

Surf Tsunami

In Search of the Perfect Wave in the Perfect Place



About the authors

Donna Barnes, Ph.D., was an elementary teacher for 12 years and now teaches students who want to be teachers, or teachers who are working on their Master's degrees, at the University of San Diego. She teaches courses in Curriculum and Methods, Methods of Literacy and Language Arts, and Children and Adolescent Literature. Crossing all these areas is a commitment to school practices that promote social justice, cultural awareness, cooperative learning, and democratic education within a constructivist framework. She has worked with teachers and students in Honduras, Chile, Lithuania, and Kenya.

Jackie Lawson-Durward is the author of the Interact title *See the USA*. She has 34 years of experience teaching elementary, 11 years as adjunct faculty at the University of San Diego, and ten years of experience as a teaching consultant. When not spending time with her husband, two adult children, and two grandchildren, she enjoys traveling, hanging out at the beach, hiking, biking, swimming, reading, and photography. Jackie currently lives in Cardiff by the Sea, California.

Author Jennifer Wheatley graduated from the University of Illinois and holds a Master's degree in Education with an emphasis in literacy from the University of San Diego. She has taught at the elementary and college level and has supervised student teachers for the University of San Diego. She has written two previous simulations for Interact, *Ancestor Adventure* and *Skateboard Science*, and has also written for *Appleseed* magazine.

Edited by William Slattery

©2010 Interact
10200 Jefferson Blvd • P.O. Box 802 • Culver City, CA 90232
Phone: (800) 359-0961 • www.teachinteract.com
ISBN# 978-1-56004-581-6

All rights reserved. Interaction Publishers Inc. grants permission to reproduce activity sheets and student handouts for classroom use. No other part of this publication may be reproduced in whole or in part, stored in a retrieval system or transmitted in any form or by any means—electronic, mechanical, photocopying, recording, or otherwise—without prior written permission from the publisher.

Table of Contents

Purpose and Overview.....	7
Summary Description	7
Detailed Overview.....	8
What Do Students Learn?.....	9
Interdisciplinary Content	10
Components	12
Getting Started.....	13
Teacher Preparation	13
Surf Team Responsibilities	16
Fate Cards.....	17
Learning Centers	18
Learning Center One: Where's the Best Surfing? ...	18
Learning Center Two: It's All About the Waves!.....	19
Learning Center Three: Give Me a Break!.....	19
Learning Center Four:	
Storm Chasers (Air Pressure).....	21
Learning Center Five: Tide Readers	22
Learning Center Six:	
Wave Riders (Why Do Things Float?)	22
Learning Center Seven: Tsunamis	23
Learning Center Eight:	
Planning to Write an Article	23
Daily Directions.....	24
Day 1	24
Day 2	25

Table of Contents

Day 3	28
Day 4	29
Day 5	29
Day 6	29
Day 7	30
Day 8	33
Day 9	33
Day 10	33
Answer Key	36
Educational Standards	
National Geography Standards	38
National Science Education Standards	39
California Applied Learning Standards	40
Reproducibles	
Learning Center One: Where's the Best Surfing? ...	41
Learning Center Two: It's All About the Waves!.....	52
Learning Center Three: Give Me a Break!.....	56
Learning Center Four: Storm Chasers.....	60
Learning Center Five: Tide Readers	65
Learning Center Six: Wave Riders.....	69
Learning Center Seven: How Big Is a Tsunami?.....	72
Learning Center Eight:	
Planning to Write an Article	75
What Do You Know About...?	79
Surf Site Preference Sheet	80

Table of Contents

Tourism, Surfing, Visas, and Currency in Countries With Surf Sites	81
Fate Cards	82
Group Presentation Rubric	84
Surf Tsunami: In Search of the Perfect Wave in the Perfect Place	85
Team Packet	87
Team Checkbook	88
Team Bank Balance Sheet	89
Cartographer's Data Sheet	90
World Map	91
Surf Break Analysis Sheet	92
Surf Break Analysis Sheet: Explanation of Categories	93
Conversion Factors	94
Main Ocean Currents	95
<i>Surfer's Gazette</i>	97
Surfer's Dictionary	118
Teacher Feedback Form	126
Release Form for Photographic Images	127

Purpose and Overview

The purpose of the *Surf Tsunami* curriculum is to harness the connection young people feel to the sport—and the culture—of surfing, and to use that natural connection to inspire interest in world geography (by investigating at least 20 of the world’s most famous surf sites) and in the science of waves. How do waves form? Where do they come from? How does the ocean floor below the waves help form the waves’ shape and power? In a series of Surf Science Learning Centers, students acquire some basic understanding of the science of waves.

