

Hispanic/Latino Curriculum – Fourth Grade Science/Math Lesson Plan
Dr. Frank Gonzalez and the Tsunami

Concept/Theme: Contributions of Dr. Frank Gonzalez/Tsunamis

Grade: Fourth

Primary Benchmark:

- SC.4.E.6.4 Describe the basic differences between physical weathering (breaking down of rock by wind, water, ice, temperature change, and plants) and erosion (movement of rock by gravity, wind, water, and ice).

Secondary Benchmark:

- SS.4.G.1.4 Interpret political and physical maps using map elements (title, compass rose, cardinal directions, intermediate directions, symbols, legend, scale, longitude, latitude).

Time: 1–2 Class Periods

Objectives:

1. The student will understand that a Hispanic, Dr. Frank Gonzalez, is a leading researcher on the subject of the tsunami.
2. The student will understand the importance of Dr. Gonzalez' work.
3. The student will understand how a tsunami is formed.
4. The student will identify countries that have been affected by tsunamis.

Differentiated Instruction Activities: Teachers may choose to do one or many of the student-centered activities. Activities cover elements of Bloom's taxonomy.

Teacher Preparation/Materials: Reading Passage, Chart Paper, Dictionaries, Quiz, Map of Central and South America, Map of the Globe, Crayons, Student Journals, Crayons/Colored Pencils, Deep baking pans, Water, 2 blocks of wood, Experiment directions, Chart Paper, Cluster Chart, Rubric

1. Pre-reading activities: Brainstorm with the class the definition of a tsunami. Chart students' responses on chart paper or on the chalkboard. Teacher may refer to pages 90-99 in the textbook, previously covered.
 - Use the world map as a transparency to chart students' responses of which countries they think may be effected by tsunamis. Review with students countries that have currently been affected by tsunamis (Thailand, India, Indonesia)
 - Ask students to name what profession studies tsunamis. Tell students they are going to read about a leading scientist of tsunamis and some tsunamis that have affected the world in the past.
 - Make the handout, "All About Tsunamis" into a transparency, and use as a **pair and share** activity; the purpose of this guide is for inquiry and prediction making.
2. During-reading activities: Distribute the Reading Passage to students. The teacher can read the passage aloud or students can read silently.

- During reading activities: place the following directions on the board:
 1. Make a check in the margin when you see Dr. Gonzalez' name.
 2. Underline words that you do not know the meaning.
 3. Circle the names of countries in the passage that have been affected by tsunamis.
3. Post-reading activities:
- **Vocabulary:** Place students in groups of three and have each group go through their underlined words. One student will be the recorder and make a master list of words and definitions; the group will go back to the reading passage and look for the definition within the context. If a definition cannot be found, a student will look up the words in the dictionary; last, another student will choose **two** of their words and report to the class by writing them on the board or chart paper. Possible words: **oceanography, tsunami, coastline, harbor, wave train, earthquakes, landslide, volcanic eruptions, cosmic bodies, meteorites, erosion, flood, gravity, sea floor, epicenter, surface-wave, trough, global, subduction**
 - **Discussion:** Discuss the content of the reading passage with students. Tell students that the reading passage defines a tsunami, highlights a prominent Hispanic researcher in the field of tsunamis, and highlights tsunamis and earthquakes in two Hispanic countries in Central and South America. Ask students if anyone is from a country that has experienced a tsunami and/or earthquake or has a relative that did. Ask them if they would like to share that with the class or arrange for a relative to tell their story. If possible, have students participate in active listening from the presenter by filling out the areas below. If not, brainstorm with students how they think it would be to live through a tsunami.

