

## STUDENT ACTIVITY

# Race and Medicine

## Project Details

### GRADE RANGE

9–12

### TIMING

60 minutes

## OVERVIEW

In this activity, students will explore the biological basis of race and discuss the benefits and challenges of classifying people into one of the 5 major race groups. The class will form research groups that have been hired to discuss evidence for racial grouping and how knowledge of a person’s race could play a role in health and medical treatment. Each group will be assigned a specific question about an aspect of race and/or health, such as the evolutionary history of humans, how genetics and heredity play a role in race, and what gene sequencing has shown us about the genetic similarities and differences between groups of people. Teams will complete research and compile evidence to support their answers to the questions. Teams will present their claims, evidence, and reasoning to the whole group as the class examines the idea and medical implications of race in humans. Students will use the new information presented and discussed to finish this activity with their own CER that answers the question, “does evidence support the classification of people by race, and is this medically important?”

## OBJECTIVE

Students will explore the benefits and misconceptions of using race as a way to classify people through various fields of science in this activity, which will challenge them to make claims, identify evidence, and give reasoning to support their conclusions about the validity of race.

*\*Note to teachers: before beginning this activity, students should have an introductory understanding of concepts such as genomics, bioinformatics, central dogma, evolution, genetic expression*

## **MATERIALS NEEDED:**

- Device with the ability to project
- Student devices (iPad, laptop)
- Poster Board / large butcherblock paper for Group CER (Claim, Evidence, Reasoning) Sheet (1 per group)
- Scratch paper for research notes
- Reviewing Race CER Summary Sheet (1 per student)
- Markers

## **NEXT GENERATION SCIENCE STANDARDS: THREE DIMENSIONS**

### **Asking Questions and Defining Problems**

HS-LS3-1 Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

### **Disciplinary Core Ideas**

LS1.A: Structure and Function

All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins.

### **Crosscutting Concepts**

Cause and Effect

Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

## **STANDARDS FOR TECHNOLOGICAL LITERACY**

### **Standard 3: The Nature of Technology**

K. The rate of technological development and diffusion is increasing rapidly.

L. Inventions and innovations are the results of specific, goal-oriented research.

### **Standard 14: Medical Technologies**

K. Medical technologies include prevention and rehabilitation, vaccines and pharmaceuticals, medical and surgical procedures, genetic engineering, and the systems within which health is protected and maintained.

## COMMON CORE STATE STANDARDS FOR ENGLISH LANGUAGE ARTS

### Grades 9–10

CCSS.ELA-LITERACY.RST.9-10.2. Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

CCSS.ELA-LITERACY.SL.9-10.1.D Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.

### Grades 11–12

CCSS.ELA-LITERACY.RST.11-12.2. Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

CCSS.ELA-LITERACY.SL.11-12.1.D. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

## PROCEDURE

### 1 Warm-Up Activity and Whole Class

**Discussion:** Begin by projecting the following picture on the overhead screen for students:

Explain to students that in today's activity they will be asked to think about what "race" is and what allows us to determine a person's race. Ask students to look at the picture of the two girls and think about what race they would classify each one as belonging to.

Humans have long been grouped based on shared geography and physical or social qualities generally defined by society. This has led to people typically being categorized into 5 major races—African, European, Asian, Oceanic, and Native American.

Ask students to share their ideas of what race they would classify each girl as belonging to, and ask them to share what information supports their conclusion—is it their physical traits? Is it tied to their ancestry? Where their parents or family origins appear to be from?



- 2 Tell students that you will give them one more piece of information about the girls and play the following short video clip: <https://www.youtube.com/watch?v=JIUK2KSbvvl> Ask students if they would revise their racial classification of the girls now knowing that they are fraternal twins, with parents of different ethnic backgrounds? Allow students to share their thoughts with the class.
- 3 Next ask students what evidence or information they think would be most important in determining a person's race? How do they determine their own race? Should we even use race as a way of grouping people? Give students a few minutes to discuss their thoughts with the people sitting around them, and then ask students to share their thoughts with the class. The teacher may record these answers on the board or overhead screen to create an informal survey.
- 4 **Small Group:** Tell students that in the next part of this activity, they will form groups and will be tasked to look more closely into the emerging links between race and medicine; how an understanding of where we come from and who our ancestors are might hold the key to important knowledge about ourselves and our health.

