National Geographic’s Easter Island: https://vimeo.com/75522343

1. How many people lived on Easter Island during its peak?

2. Caves on Easter Island were used for people to hide in. What were people hiding from?

3. What were the weapons found on Easter Island used for?

4. Archeologists found hulls from giant palm nuts, what happened to the trees on which these palm nuts grew?

5. List multiple reason for why the people on Easter Island cutting down trees.

6. What does the statement “The islanders ambition was greater than their resources” mean?

7. One breeding pair of rats can create a how large a population in three years time? What type of growth is this?

8. Why did the small trees on Easter Island die after the larger palm trees were cut down?

9. Why were the people on Easter Island trapped if they knew how to sail?

10. Was the ocean surrounding Easter Island capable of supporting enough fish to feed the people of Easter Island?

11. What happened to most of the species of birds on Easter Island?

12. How do archeologists know the people of Easter Island began to suffer from famine and hunger?

13. What did the cavers find in the most remote caves on Easter Island?

14. What brought about the ultimate end the population of Easter Island?

15. What was the population of Easter Island in 1877 (1000 years after the first landing party arrived)?
THE MYSTERY OF EASTER ISLAND

An Ecology Case Study

The history of Easter Island, its statues and its peoples, has long been shrouded in mystery. Some have suggested that aliens marooned on earth planted the statues as signals to their fellow aliens to rescue them. Others have said that the statues were constructed by a great race of guilders that were stranded on the island and built them before being rescued. Still others are convinced that an ancient society with the capability of flight constructed them along with the Nazca lines in Peru. However new evidence based on pollen analysis supports a much simpler theory, that the Easter Island inhabitants destroyed their own society through deforestation.

When Easter Island was "discovered" by Europeans in 1722, it was a barren landscape with no trees over ten feet in height. The small number of inhabitants, around 2000, lived in a state of civil disorder and were thin and emaciated. Virtually no animals besides rats inhabited the island and the natives lacked sea-worthy boats. Understandably, the Europeans were mystified by the presence of great stone statues, some as high as 33 feet and weighing 82 tons. Even more impressive were the abandoned statues-as tall as 65 feet and weighing as much as 270 tons. How could such a people create, and then move such enormous structures? The answer lies in Easter islands’ ecological past, when the island was not a barren place.

The Easter Island of ancient times supported a sub-tropical forest complete with the tall Easter Island Palm, a tree suitable for building homes, canoes, and latticing necessary for the construction of such statues. With the vegetation of the island, natives had fuel wood and the resources to make rope. With their sea-worthy canoes, Easter Islanders lived off a steady diet of porpoise. A complex social structure developed complete with a centralized government and religious priests.

It was this Easter Island society that built the famous statues and hauled them around the island using wooden platforms and rope constructed from the forest. The construction of these statues peaked from 1200 to 1500 AD, probably when the civilization was at its greatest level. However, pollen analysis shows that at this time the tree population of the island was rapidly declining as deforestation took its toll.

Around 1400 the Easter Island palm became extinct due to over harvesting. As well, its capability to reproduce had become severely limited by the proliferation of rats, introduced by the islanders when they first arrived, which ate its seeds. In the years after the disappearance of the palm, ancient garbage piles reveal that porpoise bones declined sharply. The islanders, no longer with the palm wood needed for canoe building, could no longer make journeys out to sea. Consequently, the consumption of land birds, migratory birds, and molluscs increased. Soon land birds went extinct and migratory bird numbers were severely reduced, thus spelling an end for Easter Island's forests. Already under intense pressure by the human population for firewood and building material, the forests lost their animal pollinators and seed dispersers with the disappearance of the birds. Today, only one of the original 22 species of seabird still nests on Easter Island.

With the loss of their forest, the quality of life for Islanders plummeted. Streams and drinking water supplies dried up. Crop yields declined as wind, rain, and sunlight eroded top soils. Fires became a luxury since no wood could be found on the island, and grasses had to be used for fuel. No longer could rope by manufactured to move the stone statues and they were abandoned. The Easter Islanders began to starve, lacking their access to porpoise meat and having depleted the island of birds. As life worsened, the orderly society disappeared and chaos and disarray prevailed. Survivors formed bands and bitter fighting erupted. By the arrival of Europeans in 1722, there was almost no sign of the great civilization that once ruled the island other than the legacy of the strange statues. However, soon these too fell victim to the bands who desecrated the statues of rivals.

Easter Island is a prime example of what widespread deforestation can do to a society. As the forests are depleted, the quality of life falls, and then order is lost. The example of Easter Island should be enough for us to reconsider our current practices.
PART ONE: Article Questions
1. Define the word *sustainability*.

