KENAN FELLOWS PROGRAM

Literacy in Biology

Introduction:

Literacy is an important aspect of science. To be literate in science means students are able to understand, read, and write in terms of science. This lesson is designed to get students to think critically about real world application. The lesson incorporates technology and Bloom's highest level of thinking, creativity. Students will learn about writing scientific names of organisms and classifying organisms, how organisms interact with each other and their environment, and the impact of natural disasters. Students will read a story, write journal entries answering questions about the story, and conduct research on natural disasters to present to the class. This unit provides plenty of opportunity for a teacher to re-teach concepts or re-visit Biology topics that may have been covered in previous units or that will be covered in later units.

Destination:

L1. At the end of this lesson, students should be able to classify organisms based on the biological hierarchy of classification/taxonomy.

L2. At the end of this lesson students will understand the impact of invasive species, natural disasters, predators, relationships, etc.

Students will demonstrate their understanding of classification of organisms and naming. Students will also demonstrate their understanding of ecosystems and their interactions by designing an ecosystem, and introducing a factor that would impact their ecosystem and evaluate the effect of the impacts.

Goal: 3.5

Objectives:

Bio.3.5.1 Explain the historical development and changing nature of classification systems.

Bio.3.5.2 Analyze the classification of organisms according to their evolutionary relationships.

Prior Knowledge:

Students should have knowledge of certain Biological concepts before beginning this unit. First students should be familiar with symbiotic relationships (mutualism, commensalism, parasitism, predator-prey, competition). Students should understand how populations are affected by density independent and density dependent factors. Students should also have taken Earth Science to be familiar with the component on natural disasters, but if students have not taken Earth Science, he or she will still be able to complete the unit.

Students should also have experience using a computer and completing research. Students should be familiar with search engines such as Google, and have an idea of what is considered a credible source (.edu, .gov, .org).

Time:

90 minutes

Teacher Preparation:

Teacher should read the short story in advance. Teacher should also group students in advance to complete activitie. To give students a model of the frog and the worm the teacher can purchase a green tree frog and roundworm from Pet Smart. The teacher may modify the exploration activity by using the pictures below from the Pet Smart website or by using the internet and searching for images of the two organisms. Allow the students to name the organisms the name of the characters in the story.

Pictures taken from Pet Smart website.

Materials Needed:

Computers, Printout of short story, frog, worm, easel paper, markers, construction paper

Exploration:

Literacy: Short Story hook

-by MURAKAMI Haruki translated by Jay Rubin

SUPERFROG SAVES TOKYO

http://www.geocities.jp/yoshio_osakabe/Haruki/Books/Super-Frog.html

Begin reading the short story in class. Teacher may want to read the story, since there is some vocabulary present that may need to be defined and discussed. Some students may have trouble pronouncing the names of the characters (i.e. Katagiri, and the other main characters are named Frog and Worm), so it will be good to engage them by actively reading aloud and then asking questions for understanding.

Read pages 1-8 in class. End where the second pair of ****** Last sentence is "The two teacups on the kitchen table were the only indication that Frog had ever been in Katagiri's apartment". The eight pages should take about 30 minutes to read and discuss.

Discussion Questions:

1. How does Katagiri feel about his encounter with Frog? Speechless, unbelievable, shocked
2. How does Katagiri's attitude about Frog's visit change as the story progresses? He starts speculating on reasons why Frog is visiting (association with a gang/loan)
3. What is the purpose of Frog's visit to Katagiri's home? Visiting to save Tokyo from being destroyed.
4. Why is an earthquake in Tokyo considered to be such a major problem (what will the earthquake possibly lead to)? The earthquake will cause a lot of deaths (150,000); accidents such as derailments, vehicle collisions, explosions, etc.
5. Why is the Tokyo Trust Bank significant? This is the location they plan to combat worm.
6. Why was Katagiri's job considered the perfect fit for him? His job could be dangerous at times and he had no wife and no children and no parents. Plus his siblings were already married.
7. What fear did Frog have about fighting Worm underground? He fears fighting Worm in the darkness

