Importance of DNA

Geneticists study the DNA of different organisms. DNA stands for deoxyribonucleic acid. An organism's DNA is all of the genes that code for the traits an organism has. For example, humans have genes in their DNA for the color of their eyes, color of their hair, and even the shape of their earlobes!

DNA

Geneticists study the DNA of different organisms in order to compare them. The more similar two strands of DNA are, the more closely related those organisms are. For example, Modern humans and neanderthals share 99.7% of their DNA. This means modern humans are very closely related to neanderthals!

Steps to Create a Youtube Episode

Follow the steps below to create a Youtube video that teaches viewers about the similarities or differences between early and modern humans!

Step 1: Extract DNA from a Strawberry

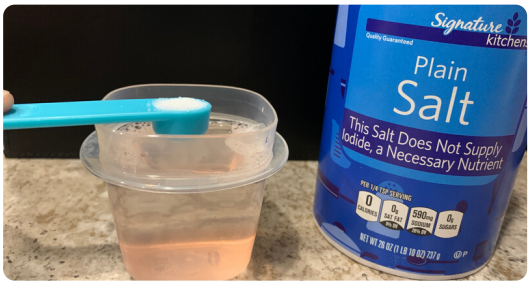
Prepare extraction solution. The extraction solution is what will help pull the DNA out of the strawberry cells.

- Collect a graduated cylinder.
- Use the graduated cylinder to measure out 90 mL of water.

- Pour the water into a small container.

- Using the graduated cylinder, measure out 10 mL dish soap.
- Add the dish soap to the water.

- Use a measuring spoon to measure ¼-tsp salt.



- Pour the salt into your soap and water mix and use a spoon to stir the mixture until the salt dissolves.

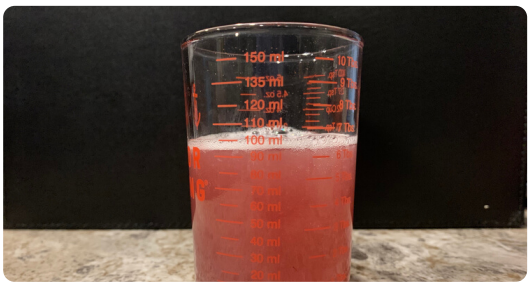
- Collect a strawberry and a plastic zipper bag from your teacher.
- Place the strawberry into the plastic bag.
- Pour the extraction mixture into the bag with the strawberry.
- Remove as much air from the bag as possible and seal it closed.

- Use your hands and fingers to smash the strawberry inside of the bag. You want to break the strawberry down as much as possible. Make sure there aren't any large strawberry chunks still remaining.

- Collect a strainer and a new container from your teacher.
- Place the strainer on top of the new container.
- Pour your mashed strawberry and extraction solution mixture through the strainer and into the new container below.

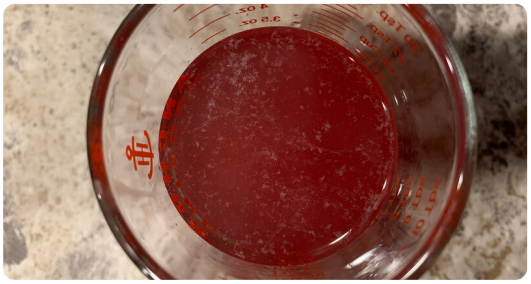
- Use a spoon or other utensil to push any chunks of strawberry against the strainer to get as much of the mixture into the container below.

- Collect a graduated cylinder from your teacher and pour your strained mixture into the graduated cylinder.
- Do not fill your graduated cylinder above 95 mL.
- If you have more than 95 mL of solution, only put 95 mL into the graduated cylinder and set the rest to the side.



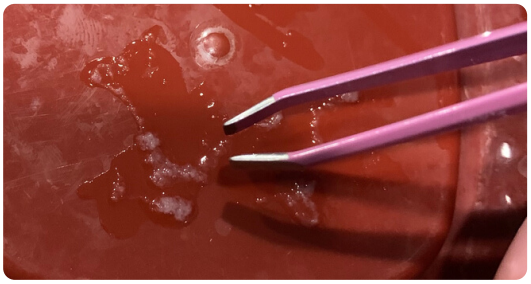
- Collect the chilled isopropyl alcohol from your teacher.
- Use the lines in your graduated cylinder to carefully pour in 5 mL of isopropyl alcohol into the graduated cylinder.

- You will start to see a white layer form on the top of your graduated cylinder. This is the strawberry's DNA!



- You can use tweezers to collect the DNA from the top of the graduated cylinder.

