


5th Grade

From Disaster to Solar Rescue

Eco-Energy for Schools



Unit Overview	
Unit Title	From Disaster to Solar Rescue
Unit Summary	<p>The focus of this unit will be the study of natural disasters, particularly tsunamis. The students will learn about the destruction caused by tsunamis, students will explore ways solar power can aid disaster victims. The unit will integrate the study of measurement, data, research, theme, inferences, writing, engineering, technology, earth, along with comparing and contrasting needs and wants. The culminating event will be building a scale model of a temporary house for victims of a disaster. The students will be given design parameters and needs for their model. The overall goal of this unit is to increase student's awareness of natural disasters and how technology and engineering can be used to react to these events.</p>
Subject Area Strands	Science – Embedded Technology & Engineering; The Earth; The Earth's Systems; Engineering Design Math –Measurement and Data ELA – Reading: Informational Texts-Key Ideas and Details; Reading: Literature-Key Ideas and Details; Writing: Research to Build and Present Knowledge Social Studies – Economics
Grade Level	5 ^h Grade
Appropriate Time	10 days

Lesson Foundation

Targeted Content Standards	Common Core Standards	
	Mathematics	<ul style="list-style-type: none"> • 5MD4 Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft., and improvised units. • 5MD5 b Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real world and mathematical problems.
	English / Language Arts	<p><u>Reading Strands for Informational Text</u></p> <ul style="list-style-type: none"> • RL.5.2 Determine a theme of a story, drama, or poem from details in the text, including how characters in a story or drama respond to challenges or how the speaker in a poem reflects upon a topic; summarize the text • RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. <p><u>Writing</u></p> <ul style="list-style-type: none"> • W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources
	TN Standards	
	Science	<ul style="list-style-type: none"> • SPI 0507.T/E.5 Apply a creative design strategy to solve a particular problem generated by societal needs and wants • SPI 0507.7.1 Describe internal forces such as volcanoes, earthquakes, faulting, and plate movements that are responsible for the earth's major geological features such as mountains, valleys, etc.
Social Studies	<ul style="list-style-type: none"> • 5.2 spi 1 Differentiate between needs and wants on a personal and national level. 	

	<p>Next Generation Science Standards</p>	<ul style="list-style-type: none"> • 5-ESS2-1. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact • 3-5-ETS1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
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Lesson Foundation – Big Ideas & Cross-Curricular Connections

Big Ideas:

- Natural disasters impact human needs.
- The sun can provide for some human needs after a disaster.
- The earth’s plate movements cause many changes in the environment.
- Finding the volume of a prism is helpful to humans.

Cross-Curricular Connections:

This unit engages students in reading and writing activities centered on the impact natural disasters have on human needs. Students will learn how earth’s plate movements cause disasters and how solar power is used to aid disaster victims. Students will use their knowledge of volume of rectangular prisms to design temporary shelter for disaster victims, while using materials that provide for maximum solar power.

Lesson Foundation – Essential Questions

1. Explain why the characters in the story responded to challenges in a given way.
2. Given the length, width, and volume, how do you find the height?
3. Describe a situation that would change your needs and wants.
4. Why do tsunamis not commonly occur on the east coast of the United States?
5. Justify the need for solar power in an area recovering from a natural disaster.
6. What are advantages/disadvantages of solar power?

Lesson Foundation – Student Objectives

<p>Going Beyond</p>	<ul style="list-style-type: none"> • I can create accurate dimensions for rectangular prisms of a given volume using cubic units, cubic centimeters, and cubic inches. • I can evaluate how human wants and needs change in different situations. • I can correlate the magnitude of earthquakes to the impact it has on humans and the environment. • I can use text evidence to analyze why characters in a story respond in a particular manner to challenges they face.
<p>Mastery</p>	<ul style="list-style-type: none"> • I can find the volume of a rectangular prism using cubic units, cubic centimeters, and cubic inches. • I can analyze how human wants and needs change in different situations. • I can compare the magnitude of earthquakes to the impact it has on humans and the environment. • I can find text evidence to show why characters in a story respond in a particular

	manner to challenges they face.
Building the Basics	<ul style="list-style-type: none"> • I can find the volume of a rectangular prism using cubic units. • I can list human wants and needs in different situations. • I can show that big earthquakes impact humans and the environment more than smaller earthquakes. • I can tell why characters in a story respond in a particular manner to challenges they face.

