Genetic Testing and Bio-Engineering: Just because we can, does it mean we should?

Content Area			Grade Level	
English Language Arts	**Science, Life Science**	U.S. History	**Middle School**	High School

Approximate Time Needed: Four to six weeks

UNIT OVERVIEW

Essential Questions: How does heredity explain the diversity among living organisms? What role should ethics play in the field of genetic science?

Common Assignments:

Developing and using a model: Students conduct an investigation (Fish in a Pond Investigation) to determine how natural selection can lead to changes in a species over time. In the lab, students make a hypothesis, model the events involved in a genetic cross, identify genotype and phenotype, complete Punnett squares over multiple generations, calculate the probability of each type of offspring, and explore how both genetic and environmental factors play a part in natural selection.

Engaging in argument with evidence: In the LDC module, students select a topic, research, and write a scientific editorial to a *Science Scholar Magazine* issue entitled: "Genetic Testing and Bio-Engineering: Just because we can, does it mean we should?" In the editorial they need to take a position on what role ethics should play in the field of science they researched.

Engaging in argument with evidence: At the end of the unit, students are hired as a team of lobbyists (an economist, an environmentalist, a farmer, and a doctor) to make a presentation to persuade a government panel to decide whether or not to ban genetically modified foods.

KEY STANDARDS

NGSS

MS-LS3-2

MS-LS4-4

MS-LS4-5

MS-LS4-6

Common Core

CCSS.RST.6–8.1

CCSS.WHST.6–8.1

Colorado

SC 8.2.2.a–d

COMMON ASSIGNMENTS

- Pre- and Post-Assessments consisting of multiple-choice and constructed responses (optional)
- Fish in a Pond Investigation Report
- LDC Argumentative Essay: What Role Should Ethics Play in Genetic Testing or Bio-Engineering?
- Genetically Modified Food Lobbyist Project

LDC TEACHING TASK

Task Template 2, Argumentation/Analysis
What role should ethics play in genetic testing or bio-engineering? After reading informational texts addressing a selected topic, write an editorial that addresses the question and support your position with evidence from the text(s).
L2: Be sure to include and address competing viewpoints.
L3: Give examples from past or current events or issues to illustrate and clarify your position.

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COMMON ASSIGNMENT STUDY

November 2015

BILL & MELINDA GATES foundation

About the Common Assignment Study

The Common Assignment Study (CAS) represents an effort to strengthen instruction through the integrated development of curriculum, instructional supports, and embedded assessments. Led by teachers in Colorado and Kentucky, CAS produced multiple high-quality instructional units in science, history, and English language arts. As new academic standards and assessments are being adopted across the states, CAS showcases teachers' pivotal role in translating these larger initiatives into rigorous and relevant classroom experiences for their students.

The CAS instructional units—which include classroom activities, assessments, and rubrics for scoring student work—were developed using the Understanding by Design framework. Each unit was strengthened by integrating a Literacy Design Collaborative (LDC) module to help scaffold and support the development of students' content literacy. Over a two-year period, the teachers developed, taught, and revised the units with the support and leadership of The Colorado Education Initiative and The Fund for Transforming Education in Kentucky; the subject matter expertise provided by the Stanford Center for Assessment, Learning and Equity; and the research support of the Center for Assessment. Throughout the study, which was funded by the Bill & Melinda Gates Foundation, Westat provided technical assistance and support and collected student work samples and scores from each unit.

The units contain shared elements ("common assignments") that were collaboratively developed and used by teachers in both states. However, teachers maintained flexibility and autonomy to tailor the units to meet local needs and make contextualized instructional choices. Teacher-leaders have taken active roles in facilitating the collaborative design process. Teachers have reported that newly developed tools and strategies have better engaged their students and provided them with richer opportunities to demonstrate their understanding of the material. Research for Action has studied the implementation of the CAS units and gathered feedback to improve how districts and schools can use CAS resources to support the integrated use of teacher-developed curricula, instructional supports, and embedded assessments.

COMMON ASSIGNMENT STUDY
www.commonassignment.org

BILL & MELINDA GATES foundation
www.gatesfoundation.org

Center for Assessment
www.nciea.org

THE COLORADO EDUCATION INITIATIVE
www.coloradoedinitiative.org

THEFUND FOR TRANSFORMING EDUCATION
www.thefundky.org

RESEARCH for ACTION
www.researchforaction.org

SCALE
Stanford Center for Assessment, Learning, & Equity
scale.stanford.edu

Westat
www.westat.com

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Desired Outcomes

Priority Standards

Next Generation Science Standards

MS-LS3-2 Develop and use a model to describe why … sexual reproduction results in offspring with genetic variation.

MS-LS4-4 Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.

MS-LS4-5 Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.

MS-LS4-6 Use mathematical representations to support explanations of how natural selection may lead to increases and decreases in specific traits in populations over time.

Common Core Literacy in Science and Technical Subjects

CCSS.RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts.

CCSS. WHST.6-8.1 Write arguments focused on *discipline-specific content*.

Colorado Standards, Evidence Outcomes

Students can:

SC.8.2.2.a Develop, communicate, and justify an evidence-based scientific explanation for how genetic information is passed to the next generation.

SC.8.2.2.b Use direct and indirect observations, evidence, and data to support claims about genetic reproduction and traits of individuals.

SC.8.2.2.c Gather, analyze, and interpret data on transmitting genetic information.

SC.8.2.2.d Use models and diagrams to predict the phenotype and genotype of offspring based on the genotype of the parents.

Transfer

Students will be able to independently use their learning to ...

- Explain how heredity and natural selection can lead to changes in a species over time.
- Take positions on current events related to genetic science.

Cross-Curriculum Transfer

Students will engage in …

- **Mathematics:** calculating probabilities and graphing data over numerous generations using Punnett squares **(Fish in a Pond Investigation).**
- **English Language Arts:** creating an authentic writing piece that requires research, pre-writing, editing **(LDC argumentative essays and Genetically Modified Food Lobbyist Project).**
- **Social Studies:** analyzing ethnical issues on genetic testing and bio-engineering **(LDC argumentative essays and Genetically Modified Food Lobbyist Project).**

Meaning

Understandings/Big Ideas

Students will understand that …

- Characteristics of an organism are controlled by genes, which may be inherited by offspring.
- DNA changes in populations over time and causes variation.
- Traits appear in two forms: dominant and recessive.
- Humans can select for specific traits, the role of technology, genetic modification, and the nature of ethical responsibilities related to selective breeding.

Essential Questions

Students will keep considering …

- How does heredity explain the diversity among living organisms?
- How are traits passed from one generation to the next?
- What traits can be passed to the next generation, and what traits cannot?
- How can patterns in the inheritance of traits be used to predict how frequently they appear in offspring?
- What role should ethics play in the field of genetic science?

Acquisition

Know (Content)

Students will know that …

- Genes contain the information needed for organisms to pass their characteristics along to offspring and that those are expressed as either dominant or recessive traits.
- As technology advances, humans will face new ethical decisions regarding genetics. (MS-LS4-5)
- Genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.
- Unit specific vocabulary. (All)
- Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. (MS-LS3-2)

Variation of Traits

- In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. (MS-LS3-2)
- In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. (To be covered by teachers outside of common assignments.) Some changes are beneficial, others harmful, and some neutral to the organism. (MS-LS3-1)

Natural Selection

- In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring. (MS-LS4-5)

Do (Skills)

Students will be skilled at …

Science and Engineering Practices

- Carrying out an investigation (simulation)
- Developing and using models
- Analyzing and interpreting data:
  - Determining genotypes and phenotypes.
  - Constructing and analyzing graphs.
  - Completing and analyzing Punnett squares.
- Using mathematics and computational thinking:
  - Determining the probability of a certain outcome of a genetic cross.
- Constructing explanations.
- Engaging in arguments from evidence.
- Obtaining, evaluating, and communicating information and evidence.

Literacy Skills

- Determining the central ideas or conclusions of a text; providing an accurate summary of the text distinct from prior knowledge or opinions. (MS-LS1-5)
- Integrating quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-LS3-1–2)
- Tracing and evaluating the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not. (MS-LS1)
- Writing arguments focused on discipline content. (MS-LS1-4)
- Drawing evidence from informational texts to support analysis, reflection, and research. (MS-LS1-5)
- Including multimedia components and visual displays in presentations to clarify claims and findings, and emphasizing salient points. (MS-LS3-1–2)

Technology

- Ethically using technology for research purposes.

Acceptable Evidence of Results

Assessments

Key performance tasks, tests, etc., including LDC task

1. **Pre- and Post-Assessment:** Students demonstrate their content knowledge and ability to apply their knowledge to solve basic genetic problems.
2. **Fish in a Pond Investigation:** Students conduct an investigation to determine how natural selection can lead to changes in a species over time. In the lab, students make hypothesis, model the events involved in a genetic cross, identify genotype and phenotype, complete Punnett squares over multiple generations, calculate the probability of each type of offspring, and explore how both genetic and environmental factors play a part in natural selection.
3. **LDC Argumentative Essay: What Role Should Ethics Play in Genetic Testing or Bio-Engineering?** Students select a topic, research and write a scientific editorial to a *Science Scholar Magazine* issue entitled: "Genetic Testing and Bio-Engineering: Just because we *can*, does it mean we *should*?" In the editorial, they need to take a position on what role ethics should play in the field of genetic science they researched.
4. **Genetically Modified Food Lobbyist Project:** Students are hired by a client to make a presentation to persuade a government panel to decide whether or not to ban genetically modified foods.