Before the tsunami During the tsunami After the tsunami

- **Compare and Contrast Journal:** Instruct students to write an entry in their journals that discusses what they know about the recent tsunami in the Indian Ocean in 2004, and the past tsunamis they have read about in Central and South America. Alternative Journal: What would they do if suddenly they found out that in 10 hours a tsunami was to hit their town?
- **Map Skills:** use the maps as transparencies or as handouts. Point out Guatemala Chile, and countries around the Indian Ocean on the map. Show students how the 1960 Chilean tsunami traveled all the way to Japan and how many of the countries surrounding the Indian Ocean were affected by the 2004 tsunami.
- **Quiz:** Students may use the reading packet to assist them in answering the questions. Answers: 1. C, 2. F, 3. A, 4. I, 5. B, 6. F, 7. C, 8. G, 9. A, 10. G; Short response: Answers will vary but they should state in a manner that explains that tsunamis need a sea floor to develop.
- **Experiment:** Tell students that they are going to do an experiment where they create their own tsunami. This activity is a wet one, therefore capable of causing a mess. If possible, students may want to wear ponchos; also, the activity may be done outside. Refer to the directions (included) and make copies for each student group. Groups will create a tsunami in a small pan, make observations of the waves developing in their pan, and record the observations. Students will also observe and record when the 2 blocks of wood are immersed and quickly forced together. Each

pair of students will discuss how this experiment resembles what they know a tsunami to be. From the observations, the groups will create a paragraph (recorder will write) telling all about the experiment.

- **Writing:** Write a 5-paragraph persuasive essay about Tsunami Warning and Readiness Systems.
 - Discuss the definition of a Meteorologist. Ask students if they can name any meteorologists from our news stations (Rob Lopicola and Steve Weagle are meteorologists for Palm Beach County's local station, WPTV). If possible, arrange for a local meteorologist from your community to visit your class to talk about early warning systems for tsunamis.
 - Tell students that from the passage and/or previous activities, they have learned about the seriousness of a tsunami. Have students fill out the cluster chart with reasons why a readiness system is important. The teacher may choose to model a sample essay before they begin.
 - Use the Editing Rubric as a transparency or handout to students. Review the rubric with students. Have students proofread their work and may use the rubric as a peer-editing tool to use in pairs.

ESOL Strategies: Alternative Assessments, Graphic Organizers, Read Alouds

Assessment:

- Student Participation, Vocabulary List, Student Quiz or Study Questions, Journal Writing
Tsunami Experiment, Observations, Discussion, Written Assignment, Essay Assignment

Resources:

Mini Lesson - Earth's Systems Change Over Time <http://breeze.palmbeach.k12.fl.us/p10831608/>
<http://www.geophys.washington.edu/tsunami/general/historic/historic.html>
http://neic.usgs.gov/neis/eqlists/10maps_world.html
<http://www.pmel.noaa.gov>
<http://www.npr.org/templates/topics/topic.php?topicId=1081>

Frank Gonzalez and the Tsunami



Dr. Frank Gonzalez grew up in San Antonio, Texas. His family is of Hispanic descent. As a child, Dr. Gonzalez had always been interested in animals of the land and sea. He first fell in love with sea life on a trip to Cuba in the Caribbean Ocean. When he grew up, he went to school for biology. He worked hard in school and studied oceanography, the study of the ocean.

He finally earned his Doctorate Degree, the highest degree in schooling, in oceanography from the University of Hawaii. He has received many awards like NOAA's (National Oceanic and Atmosphere Administration) highest award for outstanding research, and NOAA's Administrator's Award for his work on hazardous ocean waves.

Now, Dr. Gonzalez is the director for the *Tsunami Inundation Mapping Efforts at Pacific Marine Environment Laboratory* in Seattle, Washington. He develops ways to detect tsunamis early in order to reduce death and property damage from the storms. One important thing that Dr. Gonzalez developed was a new mathematical way to describe how a tsunami behaves when it arrives on shore. His biggest concern is to learn how to find tsunamis in the early stages. It is important because finding tsunamis early would help the people in countries that are affected by terrible tsunamis.

A tsunami is a wave train, or series of waves, generated in a body of water by an "all of a sudden" disturbance that vertically displaces (raises and lowers) the water line. Tsunamis are created when the sea floor is suddenly disturbed. Earthquakes, landslides, volcanic eruptions, explosions and even meteorites, can create a tsunami. This vertically displaces the water above. Waves form as the large water mass tries to gain its balance. Gravity also influences the water mass. A tsunami develops when a large area of the sea floor suddenly rises or suddenly lowers.

