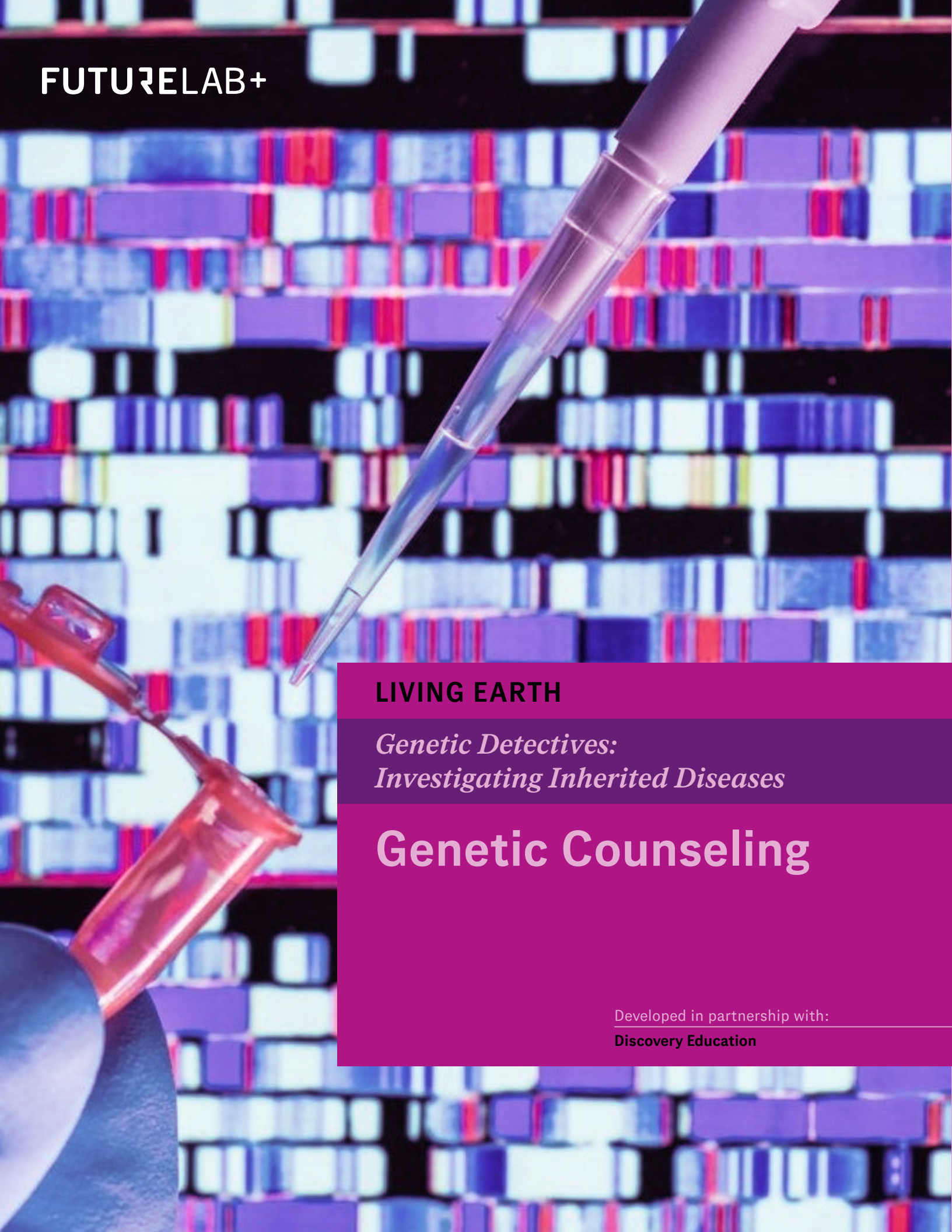
FUTURELAB+



LIVING EARTH

Genetic Detectives:
Investigating Inherited Diseases

Genetic Counseling

Developed in partnership with:

Discovery Education

In this Lesson Plan:

Print the **Teacher Section** →

Print the **Student Section** →

Cover Image
Genetic research, pipetting into a test tube in front of a DNA autoradiogram

This document is separated into two sections, For Teachers [T] *and* Student Resources [S]*, which can be printed independently.*

Select the appropriate printer icon above to print either section in its entirety.

Follow the tips below in the Range field of your Print panel to print single pages or page ranges:

Single Pages (use a comma): T3, T6

Page Range (use a hyphen): T3–T6

LIVING EARTH / INVESTIGATING INHERITED DISEASES

Treatments For our Our Patient's Disease

ACTIVITY DURATION

Six days

DRIVING QUESTION

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

ESSENTIAL QUESTIONS

How do we present our information clearly, concisely, and logically?

