

Activity 34: Aquatic language arts

Individual language arts projects with an aquatic theme.

Activity 35: Habitat detectives

A group project in library research and communication.

Activity 36: Aquatic science symposium

An aquatic conference for parents or other students.

GLOSSARY

RECIPES AND RESOURCES

- Master list for all materials used in this curriculum
- Teacher's outline: classroom note cards for each activity
- Sample questions
- Salts and solutions
- Making water with low and high dissolved oxygen
- Moving water and taking samples
- Dissolved oxygen test kits
- LaMotte dissolved oxygen test kit instructions
- Thermometers
- Balances
- Spring scales
- Measuring time
- Measuring volume
- Making graphs
- Collecting and looking at zooplankton
- Dissection
- The classroom aquarium
- Making water without chlorine or how to age tap water
- Pond water
- Elodea
- Goldfish and guppies
- Brine shrimp
- Sources of equipment and animals
- Sources for curriculum ideas and software

STUDENT PAGES FOR DUPLICATION

At the end of most activities there are pages which can be duplicated as worksheets or for information which the students need. The best tactic on worksheets is for students to learn to design their own. These are listed here, but are found by clicking on the activity itself.

- Activity 1 worksheet
- Activity 2 cards and keys
- Activity 3 worksheet
- Activity 4 worksheet
- Activity 5 worksheet
- Activity 6 worksheet
- Activity 7 worksheet
- Activity 8 worksheet
- Activity 9 worksheet
- Activity 10 worksheet
- Activity 11 worksheet
- Activity 12 worksheet
- Activity 13 worksheet
- Activity 14 worksheet
- Activity 15 worksheet
- Activity 16 game board, cards and rules
- Activity 17 worksheet
- Activity 18 cards and keys
- Activity 19 worksheet
- Activity 20 worksheet
- Activity 21 worksheet
- Activity 22 worksheet
- Activity 23 worksheet
- Activity 24 information pages
- Activity 24 worksheet
- Activity 27 worksheet
- Activity 28 worksheet
- Activity 29 and 30 worksheet
- Activity 31 worksheet