Tsunamis can attack coastlines, causing death and massive damage to property. Tsunamis are often responsible for high degrees of sand erosion. Sand erosion is when sand is washed away and does not return. This often happens with hurricanes, tsunamis, and other severe storms. They can produce floods that extend many miles onto the land crushing homes and other structures. This distance could be several miles.

Tsunamis have been known to reach heights of 100 feet when they reach shallow water near shore. This would be about the height of a three-story building. In the open ocean, tsunamis typically move at speeds of 500-600 miles per hour. They are able to travel great distances, keeping its size, and can flood areas thousands of miles from their beginning. The speed a tsunami travels depends on the depth of the water. When the water becomes shallower, the tsunami slows. Although the tsunami is slower in shallow water, its height grows. A tsunami can grow to be several meters or more in height as it nears the coast.

The following are examples of earthquakes and tsunamis from around the world.

The greatest earthquake in the world that has been recorded since the 1900's happened in 1960 off the coast of Southern **Chile**. This earthquake triggered a Pacific-wide tsunami. Many people ran from their homes for shelter. Some tried to escape by seeking refuge in small boats. Fifteen minutes after the earthquake occurred, the trough, or front, of the tsunami arrived on the coast of Chile. Over 2,000 people were killed due to the Chilean earthquake and tsunami. Millions of people were displaced from their homes.

But the tsunami of 1960 did not stop. Fourteen hours later, it reached Hawaii, where it killed 61 people and caused millions of dollars in property damage. Nine hours later, the tsunami struck Japan and killed over 150 people. Today, Chile is very active in Tsunami research and participates in global and national Tsunami Warning Systems.



Guatemala is another country that has experienced tsunamis. Off the coast of Central America is something called the *Middle America Trench*. The trench marks the site where the continental land collides with, and overrides the sea floor. This process is called *subduction*. The area of this subduction goes beneath Guatemala and is the cause of many earthquakes. These earthquakes have the capability of creating landslides, which can cause tsunamis. In the past 100 years, two earthquakes have caused tsunamis in Guatemala. In 1902, a tsunami, which began off the coast of El Salvador, caused much damage and took more than 500 lives in Guatemala and El Salvador. In 1950, another earthquake occurred off the coast of Guatemala. It generated a small tsunami that ran up the Guatemalan coast.

Still today, Guatemala does not have a national or regional warning system for earthquakes and/or tsunamis.



Recently, the most powerful earthquake in 40 years erupted under the **Indian Ocean** near **Sumatra** on Dec. 26, 2004. It caused giant, deadly waves to crash ashore in nearly a dozen countries, including India, Thailand, and Indonesia, killing over 200,000 people. This tsunami caused more casualties than any other in recorded history. People around the world came to their assistance.