Each student group will represent specialists in one scientific field, including medicine, genomics, evolutionary biology, and anthropology that are participating in roundtable discussion on race and medicine at a fictional pharmacogenetics conference. They will discuss the scientific validity of race grouping and the potential health advantages of understanding genetic differences of people of different races. A summary of some of these perspectives is included for students to understand their group's unique viewpoint on this topic.

- 5 Before students form groups, show them the following short video clip that will explain what the emerging field of pharmacogenetics is: <https://www.youtube.com/watch?v=QspSoopJYtY>
- 6 Next, introduce students to what a CER (Claim, Evidence, Reasoning) framework is, and how they will use this to answer the question they are given about race. Teachers may want to show the class this short video clip that explains each part of a CER activity: <https://www.youtube.com/watch?v=faSAIOAnf9E>
- 7 Ask students to form groups of 3–5 and give each group a piece of Poster Board or large butcher block paper and markers. Allow each group to draw one of the six question assignments about race out of a bowl or hat. (See Race CER Questions attachment that can be cut and used for students to draw.)

- 8 Once the students have chosen their question, each group should set their Poster Board or butcherblock paper up as follows:

<b>Question:</b> (Write their question here)
<b>Claim:</b>
<b>Evidence:</b>
<b>Reasoning:</b>

- 9 Students should then begin their research using their devices, such as laptops or iPads. Remind students that it is important as they begin to compile their evidence, they can use scratch paper to record it. Once they have narrowed down the most important pieces of evidence that they will use to support their claim, they should write down their claim and evidence in the appropriate sections on the Poster Board or butcher block paper. Finally, they should finish by recording their reasoning which will connect their claim and evidence.
- 10 Once all groups have finished completing their CER poster, they should choose a representative from their group to share their role (geneticist, evolutionary biologist, anthropologist.) and the information on their CER poster with the whole group. Once a group is finished their poster can be displayed in the classroom.
- 11 To end the activity, hand out a copy of the Reviewing Race CER Summary Worksheet (see attached) to each student. Ask students to use the information they have been given from each group and their own thoughts about race to answer the following question: Should we continue to classify people by race? Students should complete this sheet, if time allows (or the next day) the teacher may choose to allow students to share their ideas with each other in small groups or with the whole group.

## LINKS

<https://www.census.gov/mso/www/training/pdf/race-ethnicity-onepager.pdf>

<https://hechingerreport.org/facts-about-race-and-college-admission/>

[https://www.albany.edu/sph/cphce/mrt\\_tools/staff\\_tools/English/Staff%20Administered%20Patient%20Questionnaire.pdf](https://www.albany.edu/sph/cphce/mrt_tools/staff_tools/English/Staff%20Administered%20Patient%20Questionnaire.pdf)

<http://sitn.hms.harvard.edu/flash/2017/science-genetics-reshaping-race-debate-21st-century/>

<https://www.nytimes.com/2019/03/30/us/affirmative-action-supreme-court.html>

Science Professional	Perspective on Race (meant as a starting point for research)
<p><b>Anthropologist</b> study human societies, cultures, and their development.</p>	<p>A race is a grouping of humans based on shared physical or social qualities into categories generally viewed as distinct by society.</p>
<p><b>Geneticist</b> study genes, including how they are inherited, mutated, activated, or inactivated.</p>	<p>Genetic analysis enables scientists to estimate the geographic ancestry of a person by using ancestry-informative markers. But because all populations are genetically diverse many of these racial categories are subjective and there is no specific gene that determines a person's race.</p>
<p><b>Evolutionary biologist</b> study the evolutionary processes that produced the diversity of life on Earth, starting from a single common ancestor.</p>	<p>Typically conclude that the notion of race in humans is completely a social concept without any biological basis.</p>

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**GROUP 1**

*You are a group of geneticists working in the field of genomics.*

You have been hired to answer the question:

**“How much and what kind of genetic variation is there between humans, including humans of different races and humans of the same race?”**

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**GROUP 2**

*You are a group of physicians specializing in informatics.*

You have been hired to answer the question:

