

FUTURELAB+

LIVING EARTH

*Genetic Detectives:
Investigating Inherited Diseases*

Overview

Developed in partnership with:
Discovery Education

LIVING EARTH / INHERITED DISEASES

Overview

DRIVING QUESTION

How do you counsel patients on their risk of genetic disease while considering their health literacy?

OVERARCHING PROBLEM

You will take on the role of a genetic counselor tasked with preparing a communication resource that you will use to present to clients who may carry genes for a genetic variation or traits, such as high cholesterol, breast cancer, or severe allergies.

ESSENTIAL QUESTIONS

How are characteristics of one generation passed to the next?

What allows traits to be transmitted from parents to offspring?

How does variation affect a population under selective pressures?

MAJOR PRODUCTS

Individual

Genetic Test Report

Partner/ Group

Inherited Disease Posters

Flipgrid Presentation and Visuals

PROJECT EVALUATION

Unit Rubric

STUDENT-FACING RESOURCES

Project Information Sheet

Design Journal

National Standards

Next Generation Science Standards

Lesson	Science Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Inherited Diseases	Constructing Explanations and Designing Solutions	ETS1.A: Defining and Delimiting Engineering Problems	Connections to Engineering, Technology, and Applications of Science
Genetics	Analyzing and Interpreting Data Engaging in Argument from Evidence	LS1.A: Structure and Function LS3.A: Inheritance of Traits LS3.B: Variation of Traits	Cause and Effect Scale, Proportion, and Quantity
Genetic Mutations	Asking Questions and Defining Problems	LS1.A: Structure and Function LS3.B: Variation of Traits	Cause and Effect
Treating Inherited Disease	Constructing Explanations and Designing Solutions	LS3.B: Variation of Traits LS4.B: Natural Selection LS4.C: Adaptation	Cause and Effect
Communicating a Genetic Test Report	Constructing Explanations and Designing Solutions	Constructing Explanations and Designing Solutions ETS1.C: Optimizing the Design Solution	Connections to Engineering, Technology, and Applications of Science
Genetic Counseling	Constructing Explanations and Designing Solutions	ETS1.C: Optimizing the Design Solution	Connections to Engineering, Technology, and Applications of Science



UNIT 1 CALENDAR

<p>Lesson 1 Day 1</p> <p>Entry Event: See, Think, Wonder using phenomenon. Students ask questions to begin their Need to Know (N2K) Questions list.</p> <p>Students consider the various people who are impacted by inherited diseases.</p>	<p>L1D2</p> <p>Driving Question, project information, and rubric are shared with students.</p> <p>Students form groups based on interest by selecting which disease they want to learn more about.</p>	<p>L1D3</p> <p>Students develop their Inherited Disease Profile Posters starting by researching the Who, What, How, and the important Statistics associated with their disease.</p>	<p>L1D4</p> <p>Students participate in a Jigsaw Presentation of their disease using their posters. Students identify the similarities and differences between their disease and the others.</p>	<p>L1D5</p> <p>Students compare and contrast genetic diseases via a Gallery Walk and add questions to their Need to Know Questions.</p>	
<p>Lesson 2 Day 1</p> <p>Students identify traits of the classmates, which are used to ask questions about DNA, inheritance, and inherited diseases.</p> <p>Students review patient profiles and select a patient to counsel in the role of a genetic counselor.</p>	<p>L2D2</p> <p>Students examine the phases of meiosis, and are introduced to the key genetic vocabulary terms.</p>	<p>L2D3</p> <p>Students learn how to use a Punnett square to determine offspring genotype and phenotype of autosomal and sex-linked traits.</p>	<p>L2D4</p> <p>Students learn how to create a genetic test by developing and analyzing pedigree charts.</p>	<p>L2D5</p> <p>Students conduct a genetic test for the patient they selected on Day 1 by building and analyzing a family pedigree chart of the patient.</p>	<p>L2D6</p> <p>Students begin to develop the Genetic Test Report they will share later with their patient at the end of the unit.</p>
<p>Lesson 3 Day 1</p> <p>Students review what they know about DNA and cell organelles.</p>	<p>L3D2</p> <p>Students learn about mutations, then identify and research the mutation associated with their patient's inherited disease.</p>	<p>L3D3</p> <p>Students begin to examine protein synthesis by first investigating transcription.</p>	<p>L3D4</p> <p>Students continue to examine protein synthesis by investigating translation.</p>	<p>L3D5</p> <p>Students write a narrative that explains to their patient how the mutation associated with their inherited disease gives rise to faulty proteins.</p> <p>Students conference with the teacher to demonstrate how to build proteins with physical models.</p>	<p>L3D6</p> <p>Students identify ways to best communicate the mutation narrative to their patients. They develop that section of their Genetic Test Report further.</p>

UNIT 1 CALENDAR

<p>Lesson 4 Day 1</p> <p>Students consider environmental factors that cause genetic mutations and the impact on specific regions of the world.</p> <p>Students develop deeper understanding of adaptations and gene expression.</p>	<p>L4D2</p> <p>Students deepen their understanding of inherited disease treatments by working through self-guided mini-sessions.</p>	<p>L4D3</p> <p>Students continue deepening their understanding of inherited disease treatments by working through self-guided mini-sessions.</p>	<p>L4D4</p> <p>Students research preventative and reactive treatments for their patient's inherited disease.</p>	<p>L4D5</p> <p>Students learn about the ethical dilemmas surrounding gene editing.</p> <p>Student consider bioethics through the perspectives of genetic counselors and patients.</p>	<p>L4D6</p> <p>Students continue developing their Genetic Test Report.</p> <p>Info to add:</p> <ul style="list-style-type: none"> How can you treat your inherited disease?
<p>Lesson 5 Day 1</p> <p>Form partner groups to present their Genetic Test Report to their patients.</p> <p>Review deliverables with students.</p> <p>Students compare information in their genetic report.</p> <ul style="list-style-type: none"> What are the differences in your reports? What are the similarities? 	<p>L5D2</p> <p>Team building activity/ norm setting</p> <p>Develop team contract/ agreements</p> <p>Read article on health literacy</p> <p>Review patient profile cards with partner to discuss implications for their patient.</p> <p>Provide script template for students to develop how they're going to communicate to their patient.</p>	<p>L5D3</p> <p>Model how to take information from their genetic test reports to create their script outline.</p> <p>Decide how to communicate each section to their patient considering the patient profile and their genetic test reports.</p>	<p>L5D4</p> <p>Work Time/ Presentation Development</p>	<p>L5D5</p> <p>Fishbowl presentation/ observation</p> <p>Students consider how elements like age, gender, culture can impact how they present their information.</p> <p>What are the considerations you will need to make when planning your communication?</p> <ul style="list-style-type: none"> Age Gender Culture <p>Time to revise</p>	
<p>Lesson 6 Day 1</p> <p>Partners finish their script and visuals, and prepare for this week's presentations.</p> <p>Prep for feedback on Day 2</p>	<p>L6D2</p> <p>Students present to a small group of peers for feedback.</p> <p>Students give and receive feedback using a Tuning Protocol.</p>	<p>L6D3</p> <p>Students make revisions and present again, receiving a final round of feedback.</p>	<p>L6D4</p> <p>Students make final revisions, then record and submit presentation.</p>	<p>L6D5</p> <p>Presentations and Reflection</p>	<p>L6D6</p> <p>Reflect on the project and celebrate completed tasks.</p>