Lesson Foundations – Prerequisite Content & Skills

Content Knowledge	<ul style="list-style-type: none"> • Students need to understand the Commutative Property of multiplication. • Students need to be able to multiply fractions. • Students need to understand and calculate area of rectangular prisms.
Skills	<ul style="list-style-type: none"> • Students need to be familiar with computers and how search the Internet. • Students need to be familiar with one of the software programs.

Unit Anchor Text

Unit Anchor Text	<ul style="list-style-type: none"> • Tarshis, Lauren. I Survived the Japanese Tsunami, 2011. Scholastic, 2013. • Spetgang, Tilly. The Kid's Solar Energy Book: Even Grown-ups Can Understand. Watertown, MA: Imagine, 2011.
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Unit Companion Texts

Informational Text(s)	<p>Cross-Curricular Texts:</p> <ul style="list-style-type: none"> • <i>Unity and Warmth for Japan's Tsunami Survivors</i> by Marna Romanoff http://ourworld.unu.edu/en/unity-and-warmth-for-japan-tsunami-survivors • <i>Solar Power Charges to the Rescue of Sandy Victims</i> by David Worthington http://www.smartplanet.com/blog/bulletin/solar-power-charges-to-the-rescue-of-sandy-victims/ • <i>Philippines Storm Relief</i> posted by Rhys Sullivan http://www.illuminationsolar.com/philippines-storm-relief/ • <i>The Need for Reliable Solar Power at Sea</i> by Ray Thackeray http://www.renewableenergyworld.com/rea/news/article/2013/05/the-need-for-reliable-solar-power-at-sea • <i>Temporary Housing Construction Begins in Quake-Stricken Areas</i> http://ajw.asahi.com/article/0311disaster/quake_tsunami/AJ201103193121 • <i>INDONESIA: Work Begins on Temporary Housing for Tsunami Victims</i> http://www.irinnews.org/report/91468/indonesia-work-begins-on-
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[temporary-housing-for-tsunami-victims](#)

Informational Texts:

- Fradin, Dennis B. *Tsunamis: Witness to Disaster*. Washington, D.C.: National Geographic, 2008.
- Osborne, Mary Pope. *Tsunamis and Other Natural Disasters: A Nonfiction Companion to Magic Tree House #28, High Tide in Hawaii*. New York: Random House, 2011.

Assessments

Formative Assessments

- Teacher observation
- Group work
- Independent work
- Question / Answer
- Graphic organizers
- Article summaries
- Student reflections

Summative Assessments

- Toy Chest Design with a given volume
- Research Presentation on Solar Inventions
- *I Survived the Japanese Tsunami, 2011* Test
- Culminating Activity

Writing Assessments

- Students will write a Problem/Solution/Opinion paper.
- Small groups will write a cooperative paper explaining how human needs and wants change after disasters.
- Students will write a persuasive newspaper advertisement for a solar product.
- Students will write a paper analyzing data and explain how results can be used to design temporary housing for disaster victims.
- Students will write a poem about solar energy.
- Small groups will cooperatively write an action plan for helping disaster victims.

Unit Vocabulary

Term

Definition

Earthquake

Shaking of a part of the earth.

Needs

A necessity.

Solar energy

Radiant energy made by the sun.