Playing the role of journalists assigned to visit at least three of the world’s most outstanding surf sites, students plan simulated itineraries (practicing geography skills) and budget their trips (practicing math skills).

After a mini-lesson that strengthens sentence- and essay-writing skills, students draw upon both scientific vocabulary and the colorful lingo of surfer culture to write zesty “magazine articles” that integrate their newly acquired scientific and geographic knowledge.

Authentic assessment based on performance of cooperative group work combines with more traditional assessments of the knowledge and concepts mastered.

Summary Description

Surf Tsunami is an interdisciplinary simulation. Working in groups, students search for the best surf spot in the world. To evaluate which place they think is best, students research famous surf spots and gather pertinent information, including geographic information and scientific data derived from research and experiments. To report which place they believe best, they first present their findings orally to the “editorial board” of a surfing magazine, and then—using colorful surfer lingo—write an article for that same fictional surfer magazine. Along the way, students plan simulated trips to the leading surf spots, using geography skills to find and research the locations and math skills to budget their “travel expenses”; participate in Surf Science Learning Centers where they study waves, buoyancy, air pressure, tides, and tsunamis; and work cooperatively, setting and accomplishing goals, practicing problem solving, and exercising communication skills.

In other words, your brahs and bettys scope the beaches and the sets to sort the slammin from the shommy, the blown out from the bodacious; they plan a vaycay for high



Purpose and Overview

rollers or for surf gypsies on a hot dog budget; they scope the science that explains what makes waves juicy and rides rad; and they explain what they've learned without sounding like a bunch of random standers or lame shoobies.

The goal, in short, is to do all that can be done on dry land to equip students to understand—and to explain their understanding of—the art and science of surfing.

Detailed Overview

In the *Surf Tsunami* simulation, students play the role of journalists who have been commissioned by a surfer magazine, *Surfer's Gazette*, to travel to some of the world's most famous surfing sites. They must research the sites, choose which ones to visit, and budget their trips to make sure their travel and living expenses don't exceed the advance the magazine is paying. Their assignment is to decide which site has the perfect waves in the perfect place, and at the end of the simulation, to write an article, complete with pictures, persuading readers that the site they have selected really is the best surf spot in the world. Since they are writing for a surfer magazine, their articles need to be full of surfer lingo—but they'd better sound like mega-rippers, not lame wannabes, or the editors will reject their articles.

To prepare for their writing assignments, students will read a surfer "magazine" called *Surfer's Gazette* (included in this curriculum packet). This magazine lists some of the strengths and drawbacks of 20 world-class surfing beaches. At the same time they read the magazine, students use globes, maps, atlases, and the Internet to learn where these beaches are, and they may use books and magazines for further research. Throughout the simulation, they maintain a balance sheet to keep track of travel and living expenses, and throughout the simulation they learn and practice surfer vocabulary. Fate cards may deliver setbacks or unexpected benefits.