Supports/Scaffolding

How will learning and assessment tasks be scaffolded/supported for ALL students (ELL, special education, low performing, etc.)?

1. **Pre-Assessment:** A modified version of the test was made to simplify the language complexity without watering down what is being assessed.
2. **Fish in a Pond Investigation:** Punnett squares and data tables are provided to help the students complete the lab.
3. **LDC Argumentative Essay: What Role Should Ethics Play in Genetic Testing or Bio-Engineering?:** Students will select one of three topics and engage in pre-writing activities to help them develop topic focus. There are a variety of reading and writing scaffolds for students available in the module. Many of the texts vary in reading level so that each topic will be accessible for all students in the class. Students are provided with a module writing organizer and template to help them stay on pace and know what needs to be done. Peer edits and self-assessment will be utilized in the writing process to ensure students' progression as writers.
4. **Post-Assessment:** A modified version of the test was made to simplify the language complexity without watering down what is being assessed.
5. **Genetically Modified Food Lobbyist Project:** Students who struggle with literacy have an alternative method of demonstrating their content understanding in the short oral presentation of their work. Students investigate the issue of genetically modified foods and, representing a specific client, they take a position of whether genetically modified foods should be banned or not. Students will be asked to share a visual representation to aid in the presentation. The presentation and visual appeal to multiple modalities of the range of learners in the teachers' classrooms.

Evaluative Criteria

Scoring Keys and Rubrics

1. Pre- and Post-Assessment Key
2. Fish in a Pond Rubric
3. Modified LDC Rubric: Score student work on the following: Focus, Reading/Research, Development, and Content Understanding.
4. Genetically Modified Food Lobbyist Project Rubric

Learning Experiences and Instruction

Unit Texts and Materials	**Fish in a Pond Investigation Materials (per group)** • 30 orange goldfish • 30 pretzel goldfish • 30 white goldfish • Bowl or bag to be used as a pond • Three napkins labeled “prey,” “female,” and “male” • Graph paper • Student version of the lab
	LDC Argumentative Essay: What Role Should Ethics Play in Genetic Testing or Bio-Engineering? • The LDC Core Tools contain an instructional plan for teaching the whole module as well as a teacher version of the LDC module with all the mini-tasks, texts, and videos. • The student version uses a bird dog picture to introduce the concept of genetic changes in organisms and presents the prompt and the LDC essay template. • It is also suggested that pre-reading and pre-writing activities and peer edits be used to help students create a quality product.
	Genetically Modified Food Lobbyist Project • The teacher version contains the descriptions of the companies, a summary of the proposed legislation, suggested vocabulary, and suggestions for implementing the activity. • For digital presentations, necessary technology is required. Students will need to have access to PowerPoint and/or iMovie software, video cameras, or iPhones.
Assessment Tasks	**Pre-Assessment** • Pre-assessment consists of both multiple choice and constructed response.
	Mid-Assessment • Fish in a Pond investigation report • LDC argumentative essay
	Summative/Unit Assessment • Post-assessment consists of both multiple choice and constructed response and is the same as the pre-assessment, which will enable teachers to compare students’ knowledge before and after the unit. • Genetically Modified Food Lobbyist Project

Learning Tasks	***The Instructional Ladder:*** *Sequence of learning activities to prompt and guide student growth. Add pages accordingly.*

Fish in a Pond Investigation:

Students make a hypothesis, model the events involved in a genetic cross, identify genotype and phenotype, complete Punnett squares over multiple generations, calculate the probability of each type of offspring, and explore how both genetic and environmental factors play a part in natural selection.

LDC Argumentative Essay: What Role Should Ethics Play in Genetic Testing or Bio-Engineering?

The LDC is one task, but students are given a choice of topic: Designer Babies, Genetic Testing, or the Combined DNA Index System. Teachers may choose to limit the topic choice to one or two instead of using all three research prompts.

- **Mini-Tasks:** All the mini-tasks and resources are listed in the LDC module. It is also suggested that pre-reading and pre-writing activities and peer edits be used to help students create a quality product.
- **Ethics Jigsaw: This is a mandatory mini-task** so students can acquire background knowledge on the approaches to ethics and identify themselves within the ethics framework. Teacher directions and student handouts are included in the LDC module. Approaches to Ethics Jigsaw "Thinking Ethically: A Guide to Moral Decision Making"
- Go over LDC Rubric—what meets expectations?
- **"What is an Editorial?" mini-task:** This is important and essential for students to complete.
- Read articles— Active Reading Strategy (teaching tool, not to be collected)
- **Context Vocabulary Acquisition mini-task** is needed as part of close reading strategy, but each teacher may do this mini-task as he or she wishes.
- Complete Reading Graphic Organizer—note-taking
- Plagiarism video
- Examples of note-taking (optional)
- Writing strategies
  - Paper outline
  - One to three sentence position statement
  - First draft of paper
  - Peer and teacher review (see Peer Editing Review Sheet—optional)
- Making revisions and writing final paper
- It is suggested that computer lab/library time be provided for students in order for them to research and complete their paper.

Genetically Modified Food Lobbyist Project

- Introduce the task, company descriptions, and roles (available in unit materials).
- Assign two to four students to each of the five companies listed in this document or write descriptions of local companies to make it more relevant to your students. Students may not personally agree with their company's perspective, but they should stay in character.
- Discuss the role of a lobbyist—what they do, how they help to support the interests of a specific group and/or company.
- Introduce proposed legislation: Genetically Engineered Foods Right to Know Act. Summary of proposed legislation available in unit materials. Full legislation proposal is available at www.govtrack.us/congress/bills/113/hr1699/text.
- Brainstorm basic pros and cons of proposed legislation from a company's perspective.
- Embedded vocabulary activity—teacher choice. Vocabulary list is available in unit materials.
- Students may keep individual vocabulary journals depending on company perspective and research materials.
- Students use pro and con lists to develop research questions.
- Students perform research. From research, each student generates three claims with evidence and reasoning that supports the position of the group. Remind students about the importance of using credible sources.
- Students peer assess each other's claims, evidence, and reasoning within groups.
- Students turn in an outline of their claims, evidence, and reasoning for teacher feedback and check-in.
- Using their research findings, students create multimedia presentations that clearly state and explain their position on genetically modified foods.
- Students make presentations to legislators.

Unit Sequence

This is an example of one teacher's unit sequence that illustrates how she incorporated the Genetic Testing and Bio-Engineering common assignments into her existing genetics unit. The tan rows are the common assignments, and the rest of the unit can be used as suggested activities, or you can replace them with activities that you already use in your curriculum.

Class Periods	Assignment Title	Resources and Information
1	**Genetics Common Pre-Assessment**	Standard and modified versions and keys available in unit materials. Modified version is for students who may have reading disabilities or for English language learners. Some language is less complex. Some questions require less reading.
1	**Bikini Bottom Genetics**	Assignment and key available on website: http://sciencespot.net/Media/gen_spbobgenetics.pdf. Use after basic introduction or textbook reading on genetics. Students use content vocabulary in context and solve word problems.
1	**Vocabulary Activity**	Teacher choice—see LDC Sequence 5b for active reading vocabulary for current event article or whole class close reading. Essential vocabulary for unit: genetics, heredity, genotype, phenotype, homozygous, heterozygous, Punnett square, probability, hybrid, dominant trait, recessive trait, allele
.5–1	**Punnett Square Formative Assessment**	Teacher choice—any practice problems can be used as a formative assessment. Included here are links to practice problems and an interactive online quiz. **Practice problems:** • http://www.csun.edu/~dcw04262/files/pdf/Punnett%20Square%20Practice%20Pages.pdf • http://teacher.sduhsd.net/hmichel/documents/SALI/SALI%20Year%203/Unit%20D/Unit%20D2.pdf • http://sms.smyrna.k12.de.us/ourpages/auto/2015/1/30/40086859/WhatColorIsThePod.pdf **Interactive quiz:** http://www.quia.com/quiz/806830.html
1–3, depending on teacher choice of activity	**Inherited Traits Lab**	Teacher choice—there are many labs in which students can investigate inheritance of traits. Students can use simulations; flip coins; take surveys; or create pets, monsters, rebops, fish, and many other organisms. • Monster Genetics Coin Flip Lab • Virtual Punnett Square Lab Using Fly Traits • Paper Pets • Rebops
3	**Fish in a Pond Investigation**	Common assignment included in the Genetic Testing and Bio-Engineering unit. The lab and rubric are in the teacher version.