Next have students answer the questions below about the story to make real world connections with the story and Japan today. Some questions below will require that students research the internet. The other questions below will pertain to the story. (These questions have also been placed in a student worksheet below)

Questions for students to answer and research

1. Sketch a picture of Frog, Worm, and Mr. Katargiri.
2. Find the scientific name for Frog. Common name is Green Tree Frog
   •Scientific Name: Hyla cinerea
3. Research the behavior of the tree frog (you may use this website as an option for research: http://lllreptile.com/info/library/animal-care-sheets/amphibians/-/green-tree-frog/ you may also have students observe the behavior of the tree frog. What type of responses do you get if the room is dark? How does humidity affect the tree frog?

4. How does the behavior of a real tree frog differ from and compare to that of Frog in the story?

Comparisons of the Tree Frog to Frog in the story	Differences of the Tree Frog to Frog in the story

5. Find the scientific name for Worm. Common name is Red Worm.
- Scientific Name: Eisenia fetida
6. Research the behavior of the red worm (you may use this website as an option for research: http://en.wikipedia.org/wiki/Eisenia_foetida you may also have students observe the behavior of the tree frog. What type of responses do you get if the room is dark? How does humidity affect the red worm?

7. How does the behavior of a real red worm differ from and compare to that of Worm in the story?

Comparisons of the Red Worm to Worm in the story	Differences of the Red Worm to Worm in the story?

Teacher may modify the comparison questions using a Venn Diagram.

Teacher should begin teaching the classification/taxonomy of organisms. Teacher will use the Tree Frog (Frog from the story) to use as a guided practice example in classifying the organism. Teacher should begin with the history and domains. Then explain the levels of classification beginning with Kingdom, Phylum , Class, Order, Family, Genus, Species. Teacher should explain that the scientific name is

composed of the Genus and Species and note how the names should be written. Teacher should discuss the format such as the Genus being capitalized and species being lowercase. The teacher should also discuss how the name is italicized. Student thinking: Think about writing your name.

- Scientific Name: Hyla cinerea

- Eisenia fetida

Evaluate: Using the internet students will research the classification for Mr. Katargiri and Red worm (Worm from the story) . Students will also correctly write the scientific names for the two characters. Below is the chart students will fill in as they complete the research.

	Human (Mr. Katagiri)	Red worm (Worm)
Kingdom		
Phylum		
Class		
Order		
Family		
Genus		
Species		
Scientific Name		

For homework have students start keeping a journal. Have students complete journal entry 1 for their first homework assignments. Writing to Learn for Literacy: In the next 30 minutes, students will write a journal entry of at least 250-300 as Katagiri, Frog, or Worm. Students will take the perspective of one of the characters and predict what will happen next in the story. Students must base the story on science concepts. Students will then share their stories in a literacy circle (group of 4), and engage in discussions

about the science perspective of their character and the choices made by their character. (See attached rubric)

Note: Teacher may expand on the lesson by having students learn the parts of the worm and frog for dissections and to learn about the digestive and excretion processes of both.

Day 2

Time:

90 minutes

Materials Needed: Computers, Printout of short story, frog, worm, easel paper, markers, construction paper, colored pencils, paint, sticky notes

Goals Revisited: 3.5

Objectives revisited:

Bio.3.5.1 Explain the historical development and changing nature of classification systems.

Bio.3.5.2 Analyze the classification of organisms according to their evolutionary relationships.

Today's Goal: 2

Today's Objectives:

Explain various ways organisms interact with each other (including predation, competition, parasitism, mutualism)

and with their environments resulting in stability within ecosystems.

 natural environmental processes (relate to volcanic eruption and other geological processes)

Exploration:

Teacher will group students in groups of four and allow them to read their summaries from the perspectives of their chosen characters and predict what will happen next. Next teacher will allow students to compare their classifications of the human and red worm. Teacher will assign groups either the human or red worm classifications. Each group will write their taxonomic classifications (hierarchy of biological classification) and scientific name on a piece of white easel paper to display around the room. Students have to come to a consensus on which is the correct classification. Groups will post their work. Next the teacher will reveal the correct classifications, and allow students to compare the posted work to the correct answer through a gallery walk. Students can offer feedback on sticky notes as a form of formative assessment.

