

## Typical Lesson Plan to Propose to a Traditional High School for Teaching a Surf Class

1. TITLE: Surf Reporting, Forecasting and Big Wave Riding
2. BACKGROUND:
  - a. 9<sup>th</sup> grade
  - b. Science
  - c. Prerequisite: basic physics
  - d. Three 90 minute classes
3. OBJECTIVES:
  - a. Students will learn:
    - i. Anatomy of a Wave.
    - ii. Where does wave energy come from?
    - iii. Wavelength, Frequency and Wave speed of various wave forms.
    - iv. Discover how ocean waves are created and break.
    - v. Understand how the shoreline and shoal impact waves.
    - vi. Learn about surf and weather forecasting of both local and big wave of the North Pacific.
4. MATERIAL LIST:
  - a. "Making the Call – Big Waves of the North Pacific" DVD
  - b. AV Support
  - c. Computer access
  - d. Slinkys
  - e. Short, wide cardboard boxes with filled with one inch of sand filling the bottom of box, some pebbles and a popsicle stick. Enough for 4 – 5 stations depending on number of students.
5. INTRODUCTION: We encounter waves every second, because waves carry energy. Whether its light waves to see, sound waves to hear, or ocean waves to surf, an understanding about waves leads to a greater understanding about energy. Understanding ocean waves will enhance knowledge about weather, our oceans and environment.
6. PRESENTATION/ INTERACTIVE ITEMS/ APPLICATION AND ACTIVITY/EVALUATION ITEMS:

This presentation will discuss the types of waves we encounter, and describe the anatomy of a wave and distinguish between transverse and longitudinal waves. Student will also learn the basics of surf reporting and forecasting by reviewing both local and big wave spots. How weather, coastline and shoals affect waves will also be presented.

a. Class One: Waves and Energy

Interactive Warm-Up Activity:

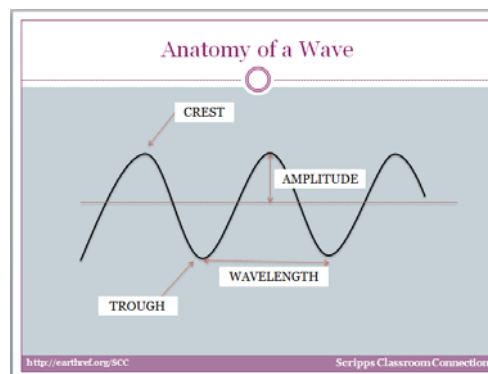
- Have students list as many type of waves as they can think of.
- Ask what do waves transfer?
- Have students work with partner to answer these question for few minutes and then discuss as a class.

Review and Correct with:

- Sound waves, visible light waves, radio waves, microwaves, water waves, sine waves, cosine waves, stadium waves, earthquake waves, waves on a string, slinky waves - These are ALL types of Waves!
- Waves transfer ENERGY!!

Activity Two:

- Have students draw the following diagram in their notebooks:



- Describe and review the parts of a wave:
  - CREST: The peak of a wave
  - TROUGH: The lowest point of a wave
  - AMPLITUDE: The height of the wave from the equilibrium to the crest (or trough).

- WAVELENGTH: The length of one full wave cycle. The distance from peak-to-peak or trough-to-trough.

#### Activity Three with Demo:

- Distinguish between the two types of waves, and gives examples of each. Students should copy down this information in their notes.
  - Transverse - The motion of the medium is at right angles to the direction in which a wave travels.
    - Stretched strings of musical instruments, electromagnetic waves, S-waves in earthquakes
  - Longitudinal - The particles of the medium move back and forth in the same direction in which the wave travels.
    - Sound waves, P-waves in earthquakes
- DEMONSTRATION: Presenter should have a student help demonstrate the motion of these waves using a slinky. One person should move their hand holding the slinky up and down to demonstrate a transverse wave. One person should grab a section of the slinky, and pull it toward himself and release it to demonstrate a longitudinal wave.

