

Anoka Hennepin K-12 Curriculum Unit Plan

Department: Elementary Science

Course/Grade Level: 4th

Unit Title: Water

Number of Lessons/Days: 1st Trimester (27-29 days)

Unit Summary: This is an earth science unit on water designed for fourth grade students. It will provide students with the basic understanding that water changes form but it remains water. Using the water cycle, the students will understand a natural pattern in our world. Working cooperatively, students will conduct an experiment, draw conclusions related to an environmental issue, and evaluate information from the collected data. Writing, critical thinking, and speaking will allow student to present their findings.

DESIRED RESULTS (STAGE 1)

Program Understanding and/or Minnesota State/Local/Core Standards and Technology Standard(s) addressed:

- I. Students will understand that earth and space are composed of different systems and cycles that influence their daily lives.
- III. Students will understand that scientists use the properties and interactions of energy and matter to explain how the physical world works.
- IV. Students will understand that the study of science involves processes that unify science disciplines and provide students with ideas and structures to help them understand the natural world.
- V. Students will understand that the process of inquiry is the collection of information verified through observation and experimentation which allow scientists to critically analyze, draw conclusions and make inferences about the natural world.
- VI. Students will understand that scientists use various communications to share knowledge and promote understanding about our natural world.
- VII. Students will understand that science influences and informs the personal and social decisions citizens face.
- VIII. Students will understand that scientists use and design technology to answer questions, share information and solve problems.

MN Standards/Benchmarks:

- 4.1.2.1 Engineers design, create and develop structures, processes and systems that are intended to improve society and may make humans more productive.
 - **4.1.2.1.1 Impact of Designed World:** Describe the positive and negative impacts that the designed world has on the natural world as more and more engineered products and services are created and used.
- 4.2.1.1: Objects have observable properties that can be measured.
 - **4.2.1.1.1 Measurement Tools & Units:** Measure temperature, volume, weight and length using appropriate tools and units.
- 4.2.1.2: Solids, liquids and gases are states of matter that have unique properties.
 - **4.2.1.2.1 Comparing States of Matter:** Distinguish between solids, liquids and gases in terms of shape and volume.
 - **4.2.1.2.2 Changes of State:** Describe how the states of matter change as a result of heating and cooling.
- 4.3.2.3: Water circulates through the Earth's crust, oceans and atmosphere in what is known as the water cycle.
 - **4.3.2.3.1- Water Cycle:** Identify where water collects on Earth, including atmosphere, ground and surface water, and describe how water moves through the Earth system using the processes of evaporation, condensation and precipitation.
- 4.3.4.1: In order to improve their existence, humans interact with and influence Earth systems.
 - **4.3.4.1.1- Water Supplies & Uses:** Describe how the methods people utilize to obtain and use water in their homes and communities can affect water supply and quality.

Overarching Understanding(s) from Curriculum Map/Course Understandings:

Students will understand that...

- heating and cooling causes changes in the form of objects, but the properties stay the same.
- water on Earth cycles and exists in many forms.
- scientists develop models to understand how systems work to predict future occurrences.
- natural resources are limited and need to be protected to sustain the environment.
- scientific investigations require us to ask questions, make observations, plan and create tests to verify predictions with evidence and data, and generate further questions.
- scientists use and interpret data from multiple observations and repeated experiments to draw logical conclusions.
- scientists use a variety of written and oral communication skills to convey their findings.
- scientists work individually and collaboratively to understand the natural world and learn from one another.
- engineers and scientists design and apply technology either as a product or a process to accomplish a task.

Topical Understanding(s) Specific to Unit:

Students will understand that...

- water changes form as it moves through the water cycle, which impacts our weather.
- the properties of water influence how it interacts within our world.
- scientists set up controlled experiments with variables and draw conclusions from their observations in order to further understand water in our world.
- human and environmental factors impact the water, which cause scientists and engineers to raise questions and find solutions to improve water quality.

Essential Question(s) from Curriculum Map. Course Essential Questions:

To understand, students will need to consider such questions as....