Temporary

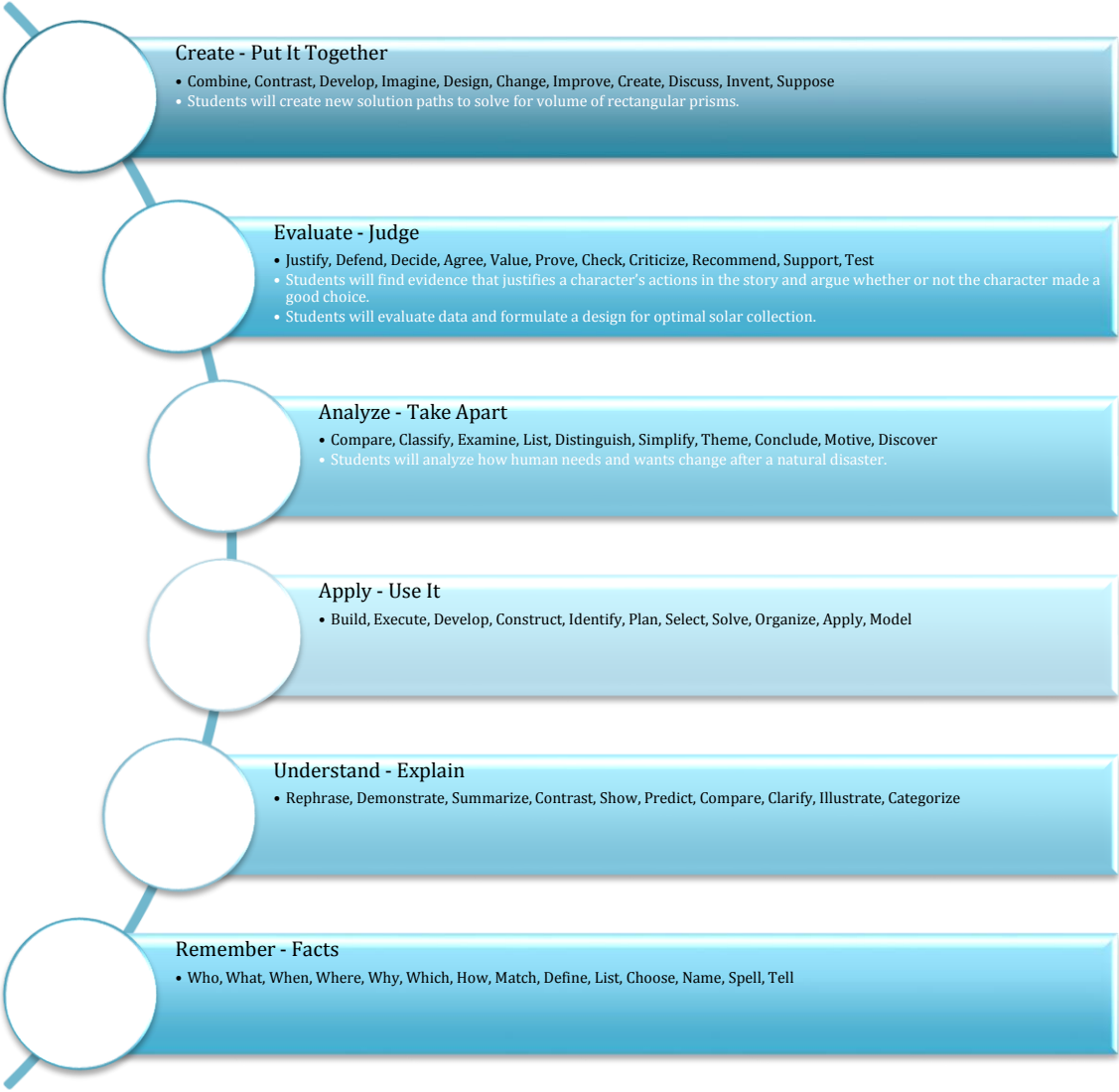
Intended to be used for a limited amount of time.

Tsunami

A large wave in the ocean usually caused by an earthquake under the sea.

Volume

The amount of space inside a solid figure.