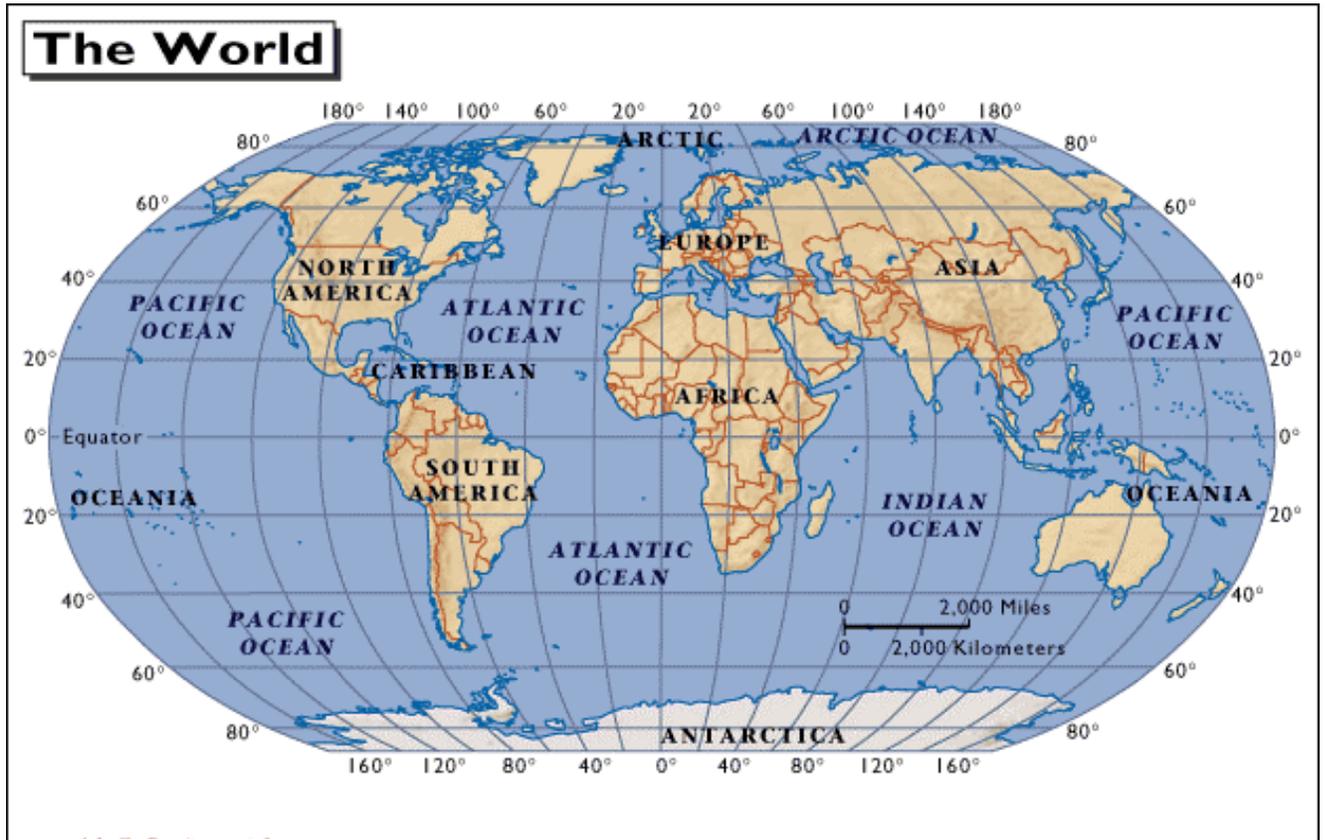
Tragically, no warning system was in place when the disaster occurred. Currently, plans are being made for the establishment of a tsunami warning system for the Indian Ocean.

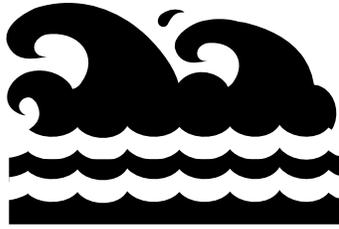
Researchers like Dr. Frank Gonzalez have devoted their lives to understanding natural, strange occurrences, or phenomena, like the tsunami. Because of people like him, tsunami warning systems are in place for many areas of the United States and the Pacific Islands including things like undersea sensors and public awareness campaigns so people know how to respond. It is important for the public to be aware of the seriousness a tsunami brings to communities around the world.

MAP OF CENTRAL AND SOUTH AMERICA



MAP OF THE WORLD





ALL ABOUT TSUNAMIS

(t) (su-'nā-mEs)

- First, mark **A** if you agree with the statements, and mark **D** if you disagree with the statements.
- Next, scan through the reading passage to find the answers and see how many you got right!

- _____ **A tsunami is like a big title wave.**
- _____ **Tsunamis can cause death and destruction.**
- _____ **Special ways have been developed in order to detect tsunamis early.**
- _____ **A tsunami can happen in areas without water.**
- _____ **Some countries do not have a warning system for tsunamis.**
- _____ **A rain storm can cause a tsunami.**
- _____ **A tsunami can flood many miles inland from the shore.**
- _____ **Guatemala is one country that has been affected by tsunamis.**