Teacher and students will complete the reading of the short story in class pgs. 8-18 Should take 30 minutes.

Discussion Questions

1. How does Katagiri describe himself to Frog when asked to join in the fight against Worm? Katagiri is 40, bald, has diabetic tendencies, flat foot, pot bellied, not liked, non athletic etc.
2. What happened to Katagiri on February 17, the day before the earthquake? He was shot, but depending on how far you read, he was found lying in the street.
3. What happened to Frog? This answer will vary depending on where you ask this discussion question.

After reading the story, teacher needs to group students in groups of 5. Teacher should ask students independently to pick the worst natural or man-made disaster they believe has ever happened in the history of the world and write why. This should be a quiet soft informal writing activity (3 minutes). Have students report out in their groups and share their answers. Next give students a sheet of white easel paper to classify their answers. They need to come to a consensus on which order to put the disasters, 1 being the worst and 5 being the least worst. You can post the answers around the room and allow each group to share their answers and why.

For example, 1. The Tsunami in Japan 2. BP oil Spill 3. Volcano eruption in Nabro…..

Teacher will begin to teach about the impact of natural disasters versus human impact. Teacher can continue lecture on how natural disasters shape the history of human societies and how natural hazards result from Earth's natural processes. Teachers may also discuss how human activities can contribute to the frequency and intensity of natural disasters, discussing them as density independent factors. Then discussing density independent factors. Teacher needs to engage students in discussion by comparing today's events to the events of the story.

Here is a list of the factors that affect density. Allow students to visualize how each will affect populations by only giving them the list of the factors and having them create their own pictorial representation of each. Also have students classify them as density independent or density dependent. Be sure to go back with the entire class and make sure their classifications are correct. Have students discuss possible factors that could have changed the ending to the story. Teacher can introduce the statement "WHAT IF….. and allow students to change the ending of the story based on one of the other factors listed below.

1. Starvation
2. Disease/Parasites
3. Accidents
4. Natural Disasters
5. Hunting/Predation

For homework, teachers will have students write a journal entry. This journal entry will be based on what the student has learned today in class.

Journal entry 2. Students will write 250-300 words. Pick a natural disaster (earthquake, tsunami, hurricane, volcanic eruption, etc.) or a density-independent/dependent factor. Describe your feelings, worries, and observations of this catastrophic event. Based on readings and research or personal experiences, explain the impact it would have on your neighborhood/town including life before and after the event.

Day 3

Time: 90 minutes

Goal: 2

Objectives: Continued from Day 2

Exploration: Teacher can allow students in their groups to share their journal stories from the previous night's homework.

Teacher will ask students to make connections between the story and real life (such as the earthquake in Japan) as students share their perspectives.

Teachers can also begin a lecture on human population, human impacts versus natural impacts, succession, etc. based on the students journal entry. Teacher may use socratic questioning or scaffolding to assist in the understanding of concepts.

Some things you want students to think about from the story.

1. How would Japan's human population have been impacted?
2. Are man-made disasters worse than natural disasters?
3. How do you think the description of the earthquake in Tokyo in the story compares with that of the real earthquake and tsunami that took place in Japan this year?
4. Describe the differences between primary and secondary succession.
5. Do you believe that Natural Disasters are a way for Mother Earth to communicate with the human population? (In other words is she telling us that we need to be using best practices at all times: reduce, reuse, recycle).

Teacher needs to discuss these concepts as well as discussing the changes in the weather patterns and possible affects of biogeochemical processes.

