

THE RIPPLE EFFECT: A STUDY OF WATER



This guide links the *The Ripple Effect: A Study of Water* unit to the Texas Essential Knowledge and Skills (TEKS) for second graders. *The Ripple Effect: A Study of Water* is a science/social studies unit that allows students to explore the properties of water, local water supplies, and sources of water pollution. Though a science/social studies unit, *The Ripple Effect: A Study of Water* also leads students to practice skills in the other subject areas of English language arts and mathematics. For example, students will prepare to speak appropriately to different audiences as described in the English Language Arts and Reading TEKS. They will also use patterns to describe relationships and make predictions, as described in the Mathematics TEKS. The following document includes the applicable TEKS and the details of *The Ripple Effect: A Study of Water* unit. The final section of this document presents the applicable Texas College and Career Readiness Standards adopted by the Texas Higher Education Coordinating Board (THECB) on January 24, 2008.

Description of Unit

Students will learn about the properties of water and issues surrounding the quality and quantity of water sources. Students will investigate a local water supply and discuss ways to conserve water and limit pollution. They will conduct a study of their own water usage in order to develop a solution for preserving the local water supply.

Goals

Students will meet these goals in their explorations:

- Develop the essential skills of logical thinking, creative problem solving, intellectual risk taking, and communicating
- Make connections across disciplines
- Draw conclusions
- Ask questions and explore theories

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- Have opportunities to generate new ideas
- Become familiar with water conservation
- Understand the sources of water pollution

Phase I. Learning Experiences

1. Use *Water, Water Everywhere* by Mark J. Rauzon to introduce the importance of water to the class. Introduce the concept of “water is everywhere.”
2. Create a KWL chart to show what students already know and what they want to learn. Talk about how much water makes up the human body, earth, and other common objects. Also discuss the physical and chemical properties of water.
3. Discuss various water sources. How do we get the water we use for cooking, drinking, and bathing? Does it all come from the same place? Compare your local community to another community that your class has studied.
4. Brainstorm ways that you use water. Each student keeps a diary of his/her family’s water usage (e.g., number of showers, how much water they drink, how much time they spend watering the lawn) for a week. As a class, compare water usage across households. What did students learn? What is the class average amount of water usage? How does water usage compare? Discuss things that can be done to help conserve water in the home.
5. Think about different sources of water pollution. Look for pollutants at home or in the school. Students will make a list of possible pollutants. Conduct an experiment on pollution and water. Add different pollutants, such as oil or acid, to different containers of water (plus a control container). What do students notice? How do the characteristics of the water change? Add water fleas. What differences do they see? What happens to the water fleas? How do the pollutants get from your home or school to the water source? What changes can you make?
6. Choose a local water supply to examine. This supply can be as small as a neighborhood pond or as large as an aquifer or other source for drinking water in the area. Look at the history of the source, geography, uses, and potential pollutants. Take a field trip to the water source, or invite a guest speaker to discuss the issue with students.

Phase II. Independent Research

A. Research process

1. Selecting a topic. Each student chooses an important issue involving water which they would like to investigate; for example: conservation, pollution, or filtration.
2. Asking guiding questions. What does the student hope to learn about the chosen issue?

3. Conducting the research. Possible sources of data include experiments, surveys, interviews, and literature reviews.
4. Drawing conclusions. What has the student learned about the issue he/she researched?

B. The product

Each student completes ONE of the following product options:

1. Work in small groups or individually to create a public service announcement (PSA) that addresses important issues with water, such as conservation or pollution. Include some useful tips for protecting the water source. If working in groups, each student should make a significant contribution to the PSA.
2. Develop an invention, idea, or plan for conserving water or creating less pollution. Design a plan to market the invention to homes in the community through the creation of mockup posters, brochures, or websites. Discuss how the invention should be used to address the problem.

C. Communication

The student presents the PSA or invention to an audience. The student talks about what he/she has learned and ways he/she can help preserve the local water supply.