How do we ensure we include key information, develop ideas, and present in a manner appropriate for our purpose, task, and audience?

OVERVIEW

This lesson begins with student pairs writing a script to present their test findings to their patients. Pairs will need to build consensus about which pieces to use from each of their individual genetic reports. They will then use a *Tuning protocol* to present to their peers and receive feedback. They will then revise their presentations based on the feedback received, record their videos, and submit them via *Flip*.

OBJECTIVES

Students will be able to:

Discover how to provide meaningful and specific feedback to peers.

Develop and strengthen written and oral presentation skills based on purpose, audience, and delivery mode (written versus oral).

Demonstrate an understanding of the benefits of transforming quantitative or technical information into effective visuals and vice versa.

STUDENT TASKS

Day 1	*Day 2*	*Day 3*	*Day 4*	*Day 5*	*Day 6*
Prepare their final presentations and any visuals they will use.	Present to a small group of peers for feedback. Give and receive feedback using a *Tuning protocol*.	Revisions and continued peer feedback.	Continue to revise. Make final recordings for *Flip* presentations.	Present their information using *Flip*.	Finish presenting their information using *Flip*. Reflect on the project and celebrate completed tasks.

MAKE CONNECTIONS!

How does this connect to the larger unit storyline?

During Lesson 6, students will provide their answers to the unit's driving question by presenting their findings, which include what has been learned at all stages of the project.

How does this connect to careers?

Pharmacologists research and develop new drug therapies. They work to make sure that any new drugs put on the market are safe and effective.

Account managers connect drug manufacturers to hospitals and health care facilities by recommending and selling therapies. Account managers must have a strong understanding of diseases and the most recent treatment options available in order to educate practitioners on the benefits of their company's therapy. They also can provide feedback to the manufacturer about the rate of demand for new treatments and therapies.

Insurance claims specialists review patient cases and pay health care providers for services rendered to the insurance holder. They must have a strong working knowledge of medical terminology and good communication skills in order to speak with patients and healthcare providers.

How does this connect to our world?

Students learn the importance of the connection between health literacy and the ultimate responsibility we have to care for ourselves and to make educated decisions about our health. In addition, they learn about the importance of advocating for and sharing health knowledge if and when possible.

Pedagogical Framing

Instructional materials are designed to meet national education and industry standards to focus on in-demand skills needed across the full product development life cycle—from molecule to medicine—which will also expose students and educators to the breadth of education and career pathways across biotechnology.

Through this collection, educators are equipped with strategies to engage students from diverse racial, ethnic, and cultural groups, providing them with quality, equitable, and liberating educational experiences that validate and affirm student identity.

Units are designed to be problem-based and focus on workforce skill development to empower students with the knowledge and tools to be the change in reducing health disparities in communities.

SOCIAL-EMOTIONAL LEARNING

In the role of a genetic counselor, students practice and record a video of a genetics testing report for a patient with a specific genetic disease. This allows for the use of empathy (a self-awareness skill) for those suffering with the disease, as well as having the social awareness of recognizing the perspective of the target audience. Students must also practice self-management skills such as giving and receiving appropriate peer feedback and practicing social awareness skills, such as overcoming frustrations while collaborating with their peers. The genetics testing report video presentation must relate to people of various ethnicities and socioeconomic backgrounds.

CULTURALLY AND LINGUISTICALLY RESPONSIVE INSTRUCTION

This lesson applies culturally and linguistically responsive instruction to providing appropriate feedback on the video presentation of a genetic test report. When recording the report, students must take into consideration factors of age, gender, culture, and health literacy challenges with clients. They must find strategies to use in order to make their reporting as clear as possible. The lesson offers opportunities for creating empathetic, culturally and linguistically responsive reports on genetic findings. Peer feedback provides support for culturally and linguistically diverse students' use of standard English, while bridging the content from scholastic research to the reality of delivering complex information to a varied population.

ADVANCING INCLUSIVE RESEARCH

In this lesson, students gain experience with making process improvements. In order to make sure that clinical trials are as effective and inclusive as they can be, researchers must frequently make improvements in trial design. One such process improvement is the reexamination of clinical trial site selection. By partnering with large research hospitals and smaller, community-based hospitals, scientists can recruit more diverse trial participants.

COMPUTATIONAL THINKING PRACTICES

The computational thinking strategy of developing algorithms is helpful for software engineers who write code, but it is also a helpful way to design process improvements. In this lesson, students develop a *Tuning protocol* in order to improve their testing reports. As they tweak and refine their product, they proceed through a series of steps that form an algorithm for how to collect feedback. By collecting and analyzing this data, students are gaining experience with two other key computational thinking strategies.

CONNECTION TO THE PRODUCT LIFE CYCLE

By continually refining and improving their testing reports, students are simulating the processes of quality control and compliance. These checks are an important part of the Manufacturing phase of the product life cycle.