1	**Cracking Your Genetic Code**	• Program description and video • Video worksheet: Available in genetics unit materials; alternate online worksheet at http://bouldercreekwinters.weebly.com/uploads/2/2/4/9/22494042/bioethics_cracking_your_genetic_code_video_questions.pdf What will it mean when most of us can afford to have the information in our DNA—all 6 billion chemical letters of it—read, stored, and available for analysis? "Cracking Your Genetic Code" reveals that we stand on the verge of such a revolution. Meet a cancer patient who appears to have cheated death and a cystic fibrosis sufferer breathing easily because scientists have been able to pinpoint and neutralize the genetic abnormalities underlying their conditions. But what are the moral dilemmas raised by this new technology? Will it help or hurt us to know the diseases that may lie in our future? What if such information falls into the hands of insurance companies, employers, or prospective mates? One thing is for certain: the new era of personalized, gene-based medicine is relevant to everyone, and soon you will be choosing whether to join the ranks of the DNA generation.
15	**Bio-Ethics LDC**	All of the instructional information and resources (texts and video) are included in the LDC Module. The sequence of activities within the LDC module includes: 1. Introduce students to the issue and the task by showing and discussing the Bird Dog Picture 2. Review approaches to Ethics Jigsaw—"Thinking Ethically: A Guide to Moral Decision Making" 3. Examine LDC Rubric—what meets expectations? 4. Discuss "What is an Editorial?" 5. Read articles using the Active Reading Strategy (not to be collected—teaching tool) a. Complete Reading Graphic Organizer—note-taking b. Article mini-task: contextual vocabulary c. Plagiarism video d. Examples of note-taking (optional) 6. Writing—draft one to three sentence position statement 7. Paper outline 8. Draft of paper 9. Peer and teacher review (see Peer Editing Review Sheet—optional) 10. Final paper
1	**Common Post-Assessment**	Standard and modified versions and keys available in unit materials. Modified version is for students who may have reading disabilities or for English language learners. Some language is less complex. Some questions require less reading.

5	**Genetically Modified Food Lobbyist Project**	1. Introduce the task, company descriptions, and roles. (Available in unit materials.) 2. Assign two to four students to one of the five companies listed in this document or write descriptions of local companies to make it more relevant to your students. Students may not personally agree with their company's perspective, but they should stay in character. 3. Discuss the role of a lobbyist—what they do, how they help to support the interests of a specific group and/or company. 4. Introduce proposed legislation: Genetically Engineered Foods Right to Know Act. Summary of proposed legislation is available in unit materials; full legislation proposal is available at http://www.govtrack.us/congress/bills/113/hr1699/text. 5. Brainstorm basic pros and cons of proposed legislation from a company's perspective. 6. Embedded vocabulary activity—teacher choice. Vocabulary list is available in unit materials. Students may keep individual vocabulary journals depending on company perspective and research materials. 7. Students use pro and con lists to develop research questions. 8. Students perform research. From research, each student generates three claims with evidence and reasoning that supports the position of the group. Remind student about the importance of using credible sources. 9. Students peer assess each other's claims, evidence, and reasoning within groups. 10. Students turn in an outline of their claims, evidence, and reasoning for teacher feedback and check-in. 11. Using their research findings, students create multimedia presentations that clearly state and explain their position on genetically modified foods. 12. Students make presentations to legislators.

Pre- and Post-Assessment

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Genetics Common Pre- and Post-Assessment, Version 1—KEY

Multiple Choice Questions

1. Which types of characteristics can be inherited?
   A. Those controlled by genes
   B. Those caused by accidents
   C. Those produced by exercise
   D. Those produced by diet

2. The passing of traits from parents to offspring is known as _____.
   A. Heredity
   B. Codominance
   C. Heterozygous
   D. Genotype

3. The inherited combination of alleles is known as the offspring's _____.
   A. Heredity
   B. Phenotype
   C. Pedigree
   D. Genotype

4. Mendel's early work with pea plants demonstrated a significant genetic discovery. The crossing of homozygous tall pea plants with homozygous short pea plants always resulted in tall plants and demonstrated that tallness in pea plants is a trait that is _____.
   A. Mutated
   B. Dominant
   C. Blended
   D. Recessive

5. Which of the following is a true statement?
   A. A phenotype is the entire genetic makeup of an organism, whereas a genotype is the combination of genes for one specific trait.
   B. A phenotype is the result of the environment on appearance, whereas a genotype is the result of genes on appearance.
   C. A phenotype is the appearance of an organism, whereas a genotype is the genetic makeup of the organism.
   D. A phenotype is the result of heterozygous alleles, whereas a genotype is the result of homozygous alleles.

6. Chromosomes are a very important part of the cell because _____.
   A. They help make our body strong
   B. They carry important proteins
   C. They carry our DNA
   D. They help hydrate our body

7. If you cross a white flower (with genotype **tt**) with a purple flower (with genotype **TT**), the possible genotypes of the offspring are _____.
   A. **TT** and **tt**
   B. All Tt
   C. All **TT**
   D. All **tt**

8. For the cross in question 7, what would the phenotype(s) be?
   A. 100% white
   B. 100% purple
   C. 100% tall
   D. 50% white, 50% purple

9. In the following Punnett square, what best describes the missing genotype?

RR	Rr
RR	

   A. Heterozygous dominant
   B. Heterozygous recessive
   C. Homozygous dominant
   D. Homozygous recessive

10. How can environmental changes affect the traits of an organism?
    A. Organisms that are best suited for environmental conditions or ones that adapt can survive and produce more offspring while organisms with less suitable traits die. This causes the number of organisms with a particular trait to be more dominant within the population.

    B. Environmental changes do not affect traits seen in organisms because organisms only inherit traits from parents. Traits are passed from parent to offspring no matter what the environmental conditions.

    C. Traits of a species remain constant and are controlled by how quickly the species can reproduce. The quicker the species is able to reproduce the more quickly the organism will inherit the traits.

    D. Populations are the cause of environmental changes and therefore cannot change the way traits are changed.

Open-Ended Questions

11. Probability is the mathematical chance that an event will occur. Explain the role probability plays in an organism's heredity.

    Each parent has two alleles for each trait but can only give one allele to the offspring. If a parent is heterozygous for a trait, the parent has a 50 percent probability of passing a dominant allele and a 50 percent probability of passing a recessive allele. If the parent is homozygous for a trait, there is a 100 percent probability of passing their allele to the offspring.

    When you know both parents' genotypes for a trait, you can calculate the probability of that trait showing up in the offspring.

12. Your dog Sally is going to have her puppies in a few months, and you are curious about what color the puppies' fur will be. Sally's fur is brown, and she is heterozygous for the fur trait. The father has white fur (homozygous recessive). Brown fur is dominant over white fur.

    A. Create a Punnett square for the cross between your dog Sally and the father.
    B. List the possible phenotypes and genotypes for their offspring.
    C. What percentage of the puppies is likely to have brown fur?

A.

	B	**b**
b	**Bb**	**bb**
b	**Bb**	**bb**

B. Phenotypes: Heterozygous brown and homozygous white

Genotypes: Bb and bb

C. The probability for puppies with brown fur is 50 percent. The probability for puppies with white fur is 50 percent.

Genetics Common Pre- and Post-Assessment, Version 2—KEY

Multiple Choice Questions

1. Which types of characteristics can be inherited?
   A. Those controlled by genes
   B. Those caused by accidents
   C. Those produced by exercise
   D. Those produced by diet

2. The passing of traits from parents to offspring is know as _____.
   A. Heredity
   B. Codominance
   C. Heterozygous
   D. Genotype

3. The inherited combination of alleles is known as the offspring's _____.
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4. Which of the following is a true statement?
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5. Chromosomes are a very important part of the cell because _____.
   A. They help make our body strong
   B. They carry important proteins
   C. They carry our DNA
   D. They help hydrate our body

6. A dominant allele _____.
   A. Overrides the effect of the other allele
   B. Is overridden by the other allele
   C. Is never passed from parent to offspring
   D. Is always passed and portrayed in the offspring

7. If you cross a white flower (with genotype **tt**) with a purple flower (with genotype **TT**), the possible genotypes of the offspring are _____.
   A. **TT** and **tt**
   B. All Tt
   C. All **TT**
   D. All **tt**

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    B. Environmental changes do not affect traits seen in organisms because organisms only inherit traits from parents. Traits are passed from parent to offspring no matter what the environmental conditions.

    C. Traits of a species remain constant and are controlled by how quickly the species can reproduce. The quicker the species is able to reproduce the more quickly the organism will inherit the traits.

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Open-Ended Questions

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    Each parent has two alleles for each trait but can only give one allele to the offspring. If a parent is heterozygous for a trait, the parent has a 50 percent probability of passing a dominant allele and a 50 percent probability of passing a recessive allele. If the parent is homozygous for a trait, there is a 100 percent probability of passing their allele to the offspring.

    When you know both parents' genotypes for a trait, you can calculate the probability of that trait showing up in the offspring.

12. Your dog Sally is going to have her puppies in a few months, and you are curious about what color the puppies' fur will be. Sally's fur is brown, and she is heterozygous for the fur trait. The father has white fur (homozygous recessive). Brown fur is dominate over white fur.

    A. Create a Punnett square for the cross between your dog Sally and the father.
    B. List the possible phenotypes and genotypes for their offspring.
    C. What percentage of the puppies is likely to have brown fur?

    A.