Wants	Something wished for but not necessary.
Teaching the Unit	
Initial Strategies	<ul style="list-style-type: none"> • Show the 1:58 minute video <i>Anatomy of a Tsunami</i> to stimulate a discussion on causes and effects of tsunamis. <ul style="list-style-type: none"> ○ What caused the wave? ○ How will humans and the environment be impacted? ○ Students will begin a KWL chart on tsunamis. <p style="text-align: center;">http://www.watchknowlearn.org/Video.aspx?VideoID=14114&CategoryID=4669</p>
Direct Instruction	<ul style="list-style-type: none"> • The teacher will direct close reads during literacy circles. • The teacher will complete mini lessons on volume. • The teacher will facilitate group discussions.
Higher-Level Cognitive Function Strategies	 <p>Create - Put It Together</p> <ul style="list-style-type: none"> • Combine, Contrast, Develop, Imagine, Design, Change, Improve, Create, Discuss, Invent, Suppose • Students will create new solution paths to solve for volume of rectangular prisms. <p>Evaluate - Judge</p> <ul style="list-style-type: none"> • Justify, Defend, Decide, Agree, Value, Prove, Check, Criticize, Recommend, Support, Test • Students will find evidence that justifies a character's actions in the story and argue whether or not the character made a good choice. • Students will evaluate data and formulate a design for optimal solar collection. <p>Analyze - Take Apart</p> <ul style="list-style-type: none"> • Compare, Classify, Examine, List, Distinguish, Simplify, Theme, Conclude, Motive, Discover • Students will analyze how human needs and wants change after a natural disaster. <p>Apply - Use It</p> <ul style="list-style-type: none"> • Build, Execute, Develop, Construct, Identify, Plan, Select, Solve, Organize, Apply, Model <p>Understand - Explain</p> <ul style="list-style-type: none"> • Rephrase, Demonstrate, Summarize, Contrast, Show, Predict, Compare, Clarify, Illustrate, Categorize <p>Remember - Facts</p> <ul style="list-style-type: none"> • Who, What, When, Where, Why, Which, How, Match, Define, List, Choose, Name, Spell, Tell

**Guided
Practice &
Activities**

WEEK ONE:

DAY 1

ELA:

- Begin a literacy circle as the students read through the book *I Survived the Japanese Tsunami, 2011 (I Survived Series #8)*.
- Students will complete a character trait map.

Social Studies:

- Students will explore the change in human needs and wants with different situations.
- Small groups will create a T-chart on needs and wants of humans under normal situations.

Math:

- Students will learn to find the volume of a rectangular prism.
- Using 24 cubic units, Unifix cubes, and students will build rectangular prisms in order to generate a formula for volume.
- Students will draw each prism created and label the length, width, height, and volume.

Science:

- Students will discover the cause and effects of tsunamis.
- Students will read *Tsunamis: Witness to Disaster* and *Magic Tree House Fact Tracker: Tsunamis and Other Natural Disasters*.
- In science journals, students will draw the anatomy of a tsunami and write about the formation of a tsunami from earthquake to landfall.

DAY 2

ELA:

- Meet with students in literacy circles.
- Students will create a timeline of the events from the story.

Social Studies:

- Students will read articles about victims of natural disasters having their basic needs met with solar power.
 - Articles:
 - *Unity and Warmth for Japan's Tsunami Survivors*
 - *Solar Power Charges to the Rescue of Sandy Victims*
 - *Philippines Storm Relief*
 - *The Need for Reliable Solar Power at Sea*
- The teacher will facilitate a group discussion on the articles.

Math:

- Students will measure empty food boxes using cubic units, cubic centimeters, and cubic inches to find the volume of each box.
- Not given enough cubes to fill the boxes, students will generate a solution path for finding the volume.

Science:

- Students will simulate a tsunami by completing the activity **Tsunami in a Bottle**

from <http://www.shakeout.org/schools/resources/> .

- In science journals, students will write a reflection on the experiment.

DAY 3

ELA:

- Meet with students in literacy circles.
- Students will cite evidence from the text while writing a Problem/Solution/Opinion paper, explaining a problem and solution from the text and stating whether he/she agrees or disagrees with the solution.