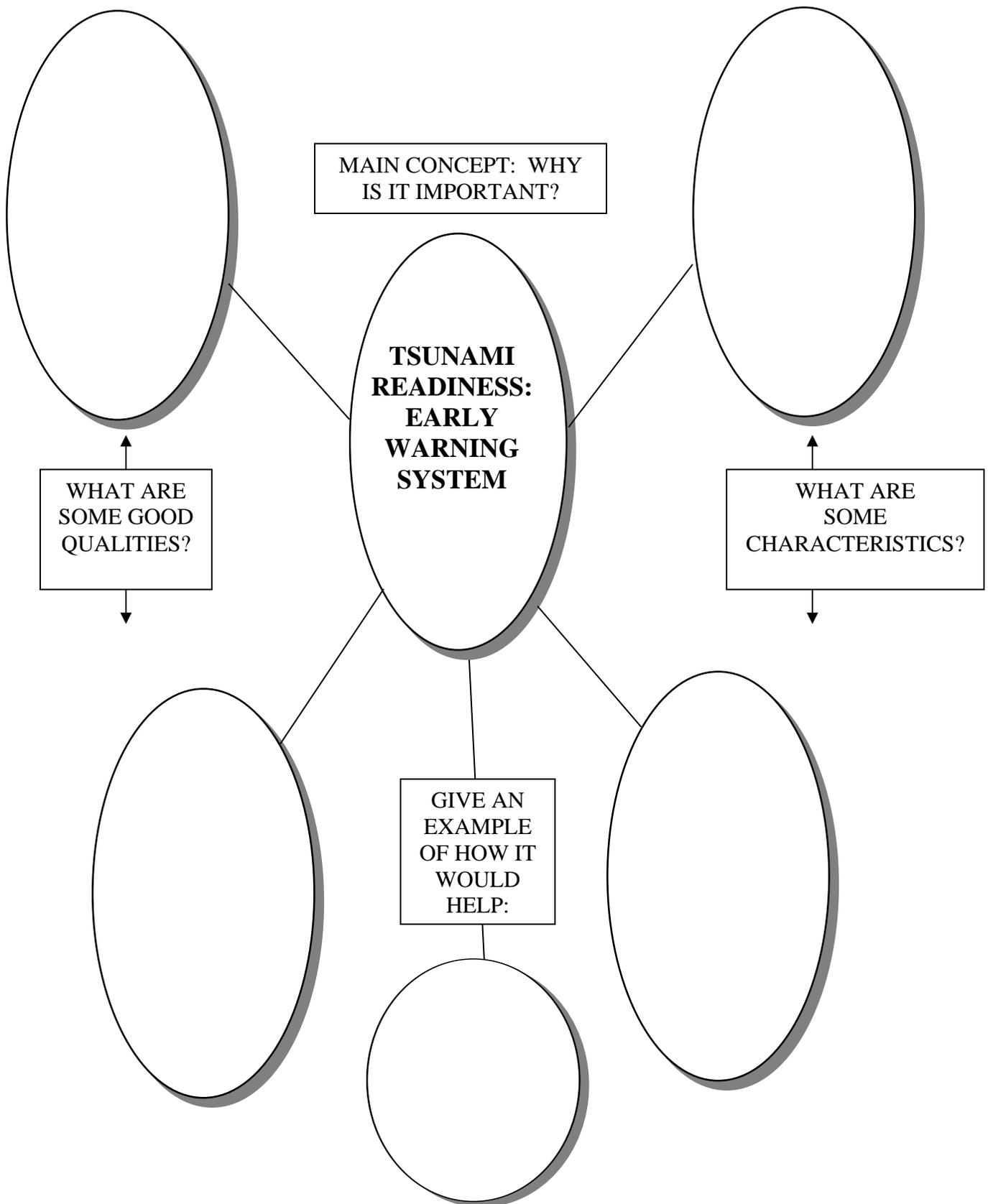
TSUNAMI EXPERIMENT

CREATE YOUR OWN TSUNAMI

DIRECTIONS:

1. Select a recorder. Recorder will write down observations on the back of this page.
2. You should have 1 baking pan and 2 small blocks of wood.
3. Fill the pan with water about half way.
4. Place the 2 blocks of wood under the water in the pan. Wait until the water is calm.
5. Recorder will write down the group's observation of the pan at this point.
6. Push the wooden blocks together from the outside in. Do this in a rapid motion, and force the water upward between the blocks. At this time, you should see waves form and splash over the sides of the pan. Students, you have just made a mini tsunami!
7. Recorder will write down the observations of the waves both slowly pushed together, and rapidly pushed together.
8. Group will discuss how this experiment resembles what they know a tsunami to be. From the observations, the groups will create a paragraph (recorder will write) telling what happened in this experiment and what they have learned.