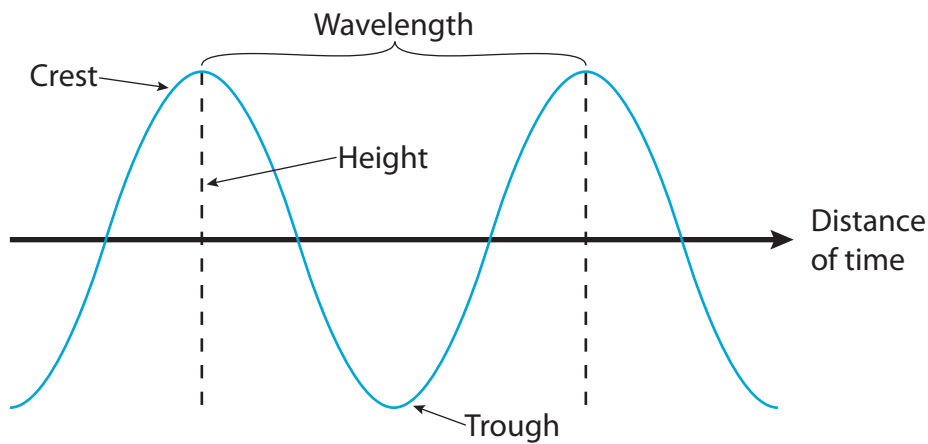
Students also participate in Surf Science Learning Centers to learn about waves, buoyancy, air pressure, tides, and tsunamis. The Learning Centers involve research, demonstrations, and experiments designed to familiarize students with basic scientific facts and principles related to waves. Along with surfer lingo, students are expected to master a certain amount of scientific terminology.

As the simulation comes to a close, students pitch their articles verbally to the magazine's "editorial board," which provides helpful feedback before the writers buckle down to polish final drafts. As final products of the simulation, students turn in posters that combine final drafts of their articles with photographs and other illustrations. As an alternative culminating project, students might be encouraged to produce Web pages instead of posters.

Day 4

Work in one or two learning centers, giving preference to Learning Centers Two and Three, **It's All About the Waves!** and **Give Me a Break!**, which both address the fundamental concept of waves. As you introduce scientific terminology, encourage students to translate scientific terms into surfer slang.

In any remaining time, teams finish research on the first surf site and start research on the second site. Remind students to rotate team roles. **Fate Cards** could come into play.



Small group

Day 5

Work in one or two learning centers. Remind students to rotate team roles. Teams finish research on the second surf site and start research on the third site. **Fate Cards** could come into play. Keep talking surfer!



Small group

Day 6

Work in one or two learning centers. Remind students to rotate team roles. Teams finish research on the third surf site. **Fate Cards** could come into play.

Before the end of the day, each team should reach consensus on which of their three surf sites really is the best candidate for "perfect wave." They should also brainstorm how they will illustrate their surf site reviews.

Dude! Don't tell me you forgot to talk like a surfer!



Small group

Name: _____

Date: _____

It's All About the Waves!

Learning Center Two

How Waves Form

Researching Waves

Understanding how waves form, move, and break is important in helping surfers find and ride the perfect wave. Research the following questions:

- What are waves?
- What are the "parts" of a wave?
- What are the different types of waves?
- Can you describe the motion of one molecule of water as the molecule responds to a wave? Is that motion different in different types of waves?
- How do waves form?
- What makes some waves bigger than others?
- Do waves always move at the same speed? If they speed up and slow down, what makes their speed change?

Learning Center Two: Directions

After researching waves, and especially ocean waves, each team member, working individually should...

