STUDENT WORKSHEET
Introduction to the Global Earthquake Explorer

INSTRUCTIONS:

1. **Work in groups as requested by your teacher.**
2. **Use complete sentences when answering questions.**
3. **Refer to the Student Instructional Guide for assistance with GEE software. It is available under the "Instructions" tab for this module in GEE.**

ENGAGEMENT

1. Your teacher will explain that there was an earthquake very recently and that we have a new software tool to look at recordings, or seismograms, of that earthquake right in our county/state.

2. Briefly describe the main functions of the Global Earthquake Explorer (GEE).

3. Your teacher will show a seismogram of a recently recorded earthquake. What was the location of the recording station that generated the seismogram that you are studying?

4. Where are other recording instruments for earthquakes located?

5. What is a "seismogram"?

6. What can we learn from this seismogram?

EXPLORING

1. If the seismogram for the recent earthquake is not appropriate for study, your teacher will have you move to a "classic" seismogram that shows the earthquake waves very clearly. Explain how to access the Classic Earthquake.

2. Load specific recording stations, given by your teacher, using GEE. Explore these stations as a way to become comfortable with GEE functions. What are the axes of the seismogram plots?

3. What are some of the other functions of the GEE?

CONCEPT DEVELOPMENT

1. Remember from your 8th grade Earth Science class that an earthquake produces three kinds of waves. What are these waves?

2. Using the classic seismogram, how are the waves on this seismogram distributed?

3. Describe the seismogram up to the first "blip".

4. What are these “blips” on the seismogram?

5. Why do these waves arrive at different times on the seismogram?

6. How are these waves different from one another?

7. Display the “simple wave” as described in the Student Instructional Guide. This will allow your teacher to explain properties of waves.

   Explain wave amplitude.

   Explain wavelength.

   Explain wave period.

   Which is being measured on the x-axis, wavelength or wave period? Explain your answer.

   What is the mathematical relationship between wave frequency and wave period?

8. Using these terms, describe the differences between the P wave and S wave.

APPLICATION

1. Again using the classic seismogram, which wave traveled at the higher velocity, the P wave or the S wave? Explain your answer.

   What is the mathematical relationship between time, distance and velocity?

2. Explain how seismologists can use the differences in the arrival times of the P wave and the S wave to determine the distance from the epicenter of the earthquake to the recording station.

3. Using the classic seismogram, construct a data table of Station, P-wave arrival time, S-wave arrival time, arrival time difference, and distance to the earthquake. Use GEE to determine the P wave and S wave arrival times **for 3 stations**.

4. Calculate the distance to the earthquake at each station using the simple equations. **Show your work!**

5. Remember, these calculations will give us distance but not direction. What would be the possible locations of the earthquake epicenter?

6. Using the calculated distances at each station, estimate the location of the earthquake on the regional map of the area.

   Define: Earthquake focus

   Define: Earthquake epicenter

   Which of these two are determined by your calculations?

7. In most cases, seismologists do not know *where* an earthquake occurred. How then do seismologists determine the distance from the earthquake epicenter to the recording station?

8. Your teacher will have the computer show a map with the locations of the recording station at which the classic seismogram was recorded, and the earthquake epicenter.

EXTENSION PHASE

1. Locate the recent earthquake or another classic earthquake on your own.

2. Relate the location of the classic or recent earthquake to Plate Tectonics.

3. Discuss in detail the fact that the intersection of the predicted locations was not a single point. Explore the possible ERRORS associated with locating earthquakes.

4. Find *when* the earthquake occurred: The Origin Time.