**“Why might a person’s race be important in medicine and treatment of patients?”**

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**GROUP 3**

*You are a group of anthropologists.*

You have been hired to answer the question:

**“What are the origins of race in human history?”**

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**GROUP 4**

*You are a group of sociologists.*

You have been hired to answer the question:

**“What is the relationship between race and ancestry?”**

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**GROUP 5**

*You are a group of evolutionary biologists.*

You have been hired to answer the question:

**“How could the evolutionary history of humans play a part in racial grouping?”**

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**GROUP 6**

*You are a group of geneticists working in pharmacogenetics.*

You have been hired to answer the question:

**“How could understanding racial differences at the genomic level be important for a person’s health?”**

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<p><b>QUESTION:</b> Does evidence support the classification of people by race, and is this medically important?</p>	
<p><b>CLAIM</b> a statement that answers the question</p>	
<p><b>EVIDENCE</b> statements that support the claim gathered through research, investigations, and observations</p>	
<p><b>REASONING</b> describes <i>how</i> the evidence supports the claim, often uses scientific theories or principles</p>	

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## GROUP 1

*You are a group of geneticists working in the field of genomics.*

You have been hired to answer the question:

**“How much and what kind of genetic variation is there between humans, including humans of different races and humans of the same race?”**

**\*Students will likely report that there is actually very little overall genetic difference between different races of people. In fact, there can be more genetic variation between people of the same race as people of two different races.**

**Link:** <http://sitn.hms.harvard.edu/flash/2017/science-genetics-reshaping-race-debate-21st-century/>

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## GROUP 2

*You are a group of physicians specializing in informatics.*

You have been hired to answer the question:

**“Why might a person’s race be important in medicine and treatment of patients?”**

**Some ethnic and racial groups have a higher incidence of genetic conditions, such as Tay-sachs and sickle-cell anemia.**

**Link:** <https://ghr.nlm.nih.gov/primer/inheritance/ethnicgroup>

**There may also be differences in the metabolism of certain drugs or the way the body responds to certain treatments between ethnic groups, or races of people. Although there is still much to be done in this field to ensure that there is genetic data from people of many different races, as it seems that most of the information we have is from people who identify as Caucasian.**

**Link:** <https://www.nature.com/scitable/topicpage/pharmacogenetics-personalized-medicine-and-race-744>

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### GROUP 3

*You are a group of anthropologists.*

You have been hired to answer the question:

**“What are the origins of race in human history?”**

Dividing people into groups by race has been done over many years, by many groups of people, and has used ancestry, physical traits, behavior, and other characteristics to classify people. The way people have defined race and continue to define it varies and has been used to identify people of similar origin in both positive and destructive ways throughout history.

Link: <https://www.britannica.com/topic/race-human>

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### GROUP 4

*You are a group of sociologists.*

You have been hired to answer the question:

**“What is the relationship between race and ancestry?”**

Ancestry can be defined as a person’s ethnic heritage; where their genetic ancestors originated. Race can be defined as the group or groups that a person identifies most closely with.

Link: <https://www.rural.palegislatore.us/race.pdf>

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### GROUP 5

*You are a group of evolutionary biologists.*

You have been hired to answer the question:

**“How could the evolutionary history of humans play a part in racial grouping?”**

The environment where people lived in our evolutionary history can impact how the genes that determine skin color are expressed. Mutations that occurred in groups of people may have been beneficial, therefore more common in those populations, and can account for physical and physiological differences between what are considered different races.

Link: <https://www.nationalgeographic.com/magazine/2018/04/race-genetics-science-africa/>

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## GROUP 6

*You are a group of geneticists working in pharmacogenetics.*

You have been hired to answer the question:

“How could understanding racial differences at the genomic level be important for a person’s health?”

People of different ethnic and genetic backgrounds may metabolize drugs or medications differently, therefore knowledge of a person’s race may be useful in the field of pharmacogenetics and in personalized medicine to ensure that the patients are getting the best treatment based on their genetic profile.

Link: <https://www.wolterskluwer CDI.com/blog/pharmacogenomics-and-race-can-heritage-affect-drug-disposition/>

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