D. A completed project consists of:

1. Research log, note cards, and/or research process sheets
2. PSA in audiotape or videotape format, or invention
3. Marketing materials for invention, including brochures, mockup posters, or website list
4. Works Cited Page

Resources:

<http://www.clarkswcd.org/Kids/KidsHome.htm>

<http://www.ene.gov.on.ca/cons/3782-e.htm>

<http://www.nsf.org/consumer/conservation/index.asp>

www.fcs.uga.edu/ext/pubs/hace/PPT-64.ppt

www.ecoplex.unt.edu

<http://www.microscopy-uk.org.uk/mag/indexmag.html><http://www.microscopy-uk.org.uk/mag/artmar02/fleanatomy.html>

A Drop of Water by Walter Wick

Down the Drain: Conserving Water (You Can Save the Planet) by Chris Oxlade and Anita Ganeri

Around the Pond, Who's Been Here? by Lindsay Barrett George

A River Ran Wild by Lynn Cherry

Oil Spill by Melvin Berger

Prince William by Gloria and Ted Rand

A River Story by Meredith Hooper

Sea Otter Rescue by Roland Smith

Beaver at Long Pond by William and Lindsay B. George

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Texas Essential Knowledge and Skills

The unit may address the following TEKS:

English Language Arts and Reading:

- 2.1 Understands how English is written and printed
- 2.2 Uses the relationships between letters and sounds, spelling patterns, and morphological analysis to decode written English
- 2.3 Comprehends a variety of texts drawing on useful strategies as needed
- 2.4 Reads grade-level text with fluency and comprehension
- 2.5 Understands new vocabulary and uses it when reading and writing
- 2.12 Reads independently for sustained periods of time and produces evidence of their reading
- 2.13 Analyzes, makes inferences, and draws conclusions about the author's purpose in cultural, historical, and contemporary contexts and provides evidence from the text to support their understanding* (Testable on the Grade 3 Reading STAAR, Reporting Category 3)
- 2.17 Uses elements of the writing process (planning, drafting, revising, editing, and publishing) to compose text
- 2.18 Writes literary texts to express their ideas and feelings about real or imagined people, events, and ideas
- 2.21 Understands the function of and uses the conventions of academic language when speaking and writing
- 2.24 Asks open-ended research questions and develops a plan for answering them
- 2.26 Clarifies research questions and evaluates and synthesizes collected information
- 2.28 Uses comprehension skills to listen attentively to others in formal and informal settings
- 2.29 Speaks clearly and to the point, using the conventions of language

Mathematics:

- 2.1 Uses mathematical processes to acquire and demonstrate mathematical understanding
- 2.2 Applies mathematical process standards to understand how to represent and compare whole numbers, the relative position and magnitude of whole numbers, and relationships within the numeration system related to place value
- 2.6 Applies mathematical process standards to connect repeated addition and subtraction to multiplication and division situations that involve equal groupings and shares
- 2.7 Applies mathematical process standards to identify and apply number patterns within properties of numbers and operations in order to describe relationships
- 2.9 Applies mathematical process standards to select and use units to describe length, area, and time
- 2.10 Applies mathematical process standards to organize data to make it useful for interpreting information and solving problems

Science:

- 2.1 Conducts classroom and outdoor investigations following home and school safety procedures
- 2.2 Develops abilities necessary to do scientific inquiry in classroom and outdoor investigations
- 2.3 Knows that information and critical thinking, scientific problem solving, and the contributions of scientists are used in making decisions
- 2.5 Knows that matter has physical properties and those properties determine how it is described, classified, changed, and used
- 2.6 Knows that forces cause change and energy exists in many forms
- 2.7 Knows that the natural world includes earth materials
- 2.8 Knows that there are recognizable patterns in the natural world and among objects in the sky
- 2.10 Knows that organisms resemble their parents and have structures and processes that help them survive within their environments

Social Studies:

- 2.2 Understands the concepts of time and chronology
- 2.5 Uses simple geographic tools, such as maps and globes
- 2.6 Understands the locations and characteristics of places and regions in the community, state, and nation
- 2.7 Understands how physical characteristics of places and regions affect people's activities and settlement patterns
- 2.8 Understands how humans use and modify the physical environment
- 2.17 Understands how science and technology have affected life, past and present
- 2.18 Applies critical-thinking skills to organize and use information acquired from a variety of valid sources, including electronic technology
- 2.19 Communicates in written, oral, and visual forms
- 2.20 Uses problem-solving and decision-making skills, working independently and with others, in a variety of settings

Texas College and Career Readiness Standards

This unit may address the following Texas College and Career Readiness Standards:

English Language Arts:

- I.A.2 Generates ideas and gathers information relevant to the topic and purpose, keeping careful records of outside sources
- II.A.1 Use effective reading strategies to determine a written work's purpose and intended audience
- II.A.2 Uses text features and graphics to form an overview of informational texts and to determine where to locate information

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- II.A.4 Draws and supports complex inferences from text to summarize, draw conclusions, and distinguish facts from simple assertions and opinions
- II.A.5 Analyzes the presentation of information and the strength and quality of evidence used by the author, and judge the coherence and logic of the presentation and the credibility of an argument
- II.A.9 Identifies and analyzes the audience, purpose, and message of an informational or persuasive text
- II.B.1 Identifies new words and concepts acquired through study of their relationships to other words and concepts
- III.A.1 Understands how style and content of spoken language varies in different contexts and influences the listener's understanding
- III.A.2 Adjusts presentation (delivery, vocabulary, length) to particular audiences and purposes
- III.B.1 Participates actively and effectively in one-on-one oral communication situations
- III.B.2 Participates actively and effectively in group discussions
- III.B.3 Plans and delivers focused and coherent presentations that convey clear and distinct perspectives and demonstrate solid reasoning
- IV.A.1 Analyzes and evaluates the effectiveness of a public presentation
- IV.A.2 Interprets a speaker's message; identifies the position taken and the evidence in support of that position
- IV.A.3 Uses a variety of strategies to enhance listening comprehension
- IV.B.1 Listens critically and responds appropriately to presentations
- IV.B.2 Listens actively and effectively in one-on-one communication situations
- IV.B.3 Listens actively and effectively in group discussions
- V.A.1 Formulates research questions
- V.B.1 Gathers relevant sources
- V.B.2 Evaluates the validity and reliability of sources
- V.B.3 Synthesizes and organizes information effectively
- V.C.1 Designs and presents an effective product

Mathematics:

- VI.B.2 Selects and applies appropriate visual representations of data
- VI.B.4 Describes patterns and departure from patterns in a set of data
- VIII.A.1 Analyzes given information
- VIII.B.1 Develops and evaluate convincing arguments
- VIII.B.2 Uses various types of reasoning
- VIII.C.3 Evaluates the problem solving process

Science:

- I.A.1 Utilizes skepticism, logic, and professional ethics in science
- I.A.2 Uses creativity and insight to recognize and describe patterns in natural phenomena
- I.A.3 Formulates appropriate questions to test understanding of natural phenomena

- I.A.4 Relies on reproducible observations of empirical evidence when constructing, analyzing, and evaluating explanations of natural events and processes
- I.B.1 Designs and conducts scientific investigations in which hypotheses are formulated and tested
- I.C.1 Collaborates on joint projects
- I.E.1 Uses several modes of expression to describe or characterize natural patterns and phenomena. These modes of expression include narrative, numerical, graphical, pictorial, symbolic, and kinesthetic
- I.E.2 Uses essential vocabulary of the discipline being studied
- III.B.1 Reads technical and scientific articles to gain understanding of interpretations, apparatuses, techniques or procedures, and data
- III.B.2 Sets up apparatuses, carries out procedures, and collects specified data from a given set of appropriate instructions
- III.B.3 Recognizes scientific and technical vocabulary in the field of study and use this vocabulary to enhance clarity of communication
- III.B.4 Lists, uses and gives examples of specific strategies before, during, and after reading to improve comprehension
- III.C.1 Prepares and represents scientific/technical information in appropriate formats for various audiences
- III.D.1 Uses search engines, databases, and other digital electronic tools effectively to locate information
- III.D.2 Evaluates quality, accuracy, completeness, reliability, and currency of information from any source
- V.C.1 Recognizes patterns of change
- V.D.1 Understands that scientists categorize things according to similarities and differences
- VI.C.1 Knows multiple categories of evidence for evolutionary change and how this evidence is used to infer evolutionary relationships among organisms
- VI.C.2 Recognizes variations in population sizes, including extinction, and describe mechanisms and conditions that produce these variations

