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Is It in Our Genes: Race and Health

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ABE Master Teacher Fellowship Program

AMGEN® Biotech Experience

Scientific Discovery for the Classroom

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The curriculum projects designed by the 2020–21 ABE Master Teacher Fellows are a compilation of curricula and materials that are aligned with the Amgen Biotech Experience (ABE) and prepare students further in their biotechnology education. These projects were created over the course of a 1-year Fellowship in an area of each Fellow's own interest. Each is unique and can be adapted to fit the needs of your individual classroom. Objectives and goals are provided, along with expected outcomes. Projects can be used in conjunction with your current ABE curriculum or as an extension.

As a condition of the Fellowship, these classroom resources may be downloaded and used by other teachers for free. The projects are not edited or revised by the ABE Program Office (for content, clarity, or language) except to ensure safety protocols have been clearly included where appropriate. We are grateful to the ABE Master Teacher Fellows for sharing their work with the ABE community.

If you have questions about any of the curriculum pieces, please reach out to us at ABEInfo@edc.org. We will be happy to connect you with the author and provide any assistance needed.

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1. Project Overview

Project Title	Is It in Our Genes? Race & Health.	**Public Product(s) (Individual and Team)**	Note which products are individual or team and the product/performance's intended audience. Document with explanation of public product 1. Present to someone not in their class (ask 3 questions to someone outside of class, maybe family or community member) – this helped them finalize project (Who did you present to? What were their initial reactions? What questions did they ask?) 2. Submit PSA for feedback and grading 3. PSAs can be presented to school/community leaders
Driving Question	What is the difference between race and genetics, and why do they matter to me and my community?		
Grade Level/ Subject	10–12 (in a Biology or Life Science class)		
Time Frame	5–10 days + ABE *Exploring Precision Medicine* module (8–12 days)		
Project Summary	As a companion to the ABE *Exploring Precision Medicine* module, students explore and compare the concepts of race and genetics, and the social and medical impact these categories may have on themselves and their community. Students investigate the origins and impact of genomic and phenotypic variation, then develop a public message (PSA) about why precision medicine matters to their community.		

2. Learning Goals

Standards

AP bio curriculum: Essential knowledge:
EVO-1.E.1: Natural selection acts on phenotypic variations in populations.
EVO-1.E.2: Environments change and apply selective pressures to populations.
EVO-1.E.3: Some phenotypic variations significantly increase or decrease fitness of the organism in particular environments.
EVO-1.I.1: Reduction of genetic variation within a given population can increase the differences between populations of the same species.
EVO-1.N.2: A comparison of DNA nucleotide sequences and/or protein amino acid sequences provides evidence for evolution and common ancestry.
SYI-3.D.1;IST-1.J.1; IST-1.J.3: Many traits are the product of multiple genes and/or physiological processes acting in combination; these traits therefore do not segregate in Mendelian patterns.
SYI-3.B.1: Environmental factors influence gene expression and can lead to phenotypic plasticity. Phenotypic plasticity occurs when individuals with the same genotype exhibit different phenotypes in different environments.

Literacy Skills

Name the literacy skills that will be required in the project and/or will be the focus of support. This is for teachers of all subject areas and grade levels (e.g., expository writing, reading informational text, presentation of ideas with evidence, engage in collaborative conversation, etc.).

Develop a PSA – video and script (PSA development happens concurrently with *Exploring Precision Medicine* module)

Success Skills

Critical thinking, collaboration, self-management
Could also include graduate profile skills or career pathways outcomes
“Transformative intellectuals: students who utilized scientific skills within the larger context of their communities; by demonstrating complex thinking about science and social justice issues writ large.”

Rubric

Link/name rubric(s) you intend to use: Last page of this document

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NGSS:
HS-LS3-2 Heredity; HS-LS4-2 Biological Evolution; HS-LS4-4 Biological Evolution

Key Vocabulary
Genome, Ancestor, Human Genome Project, Genotype, Phenotype, Race, DNA, Social Determinants of Health

3. Project Milestones

Milestone #1	Milestone #2	Milestone #3	Milestone #4	Milestone #5	Milestone #6 Public Product
Students will understand the definition of race and that race is a social construct. **Think/Pair/Share** What is race? Write individually. How do you define it? What are you not sure about? What questions do you have about it? Is this an important concept for you? Why/why not? Partner discussion – then report what they said Similarities and differences that emerged **Discussion** Give official definitions. How is what you thought aligned or different from what has been out there? How has race been constructed as a human idea? **Prior knowledge:** Genotype and phenotype: which is which? Do a Kahoot or something? **Homework:** Picture what characteristics your children might have?	**Students will understand that variations in humans have led to classifications that are not useful.** **Who am I? How are genealogy and genetics related/different?** Genealogy and genetics How have they been conflated? "What is Ancestry?" (student will only read this excerpt, p. 1–2) Anthropological perspectives on genomic data, genetic ancestry, and race (students will only read this excerpt, p. 2–4) Jigsaw discussion: Split AAPA statement on Race & Racism into 5 groups Whole group discussion: • How did variation in humans come to be? • How have humans been grouped based on these variations? How has that been helpful or harmful?	**Students will understand the ethical concerns of scientific research and how these are related to grouping of humans.** Students will read the article on modern genetic ethical concerns. For homework, students will choose one of the "unethical" experiments listed to further explore. See bottom of the document. Students will answer the following questions for their topics: 1. What benefits has science brought to our society? 2. Who determines the moral/ethical values of scientific research? 3. In what ways have the grouping of humans (e.g., race) played a role in scientific research? 4. How has biotechnology complicated the ethics of scientific research? 5. How can we ensure that future science is ethical and morally appropriate?	**Students will understand how phenotype and social constructs of race have been used to exploit and harm communities in the name of science.** Preface for teachers and students to prep for topical nature Begin by reading, Race is Real, But It's Not Genetic! **Jigsaw:** students will report to the class their extended research about the scientific experiments explored for homework: Nazi scientists, prisoners in Illinois were infected with malaria, Tuskegee syphilis study, birth control pill in Puerto Rico, Holmesburg prison experiments Ota Benga, Guatemala syphilis experiments, Marion Sims, Henrietta Lacks, Samuel A. Cartwright. As a concluding exercise, students can take some time to reflect on what they learned. Then as a class, share some of those insights. Group discussion guiding questions: 1. What ways has this activity changed the way you see science?	**Students will understand the positive potential and the dangers of providing genetic information.** Should I be worried about at-home genetics products? 23 and me etc. Anonymous poll: can include a bit about "would you want to know?" "Is it ethically appropriate to separate people by race?" "Is it ethical to distinguish people genetically?" Read the introduction to the Eugenics programs and answer the questions in the document. Purpose and process and Precision Medicine Conclude by reading this short article, Are rats born racist? And answering these questions as a group: 1. Are we born to discriminate? 2. Is discrimination the same thing as racism? 3. What can we learn about the misuse of science ideas in society? 4. How can science improve our society?	E.g., Final presentation and reflection PSA: Why does PM matter to me and my community?

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Milestone #1	Milestone #2	Milestone #3	Milestone #4	Milestone #5	Milestone #6 Public Product
How likely is that – genotype and phenotype? Read the abstract for this article: "Human Races are not like dog breeds: refuting a racist analogy." Write down your impressions and questions. **Key Student Question:** "How has race been defined?"			2. How can we hold seemingly opposing views at the same time? 3. How can we ensure that science is serving all of humanity? 4. What is your individual (and collective) role with this work? 5. Why is learning about science and history important?	5. What are the major limitations of grouping people by race? 6. How can the rat experiment help us to understand racism?	

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