2. Explain what happened to all the palm trees on Easter Island.

3. Where did the rats come from and why did they have such a negative effect on the palm tree?

4. Explain what happened to the birds on Easter Island.

5. What did the decline of porpoise (e.g. dolphin) bones in garbage piles indicate?

6. Why weren’t the people on Easter Island able to grow their own food to survive?

7. Why did the Easter Islanders stop producing giant Moai statutes?

8. Imagine that you could help the people of Easter Island prevent the destruction of their civilization before it happened. What three pieces of advice would you give them to help them avoid the collapse of their society and make them live more sustainably?
PART TWO: Identifying the parts of an experiment

Dr. Sonia Haoa has been researching the Easter Islands for years. She knows from researching other cultures that increasing population growth combined with a fragile environment can lead to a population collapse. She wondered if this was the same reason for the downfall of the Rapa Nui society. She thought, yes, the cause of the population crash of the Rapa Nui society was due to the population growth resulting in reduction of natural resources. She decided to test this by comparing the population vs. the amount of natural resources available. She would compare the results to a stable growth society. She asked the question; How does the amount of natural resources available affect the population of the Rapa Nui society? She thought that if the amount of natural recourses decrease, then the population of Rapa Nui society would decrease because there would not be enough food and shelter for the people.

1. What was the observation?

2. What was the informal question that led to the experiment?

3. What evidence did Dr. Haoa use to try and answer the informal question?

4. What was her inference (informal hypothesis)?

5. How was she going to test the question?

6. What is the control group?

7. What was the experimental question?

8. What is the independent variable?

9. What is the dependent variable?

10. What was her hypothesis?
PART TWO: Graphing Skills

How does the amount of natural resources available affect the population of the Rapa Nui society?

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Use I-TALK to create a graph

Graphing skill #1: Choosing the right type of graph:
1. What type of graph should be used? (see choosing the correct graph handout)?

Graphing skill #2: Labeling Axes (Use DRY-MIX):
2. What would be the correct labels for the graph including units?
   Label for X-axis______________  Label for Y-axis______________

Graphing skill #3: Scaling Axes:
3. Count the intervals on the graph. What number will you go by on the X-axis? Show your work.
4. Count the intervals on the graph. What number will you go by on the Y-axis? Show your work.

Graphing skill #4 choosing a title
5. What would be a good title for the graph?

Graphing skill #7 Graphing Correlations
6. Does the graph show a positive correlation, negative correlation or no correlation? How do you know?
7. Is the correlation strong, moderate or weak? Explain your answer.
Accuracy & Precision

- Define accuracy
- Define precision

1. A researcher was attempting to tie a rope around the top of the head of a moai statue in order to move the statue. Unfortunately, every time he tossed the rope he would hit exactly on the same spot, on right side of the statue.

   - Describe the accuracy and precision of the throw:
   - What may have caused these results?

2. The following measurements were made to determine the mass of a particular moai statue. It is known that the statue’s mass is 2000 kg. The measurements were: Trial #1 2010 kg, Trial #2 2000 kg, Trial #3 1990 kg

   - Describe the accuracy and precision of the data:
   - What may have caused these results?

3. The following measurements were made to determine the density of the stone used creating the moai statues. The generally expected value is 2.2 g/mL. The results of the measurements were: Trial #1 2.2 g/mL, Trial #2 2.3 g/mL, Trial #3 2.1 g/mL

   - Describe the accuracy and precision of the data:
   - What may have caused these results?

Dimensional analysis

1. Chandler is 4,180 miles from Easter Island. What is this distance in kilometers? (1 km = .62 mile)

2. The tallest moai erected, called Paro, was almost 10 metres high and weighed 90.4 tons! What is the height in inches? What is the weight in kilograms? (1 meter = 100 cm, 12.54 cm = 1 in, 1 ton = 2000 lbs, 2.2 lbs = 1 kg)

3. In the early ’80s, researchers tried to recreate some of the statues and move them using only tools that the islanders had to their disposal. They found this almost impossible to do. Then in 1987, American archaeologist Charles Love managed to move a moai replica. He and his men rolled the statue 46 meters in just 2 minutes. How fast is that in mi/hour? (1000 meters = 1 kilometer, .621 miles = 1 kilometers, 60 min = 1 hour).

4. Dr. Sonia Haoa is trying to carbon date the 900 moai statues on Easter Island. Using modern techniques, she is able to carbon date 3 statues every day. How many months will it take her to carbon date all of the statues?