Social Studies:

- Small groups will brainstorm important points from the articles read on Day 2.
- Students will write a summary of the articles.

Math:

- Students will practice finding the volume of rectangular prisms by using a ruler and measuring empty food boxes.
- Students will round measurements to the nearest one-fourth inch.
- Students will use their knowledge of multiplying fractions to solve equations.

Science:

- Students will simulate faults of different sizes by completing the activity **Bigger Faults Make Bigger Earthquakes** from <http://beyondpenguins.ehe.osu.edu/issue/earths-changing-surface/hands-on-science-and-literacy-activities-about-erosion-volcanoes-and-earthquakes>.
- Students will reflect in their science journals about the experiment.

DAY 4

ELA:

- Meet with students in literacy circles.
- Working in small groups, students will record words from the book that are unfamiliar to them, discuss the meaning of these new words, use context clues from the text, prior knowledge, and both print and online resources to clarify the meaning of each word.
- Students create a chart of the words with the definitions and an example of the word used in context.

Social Studies:

- Using the needs/wants chart made on Day 1, students will discuss how these change after a disaster.
- Small groups will write a cooperative paper explaining how human needs and wants change after disasters.

Math:

- Given the volume of a packing box, students must find the combined volume of three rectangular prisms in the class that will fit in the packing box.

Science:

- Students will use their knowledge from the Day 3 experiment to explore various sized waves.

- Students will fill an extra-long plastic storage container with two inches of water.
- Students will drop various sized wood blocks in the water to simulate fault movements.
- Students will record their observations in science journals.

DAY 5

ELA:

- Meet with students in literacy circles.
- Students will write a paper on how they would feel if they experienced the same events from the story that the main character experienced.
- Students will apply their knowledge of the unfamiliar words from Day 4 literacy circles by using the words in their paper.

Social Studies:

- In small groups, students will brainstorm ways they can help people affected by a disaster.
- Students will cooperatively write a plan of action for helping disaster victims.

Math:

- Students will use centimeter grid paper to create three dimensional rectangular prisms of various measurements.
- Students will rotate around the room finding the volume of each prism.
- Students will count the units on the grid paper to determine the length, width, and height.

Science:

- Students will fill an extra-long plastic storage container with two inches of water.
- Using a variety of materials, such as wooden craft sticks, Play-Doh, or soil, students will attempt to build a barrier to stop a tsunami.
- After construction is complete, students will test their barrier by dropping wooden blocks into the water to cause a tsunami.
- Students will record results in science journals.

WEEK TWO:

DAY 1

ELA:

- A literacy circle will be held daily as students read through the book *The Kids' Solar Energy Book* by Tilly Spetgang.
- Students will make a graphic organizer showing the advantages and disadvantages of solar power.

Social Studies:

- Students will read two articles about victims of natural disasters living in temporary houses.
- The teacher will facilitate a group discussion on the articles.
- The articles are: *Temporary Housing Construction Begins in Quake-Stricken Areas* and *INDONESIA: Work Begins on Temporary Housing for Tsunami Victims*.

Math:

- Students will continue to learn to find the volume of rectangular prisms.
- Students will draw designs for two toy chests that hold 30 cubic meters of toys, each chest must have different dimensions.

Science:

- Students will investigate the thermal energy storage capacities of different materials.
- Students will complete the activity **Solar Hot Box** to determine colors and materials that collect maximum solar energy.
- Students will record results in their science journals.
http://dnr.louisiana.gov/assets/docs/energy/citizens/educationalresources/energy_ed.pdf

DAY 2**ELA:**

- After literacy circles have met, students will go on a scavenger hunt through the school listing all items that could be replaced by solar power.

Social Studies:

- Small groups will brainstorm important points from the articles read on Day 1. Students will write a summary of the articles.

