Tsunami activity 8: **Create a tsunami model**

Description: A hands-on lab experiment, designed and conducted by students, to generate and measure tsunami waves and prepare a scientific report. This is followed by a classroom demonstration and discussion. The activity may be adapted to grades 6 to 8.

Materials: Student handout (1. Lab experiment: make a tsunami model and measure waves)

Duration: This is a homework assignment, but teacher should allow sufficient class time for group planning at the start. To be followed by 1 class period for class presentations and discussion.

Teacher instructions:

1. Students, either individually or in small groups, will design and conduct the lab experiment as a homework assignment and submit a written scientific report. Although each individual or group will experiment with only one energy source, the teacher should ensure that the class will cover a range of sources – earthquake, landslide, meteorite, and volcano.
2. Distribute the student instruction sheet (attached).
3. Teacher will evaluate the written reports.

   Note:

   - To be complete, the reports should include a purpose, hypothesis, introduction and background information, list of materials, diagram, procedure, results, sources of error, discussion, conclusion and references.
   - 'Results' (amplitude, wavelength, velocity, directional effects) will vary from model to model depending upon the chosen energy source and model design. However, results must be reasonable. With respect to directional effects, although the waves will move in all directions, in the case of earthquakes, the waves are greater in the direction perpendicular to the fault plane.
   - In their reports, the student should address the scientific principle behind generation of a tsunami wave. (i.e. The source displaces the water and gravity acts to restore the water to an equilibrium position. This movement of the water creates waves. Gravity is the driving force.)
4. Class presentation: The teacher will either select representative experiments for each energy source to be demonstrated in class or ask for verbal reports on the results of the experiments.
5. Class discussion: The teacher will then lead a class discussion on tsunami wave generation. Differences between source types will be found. In particular, the class should discuss the differences in waves generated from impact sources and earthquake sources.

   Note: Impact-source tsunamis dissipate much faster than earthquake sources. Also, the amplitude of the waves generated by earthquakes tend to be greater in the two directions moving perpendicular to the fault than the other directions whereas impact-generated tsunamis are equal in all directions.

Student handout 1

Lab experiment: make a tsunami model and measure waves

Tsunamis are caused by earthquakes, volcanic eruptions, underwater landslides, or impact by a large landslide or meteorite. You will design and conduct a lab experiment to demonstrate, from source to shore, a tsunami generated by one of these energy sources.

1. Research the fundamentals of tsunami generation by your energy source to ensure that your lab experiment reflects tsunami processes in real life.
2. Your model container should have "height markers" in several locations so that you can "measure" the amplitude of your waves as they approach shore.
3. Run three different trials in your experiment, using a different magnitude of force for each trial. (For example, if your source represents a meteorite, use three different sizes of objects to demonstrate the impact; if an earthquake, use different displacements; etc.)
4. After designing and conducting your experiment, write a scientific report to describe your findings. Your scientific report must include the following sections: Purpose, Hypothesis, Introduction and Background, List of Materials, Procedure, Results, Sources of Error, Discussion, Conclusion and References. 'Procedure' must include a scale diagram of the model. 'Results' should describe the development of your tsunami waves from the source of energy to the shore, including estimated values for amplitude and wavelength for each trial.
5. The 'Discussion' section of your scientific report should summarize wave size, how quickly the waves seemed to travel, direction or directions of wave travel, and any directional differences in size, speed, etc., as well as explaining the scientific principle behind the wave generation and the driving force.
6. If requested, you should be prepared to demonstrate the experiment for the class, or, if it is impossible to bring the model to school, you should be able to verbally describe it to the class and present the results.