	B	**b**
b	**Bb**	**bb**
b	**Bb**	**bb**

    B. Phenotypes: Heterozygous brown and homozygous white

    Genotypes: Bb and bb

    C. The probability for puppies with brown fur is 50 percent. The probability for puppies with white fur is 50 percent.

Genetics Common Pre- and Post-Assessment, Version 1

Multiple Choice Questions

1. Which types of characteristics can be inherited?
   A. Those controlled by genes
   B. Those caused by accidents
   C. Those produced by exercise
   D. Those produced by diet

2. The passing of traits from parents to offspring is known as _____.
   A. Heredity
   B. Codominance
   C. Heterozygous
   D. Genotype

3. The inherited combination of alleles is known as the offspring's _____.
   A. Heredity
   B. Phenotype
   C. Pedigree
   D. Genotype

4. Mendel's early work with pea plants demonstrated a significant genetic discovery. The crossing of homozygous tall pea plants with homozygous short pea plants always resulted in tall plants and demonstrated that tallness in pea plants is a trait that is _____.
   A. Mutated
   B. Dominant
   C. Blended
   D. Recessive

5. Which of the following is a true statement?
   A. A phenotype is the entire genetic makeup of an organism, whereas a genotype is the combination of genes for one specific trait.
   B. A phenotype is the result of the environment on appearance, whereas a genotype is the result of genes on appearance.
   C. A phenotype is the appearance of an organism, whereas a genotype is the genetic makeup of the organism.
   D. A phenotype is the result of heterozygous alleles, whereas a genotype is the result of homozygous alleles.

6. Chromosomes are a very important part of the cell because _____.
   A. They help make our body strong
   B. They carry important proteins
   C. They carry our DNA
   D. They help hydrate our body

7. If you cross a white flower (with genotype **tt**) with a purple flower (with genotype **TT**), the possible genotypes of the offspring are _____.
   A. **TT** and **tt**
   B. All **Tt**
   C. All **TT**
   D. All **tt**

8. For the cross in question 7, what would the phenotype(s) be?
   A. 100% white
   B. 100% purple
   C. 100% tall
   D. 50% white, 50% purple

9. In the following Punnett square, what best describes the missing genotype?

RR	Rr
RR	

   A. Heterozygous dominant
   B. Heterozygous recessive
   C. Homozygous dominant
   D. Homozygous recessive

10. How can environmental changes affect the traits of an organism?
   A. Organisms that are best suited for environmental conditions or ones that adapt can survive and produce more offspring while organisms with less suitable traits die. This causes the number of organisms with a particular trait to be more dominant within the population.

   B. Environmental changes do not affect traits seen in organisms because organisms only inherit traits from parents. Traits are passed from parent to offspring no matter what the environmental conditions.

   C. Traits of a species remain constant and are controlled by how quickly the species can reproduce. The quicker the species is able to reproduce the more quickly the organism will inherit the traits.

   D. Populations are the cause of environmental changes and therefore cannot change the way traits are changed.

Open-Ended Questions

11. Probability is the mathematical chance that an event will occur. Explain the role probability plays in an organism's heredity.

12. Your dog Sally is going to have her puppies in a few months, and you are curious about what color the puppies' fur will be. Sally's fur is brown, and she is heterozygous for the fur trait. The father has white fur (homozygous recessive). Brown fur is dominant over white fur.

    A. Create a Punnett square for the cross between your dog Sally and the father.
    B. List the possible phenotypes and genotypes for their offspring.
    C. What percentage of the puppies is likely to have brown fur?

Genetics Common Pre- and Post-Assessment, Version 2

Multiple Choice Questions

1. Which types of characteristics can be inherited?
   A. Those controlled by genes
   B. Those caused by accidents
   C. Those produced by exercise
   D. Those produced by diet

2. The passing of traits from parents to offspring is known as _____.
   A. Heredity
   B. Codominance
   C. Heterozygous
   D. Genotype

3. The inherited combination of alleles is known as the offspring's _____.
   A. Heredity
   B. Phenotype
   C. Pedigree
   D. Genotype

4. Which of the following is a true statement?
   A. A phenotype is the entire genetic makeup of an organism, whereas a genotype is the combination of genes for one specific trait.
   B. A phenotype is the result of the environment on appearance, whereas a genotype is the result of genes on appearance.
   C. A phenotype is the appearance of an organism, whereas a genotype is the genetic makeup of the organism.
   D. A phenotype is the result of heterozygous alleles, whereas a genotype is the result of homozygous alleles.

5. Chromosomes are a very important part of the cell because _____.
   A. They help make our body strong
   B. They carry important proteins
   C. They carry our DNA
   D. They help hydrate our body

6. A dominant allele _____.
   A. Overrides the effect of the other allele
   B. Is overridden by the other allele
   C. Is never passed from parent to offspring
   D. Is always passed and portrayed in the offspring

7. If you cross a white flower (with genotype **tt**) with a purple flower (with genotype **TT**), the possible genotypes of the offspring are _____.
   A. **TT** and **tt**
   B. All **Tt**
   C. All **TT**
   D. All **tt**

8. For the cross in question 7, what would the phenotype(s) be?
   A. 100 % white
   B. 100% purple
   C. 100% tall
   D. 50% white, 50% purple

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   B. Environmental changes do not affect traits seen in organisms because organisms only inherit traits from parents. Traits are passed from parent to offspring no matter what the environmental conditions.

   C. Traits of a species remain constant and are controlled by how quickly the species can reproduce. The quicker the species is able to reproduce the more quickly the organism will inherit the traits.

   D. Populations are the cause of environmental changes and therefore cannot change the way traits are changed.

Open-Ended Questions

11. Probability is the mathematical chance that an event will occur. Explain the role probability plays in an organism's heredity.

12. Your dog Sally is going to have her puppies in a few months, and you are curious about what color the puppies' fur will be. Sally's fur is brown, and she is heterozygous for the fur trait. The father has white fur (homozygous recessive). Brown fur is dominant over white fur.

    A. Create a Punnett square for the cross between your dog Sally and the father.
    B. List the possible phenotypes and genotypes for their offspring.
    C. What percentage of the puppies is likely to have brown fur?

Common Assignment 1

Fish in a Pond Investigation

Table of Contents

Fish in a Pond Investigation

Learning Targets

Students will:

- Model how an organism's characteristics are controlled by genes and how these genes, in turn, may be inherited by offspring.
- Generate a hypothesis based on their background knowledge.
- Conduct and gather data during the simulation.
- Complete Punnett squares representing multiple generations.
- Calculate probabilities of offspring over multiple generations.
- Graph and analyze data from the simulation.
- Write conclusions based on data.

Criteria for Success

Complete the pre-lab, procedure, data table, graphing, and conclusion portions of this lab with 90 percent success.

Purpose

In this lab, students will investigate how natural selection can lead to changes in a species over time. Students will make predictions in the form of a hypothesis, model the events involved in a genetic cross, and explore how both genetic and environmental factors play a part in natural selection.

Student Materials for Each Group

- 30 orange goldfish
- 30 pretzel goldfish
- 30 white goldfish
- Bowl or bag to be used as fish pond
- Three napkins labeled "prey," "female," and "male"
- Graph paper

Teacher Materials

Baggy with nursery fish—this bag holds a variety of offspring fish to be delivered to each group after they have mated their parent fish using the Punnett squares. When students pull prey fish, they can go into this bag to be reused later as offspring.

Background Information

- The orange goldfish represent fish that have the smooth scale phenotype and are **homozygous dominant (DD).** Orange goldfish are delicious to predators.
- The white goldfish represent fish that have the smooth scale phenotype, the spike allele, and are **heterozygous dominant (Dd).** White goldfish are also tasty to predators.
- The pretzel goldfish represent fish with the spike scale phenotype, are **homozygous recessive (dd),** and are avoided by predators because of the spikey scales.

Student Procedures

Round 1: PLEASE DO NOT EAT THE GOLDFISH

1. Wash your hands.
2. Write the words “prey,” “female,” and “male” on your napkins.
3. Place the goldfish in the lake (bowl), and mix them around.
4. Choose one person to be the predator. While someone else counts to three, the predator picks a fish out of the pond one-by-one and places it on the “prey” napkin (try to pick smooth fish and avoid pretzel fish). Your prey fish are now dead and no longer part of the population.
5. Repeat step 4 until everyone in your group gets one chance to be a predator.
6. Close your eyes and choose, at random, **five fish** from the bowl and place them on the **“female” napkin.**
7. Close your eyes and choose, at random, **five fish** from the bowl and place them on the **“male” napkin.**
8. a) Now choose, at random, one male fish and one female fish from the napkins, and enter their genotypes (**male—top** of Punnett square, **female—left side** of Punnett square) into the Punnett square under generation one (F_1).

   b) Whichever square is shaded in each of the Punnett squares (1–5) will be the outcome of the offspring in the F_1 generation and needs to be introduced into the pond population. Take the offspring fish out of the nursery, and introduce them into the bowl. Reintroduce the parent fish back into the pond as well. If you do not have the phenotype (appropriate kind of goldfish) in your nursery, ask your teacher for a fish of that phenotype.
9. Repeat step 8 until you have five Punnett squares completed. You should have placed 15 fish back into the bowl (10 captured parent fish and five offspring).