CONCEPT DEFINITION MAP



Dr. Frank Gonzalez and the Tsunami Quiz

NAME _____ DATE _____

Directions: Read the following multiple-choice questions. Choose the best answer for each question.

- Which statement from the passage shows that Dr. Gonzalez is dedicated to helping people become safe from tsunamis?
 - As a child, Dr. Gonzalez has always been interested in animals of the land and sea.
 - He worked hard in school and studied oceanography, the study of the ocean.
 - His biggest concern is to learn about how to find tsunamis in the early stages.
 - He finally earned his Doctorate Degree, the highest degree in schooling, in oceanography from the University of Hawaii.
- Which of the following forces is a cause of a tsunami?
 - earthquakes
 - rain storms
 - tornadoes
 - sand erosion
- A tsunami can travel at speeds up to _____ miles per hour.
 - 500-600
 - 50-60
 - 5-6
 - 5000-6000
- As a tsunami approaches shore, its speed decreases and its height increases. A tsunami has been known to reach heights of up to _____.
 - 10 feet
 - 110,000 feet
 - 1000 feet
 - 100 feet
- According to the passage, which is an important part of Dr. Gonzalez' tsunami research?
 - His work with home builders to build safer homes for tsunamis.
 - His work on a new mathematical formula to describe tsunami behavior.
 - His work with saving ocean life in coastal areas when tsunamis hit.
 - His work on new words concerning tsunamis for science dictionaries.
- Approximately, how many people died in Chile when the tsunami of 1960 hit Chile?
 - 2000
 - 50
 - 25
 - 1000

7. What is meant by the phrase “vertically displaces”?
- A. a circular motion
 - B. a forward motion
 - C. an up and down motion
 - D. a side to side motion
8. Which is a possible reason why two tsunamis have hit Guatemala in the past?
- F. the ocean is deep around the coast of the country
 - G. the Middle America Trench causes subduction
 - H. the rains in the country are year round
 - I. the other countries surrounding Guatemala are mountainous
9. If a tsunami begins in Chile, it is possible for its effects to reach Japan.
- A. True
 - B. False
10. The countries around the Indian Ocean are safe due to their Global Warning System for Tsunamis.
- F. True
 - G. False

Read and answer the following short response question. Write your answer on the lines provided. Include details from the reading passage to support your answer.

Dr. Frank Gonzalez and the Tsunami

READ
THINK
EXPLAIN

Use examples from the reading passage to explain how a tsunami is formed.

ESSAY ASSIGNMENT



PERSUASIVE ESSAY WRITING

You have just read about Dr. Gonzalez and tsunamis. Pretend you are a meteorologist for the state of Florida. It is your job to convince the state of Florida to hire Dr. Frank Gonzalez as a consultant to prepare the state of Florida for the future in Tsunami Warnings and Readiness.

Write an essay persuading the State of Florida to hire Dr. Frank Gonzalez as their consultant. Use a Cluster Chart to brainstorm why it is important to have Tsunami Warning and Readiness in Florida.



EDITING RUBRIC



DIRECTIONS: Circle the number you think best fits the statement. Circling “1” would show you strongly disagree with the statement and circling “5” would show you strongly agree with the statement.

	Strongly Disagree				Strongly Agree
1. The writer stayed on the topic.	1	2	3	4	5
2. The writer had a beginning, including a topic sentence.	1	2	3	4	5
3. The writer had one or more paragraphs as the body (middle).	1	2	3	4	5
4. The writer had a conclusion (end).	1	2	3	4	5
5. The writer gave specific examples.	1	2	3	4	5
6. The writer used correct spelling.	1	2	3	4	5
7. The writer used complete sentences.	1	2	3	4	5
8. The writer used correct grammar.	1	2	3	4	5
9. The writer used correct punctuation.	1	2	3	4	5
10. The essay was easy to understand.	1	2	3	4	5