- Where does all the water on the Earth come from and where does it go?
- How does matter change?
- How do models help scientists/engineers?
- Does science always make things better?
- What is scientific inquiry?
- How do scientists share what they know with others?
- What problems are there in our environment?
- What can I do to help solve the problems?

Topical Essential Questions for Unit:

To understand, students will need to consider such questions as....

- How does water act on different surfaces?
- How does the water cycle impact our weather?
- What happens to water when it freezes or is heated?
- What is our responsibility in caring for water in our world?
- Why can't I drink water directly out of a lake?
- How do scientists use investigations to answer questions?
- How does the engineering process help engineers?

To understand, students will need to...

know... Students will need to know the following in order to... (e.g. facts, concepts, generalizations, rules, theories, principles)

- water flows downhill.
- increasing the slope over which water flows makes it flow more quickly.
- water expands when heat is added and contracts when heat is taken away.
- warm water is less dense and cold water is more dense.
- a solid has definite volume and shape; a liquid has only definite volume.
- evaporation is the process by which liquid water changes to water vapor, a gas which has no definite shape or volume.
- temperature and amount of surface area affects the rate of evaporation.
- evaporation and condensation contribute to the movement of water through the water cycle.
- condensation may occur when water vapor in the air cools and changes into a liquid.
- human interactions affect the quality of water.
- scientists/engineers investigate to answer questions.

ESSENTIAL VOCABULARY

MCA Essential Vocabulary

- **advantage** – the good or benefit that is gained from something
- **atmosphere** – a thick layer of air, moisture and small particles of matter that surround the earth
- **condensation** – when water vapor touches a cool surface it turns into a liquid
- **design solution** – a plan for an invention to solve a problem
- **disadvantage** – a problem, a difficulty or an obstacle
- **engineering** – using math and science to design and build things that solve problems
- **evaluate** – to grade or assess
- **evaporation** – when heat changes liquid (water) into a vapor or gas
- **ground water** - water that is found beneath the earth's surface
- **impact** – the effect of one thing on another
- **infiltration** – process by which water on the ground surface enters the soil
- **inquiry** – the process of asking questions to find information
- **interdependence** – when two or more things need each other to function

be able to... (Students will be able to DO... skills, procedures, processes)

- observe and explore properties of water in liquid, solid, and gaseous states.
- observe the expansion and contraction of water as it warms and cools.
- investigate factors that influence evaporation and condensation of water.
- Explain the components of the water cycle.
- record observations in writing and pictures.
- become aware of the importance of water in our lives.
- use scientific thinking processes to conduct investigations and build explanations: observing, communicating, comparing, and organizing.
- examine the water quality of local water samples.
- investigate environmental issues about water quality.
- follow the engineering design process to solve a problem.

- **invention** – something created to solve a problem
- **ocean** – a large body of salt water
- **water cycle** – a repeating sequence of evaporation, condensation and precipitation

Water Unit Essential Vocabulary

- absorb –to take in or soak up into another material
- variable – a factor that can be changed in an experiment that may affect the results
- Celsius – metric measurement of temperature where water freezes at 0°
- contract – to get smaller and take up less space
- dissolve- to break apart in liquid

- expand – to get bigger and take up more space
- Fahrenheit – U.S. based measurement of temperature where water freezes at 32°
- gas – a state of matter without shape or volume
- hydrologist – A scientist who studies water
- states of matter – solid, a liquid or gas
- surface tension - The skin-like surface on water that pulls it together into the smallest possible area.
- temperature – a measure of how hot or cold something is
- volume – a measure of how much space something takes up
- water - A liquid earth material.
- water quality – how clean or pure the water is
- water vapor – when water is heated it becomes a gas

- Common misunderstanding(s):
 - Water gets used up and is gone.
 - Ice floats so cold water must be less dense than hot water.
 - Steam is hot air.
 - Water in an open container is absorbed by the container, disappears, changes into air, or dries up and goes into the air.
 - The water cycle involves freezing and melting of water.
 - Water only gets evaporated from the ocean or lakes.
 - The water cycle only includes rain and snow.