Teacher needs to take students to make arrangements so that each student has a computer and internet access. Students may work in pairs if computer usage is limited. Students will work on

online labs from National Geographic. The labs will take a total of 30 minutes to complete. The name of this session is Forces of Nature. There are labs, maps, and case studies that support this activity. Students will complete each lab and review each map for tornadoes, volcanoes, hurricanes, and earthquakes. Students will cause their own tornado, build their own volcano, spin their own hurricane, and set off their own earthquake. As students complete each one of these activities, they will record their observations and the conditions that needed to be set in order for their natural disaster to occur. Students will explore two case studies from each of the given forces (tornadoes, volcanoes, hurricanes, and earthquakes). Students will write three facts they have learned from each of the case studies reviewed.

http://environment.nationalgeographic.com/environment/natural-disasters/forces-of-nature/

Attached is a worksheet created, that ensures students complete the activities above. Answers have also been included for the teacher copy. The teacher can differentiate this activity by having students read the case studies for each of the major forces of nature and then write a summary and response for the case studies. The teacher may also differentiate this activity by assigning students to groups and assigning each group a natural disaster. The teacher can then have each group design a poster that addresses the key aspects the site presents about each natural disaster and present their natural disaster to the class, or the teacher may ask students to create models and present through a gallery walk.

For homework, students will complete their final journal entry.

Journal entry 3: Students will complete a journal entry as their chosen character. Students will write an alternative ending to the story from the perspective of their character. The journal entry will be 250-300 words in length. Students will include a symbiotic relationship (Biology) or another triggered natural disaster that resulted from the possibility of the earthquake.

Day 4

Time: 90 minutes

Students will complete a Natural Disaster Project. The purpose of this project is to help students understand the instability of life just as Murakami's theme in Super Frog Saves Tokyo In this project, students will work in pairs and choose a natural disaster to depict. . This project is also significant because natural disasters occur all over the world. Countries across the world have to be prepared if a natural disaster occurs. Students will use critical thinking skills and 21st century skills to prepare a recovery plan. This project will provide students with the opportunity to use real world application skills.

Part A. Students will create a before and after depiction of the affects of his or her natural disaster. This will be part A of the product.

Part B. Students will also create a plan for recovery for their chosen city. The plan for recovery can be a drawing (must be larger than 8 x 11), a speech, etc. but all students must have a physical product for recovery but must include a typed plan that is five to eight pages double spaced and 12 point font. The plan should include how people, relationships, ecosystems, etc. will be rehabilitated, reconstructed, and rebuilt. This should be as detailed as possible. Some questions to think about: How are you going to recover the ecosystems that were destroyed by your natural disaster? Which type of ecological succession is this? How does this disaster effect food chains in your ecosystem? How are you going to identify victims and provide services? What will you say to victims to calm them down?

Supplemental Information

When incorporating goals, teachers may extend this unit by incorporating dissections. Teacher may include the dissection of a frog and worm. Teacher may see attached dissection worksheets. Teachers may also include the dissection of a flower to extend the lesson. See attached worksheets for dissections as a way to differentiate.

Critical Vocabulary

1. Scientific name
2. Taxonomy
3. Parasitism
4. Mutualism
5. Commensalism
6. Kingdom
7. Phylum
8. Class
9. Order
10. Family
11. Genus
12. Species
13. Natural Disaster

Author Info

My name is Sheena Hamilton, and I am the author of the Kenan Unit Literacy in Biology. I teach at Farmville Central High School in Farmville, NC. This school system is a part of Pitt County Schools. At Farmville I teach Chemistry and Biology. I've been teaching high school for four years. I also teach GED classes part time. I have a Bachelor of Science in Biology, Bachelor of Arts in Chemistry, and a Master of Education with a concentration in Curriculum and Instruction.

My unit is centered around incorporating literacy into science. Literacy is a huge part of the new Essential Standards and Common Core Standards. Literacy includes both reading and writing, and it is important to strengthen both of those skills in learning.

Name: Student Worksheet for Day 1

After reading pages 1-8 of the story Super Frog Saves Tokyo, answer the questions below.