Generation F_1 Punnett Squares

Students will complete 5 Punnett squares in Generation F_1. This is one sample.

1.	D	d
D	DD	Dd
d	Dd	dd

Using Mathematics—Generation F_1

Calculate the probability of the offspring for two of the above Punnett squares.

1st Punnett square
orange fish = ___of ___or ____ %
white fish = ___of ___or ____%

pretzel fish = ___of ___or ____%

2nd Punnett square
orange fish = ___of ___or ___%
white fish = ___of ___or ___%

pretzel fish = ___of ___or ____%

Round 2: PLEASE DO NOT EAT THE GOLDFISH

Repeat steps 4–9 using the Generation F_2 Data Table and the Generation F_2 Punnett Squares. Make sure that you introduced the offspring and reintroduced the parents back into the pond (bowl). Count the total number of each type of fish, and record it in the ending total for Generation F_1 and the starting total for Generation F_2.

Round 3: PLEASE DO NOT EAT THE GOLDFISH

Repeat steps 4–9 using the Generation F_3 Data Table and the Generation F_3 Punnett Squares F_3. Make sure that you introduced the offspring and reintroduced the parents back into the pond (bowl). Count the total number of each type of fish, and record it in the ending total for Generation F_2 and the starting total for Generation F_3.

Representing Data

Complete a graph on attached graph paper for data analysis that includes the following:

- A line graph using each generation of fish on the X-axis and ending population of fish on the Y-axis. You will have three lines, one for each fish phenotype: DD—red, Dd—blue, and dd—green.
- Remember your graphing rules:
  1. Title of your graph—what are you representing?
  2. Key—what do the different colors stand for?
  3. Even numbering/scale—use the squares on the graph paper equally.
  4. Labels on both axes—X and Y.

The directions for the graphing section are very specific, but you may want to do a mini-lesson on graphing before students begin to create their graphs.

Helpful Hints

1. When purchasing goldfish for a class of 30, estimate 1.5 bags of parmesan (white), 1.5 bags of cheddar (orange), and 2 bags of pretzel (spikey).
2. Orange goldfish can easily be purchased in bulk for a significant savings.
3. Bags of fish (ponds) can be reused for several class periods if students use their beginning and ending population numbers as a place to pause the lab. In this case, each day would begin with students counting their fish, referring to data, and trading fish with the teacher to get the proper beginning numbers for the day.
4. Pre-bagging the fish is very important.
5. The lab procedures state that students may not eat the fish. For the wellness of students, consider prohibiting the eating of lab materials, especially since these fish have been handled by multiple students. If you want to treat your students to a snack, bring in additional goldfish crackers that are not used in the investigation.
6. Groups should consist of three to four students.
7. Once data have been collected, student work can be done individually. If left in groups, emphasize that each student is responsible for all questions. Questions should not be divided between members in order to prevent copying answers.

Possible Student Responses to the Pre-Lab Questions

Read over laboratory and answer the following questions:

1. What do you think will be the possible **phenotypes** of the offspring for future generations? Why?

   Student answers should include both phenotypes (spikey and non-spikey). Although smooth scaled fish are desirable prey, they have a dominant allele that will show up in the phenotype if present, and the lab begins with twice as many smooth fish as spikey fish.

   Many students will say that there are three phenotypes (pretzel, orange, and white) because that is what they observe. This is a great time to address misconceptions and reinforce that the color of the goldfish is a code for phenotype. Some students might say that only spikey fish will survive. This inference is acceptable at this point, but you may want to address this misconception in class discussion.

2. What do you think will be the possible **genotypes** of the offspring for future generations? Why?

   There are three possible genotypes in the future generations (DD, Dd, and dd,) because all of these genotypes are present in the pond with equal populations at the beginning of the lab. Different combinations of alleles in remaining fish (after the 1st prey removal) will result in a variety of genotypes in the offspring.

   Many students will say that only spikey fish (dd) will survive, because they are not desired prey. You can address this as a misconception or allow students to revisit their pre-lab questions after all of the data are collected.

Hypothesis (if … then … because)

Based on what you read, create a hypothesis for the lab: What type of fish will be present in future populations?

If spikey fish are avoided by predators, **then**

Example—answers will vary: *The spikey fish population will increase over time in each generation because more spikey fish will survive and reproduce.*

Possible Student Responses to Generation F_1 Punnett Squares

Answers will vary for Punnett squares because students draw random fish and choose mating pairs. In the mating pairs represented below, the teacher would provide the following offspring from the nursery: one orange, two pretzel, two white. Students add the mating pairs and the offspring back into the pond.

1.	D	d
D	DD	Dd
d	Dd	dd

2.	d	d
d	dd	dd
d	dd	dd

3.	D	D
D	DD	DD
d	Dd	Dd

4.	D	d
d	Dd	dd
d	Dd	dd

5.	D	D
d	Dd	Dd
d	Dd	Dd

Generation F_1 Data Table

	Population of pretzel fish (dd)	Population of white fish (Dd)	Population of orange fish (DD)	General observations
Starting	30	30	30	*Prey—3 white, 5 orange*
Ending	*30 + 2 offspring = 32*	*30 - 3 (prey) + 2 offspring = 29*	*30 - 5 (prey) + 1 offspring = 26*	***Students do not need to show the math.***

Using Mathematics—Generation F_1

Calculate the probability of the offspring for two of Punnett squares from round 1.

1st Punnett square

orange fish = 1 of 4 or 25 %

white fish = 2 of 4 or 50 %

pretzel fish = 1 of 4 or 25 %

2nd Punnett square

orange fish = 0 of 4 or 0 %

white fish = 0 of 4 or 0 %

pretzel fish = 4 of 4 or 100 %

Generation F_2 Punnett Squares

1.		

2.		

3.		

4.		

5.		

Generation F_2 Data Table

	Population of pretzel fish (dd)	Population of white fish (Dd)	Population of orange fish (DD)	General observations
Starting	*32*	*29*	*26*	*Ending population of F_1 Generation*
Ending				

Using Mathematics—Generations F_2

Calculate the probability of the offspring for two of the Punnett squares from round 2.

3rd Punnett square
orange fish = _____ of _____ or _____%
white fish = _____ of _____ or _____%
pretzel fish = _____ of _____ or _____%

4th Punnett square
orange fish = _____ of _____ or _____%
white fish = _____ of _____ or _____%
pretzel fish = _____ of _____ or _____%

Generation F_3 Punnett Squares

1.		

4.		

2.		

5.		

3.		

Generation F_3 Data Table

	Population of pretzel fish (dd)	Population of white fish (Dd)	Population of orange fish (DD)	General observations
Starting				
Ending				

Using Mathematics—Generations F_3

Calculate the probability of the offspring for two of the Punnett squares from round 3.

5th Punnett square
orange fish = _____ of _____ or _____%
white fish = _____ of _____ or _____%
pretzel fish = _____ of _____ or _____%

2nd Punnett square
orange fish = _____ of _____ or _____%
white fish = _____ of _____ or _____%
pretzel fish = _____ of _____ or _____%

Data Analysis

1. Discuss what happened to the population of your orange fish, white fish, and pretzel fish. Make sure to include increases and decreases in the population.

   Students should track each genotype through three generations using data evidence. The graph is a useful visual aid for this question.

2. How does the phenotype of the population change from Generation F_1 to Generation F_3? Remember to refer to your data tables and graph.

   Students should combine the orange and white fish populations in order to correctly express numbers for the smooth scale phenotype. Students can use data for evidence and show calculations.

Communicating Findings

3. Compare your graph to another group's graph. What similarities and differences do you find in your graphs?

   Students should look for increases and decreases in populations, angle of slopes, scale and size of graph, ending populations, and any other patterns. Students should use specific details instead of general information. For example "both graphs had a line for orange fish that rose in Generation F_2 and fell in Generation F_3" is better than "the graphs had similar shapes." A graphic organizer is an organized way to address this with some students.

4. Discuss with another group the possible human errors that could have occurred or did occur.

   A common error is that students forget to place the female on the side of the Punnett square and the male on top. When group members are not uniform, the genotype offspring may be affected. Students should take time to reflect and self-evaluate.

Conclusion

5. What was your hypothesis? Was it supported or rejected? Why? Refer to your data.

   Example: My hypothesis was that if spikey fish are avoided by predators, then the spikey fish population will increase over time in each generation because more spikey fish will survive and reproduce. This hypothesis was supported. This is evidenced in the data table for each generation. The pond began with 30 pretzel fish. Generation F_1 ended with 32, F_2 ended with 35, and F_3 ended with 36. This demonstrates a steady increase.

6. Infer what the phenotypes of the Generation F_4 population would be? What leads you to this inference?

   Students may make inferences based on the slope of their graph and/or patterns in the graph over generations. Students may also calculate the average increase or decrease of the population over the past generations and apply that to Generation F_3 to make an inference about F_4.

7. How can patterns in the inheritance of traits be used to predict how frequently they appear in offspring?

   Patterns in the inheritance of traits can be used to predict how frequently they may appear in future generations. Traits are controlled by alleles, and when a recessive trait appears from a dominant phenotype parent, one can infer that each parent carried the recessive version of the gene. Genotypes, when entered into Punnett squares, can help predict the probability of traits occurring in following generations.