Social Studies:

- I.B.2 Identifies and evaluates sources and patterns of change and continuity across time and place
- I.F.1 Uses a variety of research and analytical tools to explore questions or issues thoroughly and fairly
- IV.A.1 Identifies and analyzes the main idea(s) and point(s) of view in sources
- IV.A.2 Situates an informational source in its appropriate contexts
- IV.A.3 Evaluates sources from multiple perspectives
- IV.A.4 Understands the differences between a primary and secondary source and use each appropriately to conduct research and construct arguments
- IV.A.5 Reads narrative texts critically
- IV.A.6 Reads research data critically
- IV.B.1 Uses established research methodologies

- IV.B.3 Gathers, organizes, and displays the results of data and research
- IV.B.4 Identifies and collects sources
- IV.C.1 Understands/interprets presentations critically
- IV.D.1 Constructs a thesis that is supported by evidence
- V.A.1 Uses appropriate oral communication techniques, depending on the context or nature of the interaction
- V.A.2 Uses conventions of standard written English

Cross-Disciplinary Standards:

- I.A.1 Engages in scholarly inquiry and dialogue
- I.B.2 Constructs well-reasoned arguments to explain phenomena, validate conjectures, or support positions
- I.B.3 Gathers evidence to support arguments, findings, or lines of reasoning
- I.B.4 Supports or modifies claims based on the results of an inquiry
- I.C.1 Analyzes a situation to identify a problem to be solved
- I.C.2 Develops and applies multiple strategies to solving a problem
- I.C.3 Collects evidence and data systematically and directly relate to solving a problem
- I.D.1 Self-monitors learning needs and seeks assistance when needed
- I.D.2 Uses study habits necessary to manage academic pursuits and requirements
- I.D.3 Strives for accuracy and precision
- I.D.4 Perseveres to complete and master tasks
- I.E.1 Works independently
- I.E.2 Works collaboratively
- II.A.1 Uses effective prereading strategies
- II.A.3 Identifies the intended purpose and audience of the text
- II.A.4 Identifies the key information and supporting details
- II.A.5 Analyzes textual information critically
- II.A.6 Annotates, summarizes, paraphrases and outlines texts when appropriate
- II.A.7 Adapts reading strategies according to structure of texts
- II.A.8 Connects reading to historical and current events and personal interest
- II.B.1 Writes clearly and coherently, using standard writing conventions
- II.B.2 Writes in a variety of forms for various audiences and purposes
- II.B.3 Composes and revises drafts
- II.C.1 Understands which topics or questions are to be investigated
- II.C.2 Explores a research topic
- II.C.3 Refines a research topic based on preliminary research and devise a timeline for completing work
- II.C.4 Evaluates the validity and reliability of sources
- II.C.5 Synthesizes and organizes information effectively

- II.C.6 Designs and presents an effective product
- II.C.7 Integrates source material
- II.C.8 Presents final product
- II.D.1 Identifies patterns or departures from patterns among data
- II.D.2 Uses statistical and probabilistic skills necessary for planning an investigation, and collecting, analyzing, and interpreting data
- II.D.3 Presents analyzed data and communicate findings in a variety of formats
- II.E.1 Uses technology to gather information
- II.E.2 Uses technology to organize, manage, and analyze information
- II.E.3 Uses technology to communicate and display findings in a clear and coherent manner
- II.E.4 Uses technology appropriately