1. Sketch a picture of Frog, Worm, and Mr. Katargiri.

2. Find the scientific name for Frog. Common name is Green Tree Frog
   •Scientific Name:

3. Research the behavior of the tree frog (you may use this website as an option for research: http://lllreptile.com/info/library/animal-care-sheets/amphibians/-/green-tree-frog/ you may also have students observe the behavior of the tree frog. What type of responses do you get if the room is dark? How does humidity affect the tree frog?

4. How does the behavior of a real tree frog differ from and compare to that of Frog in the story?

Comparisons of the Tree Frog to Frog in the story	Differences of the Tree Frog to Frog in the story

5. Find the scientific name for Worm. Common name is Red Worm.
- Scientific Name:

Student Worksheet Day 1 Continued…….

6. Research the behavior of the red worm (you may use this website as an option for research: http://en.wikipedia.org/wiki/Eisenia_foetida you may also have students observe the behavior of the tree frog. What type of responses do you get if the room is dark? How does humidity affect the red worm?

7. How does the behavior of a real red worm differ from and compare to that of Worm in the story?

Comparisons of the Red Worm to Worm in the story	Differences of the Red Worm to Worm in the story?

Rubric for Journal Entry 1

Day 1 Journal Entry Rubric: Students will write a journal entry of at least 250-300 as Katagiri, Frog, or Worm. Students will take the perspective of one of the characters and predict what will happen next in the story. Students must base the story on science concepts.

	Exemplary 4	Accomplished 3	Developing 2	Beginning 1	Not Shown 0
Purpose	Your entry addresses all parts of the journal prompt, shows your reasoning, and uses specific examples to back up your opinion.	Your entry addresses most of the journal prompt, shows your reasoning, and uses specific examples to back up your opinion.	Your entry failed to do one of the following: address the journal prompt, show your reasoning, or use specific examples to back up your opinion.	Your entry failed to do two of the following: address the journal prompt, show your reasoning, or use specific examples to back up your opinion.	Your entry failed to do all of the following: address the journal prompt, show your reasoning, and use specific examples to back up your opinion.
Length	Student wrote entry at least 250 words.	Student wrote entry 200-249 words, but did not meet the full requirement.	Student wrote entry 199-150 words, but did not meet the full requirement.	Student wrote entry 149-100 words, but did not meet the full requirement.	Student wrote entry 99 words or less and did not meet the full requirement.
Conventions	All grammar and spelling is correct.	Only one or two grammar and spelling errors.	A few grammar and spelling errors.	Many grammar and spelling errors.	Most of the paper contains grammar and spelling errors.
Participation	Student read journal entry to group and actively participated in group discussions with all members.	Student read journal entry to group and actively participated in group discussions with most members.	Student read journal entry to group, but did not actively participate in group discussions. (Participation was with one member).	Student only completed one part of the participation requirement. Student either read journal entry only or either completed group discussion only.	Student did not read story or participate in group discussions.

Rubric for Journal Entry 2

Rubric for Day 2 Journal Entry Students will write 250-300 words. Pick a natural disaster (earthquake, tsunami, hurricane, volcanic eruption, etc.) or a density-independent/dependent factor. Describe your feelings, worries, and observations of this catastrophic event. Based on readings and research or personal experiences, explain the impact it would have on your neighborhood/town including life before and after the event.