#### Interactive Activity Four:

- Have student group together in pairs and ask them what type of wave is an ocean wave? They may view this as a trick question. Discuss as a class.
  - While it seem surface waves seems transverse, they are considered both longitudinal and transverse due to ripple effect moving in a circular pattern. When there is continuous energy transfer in one direction, due to friction from wind, it will generate more energy in the direction of the wind.

#### Group Activity Five:

- Watch Chapter One “Surfology” of “Making the Call – Big Waves of the North Pacific”
- Discuss and review the basics of how waves are formed:
  - Wind blows across the ocean surface in areas called “fetch zones” to form chop.
  - As the chop moves out of the fetch zone, it may form into lines of swell.

- These lines of swell travel across the ocean in groups called sets.
- The swell forms waves that break when they move into shallow water: reef, structure, beach or headland.

#### Homework for Class One:

- Students should look up two different online surf report sites and prepare a surf report for a local surf spot (Manasquan) for class the next day:
  - Surfline
  - Magic Seaweed
- Students should watch the local weather and prepare a weather report for class the next day.

#### B. Class Two: Basic Surf Report and Forecasting

##### Activity One:

##### Review Homework Surf and Weather Report

- Review the very basic components of a surf report and how these factors affect a local surf spot (Manasquan):
  - Wind speed and direction
  - Swell height and direction
  - Swell Period
  - Atmospheric Pressure/ weather
  - Shoreline and Shoal (ocean floor)

##### Group Activity Two:

- Watch Chapter Two “Waimea Bay” and Chapter Three “Outer Log Cabins” of “Making the Call – Big Waves of the North Pacific”

##### Activity Three:

##### Learning About Wave Reflection and Refraction

- When a wave hits a barrier, it is reflected depending on the direction of the barrier.

- When a wave enters a different medium at a non-perpendicular angle, the direction of the wave changes. This is called refraction.
- Refraction is a crucial factor in determining the characteristics of any surfing break: the waves can be bigger, smaller, longer, shorter, faster, slower or hollow.
- When a wave travels through a small hole/area in a barrier, it bends around the edges. This is called diffraction.

#### Interactive Activity Four:

##### Sand Sculpture

- Have students form groups of four and discuss how the ocean floor affects wave power and size.
- Using a sandbox, have each group create and simulate various situations for a wave to break:
  - Sandbar
  - Jetty or pier with pebbles
  - Headland
  - Reef
- Recreate the Manasquan Inlet Break, which students based their homework on. Set up the ideal conditions for this location.
- Write a group surf report based on these conditions.

#### Homework for Class Two:

- Research one new local surf spot and write the perfect surf report for that location.
- Research Waimea Bay or Outer Log Cabins online and write the surf report for the day before next class. Explain why the spot is either breaking favorably or not.

### C. Class Three: Finish Material, Summarize and Test

#### Activity One:

##### Review Homework

- Break into groups and discuss homework. Review and correct if necessary.

## Group Activity Two:

Finish the movie and discuss any questions or concerns.

## Activity Three: Test

- 1) Name three types of waves found around you?
- 2) What is a fetch zone?
- 3) What do waves transfer?
- 4) Draw a diagram describing the anatomy of a wave.
- 5) Describe the progression of how a wave is formed from chop to a breaking wave.
- 6) How does the ocean floor affect size and shape of a wave?
- 7) What is a closeout?
- 8) Draw the surf spot at Manasquan Inlet and include the ideal wind and swell direction.
- 9) Why is refraction so important in determining the characteristics of a wave?
- 10) Name two types of waves and give one example of each.
- 11) List at least four components of a surf report?
- 12) Where is Outer Log Cabins?
- 13) How does the shoreline affect a breaking wave?
- 14) How can a storm hundreds of miles away create surf?
- 15) Why would it be important to check the surf in person prior to surfing even though you checked the weather and surf report already?
- 16) What is Surfline?

## REFERENCES:

1. <http://earthref.org/SCC>
2. 2012 NSSIA MANUAL
3. Making the Call – Big Waves of the North Pacific
4. <http://magicseaweed.com>
5. <http://surflineline.com>
6. <http://pbs.org>