8. What new learnings did you obtain from completing this laboratory activity?

   Answers will vary. Students may discuss the differences between genotype and phenotype. Others may discuss how adaptations influence the ability of an organism to survive and reproduce. Some may discuss predator/prey relationships or effects of population fluctuation on an ecosystem.

Scientific Practices Rubric

INITIATING THE INQUIRY
What is the evidence that the student can formulate questions and models that can be explored by scientific investigations as well as articulate a testable hypothesis?

SCORING DOMAIN	EMERGING	E/D	DEVELOPING	D/P	PROFICIENT	P/A	ADVANCED
Stating a Hypothesis (When Appropriate)	• Articulates a prediction that has limited relationship to the question under investigation		• Articulates a relevant prediction of the expected results, but variables are unclearly stated		• Articulates a hypothesis about the investigated question, with a basic and accurate description of the variables (“if ... then …”)		• Articulates a hypothesis about the investigated question, with accurate and specific explanation of the relationship between variables (“if ... then … because”)

REPRESENTING, ANALYZING, AND INTERPRETING THE DATA
What is the evidence that the student can organize, analyze, and interpret the data?

SCORING DOMAIN	EMERGING	E/D	DEVELOPING	D/P	PROFICIENT	P/A	ADVANCED
Using Mathematics and Computational Thinking (When Appropriate)	• Expresses relationships and quantities (units) using mathematical conventions with major errors • Evaluation of whether the mathematical computation results “make sense” is omitted		• Expresses relationships and quantities (units) using mathematical conventions with minor errors • Makes note of whether the mathematical computation results “makes sense” without reference to the expected outcome		• Accurately expresses relationships and quantities (units) using appropriate mathematical conventions • Explains whether the mathematical/computation results “make sense” in relationship to the expected outcome		• Accurately and consistently expresses relationships and quantities (units) using appropriate mathematical conventions • Consistently evaluates whether the mathematical/computation results “make sense” in relationship to the expected outcome

Analyzing the Data	• Analyzes data using inappropriate methods or with major errors or omissions • Consistency of outcome with initial hypothesis, when appropriate, is not compared		• Accurately analyzes data using appropriate methods with minor omissions • Compares consistency of outcome with initial hypothesis, when appropriate		• Accurately analyzes data using appropriate and systematic methods to identify patterns • Compares consistency of outcome with initial hypothesis, when appropriate, and identifies possible sources of error		• Accurately analyzes data using appropriate and systematic methods to identify and explain patterns • Compares and explains consistency of outcome with initial hypothesis, when appropriate, and explains possible sources of error and impact of errors

CONSTRUCTING EVIDENCE-BASED ARGUMENTS AND COMMUNICATING CONCLUSIONS
What is the evidence that the student can articulate evidence-based explanations and effectively communicate conclusions?

SCORING DOMAIN	EMERGING	E/D	DEVELOPING	D/P	PROFICIENT	P/A	ADVANCED
Communicating Findings	• Attempts to use multiple representations to communicate conclusions with inaccuracies or major inconsistencies with the evidence • Implies conclusions with no discussion of limitations		• Uses multiple representations (words, tables, diagrams, graphs, and/or mathematical expression) to communicate conclusions with minor inconsistencies with the evidence • States conclusions with general discussion of limitations		• Uses multiple representations (words, tables, diagrams, graphs, and/or mathematical expressions) to communicate clear conclusions consistent with the evidence • Explains conclusions with specific discussion of limitations		• Uses multiple representations (words, tables, diagrams, graphs, and/or mathematical expressions) to communicate clear and detailed conclusions consistent with the evidence • Explains conclusions and impact of limitations or unanswered questions

Fish In A Pond Investigation

Name:_____ Period:_____

Lab partner(s):_____

Learning Targets—I Can:

- Model how an organism's characteristics are controlled by genes and how these genes, in turn, may be inherited by offspring.
- Generate a hypothesis based on my background knowledge.
- Conduct and gather data during the simulation.
- Complete Punnett squares representing multiple generations.
- Calculate probabilities of offspring over multiple generations.
- Graph and analyze data from the simulation.
- Write conclusions based on data.

Criteria for Success

Complete the pre-lab, procedure, data table, graphing, and conclusion portions of this lab with 90 percent success.

Purpose

In this lab, you will investigate how natural selection can lead to changes in a species over time. You already know that making predictions can be a sign that you understand the event you are studying. In this lab, you will make predictions in the form of a hypothesis, model the events involved in a genetic cross, and explore how both genetic and environmental factors play a part in natural selection.

Background Information

- The orange goldfish represent fish that have the smooth scale phenotype and are **homozygous dominant (DD).** Orange goldfish are delicious to predators.
- The white goldfish represent fish that have the smooth scale phenotype, the spike allele, and are **heterozygous dominant (Dd).** White goldfish are also tasty to predators.
- The pretzel goldfish represent fish with the spike scale phenotype, are **homozygous recessive (dd),** and are avoided by predators because of the spikey scales.

Pre-Lab Questions

Read over the lab instructions and answer the following questions.

1. What do you think will be the possible **phenotypes** of the offspring for future generations? Why?

2. What do you think will be the possible **genotypes** of the offspring for future generations? Why?

Hypothesis (if … then … because)

Based on what you read, create a hypothesis for the lab: What type of fish will be present in future populations?

If spikey fish are avoided by predators, **then …**

Materials

- 30 orange goldfish
- 30 pretzel goldfish
- 30 white goldfish
- Bowl or bag to be used as a pond
- Three napkins labeled “prey,” “female,” and “male”
- Graph paper

Procedure

Round 1: PLEASE DO NOT EAT THE GOLDFISH

1. Wash your hands.
2. Write the words “prey,” “female,” and “male” on your napkins.
3. Place the goldfish in the lake (bowl), and mix them around.
4. Choose one person to be the predator. While someone else counts to three, the predator picks a fish out of the pond one-by-one and places it on the “prey” napkin (try to pick smooth fish and avoid pretzel fish). Your prey fish are now dead and no longer part of the population.
5. Repeat step 4 until everyone in your group gets one chance to be a predator.
6. Close your eyes and choose, at random, **five fish** from the bowl and place them on the **“female” napkin.**
7. Close your eyes and choose, at random, **five fish** from the bowl and place them on the **“male” napkin.**
8. a) Now choose, at random, one male fish and one female fish from the napkins, and enter their genotypes (**male—top** of Punnett square, **female—left side** of Punnett square) into the Punnett square under generation one (F_1).

   b) Whichever square is shaded in each of the Punnett squares (1–5) will be the outcome of the offspring in the F_1 generation and needs to be introduced into the pond population. Take the offspring fish out of the nursery, and introduce them into the bowl. Reintroduce the parent fish back into the pond as well. If you do not have the phenotype (appropriate kind of goldfish) in your nursery, ask your teacher for a fish of that phenotype.
9. Repeat step 8 until you have five Punnett squares completed. You should have placed 15 fish back into the bowl (10 captured parent fish and five offspring).

Generation F_1 Punnett Squares

1.		

2.		

3.		

4.		

5.		

Generation F_1 Data Table

	Population of pretzel fish (dd)	**Population of white fish (Dd)**	**Population of orange fish (DD)**	**General observations** (increases, decreases, errors, broken pieces, group dynamics)
Starting	30	30	30	
Ending				

Using Mathematics—Generation F_1

Calculate the probability of the offspring for two of the Punnett squares from round 1.

1st Punnett square

orange fish = ____ of __4__ or ____%

white fish = ____ of __4__ or ____%

pretzel fish = ____ of __4__ or ____%

2nd Punnett square

orange fish = ____ of __4__ or ____%

white fish = ____ of __4__ or ____%

pretzel fish = ____ of __4__ or ____%

Round 2

Repeat steps 4–9 using the Generation F_2 Data Table and the Generation F_2 Punnett Squares. Make sure that you introduced the offspring and reintroduced the parents back into the pond (bowl). Count the total number of each type of fish and record it in the ending total for Generation F_1 and the starting total for Generation F_2.

Generation F_2 Punnett Squares

1.		

4.		

2.		

5.		

3.		

Generation F_2 Data Table

	Population of pretzel fish (dd)	**Population of white fish (Dd)**	**Population of orange fish (DD)**	**General observations**
Starting				
Ending				

Using Mathematics—Generations F_2

Calculate the probability of the offspring for two of the Punnett squares in round 2.

3rd Punnett square

orange fish = ____ of ____ or ____%

white fish = ____ of ____ or ____%

pretzel fish = ____ of ____ or ____%

4th Punnett square

orange fish = ____ of ____ or ____%

white fish = ____ of ____ or ____%

pretzel fish = ____ of ____ or ____%

Whichever square is shaded in each of the Punnett squares (1–5) will be the outcome of the offspring in the F_2 generation and needs to be introduced into the pond population. Take the offspring fish out of the nursery, and introduce them into the bowl. Reintroduce the parent fish back into the pond as well. If you do not have the phenotype (appropriate kind of goldfish) in your nursery, ask your teacher for a fish of that phenotype.