	Exemplary 4	Accomplished 3	Developing 2	Beginning 1	Not Shown 0
Purpose	Your entry addresses all parts of the journal prompt, shows your reasoning, and uses specific examples to back up your opinion.	Your entry addresses most of the journal prompt, shows your reasoning, and uses specific examples to back up your opinion.	Your entry failed to do one of the following: address the journal prompt, show your reasoning, or use specific examples to back up your opinion.	Your entry failed to do two of the following: address the journal prompt, show your reasoning, or use specific examples to back up your opinion.	Your entry failed to do all of the following: address the journal prompt, show your reasoning, and use specific examples to back up your opinion.
Length	Student wrote entry at least 250 words.	Student wrote entry 200-249 words, but did not meet the full requirement.	Student wrote entry 199-150 words, but did not meet the full requirement.	Student wrote entry 149-100 words, but did not meet the full requirement.	Student wrote entry 99 words or less and did not meet the full requirement.
Conventions	All grammar and spelling is correct.	Only one or two grammar and spelling errors.	A few grammar and spelling errors.	Many grammar and spelling errors.	Most of the paper contains grammar and spelling errors.
Participation	Student read journal entry to group and made real life connections with each group member's story.	Student read journal entry to group and actively made real life connections with most group member's stories.	Student read journal entry to group, but did not make real life connections with most group member's stories. (Participation was with one	Student only completed one part of the participation requirement. Student either read journal entry only or either completed group participation/real life connection.	Student did not read journal entry or participate in group discussions.

			member).		

Rubric for Day 3 Journal Entry

Journal entry 3: Students will complete a journal entry as their chosen character. Students will write an alternative ending to the story from the perspective of their character. The journal entry will be 250-300 words in length. Students will include a symbiotic relationship (Biology) or another triggered natural disaster that resulted from the possibility of the earthquake.

	Exemplary 4	Accomplished 3	Developing 2	Beginning 1	Not Shown 0
Purpose	Your entry addresses all parts of the journal prompt, shows your reasoning, and uses specific examples to back up your opinion.	Your entry addresses most of the journal prompt, shows your reasoning, and uses specific examples to back up your opinion.	Your entry failed to do one of the following: address the journal prompt, show your reasoning, or use specific examples to back up your opinion.	Your entry failed to do two of the following: address the journal prompt, show your reasoning, or use specific examples to back up your opinion.	Your entry failed to do all of the following: address the journal prompt, show your reasoning, and use specific examples to back up your opinion.
Length	Student wrote entry at least 250 words.	Student wrote entry 200-249 words, but did not meet the full requirement.	Student wrote entry 199-150 words, but did not meet the full requirement.	Student wrote entry 149-100 words, but did not meet the full requirement.	Student wrote entry 99 words or less and did not meet the full requirement.
Conventions	All grammar and spelling is correct.	Only one or two grammar and spelling errors.	A few grammar and spelling errors.	Many grammar and spelling errors.	Most of the paper contains grammar and spelling errors.

STUDENT WORKSHEET FOR NATIONAL GEOGRAPHIC ACTIVITY

Name_____

Directions: Using the computer go to the website below and answer the questions below. http://environment.nationalgeographic.com/environment/natural-disasters/forces-of-nature/ . Click on the Forces of Nature Lab tab.

1. Click on 1, the Tornado. Read about tornadoes under "What is a tornado?" Define what a tornado is. (Cause your own tornado at the left by changing the conditions listed).

2. What are waterspouts? Dust devils?

3. Click on 2, what are the causes of tornadoes?

4. When does tornado season begin in the United States? What time of day are tornadoes most likely to start?

5. Click next. In what type of weather conditions does a tornado form?

6. Click on 3, tornadoes are capable of widespread. How large can tornadoes roar?

7. Click on 4, watch the video. Why are their less deaths per year in the United States caused by tornadoes?

8. Click on 5, when are tornado watches and warnings issued?

In the top left hand corner, change the natural disaster from Tornado to Volcano.

9. What are volcanoes?

10. Approximate how many volcanoes are active today? Where are most of these active volcanoes located?

11. What are the benefits of volcanoes?

12. Click on 2, where do most volcanoes occur?

13. Click on 3.Write one fact about island arc volcanoes, intraplate volcanoes, rift volcanoes.

14. What is subduction?

15. What two characteristics characterize volcanoes?

16. What is viscosity?

In the top left hand corner, change the natural disaster from Volcano to Hurricane.

