

Introduction

Scientists have not always known how humans migrated thousands of years ago into the Caribbean. Thanks to a wide variety of research, they now have an idea. In this lesson, students will use both archeological and DNA evidence to trace migration patterns into the region.

Learning Objectives

At the end of this activity, students will be able to:

- Identify similarities and differences between DNA sequences.
- Trace human migration patterns based on DNA and archaeological evidence.

Key Terms

- DNA
- Nucleotide
- Migration
- Population
- Radiocarbon Dating

Time Requirement

Around 2 class periods that are 45 minutes long or 1 block period.

Grade Level

6th to 9th grade (with adjustments)

Teacher Preparation

Each pair or group of students will need a single-side printed student handout, scissors, and glue or tape. (Students may also use string to connect the larger photos to their location on the map.)

This activity can also be completed virtually using the google slides [presentation](#) that students can edit.

Scientific Background

1 Students will need to have background information about DNA (deoxyribonucleic acid). DNA contains four nucleotides: Adenine, Guanine, Cytosine, and Thymine (abbreviated A, G, C, T). Based on Chargaff's rule of base pairing, the nucleotides pair up with one another on the inside of the sugar-phosphate backbone to form the double helix. Adenine (A) always pairs with thymine (T) and cytosine (C) always pairs with guanine (G). While 99.9% of DNA sequences are identical in all humans, there are unique sections that introduce genetic diversity into the human population.

For older students, you could go into specifics about genes and the discovery of DNA. You could talk about the places where humans differ in their DNA sequences, emphasizing SNPs, or single nucleotide polymorphisms. This is a great word to break down -- single = one, nucleotide = a word we presented earlier, poly = many, morph = form; so SNPs can be defined as a single nucleotide where it is possible to have many forms here, forms are base pairs. Younger students just need to know the basics.

2 Genomics is the study of the human genome. This Caribbean study is currently the largest study of DNA sequencing in the Americas and one of the largest in the world. The researchers used a wide variety of methods in this study:

- Genetics researchers analyzed the DNA sequences in human skeletons - The DNA sequences were compared and analyzed to study the number of mutations or changes in the DNA sequences.
- Radiocarbon dating was used to determine the age of the skeletons - Carbon-14 decays at a known rate and was used to determine the age of the skeletons.
- The archaeologists studied the various types of tools to create their own understanding of who was living there.

By comparing artifacts with the DNA sequences, it was possible to see if changes in artifacts were a local development or if they reflected new migrations. Together the researchers compared DNA sequences during two archeological time periods, the Archaic Age and the Ceramic Age. **They found that the genetic sequences did change when the tool type changed.**

To find more information about the human genome, visit genome.gov.

Lesson Plan

1 PART 1: VIDEO INTRODUCTION

Hook the students with the following video clips from **PBS: Faces of America**. These are available for download for teachers. Briefly discuss the human genome at this point.

Time: 10 minutes

2 PART 2: READING ACTIVITY

- Students should read the article "**Where did the first people in the Caribbean come from?**" in Science Journal for Kids related to this research. Discuss any misconceptions. Discuss the methodology in the background information listed above. It is important that students understand that there are multiple pieces of evidence that went into this study.
- Answer the comprehension questions at the end of the article. This could be done as homework if needed.

Time: 30-45 minutes

3 PART 3: HANDS-ON CER (CLAIMS-EVIDENCE-REASONING) ACTIVITY:

- Students should place the DNA sequences and the ceramic tools on the map to go with the corresponding numbers.

Note: Not all locations have DNA sequences and corresponding stone tools and ceramic pieces.

- Clarify that the claim is the answer to the question in the title. The study claims that humans migrated from Central and South America into the Caribbean.
- Complete the claim-evidence-reasoning chart. Students will need to fill out the evidence and reasoning section by gathering evidence from the article and the map.

Time: 30-40 minutes

Extensions

DISCUSSION: BIOLOGY VS. CULTURE

After completing the Claims-Evidence-Reasoning activity, discuss the differences between biology and culture. DNA sequences may not always match up with the expected stone tools or ceramics. This is a good time for students to gain an understanding that differences in DNA determine who are biologically, but not who you are as a person. There are many different factors that determine who you are. DNA is just one component of that individuality. If you want to expand on this topic, we recommend the PBS resource *Our Genes/Our Choices* lesson **"It's genetic - or is it?"** which could be used as an extension.

WRITING EXTENSION

Write a paragraph that answers the following questions:

1. Why do we care about finding out about our ancestors? You can use personal stories or think hypothetically.
2. What evidence did the scientists use in this study to come up with a conclusion?
3. How and why do scientists use multiple types of evidence to come up with a conclusion?
4. Can you think of another example where scientists would need to use multiple sources of data to determine a question?

This could be scaffolded for younger students.

STORYTELLING: ORIGIN MYTHS

Optionally, you can discuss the origin myth of the Taino People: The people, called Taínos, whose skeletons from the Dominican Republic these researchers studied, believed that the modern world was created when four mythical brothers entered the house of the chief god and dropped a gourd that was hanging from the rafters. Their world was created when the seas, fishes, and islands rushed out when the gourd broke. Later, when the Taínos were held hostage in a cave by the Sun, their culture hero, Deminán, defeated the Sun and led his people to freedom. All other humans emerged from a separate cave whose name is translated as the "Cave without importance." Let the students watch, **The Taino Myth of the Cursed Creator** on TED-Ed.