Round 3

Repeat steps 4–9 using the Generation F_3 Data Table and the Generation F_3 Punnett Squares. Make sure that you introduced the offspring and reintroduced the parents back into the pond (bowl). Count the total number of each type of fish and record it in the ending total for Generation F_2 and the starting total for Generation F_3.

Generation F_3 Punnett Squares

1.		

2.		

3.		

4.		

5.		

Generation F_3 Data Table

	Population of pretzel fish (dd)	Population of white fish (Dd)	Population of orange fish (DD)	General observations
Starting				
Ending				

Using Mathematics—Generations F_3

Calculate the probability of the offspring for two of the Punnett squares in round 3.

5th Punnett square

orange fish = ____ of ____ or ____%

white fish = ____ of ____ or ____%

pretzel fish = ____ of ____ or ____%

2nd Punnett square

orange fish = ____ of ____ or ____%

white fish = ____ of ____ or ____%

pretzel fish = ____ of ____ or ____%

Representing Data

Complete a graph on attached graph paper for data analysis that includes the following:

- A line graph using each generation of fish (1st, 2nd, 3rd) on the X-axis and ending population (number) of fish on the Y-axis. You will have three lines, one for each fish phenotype: DD—red, Dd—blue, and dd—green.
- Remember your graphing rules:
  - Title of your graph—what are you representing?
  - Key—what do the different colors stand for?
  - Even numbering/scale—use the squares on the graph paper equally.
  - Labels on both axes—X and Y.

Data Analysis

1. Discuss what happened to the population of your orange fish, white fish, and pretzel fish. Make sure to include increases and decreases in the population.

2. How does the phenotype of the population change from Generation F_1 to Generation F_3? Remember to refer to your data tables and graph.

Communicating Findings

3. Compare your graph to another group's graph. What similarities and differences do you find in your graphs?

4. Discuss with another group the possible human errors that could have occurred or did occur.

Conclusion

5. What was your hypothesis? Was it supported or rejected? Why? Refer to your data.

6. Infer what the phenotypes of the Generation F_4 population would be? What leads you to this inference?

7. How can patterns in the inheritance of traits be used to predict how frequently they appear in offspring?

8. What new learnings did you obtain from completing this laboratory activity?

Literacy Design Collaborative

Common Assignment 2

LDC Argumentative Essay: What Role Should Ethics Play in Genetic Testing or Bio-Engineering?

Table of Contents

Literacy Design Collaborative

MC IMPORT: Ethics of Genetic Testing and Bio-Engineering

by Jessica E. Pollard, Susan Schultz, and Chastity Stringer

Adapted from "MC IMPORT: Ethics of Genetic Testing" by Chastity Stringer

Students create an editorial on the ethics of genetic testing, which will allow them to interact more deeply with the ethical responsibilities that result from the advancements in technology.

This LDC module was designed to be embedded within a genetics unit. Before this module, students will engage in lessons about heredity of traits, Punnett squares, genetic mutations, natural selection, analyzing data and evaluating patterns of inheritance.

These prior lessons will help students understand the big ideas.

- Characteristics of an organism are controlled by genes which may be inherited by offspring.
- DNA changes in population over time and causes variation.
- Traits appear in two forms: dominant and recessive.

Original Author(s): Chastity Stringer, Jessica Pollard, Anne Love, Marjorie Oyler, Craig Schroeder, Amy Eads, Jessica Murray, James Backstrom, and Tracy Teetaert

GRADES
7 - 8

DISCIPLINE
Science

COURSE
Life Science

MC IMPORT: Ethics of Genetic Testing and Bio-Engineering

Section 1: What Task?

Teaching Task

Task Template 2 - Argumentation

What role should ethics play in genetic testing and bio-engineering? After reading informational texts addressing a selected topic write an editorial that addresses the question and support your position with evidence from the text(s).

D L2 Be sure to acknowledge competing views.

D L3 Give examples from past or current events or issues to illustrate and clarify your position.

Standards

Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects

CCR.R.1
Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

CCR.R.2
Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

CCR.R.4
Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

CCR.R.7
Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.

CCR.R.10
Read and comprehend complex literary and informational texts independently and proficiently.

CCR.W.1
Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

CCR.W.4
Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

CCR.W.5
Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

CCR.W.9
Draw evidence from literary or informational texts to support analysis, reflection, and research.

CCR.W.10
Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

Custom Standards

RST.6-8.1
Cite specific textual evidence to support analysis of science and technical texts.

RST.6-8.2
Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

RST.6-8.4
Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.

RST.6-8.5
Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.

Next Generation Science Standards

-

Students who demonstrate understanding can:

MS-LS3-1
Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.

MS-LS3-2
Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.

MS-LS4-5
Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.

Texts

MC IMPORT: Ethics of Genetic Testing and Bio-Engineering

- To Stop Crimes, share your genes. CODIS New York Times article. (student)
- My Medical Choice. Angelina Jolie opinion about her choice. (student)
- Seeking your genetic information pros and cons. Great resource for struggling students. (student/teacher)
- Cracking Your Genetic Code. Link to NOVA movie (additional activities to accommodate the movie are in uploaded resources). (teacher)
- Predisposed Genetic Testing articles .docx
- Angelina Jolie.docx
- The DNA Dilemma.docx
- DNA Profiling and CODIS Article.docx
- DNA and CODIS Solve Decade Old Crime - Missing and Exploited Children.pdf
- Genetic Ethics Videos-3.docx
- designer_baby_articles_modified V2.docx

MC IMPORT: Ethics of Genetic Testing and Bio-Engineering

Argumentation Rubric for Grade 6-12 Teaching Tasks

	Not Yet	Approaches Expectations	Meets Expectations	Advanced
	1	2	3	4
Focus	Attempts to address prompt but lacks focus or is off task. D: Attempts to address additional demands but lacks focus or is off task.	Addresses prompt appropriately and establishes a position but focus is uneven. D: Addresses additional demands superficially.	Addresses prompt appropriately and maintains a clear, steady focus. Provides a generally convincing position. D: Addresses additional demands sufficiently.	Addresses all aspects of prompt appropriately with a consistently strong focus and convincing position. D: Addresses additional demands with thoroughness and makes a connection to claim.
Controlling Idea	Attempts to establish a claim, but lacks a clear purpose.	Establishes a claim.	Establishes a credible claim.	Establishes and maintains a substantive and credible claim or proposal.
Reading/Research (when applicable)	Attempts to reference reading materials to develop response, but lacks connections or relevance to the purpose of the prompt.	Presents information from reading materials relevant to the purpose of the prompt with minor lapses in accuracy or completeness.	Accurately presents details from reading materials relevant to the purpose of the prompt to develop argument or claim.	Accurately and effectively presents important details from reading materials to develop argument or claim.
Development	Attempts to provide details in response to the prompt, but lacks sufficient development or relevance to the purpose of the prompt.	Presents appropriate details to support and develop the focus, controlling idea, or claim, with minor lapses in the reasoning, examples, or explanations.	Presents appropriate and sufficient details to support and develop the focus, controlling idea, or claim.	Presents thorough and detailed information to effectively support and develop the focus, controlling idea, or claim.
Organization	Attempts to organize ideas, but lacks control of structure.	Uses an appropriate organizational structure for development of reasoning and logic, with minor lapses in structure and/or coherence.	Maintains an appropriate organizational structure to address specific requirements of the prompt. Structure reveals the reasoning and logic of the argument.	Maintains an organizational structure that intentionally and effectively enhances the presentation of information as required by the specific prompt. Structure enhances development of the reasoning and logic of the argument.
Conventions	Attempts to demonstrate standard English conventions, but lacks cohesion and control of grammar, usage, mechanics, language and tone. Sources are used without citation.	Demonstrates an uneven command of standard English conventions and cohesion. Uses language and tone with some inaccurate, inappropriate, or uneven features. Inconsistently cites sources.	Demonstrates a command of standard English conventions and cohesion, with few errors. Response includes language and tone appropriate to the audience, purpose, and specific requirements of the prompt. Cites sources using appropriate format with only minor errors.	Demonstrates and maintains a well-developed command of standard English conventions and cohesion, with few errors. Response includes language and tone consistently appropriate to the audience, purpose, and specific requirements of the prompt. Consistently cites sources using appropriate format.
Content Understanding	Attempts to include disciplinary content in argument, but understanding of content is weak; content is irrelevant, inappropriate, or inaccurate.	Briefly notes disciplinary content relevant to the prompt; shows basic or uneven understanding of content; minor errors in explanation.	Accurately presents disciplinary content relevant to the prompt with sufficient explanations that demonstrate understanding.	Integrates relevant and accurate disciplinary content with thorough explanations that demonstrate in-depth understanding.

MC IMPORT: Ethics of Genetic Testing and Bio-Engineering

Background for Students

You are a journalist for *Science Scholar Magazine*, a monthly periodical that presents facts and opinions about current events and trends in the science community. The next edition will highlight ethical decision-making in science, and will be titled "Genetic Testing and Bio-Engineering: Just because we *can*, does it mean we *should*?"