17. What are the differences between hurricanes, typhoons, and cyclones?

18. Click on 2, How many miles per hour must winds move in order to be characterized as a hurricane?

19. What are the three main parts of a hurricane?

20. Click on 3, complete the activity and describe what you see.

21. Click on 4, what is a storm surge?

22. Click on 5, what is the most destructive force in a hurricane?

23. What does NOAA stand for?

In the top left hand corner, change the natural disaster from Hurricane to Earthquake.

24. How many earthquakes are detected worldwide on average per year?

25. When and where did the deadliest quake occur on Earth?

Click on page 2 for Earthquakes

26. Where do earthquakes occur?

27.How does an intraplate happen?

28.How many tremblors is the quake belt responsible for?

Click on page three for Earthquakes

29.The process of the Earth's plates are constantly moving and interacting?

Click on page four for Earthquakes

30.Choose two faults (normal fault, reverse fault, strike slip fault, dip-slit fault) and describe these types of faults.

Click on page five for Earthquakes

31. What is the hypocenter in an earthquake?

32. What is the epicenter?

33. What are seismologists ?

34. How do seismologists determine a quake's location?

35. What instruments do seismologists use to measure P and S waves?

36. What scale is used to determine the magnitude of an earthquake?

37. Can earthquakes be prevented? Explain your answer.

38. Complete the locate an earthquake activity and trigger the earthquake activity on page six and seven respectively.

TEACHER ANSWER KEY WORKSHEET FOR NATIONAL GEOGRAPHIC ACTIVITY

Name_____

Directions: Using the computer go to the website below and answer the questions below. http://environment.nationalgeographic.com/environment/natural-disasters/forces-of-nature/ . Click on the Forces of Nature Lab tab.

1. Click on 1, the Tornado. Read about tornadoes under "What is a tornado?" Define what a tornado is. (Cause your own tornadoe at the left by changing the conditions listed).

   A tornado is a violently rotating column of air that extends from a thunderstorm to the ground.

2. What are waterspouts? Dust devils?

   Waterspouts are weak twisters that form over warm water. They sometimes move inland and become tornadoes.

   Dust devils are small, rapidly rotating columns of air that are made visible by the dust and dirt they pick up.

3. Click on 2, what are the cause of tornadoes?
   The most violent tornadoes come from supercells (large thunderstorms that have winds already in rotation.

4. When does tornado season begin in the United States? What time of day are tornadoes most likely to start?
   Tornado season begins in early spring. Although tornadoes can occur any time of day, most form in the late afternoon.

5. Click next. In what type of weather conditions does a tornado form?
   Tornadoes form when warm humid air collides with cold, dry air.

6. Click on 3, tornadoes are capable of widespread. How large can tornadoes roar?
   300 miles

7. Click on 4, watch the video. Why are their less deaths per year in the United States caused by tornadoes?
   Improved forecasting and warning systems are in place.

8. Click on 5, when are tornado watches and warnings issued?
   Tornado watches are issued when weather conditions are conducive for tornado formation.
   Tornado warnings are issued when a tornado has been sighted or indicated on radar.

9. What are volcanoes?
   Volcanoes are vents in the Earth's surface from which molten rock, debris, and steam issue.

10. Approximate how many volcanoes are active today? Where are most of these active volcanoes located?
    About 1900 volcanoes are active today. 90% are located in the Ring of Fire.

11. What are the benefits of volcanoes?
    They provide valuable mineral deposits, fertile soils, geothermal energy, and build new land

12. Click on 2, where do most volcanoes occur?
    Most volcanoes occur at plate boundaries.

13. Click on 3.Write one fact about island arc volcanoes, intraplate volcanoes, rift volcanoes.
    Answers will vary

14. What is subduction?
    Subduction is the process of two plates coming together, and one plate sliding under the other.

15. What two characteristics characterize volcanoes?
    Explosiveness and viscosity

16. What is viscosity?
    Viscosity is the measure of a substance's ability to resist flow.

17. What are the differences between hurricanes, typhoons, and cyclones?

The differences are their origins or where they are formed. (i.e. if they develop in this area then they are….)