Math:

- For homework, the students will bring to class the dimensions of their bedroom, kitchen, and living room in their own homes.
- In class, students will calculate the volume of each room and give a total volume for the three rooms.
- Using data from articles read on Day 1 in Social Studies, which gives the square footage of disaster victims' temporary houses, students will calculate possible dimensions of these temporary houses.
- Students will use their knowledge of area and volume to compare this data with the dimensions of their own homes.
- Students will write a reflection on their findings.

Science:

- Students will analyze data from the Day 1 experiment.
- Students will write a paper on how the results can be used to design temporary housing for disaster victims.

DAY 3**ELA:**

- After literacy circles have met, students will write a newspaper advertisement trying to persuade people to purchase a solar product.

Social Studies:

- In response to articles read, students will research solar inventions that will aid humans after a disaster.
- Students will create a presentation using a program such as PowerPoint, Glogster, Prezi, Wikispace, or Museum Box.

	<p>Math:</p> <ul style="list-style-type: none"> • Students will begin the design stage of the culminating activity. • Students will design a scale model of a temporary house for victims of a disaster. • The volume of the house can be no more than 2000 cubic feet, using the scale of 1 centimeter equals 1 foot. <p>Science:</p> <ul style="list-style-type: none"> • Data from the Solar Hot Box activity will be used in choosing the material and color for the scale model temporary house. <p>DAY 4</p> <p>ELA:</p> <ul style="list-style-type: none"> • After literacy circles have met, students will write a poem about solar energy. <p>Social Studies:</p> <ul style="list-style-type: none"> • Students will continue working on creating their presentation of solar inventions. <p>Math and Science:</p> <ul style="list-style-type: none"> • Students will build their scale model temporary house. <p>DAY 5</p> <ul style="list-style-type: none"> • Students will present their presentations on solar inventions. • Students will present their scale models. • As a whole class, students will complete the L section of the KWL chart from the beginning of the unit.
<p>STEM Projects</p>	<ul style="list-style-type: none"> • Tsunami in a Bottle http://www.shakeout.org/schools/resources/ • Bigger Faults Make Bigger Earthquakes http://beyondpenguins.ehe.osu.edu/issue/earths-changing-surface/hands-on-science-and-literacy-activities-about-erosion-volcanoes-and-earthquakes • Solar Hot Box Activity http://dnr.louisiana.gov/assets/docs/energy/citizens/educationalresources/energy_ed.pdf
<p>STEM Culminating Event</p>	<ul style="list-style-type: none"> • The culminating activity will be building a scale model of a temporary house for victims of a disaster. • The model is to have a volume of no more than 2000 cubic feet, using the scale of 1centimeter equals 1 foot. • The model should be made of materials and colors that provide for maximum solar power collection.
<p>Differentiated Instruction</p>	<ul style="list-style-type: none"> • Provide leveled books and articles. • Alter writing assignments to accommodate different learners. • Small group activities allow for peer collaboration and tutoring. • Allow calculators and manipulatives. • Provide measurements of boxes instead of students measuring with rulers.

<p>Re-teaching Strategies</p>	<ul style="list-style-type: none"> • Allow the use of manipulatives and calculators to aid in comprehension of volume. • Students will be given more visual support in understanding tsunamis and the impact they have on humans by viewing animations at http://nctr.pmel.noaa.gov/animate.html and http://embc.gov.bc.ca/em/tsunamis/causes_2.htm • To aid in comprehension of texts, students reread parts of text with peers and teacher. • Students keep a literacy journal on each text with notes on themes, supporting details, and draw pictures of events in sequence. • Students will create thinking maps and flashcards on points such as plot, set, characters, and vocabulary. • Students will create mnemonic device to remember skills, formulas, and key facts.
<p>Enrichment Strategies</p>	<ul style="list-style-type: none"> • Students will write a report on how to design a solar house using inventions and materials that provide for optimal solar collection. • Students will design and administer a survey on solar usage in America for the purpose of bringing awareness to the need for using renewable resources. • Students will create a poster showing renewable and nonrenewable resources. The student will define renewable and nonrenewable, show multiple examples of each, and explain the effects on the environment of using each resource.
<p>Independent Practice Activities</p>	<ul style="list-style-type: none"> • Students will read books and articles. • Students will complete a character trait map. • Students will practice finding volume. • Students will create a timeline of story events. • Students will write a Problem/Solution/Opinion paper. • Students will create a graphic organizer showing the advantages and disadvantages of solar power. • Students will list items that can be replaced with solar power. • Students will write a poem about solar energy. • Students will write a paper analyzing data and explain how results can be used to design temporary housing for disaster victims. • Students will write reflections about experiments. • Students will write article summaries.
<p>Materials & Resources</p>	<p>Pencils Paper Chart paper Tape Unifix Cubes Cubic centimeter blocks Cubic inch blocks Paint Empty food boxes Markers 2-liter plastic soda bottles Different colors cellophane Small gravel (fish tank gravel) Water Empty water bottles (16 oz.)</p>