- You can use the tweezers to gently lay the DNA out on a dish or plate and carefully manipulate it to see the structure.



Step 2: Make a Claim

You will make a claim about Neanderthals and Homo sapiens in your video. A claim is the main point or focus of the video. It is the message you want your viewers to understand by the time the video is over. Your claim should tell whether you are discussing the similarities or the differences between early and modern humans. An example claim is:

- Modern humans are different than ancient humans because modern humans are able to complete more complex tasks than ancient humans. This is because modern humans have DNA that creates larger brain size than ancient humans.

First, decide whether you will focus on the similarities or differences between modern humans. Circle you choice below:

Similarities **Differences**

- Next, read sources on the handout: Sources to Use and choose which sources will help support your claim.
  - Note: You may want to circle or highlight the sources that relate to your claim.
- Next, write your claim below:

Step 3: Write Script for Youtube Episode

Your script should have three parts: an introduction, a middle section, and a conclusion. Write each part below.

Introduction:

- Welcome viewers to your Youtube channel.
- Explain to viewers what they will be learning about during this episode.

Write at least three sentences for your introduction below:

Middle:

- Show viewers the DNA you created and explain what DNA is.
- Explain why geneticists look at DNA from Neanderthals and other ancient humans.
- Make a claim about how DNA is responsible for the similarities or differences between early and modern humans.

Write at least 6 sentences for your middle below:

Conclusion:

- Restate your claim.
- Tell your viewers about other videos you plan to make in the future or invite viewers to write in to ask questions about what they saw.

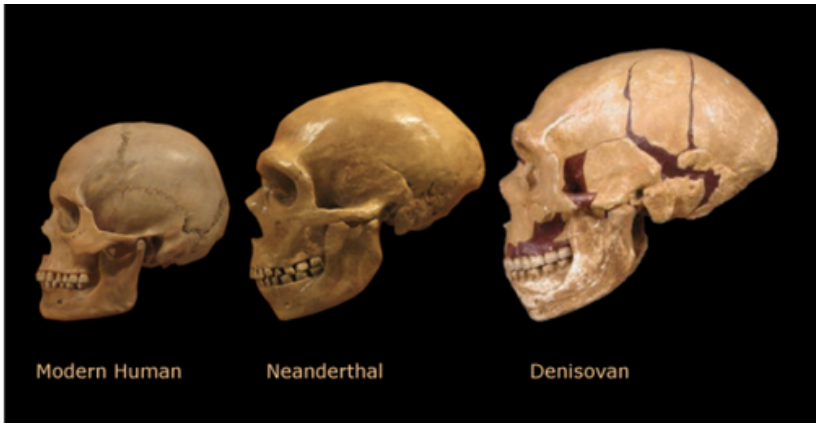
Write at least three sentences that you will use for the end of your video below:

Step 4: Rehearse and Record Youtube Episode

- Rehearse your script until you feel comfortable with it. Make sure you know who is supposed to say what.
- Get a smart phone or a tablet from your teacher and record your episode!

Sources to Use

This image shows skulls from three different species. You can see that modern humans, known as Homo Sapiens, have a much smaller skull compared to Neanderthals and Denisovans. Even though Homo Sapiens had smaller skulls, they had the largest brains . Scientists believe one reason that Homo Sapiens survived was because of their larger brain. A larger brain meant that Homo Sapiens were able to learn more complex skills. For example, Homo Sapiens learned to build weapons and tools, develop a written language, and a system of trade. They were also more skilled at finding food and water to survive.



https://natrainner.wordpress.com/2018/02/11/the-siberian-densiovans/

This is a model of what scientists believe a Neanderthal man might have looked like. The Neanderthals are homo sapiens' closest relative. This means they were the most like us. For example, both Neanderthals and Homo sapiens both have a spoken language. However, there are many differences between them. Neanderthals' bodies were shorter and heavier compared to Homo sapiens' bodies.

https://natrainner.wordpress.com/2018/02/11/the-siberian-densiovans/

This is a picture of a Neanderthal model with red hair. Scientists learned that some Neanderthals had red hair, light skin, and freckles. Light skin and hair are caused by a mutation in the MC1R gene. The MC1R gene is related to skin and hair color. This was important because people who had lighter skin were able to absorb, or take in more Vitamin D. This vitamin comes from sunlight and helps keep people healthy. People who had this gene were probably able to live more easily in colder climates with less sunlight. This is because even with less sunlight, there skin could absorb the light easier than those with darker skin.

http://sciencevibe.com/2017/05/25/red-hair-believe-it-or-not-comes-from-neanderthals-genetic-mutation/