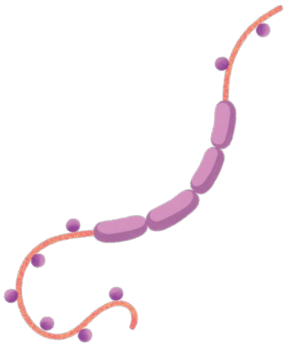
Day 1

Slides 1–7

CULTURALLY AND LINGUISTICALLY RESPONSIVE INSTRUCTION

Peer collaboration and feedback provides support for culturally and linguisticall diverse students' use of standard English, while bridging the content from scholastic research to the reality of delivering complex information to a varied population.

Slides 1–7	
Students prepare their final presentations and any visuals they will use. (45 minutes)	
1	Have students use the rubric to individually assess their own work. Have partners share and decide on their focus for work time. Work Time Expectations: Develop the script for their presentations along with any visuals that will be used.
2	Tell students to be prepared to present to a small group of students next class session.



Day 2

Slides 8–10

INDUSTRY & CAREER CONNECTION

As students develop their Flipgrid and present it to the class, they are using skills that pharmaceutical account managers utilize in their daily work. These professionals present to new clients and must communicate effectively in order to build a customer relationship.

Slides 8–10

Students present to a small group of peers (who are assigned different patients) for feedback. Students will give and receive feedback using a *Tuning protocol*. (45 minutes)

1. Tell students they will share their presentations with two other groups and receive feedback. They will need to have the following with them during this feedback session:
   - **a.** Presentation script and any visuals for the presentation
   - **b.** Project Rubric
   - **c.** The completed **Genetic Test Report**
   - **d.** Notebook paper, pencil
2. Group three pairs of students who each have a different patient.
3. Review the protocol with students. Remind them that you will call time to move them from one step to the next. While receiving feedback, the presenter should only listen and take notes.
   - **a.** **Presentation** (5 minutes) Before presenting, each pair shares their patient profile card with the audience. While presentations are being made, the audience takes notes.
   - **b.** **Clarifying Questions** (1 minute) Audience asks clarifying questions. Presenter may respond.
   - **c.** **Individually Assess** (1 minute) Audience reviews rubric and prepares feedback.
   - **d.** **Praise** (2 minutes)
     - "I like…"
     - "When you said… it stood out because…"
   - **e.** **Question** (2 minutes)
     - "I wonder…"
     - "One question I have is…"
   - **f.** **Suggest** (2 minutes)
     - "One change I would make is…"
     - "I suggest…, because…"

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Day 2

Continued

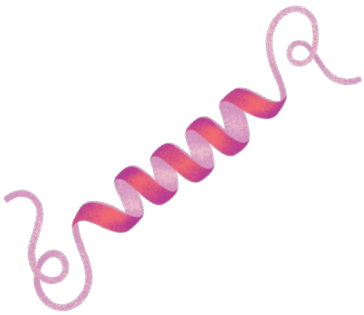
Slides 8–10

4. Repeat with the Round 2 of presenters. Save Round 3 for the next class session as there will not be enough time.

5. Whole Group Debrief:

   a. What was helpful about this feedback process today, in both roles?

   b. How did your feedback group do with the protocol? How might you be able to improve (individually or collectively) for the next round?



Day 3

Slides 11–15

COMPUTATIONAL THINKING IN ACTION

As students work through the Tuning protocol, they are using the computational thinking strategy of developing algorithms to refine the process of collecting feedback.

Slides 11–14

Begin Round 3 of *Tuning protocol* for peer feedback. (20 minutes)

1	Have feedback groups from the prior day regroup and review the *Tuning protocol*. Then revisit the final reflection question from the day before: How did your feedback group do with the protocol? How might you be able to improve (individually or collectively) for the next round?
2	Complete Round 3 of the *Tuning protocol*.
3	Whole Group Debrief:
	+/Δ (plus/delta): What is one piece of your work that was affirmed (+) today, and what is one change (Δ) you want to make?

Slides 15

Pairs review feedback that was given and decide on a course of action to revise the presentation. They revise presentation scripts and visuals (if appropriate) and prepare for the final presentation. (25 minutes)

COMPUTATIONAL THINKING IN ACTION

Here, students use the computational thinking strategy of analyzing data to review feedback and decide which revisions they will make.

Pairs discuss the feedback they received during the *Tuning protocol* and decide on any revisions they will make during the final work session.