18. Click on 2, How many miles per hour must winds move in order to be characterized as a hurricane?
    74 miles per hour

19. What are the three main parts of a hurricane?
    The eye, eyewall, and the feeder bands

20. Click on 3, complete the activity and describe what you see.
    Answers will vary

21. Click on 4, what is a storm surge?
    A storm surge is rise in the sea level itself.

22. Click on 5, what is the most destructive force in a hurricane?
    Water

23. What does NOAA stand for?
    National Oceanic Atmospheric Administration

In the top left hand corner, change the natural disaster from Hurricane to Earthquake.

24. How many earthquakes are detected worldwide on average per year?
    About 500,000 worldwide

25. When and where did the deadliest quake occur on Earth?
    In China 1557, killing an estimated 830,000 million

26. Where do earthquakes occur?
    Most earthquakes occur along faults (which are fractures in the Earth's crust)

27.How does an intraplate happen?

An intraplate happens when stress builds up and the Earth's crust is stretched or squeezed together until it rips.

28.How many tremblors is the quake belt responsible for?

80 percent

Click on page three for Earthquakes

29.The process of the Earth's plates are constantly moving and interacting?

Plate tectonics

Click on page four for Earthquakes

30.Choose two faults (normal fault, reverse fault, strike slip fault, dip-slit fault) and describe these types of faults.

Click on page five for Earthquakes

31. What is the hypocenter in an earthquake?
The place where the movement first occurred in the fault

32. What is the epicenter?
The point on the surface directly above the hypocenter.

33. What are seismologists ?
Seismologists are earthquake scientists.

34. How do seismologists determine a quake's location?
They compare the arrival times of P and S waves at observatories

35. What instruments do seismologists use to measure P and S waves?
Seismograph

36. What scale is used to determine the magnitude of an earthquake?
Richter scale

37. Can earthquakes be prevented? Explain your answer.

No

38. Complete the locate an earthquake activity and trigger the earthquake activity on page six and seven respectively.

Natural Disasters Project Rubric

Part A. Students will create a before and after depiction of the affects of his or her natural disaster. This will be part A of the product.

Part B. Students will also create a plan for recovery for their chosen city. The plan for recovery can be a drawing (must be larger than 8 x 11), a speech, etc. but all students must have a physical product for recovery but must include a typed plan that is five to eight pages double spaced and 12 point font. The plan should include how people, relationships, ecosystems, etc. will be rehabilitated, reconstructed, and rebuilt. This should be as detailed as possible. Some questions to think about: How are you going to recover the ecosystems that were destroyed by your natural disaster? Which type of ecological succession is this? How does this disaster effect food chains in your ecosystem? How are you going to identify victims and provide services? What will you say to victims to calm them down?

Criteria	Exemplary 20	Accomplished 15	Developing 10	Beginning 5	Score
Artwork/Presentation	Highly appealing in style and presentation	Acceptable in style and presentation	Somewhat acceptable in style and presentation	Lacks appeal in style and presentation	
Written Recovery Plan	Creatively and accurately includes key details for recovery plan	Includes many details for recovery plan	Attempts to include details for recovery plan	Demonstrates limited knowledge of details for recovery plan	
Conventions	All grammar and spelling is correct	Only one or two grammar and spelling errors	A few grammar and spelling errors	Many grammar and spelling errors	
Understanding	Clearly and accurately demonstrates understanding of all concepts learned and is exemplified in project	Demonstrates understanding of most concepts learned and is mostly exemplified in project	Somewhat demonstrates understanding of concepts learned and is somewhat exemplified in project	Does not demonstrate understanding of concepts learned and is not exemplified in project	
Length and Format	Students wrote 5 or more pages	Students wrote 4 to 5 pages double	Students wrote 2-3 pages double	Students wrote 2 or less pages double	

	double spaced in a 12 point font.	spaced in a 12 point font.	spaced in a 12 point font.	spaced in a 12 point font.	
Total	----------	----------	----------	----------	