Sources to Use

This picture shows a Neanderthal child's teeth. Scientists have found that the teeth of Neanderthals do not have as much enamel as teeth from Homo Sapiens. This allowed Neanderthal teeth to grow more quickly than those of Homo Sapiens, whose teeth have thicker enamel. Scientists also believe that the thinner enamel was caused in part because of poor health. Studies of Neanderthal teeth have also found traces of lead that might have come from unhealthy drinking water. This would have also worn away the enamel on Neanderthal teeth.

https://www.nationalgeographic.com/science/2018/10/news-neanderthal-teeth-nursing-seasons-stress/

This picture is of a group of Neanderthals. Archaeological evidence suggests that half a million years ago, Neanderthals, Denisovans, and modern humans were one big group. The population of each group was roughly the same. Over time, these three groups split up. The Neanderthals moved to western Europe and Asia. The Denisovans moved to east Asia. Homo sapiens lived in Africa. Scientists have often wondered why the Neanderthal and Denisovan populations died out. One idea is that the places the Neanderthal and Denisovan people moved to were colder and more difficult to live in. There were more deaths due to starvation or from the cold. These moves caused the population of the Neanderthal and Denisovans to grow smaller. Because the climate of Africa was warmer, it was easier for homo sapiens to increase their population. The warmer climate of Africa would be easier to live in.

https://www.nationalgeographic.com/news/2014/5/140502-neanderthal-stone-age-humans-anthropology-science-evolution-denisovan/

This picture shows Neanderthals cooking and eating. The ability to taste bitter foods is controlled by a gene called TAS2R38. When scientists tested DNA materials of a Neanderthal, they learned that the person had this same gene. Learning about this gene tells scientists that Neanderthals could tell the difference between different types of food they ate. For example, if the food tasted sweet or salty, the Neanderthal could tell. Because of this gene, scientists believed that Neanderthals may have liked certain foods more because of the way they tasted.

https://www.sciencephoto.com/media/414969/view/neanderthals-cooking-vegetables-artwork

Sources to Use

This is a map showing the different places that Neanderthals lived. Over 400,000 years ago, the Neanderthal people had migrated throughout Europe, portions of Asia and the Middle East. This suggests that Neanderthals were adapting, or getting used to, different types of climates. For example, to the north, Neanderthal people were found in Wales, a country that has both warm and cold weather. To the far east, the Neanderthals settled in Siberia, known for its harsh and cold winters. The area in the Middle East would be hot and dry. Adapting to different climates was necessary for the Neanderthal people to survive.

https://commons.wikimedia.org/wiki/File:Range_of_Homo_neanderthalensis.png

This image shows a group of Neanderthals during winter. Studies of Neanderthal DNA has shown that one of the many genes make Neanderthals different from present-day humans is the gene RPTN. PTN helps protect skin cells and is found in the hair, skin and sweat glands. Scientists believe that the lack of RPTN helped Neanderthals adapt to cold weather. This means that because they did not have this particular gene, the Neanderthal people did not feel the cold like we do today. However, the lack of RPTN meant the Neanderthals had less resistance to disease. An immune system protects us from diseases. By not having a strong immune system, meant that Neanderthals got sick more often.

https://www.ancient-origins.net/news-history-archaeology/neanderthal-dna-0012200

This image shows Neanderthals hunting. Scientists studying Neanderthal DNA have learned that some genes that helped Neanderthals, are not as helpful to modern-day humans. For example, the Neanderthals carried a gene that helped their blood clot quickly. This was very important, as Neanderthals were often injured while hunting. Their bodies would need to heal quickly in order to continue that activity. Today, that same gene is found in modern Homo Sapiens. However, quick clotting blood can form blood clots in other parts of the body. What once helped Neanderthals survive actually puts humans today at a severe health risk. This is because the clots block the flow of blood to other parts of the body that need it.

https://www.smithsonianmag.com/science-nature/neanderthals-hunted-groups-one-more-strike-against-dumb-brute-myth-180969472/

Sources to Use

This is an image of a Neanderthal child. Today, scientists have succeeded in identifying Neanderthal DNA in people. Scientists believe that at some point, Neanderthal people and homo sapiens met. They had children. Those children carried both modern human and Neanderthal DNA. These genes were passed on through generations of people. By studying the DNA of Neanderthals, scientists and geneticists can better identify what Neanderthal genes, people might have in their DNA. As more information is gained, we can better understand our connections to the people who lived long before us.

http://www.bbc.com/earth/story/20151116-what-did-the-neanderthals-do-for-us