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Day 4

Slides 16–18

Slides 16–18

Students record final presentation via *Flip*. (45 minutes)

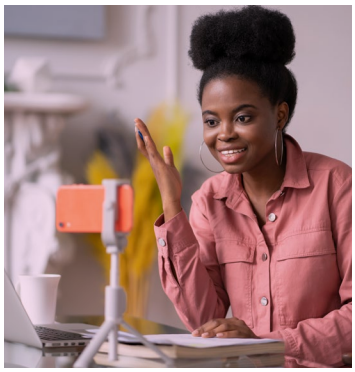
1. **Prepare ahead of time:** If you do not already have an account, set up a *Flip Educator* account. Create four separate groups, one for each patient. Be sure to capture the group codes for each patient group. You will need to share these with students. Add a discussion topic for each patient that includes the following directions:

2. Title of Post: Patient Name

3. Prompt: The following should be posted as a response in *Flip*:
   - **a.** Recorded presentation to patient(s)
   - **b.** Medical report with visuals

4. In Class:
   - **a.** Review directions for submission with students.
   - **b.** Provide each pair of students with the *Flip* code they will need to add their video responses.
   - **c.** Give a brief tutorial of how to post a response if your students are new to *Flip*.
   - **d.** Uploading a link to the **Genetic Test Report**:
     - If using Google: Remind students to change the share settings so anyone with the link can view and then simply copy and paste the link to their report into the "Link" section of the *Flip* response.
     - If you do not have access to Google or another form of cloud document storage, you may wish to omit this part and have students print out a copy of their **Genetic Test Report** for the exhibition.
     - You may also wish to have the visuals printed out or linked separately for quick reference.

5. Give students the remainder of the class session to record and submit their work.



Day 5

Slides 19–21

Slides 19–20

Prep Ahead of Time: Divide room into four spaces, one area for each patient. Number each presentation station making sure you have a number for each group. Make copies of the *Patient Response and Reflection* capture sheet. Each student will need three copies.

During Class:

a. Students should set up their reports and visuals (if printed) and *Flip* video presentations.

b. Inform students that they will be visiting and listening to two presentations today and one tomorrow.

c. They will serve an important role as the patients in these presentations.

d. Review the *Patient Response and Reflection* capture sheet with the class.

Slide 21

Students will review two presentations, and reflect and respond. (35 minutes)

1 Have students begin the review of their project. Have them take note of the number at their station.

2 Instruct students to now rotate to a new patient, but to find the same number that matches the number at the station.

Teacher note > *If you do not have equal numbers of projects per patient, you will need to instruct groups what number project to review.*

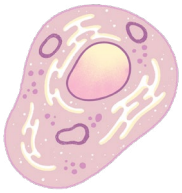
3 Remind students that while they are still with their partners, you would like them to watch the presentation and respond on the reflection sheet individually. Have students keep their reflection sheets until tomorrow.

4 Allow 15 minutes for each rotation. Keep the prompt slide visible.

5 After 15 minutes, have students rotate.

Day 6

Slides 22–25



Slides 22–23

Have students set up presentations and complete final round of review. (20 minutes)

Repeat presentation cycle—Round 3.

Slides 24–25

Reflection and Celebration (25 minutes)

1	Have students return the completed *Patient Response and Reflection* capture sheets to the station of the project reviewed.
2	Groups return to their own station and review the feedback from their peers.
3	Prompt groups to consider what worked well during this project and what pieces made them feel proud of their effort. Allow pairs to share aloud.
4	Revisit N2Ks one last time. Consider any questions that still remain and discuss how students might continue this work in the future.
5	Have each pair share what was the most challenging part of this project and what they might do differently if they were to complete this project again. Take time to celebrate the successful learning and hard work.
6	Listen carefully for additional scaffolding pieces that might be needed for your next project with these students or insights on how you might revise this project for next year!

National Standards

Next Generation Science Standards

Science and Engineering Practices (SEP)	Disciplinary Core Ideas (DCI)	Crosscutting Concepts (CC)
Practice 6 **Constructing Explanations and Designing Solutions** Design a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.	**ETS1.C** **Optimizing the Design Solution** Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed.	**Constructing Explanations and Designing Solutions** Design a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.

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Patient Response and Reflection

Directions
Watch the presentation. Respond with reflective comments based on the expectations below. Use the Feedback column for areas of growth and the Exceeded column for areas that glow.

Your name:

Presentation Reviewed:

Feedback How can this presentation be improved?	**Baseline** This presentation met all expectations.	**Exceeded** How does this presentation exceed expectations?
	All findings, including information, hereditary considerations, likelihood of survival and reproduction, and treatments available were clearly communicated in a way that I understood. I feel like I can make an educated decision on how to move forward in this process.	
	The genetic counselors paid careful attention to my background information and used tone and language that showed sensitivity and expressed care while still delivering unbiased facts about this disease.	
	The patient resource with visuals was well-organized and presented in a way that helped me better understand the most important and technical information presented.	