Rulers and yardsticks
“What Do I See?” handout
Different lengths of string
Shoe boxes
Centimeter grid paper
Thermometers
Aluminum Foil
Different colored construction paper
Science Journals
Extra-long plastic storage container
Play-Doh
Various sized wooden blocks
Wooden craft sticks
Soil

INTERNET RESOURCES:

Anatomy of a Tsunami (video)

<http://www.watchknowlearn.org/Video.aspx?VideoID=14114&CategoryID=4669>

Character Trait maps: http://www.educationoasis.com/curriculum/GO/character_story.htm

ARTICLES:

Unity and Warmth for Japan’s Tsunami Survivors by Marna Romanoff

<http://ourworld.unu.edu/en/unity-and-warmth-for-japan-tsunami-survivors>

Solar Power Charges to the Rescue of Sandy Victims by David Worthington

<http://www.smartplanet.com/blog/bulletin/solar-power-charges-to-the-rescue-of-sandy-victims/>

Philippines Storm Relief posted by Rhys Sullivan

<http://www.illuminationsolar.com/philippines-storm-relief/>

The Need for Reliable Solar Power at Sea by Ray Thackeray

<http://www.renewableenergyworld.com/rea/news/article/2013/05/the-need-for-reliable-solar-power-at-sea>

Temporary Housing Construction Begins in Quake-Stricken Areas

http://ajw.asahi.com/article/0311disaster/quake_tsunami/AJ201103193121

INDONESIA: Work Begins on Temporary Housing for Tsunami Victims

<http://www.irinnews.org/report/91468/indonesia-work-begins-on-temporary-housing-for-tsunami-victims>

BOOKS:

Tarshis, Lauren. *I Survived the Japanese Tsunami*, 2011. Scholastic, 2013.

Spetgang, Tilly. *The Kid's Solar Energy Book: Even Grown-ups Can Understand*. Watertown, MA: Imagine, 2011.

Fradin, Dennis B. *Tsunamis: Witness to Disaster*. Washington, D.C.: National Geographic, 2008.

Osborne, Mary Pope. *Tsunamis and Other Natural Disasters: A Nonfiction Companion to Magic Tree House #28, High Tide in Hawaii*. New York: Random House, 2011.

INTERNET ACTIVITIES:

Tsunami in a Bottle <http://www.shakeout.org/schools/resources/>

Bigger Faults Make Bigger Earthquakes <http://beyondpenguins.ehe.osu.edu/issue/earths-changing-surface/hands-on-science-and-literacy-activities-about-erosion-volcanoes-and-earthquakes>

Solar Hot Box Activity

http://dnr.louisiana.gov/assets/docs/energy/citizens/educationalresources/energy_ed.pdf

Tsunami Animation by Emergency Management of British Columbia

http://embc.gov.bc.ca/em/tsunamis/causes_2.htm

Tsunami Animation by NOAA Center for Tsunami Research

<http://nctr.pmel.noaa.gov/animate.html>

Comments

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