LESSON PLAN FORM
Teacher Education Department – Csudh

Candidate:
Michael Connor

Subject(s):
Integrated Coordinated Science

Grade level(s):
9

Date:
8/2/2008

Standard(s):
California geology 9a, 9c; Energy in the Earth System; Ocean and Atmospheric Circulation 5a, 5b, 5c, 5d

Single/Multi-Day Lesson:
Single Day

I. DESCRIPTION OF CONTENT & CONTENT TYPE (Fact, Procedure, Concept, or Principle):
The principle of ocean wave interaction with shorelines and beaches. How the shoreline bottom affects the shape of bereaking wave. The effects of surf/wave action on beach sand and erosion. The effect of groins on the sand flow and the emergence of sanddbars and how these can affect the shape of a breaking wave due to the contour ot the shoreline bottom.

II. LEARNING OUTOME (Objective):
Students will investigate how the bottom of the shoreline affects the shape of a breaking wave. They will discover why surfers like to surf next to piers, groins and over reefs.
Students will investigate how soft wave action will erode a beach differently than intense wave action, inferring about how the beach can change shape over the course of a year (summer/soft wave action versus winter/intense wave action).

III. CURRICULUM CONNECTION (How This Lesson Fits into Unit Plan):
This lesson can fit into the earth science and geology unit of ICS and a unit on biogeochemical processes (erosion). Ity could also be incorporated into a unit on waves in a physics component of ICS.

IV. INSTRUCTION

A. ENGAGEMENT (Motivational Activity):
A short video clip of a surfer surfing on a wave could begin a discussion on what makes some beaches better for surfing than others. Also a few slides showing erosion processes could intitiate a discussion on possible ways to preserve beaches, leading to the introduction of the term "groin." or jetty - a term that will come into play in the associated activity inviolving a wave generating model or wave pool.

B. INSTRUCTIONAL SEQUENCE (Teaching Methodology with Student Activities):
Since there is only going to be one wave pool in the classroom, the students are going to have to work in groups and only one group at a time will be able to use the wave pool. There will be several other activities to keep the students busy while they are waiting for the main activity. Working in small groups and using the simplest of tools like circular bowls, foot-long plastic shoe boxes, straws and a stopwatch; students can "model" wave behavior in deep and shallow water, graph their observations,. A

sealed bottle with equal parts of water and vegetable oil demonstrates waves in slow motion and the way waves act below the ocean's surface. As a demonstration for the class we can use a clear glass pie pan "wave machine" placed on an overhead projector.

C. APPLICATION ACTIVITY (Practice and/or Reflection):

he main activity in this lesson will inolve students investigating the phenomenon of small waves generated in a wave pool of the dimensions 3 feet by 5 feet. This wave pool is a modified version of the one suggested by Bruce Gabrielson in the article " Building a Simple Wave Generation Model" (see :http://blackmagic.com/ses/surf/papers/mywaveproject.html). Instead of a cocrete bottom, I propose using chicken wire/mesh and plaster covered with a waterproof surface like fiberglass and resin (like a surfboard's manufaturing technique).
The students will be asked to generate waves and observe the effect on sand at the end of the model simulating a beach. They will do two different sets of waves a) the first set will be soft wave , approximately two minutes worth. These will simulate summertime wave action; b) the second set - in the same mount of time - will be more intencse, rougher wave action. This will represent wntertime wave action. The students will record the effect on the sand - did it erode or did it accrete (ie build up)?
Secondly, the effect of a rock jetty or a "groin" will be observed. Questions that students will seek to answer are a) how does a groin affect the sand flow as an ocean current pushes the sand against and close to the groin. b) doe the bottom contour of the shoreline bottom cahnge as a result of the presence of the groin? What effect does this sand (sand bar) have on the shape of any waves that might be breaking over the sandbar? c) What can be inferred about the waves that break near a groin as far as surfers are concerned? Does it make for waves that have what surfers would refer to as "good shape? d) Does the groin cause the beach to change in shape if the wave action created by the students simulates the longshore current?

D. MATERIALS & RESOURCES:

The wave genarating model that I propose is based on the general principles of the Gabrielson model with these modifications. It will be 3 feet by 5 feet. It will be made out of wood not staimless steel. It will have 8 inch high sides, not 4 inch (Two levels of 2"X4"s, instesd of one level). The main modification will be to have a big plastic tarp (purchased from Home Depot or a similar outlet) which will be folded over several times to provide maximum water impermeability. The water used will be provided by large plastic storage containers. The convenience of these is that the water can be both added easily and withdrawn easily from the wave pool. Sand will be available for the beach end of the model. Also rocks joined together permanently by cement and chicken wire/ mesh will be used to simulate a groin or rock jetty.

V. ASSESSMENT STRATEGIES (Methods for Obtaining Evidence of Learning):

A worksheet will be designed to allow students to ponder these questions:
-During summertime whern the waves are smaller and softer, would you expect the beach to erode or rather for sand to build up (accrete)?
-During wintertime when the waves are rougher, would you expect the sand on the beach to erode or to build up?
-How does a groin affect the flow of sand (due to the longshore current) in the region parallel to the beach?
-How does the groin affect the contour of the sand bottom in the area next to the groin?
-How does the groin affect the shape of the waves around the groin? What can be inferred about the kinds of waves surfers might find near a groin? What can be inferred about the kinds of waves that might occur around a pier and also on or near a reef?
-Are groins a reasonable way to prevent sand loss on beaches that are faced with erosion? Why or why not?

VI. ACCOMODATIONS FOR INDIVIDUAL LEARNERS (Content, Instruction, Practice):
With classrooms having many English learners these days it would be advisable to have a vocabulary page in the students' notebook devoted to terms relevant to this lesson that might be new. Words such as these might be put up on a word wall: LONGSHORE CURRENT, GROIN, JETTY. CONTOUR,SWELL, WAVE ACTION, EROSION, ACCRETE.

VII. HOMEWORK (If Appropriate):