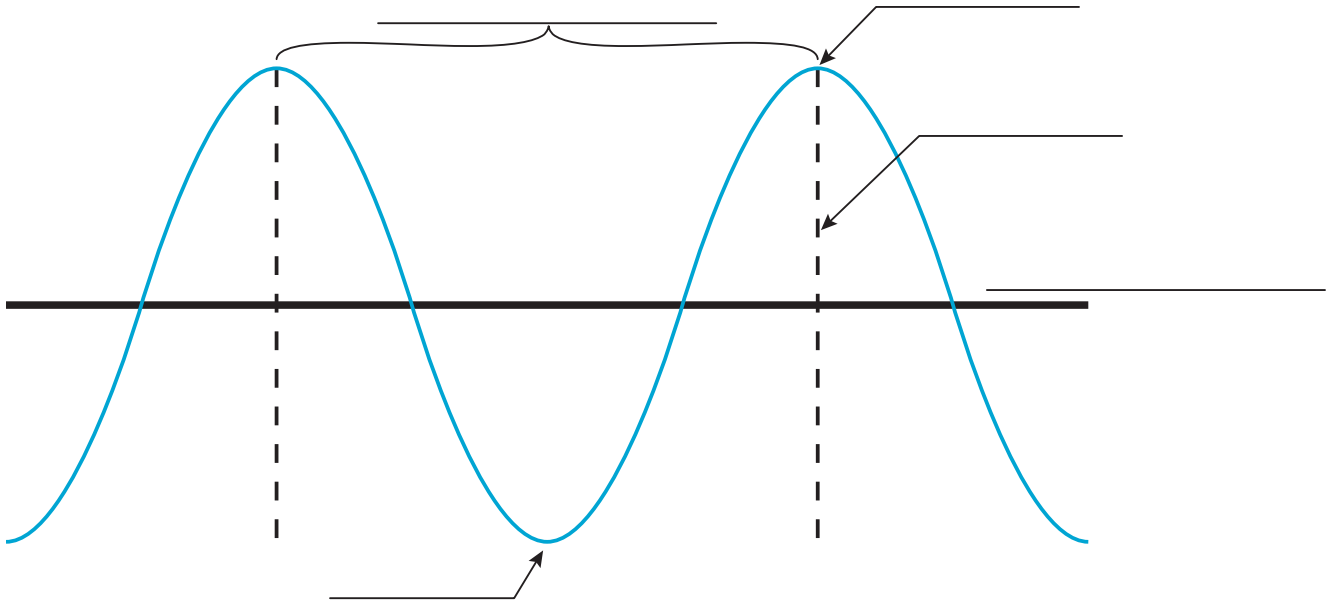
1. Answer the above questions in writing. Use complete sentences. As much as possible, use scientific terminology.
2. Draw a diagram of a wave and label its parts.
3. Without looking at your diagram or what you have written, talk to your teammates about the questions above, explaining your answers to your teammates. Listen carefully as they explain their answers to you. Do all your ideas match all their ideas? If any ideas don't match, do more research. The team manager should tell the teacher when the whole team is in agreement and ready to answer every question.

Learning Center Two: Web Resources

All of the following links can be found at: <http://www.teachinteract.com/tsunami>

- The *How Stuff Works* Web site includes a great article called “How Surfing Works” (Wilson, Tracy V., 11 June 2007. HowStuffWorks.com. <http://adventure.howstuffworks.com/outdoor-activities/water-sports/surfing.htm>, 10 March 2010.) Written in everyday language without much scientific jargon, the entire article is well worth reading, but section six, “The Physics of Waves,” is especially useful, and it includes a very good diagram.
- For another very good, very short explanation of waves and wave motion (this one is especially good at explaining what a wave is), see the “General Wave Motion” page (<http://www.school-for-champions.com/science/waves.htm> by Ron Kurtus, revised June 24, 2006) on the School for Champions Web site.
- Technical but readable, the Web page “Ocean Waves Styles and Patterns” (<http://earthsci.org/processes/weather/waves/Waves.htm> on the Earth Science Australia Web site, last modified Sunday, January 10, 2010) supplies three really good pictures that show capillary waves, whitecap waves, and the formation of ocean swells in the open ocean.
- For a technical scientific explanation of waves, visit the following Web site: <http://www.seafriends.org.nz/oceano/waves.htm> (“Oceanography: Waves—theory and principles of waves, how they work and what causes them,” by Dr. J. Floor Anthoni, 2000.) The most useful sections are “Waves in the Environment,” “Wave Motion” (read the first five paragraphs and skip the boxed insert), “Waves and Wind” (the first three paragraphs and the last paragraph), and “Waves Entering Shallow Water” (the first two paragraphs). This resource is especially good on how wind causes wave size to increase.
- The Water Encyclopedia Web site’s “Waves” page provides excellent information about characteristics of waves, breaking waves, and the formation of waves at sea. See <http://www.waterencyclopedia.com/Tw-Z/Waves.html> by Ron Crouse, March 10, 2010.
- Fun for all ages, a whole-class group activity from the University of Southern California’s Sea Grant Program: <http://www.usc.edu/org/seagrants/Education/IELessons/Docs/RideTheWaves.pdf>
- For highly technical language accompanied by wonderfully revealing diagrams: <http://hyperphysics.phy-astr.gsu.edu/hbase/Waves/watwav2.html>
- One more technical site for bodacious wave scientists: <http://www.antrimdesign.com/articles/waves.html>

Learning Center Two: Diagram Activity 1



Label this generic wave diagram using the following terms:

- crest
- trough
- wave height
- wavelength
- period