Your task for this month's magazine is to research current topics in genetics and write an editorial that addresses the following question: What role should ethics play in [insert topic of genetics you are researching]? For example: What is the role of ethics in genetically engineering "Designer Babies"?

When you write your editorial, be sure to use evidence and examples from research to support your claims and reinforce your position. Address any opposing viewpoints. A fabulous research based editorial on a controversial topic should allow our magazine to receive national recognition and increased sales.

Extension

Not provided

MC IMPORT: Ethics of Genetic Testing and Bio-Engineering

Section 2: What Skills?

Preparing for the Task

TASK ANALYSIS: Ability to understand and explain the task's prompt and rubric and build connections to the task and content from existing knowledge, skills, experiences, interests, and concerns.

Reading Process

ACTIVE READING: Ability to identify the central point and main supporting elements of a text; identify and analyze competing arguments; and make clarifying connections and provide examples.

ESSENTIAL VOCABULARY: Ability to identify and master terms essential to understanding a text.

ACADEMIC INTEGRITY: Ability to use and credit sources appropriately.

NOTE-TAKING AND ANNOTATION: Ability to select important facts and passages relevant to the task for use in one's own writing.

Transition to Writing

BRIDGING CONVERSATION: Ability to link reading to writing task.

Writing Process

POSITION: Ability to establish a position.

PLANNING: Ability to develop a line of thought and text structure appropriate to an argumentation task.

DEVELOPMENT: Ability to construct an initial draft with an emerging line of thought and structure. L2 Analyze competing arguments. L3 Make clarifying connections and/or provide examples.

REVISION: Ability to refine text, including line of thought, language usage, and tone as appropriate to audience and purpose.

EDITING: Ability to proofread and format a piece to make it more effective.

COMPLETION: Ability to submit final piece that meets expectations.

MC IMPORT: Ethics of Genetic Testing and Bio-Engineering

Section 3: What Instruction?

PACING	SKILL AND DEFINITION	PRODUCT AND PROMPT	SCORING GUIDE	INSTRUCTIONAL STRATEGIES
Preparing for the Task				
1 hr	**TASK ANALYSIS**: Ability to understand and explain the task's prompt and rubric and build connections to the task and content from existing knowledge, skills, experiences, interests, and concerns.	**ESSENTIAL QUESTION ENGAGEMENT** Observe the bird-dog picture and analyze the statement "Just because we *can*, does it mean that we *should*?" Write your observations and analysis below:	Student meets expectations if he/she: No Scoring	Introduce the article "Thinking ethically: a guide to moral decision making." http://www.scu.edu/ethics/practicing/decision/thinking.htmlEthics Approach JigsawAssign students to 5 groups, each group becomes a specialist on one of the 5 approaches to ethics. Each student in the group is responsible for taking notes that will allow him/her to present information to jigsaw peers. After a few minutes, teacher will assign each student to a new group that includes 1 person from each specialist group. Each person will have 2 minutes to present their ethical approach to their group. Allow time for questions. Students are responsible for taking short notes during each peer presentation. Teacher will have 5 approaches to ethics posted in the classroom (individual poster paper). Students will write their names on a post-it, and place it on the poster that best matches the ethical approach by which they operate.
	Additional Attachments: **Ethics Article link and Jigsaw Directions** **5ApproachestoEthicsJigsaw.pdf** **BirdDog.docx**			
20 mins	**TASK ANALYSIS**: Ability to understand and explain the task's prompt and rubric and build connections to the task and content from existing knowledge, skills, experiences, interests, and concerns.	**DECONSTRUCTING THE RUBRIC & EVALUATE COMMAND TERMS** Read and reflect on what proficiencies are needed to achieve a "meets expectations" score (3), or higher, on each section of the rubric.	Student meets expectations if he/she: • Reviews and highlights the descriptions of a "meets expectation" score on the rubric.	Pass the argumentative rubric to students. As a class discuss each category under the "meets expectations" (3) column. Have students read and reflect on what proficiencies are needed to achieve a "meets expectations" score (3), or higher, on each section of the rubric. Bring attention to key vocabulary on the rubric using underlining, or highlighting strategies.
	Additional Attachments: **Command Terms**			
1 hr	**TASK ANALYSIS**: Ability to explain the task's prompt and rubric and build connections to the task and content from existing knowledge **and** skills,	**WHAT IS AN EDITORIAL?** Define what an editorial is, identify attributes of an editorial, read examples and analyze text as a whole group.	Student meets expectations if he/she: • Completes activity. • Answers the prompt How is an editorial different from other types of news articles?	Editorials are meant to influence public opinion, promote critical thinking, and sometimes cause people to take action on an issue. In essence, an editorial is an opinionated news story. • Review attributes of an editorial. • With the whole group, model locating the attributes in an example editorial. Give students editorial examples, which can be differentiated according to needs. Students identify attributes of the editorial and share in small groups with the same editorial.

MC IMPORT: Ethics of Genetic Testing and Bio-Engineering

PACING	SKILL AND DEFINITION	PRODUCT AND PROMPT	SCORING GUIDE	INSTRUCTIONAL STRATEGIES
	Additional Attachments: What is an editorial?			
Reading Process				
1 hr and 35 mins	**ACTIVE READING**: Ability to identify the central point and main supporting elements of a text; identify and analyze competing arguments; and make clarifying connections and provide examples.	**SHORT CONSTRUCTED RESPONSE** Complete a graphic organizer for each article. "What is the author's claim? Identify text elements that illustrate this." L2 "What competing arguments (counterclaims) across the texts have you encountered or can you think of?" L3 "What historical or current examples can you note that relate to the task prompt?"	Student meets expectations if he/she: • Answers questions with credible responses and supporting elements from the texts/images.	Students will • Choose one of the following topics: designer babies, CODIS, or predisposed genetic disorders. • Read and analyze documents. • Complete the attached graphic organizer for each article. • Use the guiding questions to reflect on the readings. • Reflect on and identify evidence within the article on the author's claim. • Reflect on and identify evidence of any counter claims. • Complete the organizer by giving two supports of their claim based on evidence from the article.
	Additional Attachments: graphic organizer-CODIS.pdf graphic organizer-Predisposed genetic disorders .pdf graphic organizer-designer babies.pdf			
1 hr	**ESSENTIAL VOCABULARY**: Ability to identify and master terms essential to understanding a text.	**KEY UNIT VOCABULARY** Vocabulary list: "In your notebook, list and define words and phrases that challenge your understanding of the text/s."	Student meets expectations if he/she: • Completes mini-task. • Provides accurate definitions and/or explanations.	Throughout the unit students will engage with key vocabulary terms. • Make pictorial representations or use graphic organizers to illustrate vocabulary terms (e.g. word mapping). • Write definitions in their own words.
	Additional Attachments: Genetics Vocabulary.docx			
30 mins	**ACADEMIC INTEGRITY**: Ability to use and credit sources appropriately.	**SHORT CONSTRUCTED RESPONSE** Definition and strategies: "Explain why plagiarism is a problem and list ways to avoid it."	Student meets expectations if he/she: • Proper use and credit of sources. • Explain appropriate strategies to avoid plagiarism.	• Discuss respect for others' work to assemble evidence and create texts. • Discuss academic penalties for stealing others' thoughts and words. • Instruct students on proper citation of sources used.

MC IMPORT: Ethics of Genetic Testing and Bio-Engineering

PACING	SKILL AND DEFINITION	PRODUCT AND PROMPT	SCORING GUIDE	INSTRUCTIONAL STRATEGIES
	Additional Attachments: Plagiarism video link			
40 mins	**NOTE-TAKING AND ANNOTATION**: Ability to select important facts and passages relevant to the task for use in one's own writing.	**CLOSE READING STRATEGIES FOR ANALYZING TEXT** Notes and Annotation: "For each text, take notes and/or annotate elements relevant to the task. Make sure you have the information to do a citation when needed to avoid plagiarism."	Student meets expectations if he/she: • Identifies relevant elements – facts, quotes, explanations. • Includes necessary citation information to support facts, questions, etc. (for example, page numbers for a long text, clear indication when quoting directly).	• Teach or review strategies for note taking and/or annotation • Check that early student work is in the assigned format (or in another format that gathers the needed information effectively).
Transition to Writing				
30 mins	**BRIDGING CONVERSATION**: Ability to link reading to writing task.	**STUDENT DISCOURSE ABOUT TEXT** "Review the task and identify key points and information from your texts/images that will help you address the task."	Student meets expectations if he/she: No Scoring	• Review the task. • Discussion-based strategies, such as seminars. • Small group discussion using teaching task.
Writing Process				
30 mins	**POSITION**: Ability to establish a position.	**SHORT CONSTRUCTED RESPONSE** Position statement:"Write a 1-3 sentence position statement which establishes the focus and purpose of your work."	Student meets expectations if he/she: • Writes a concise summary statement answering the main prompt. • Establishes claim or position for the paper. • Identifies key points that support development of argument.	• Offer several examples of position statements. • Ask class to discuss what makes them strong or weak. • Review the list that students created earlier to identify needed elements from skills cluster 1.
1 hr	**PLANNING**: Ability to develop a line of thought and text structure appropriate to an argumentation task.	**OUTLINE** Outline/organizer: "Create an outline based on your notes in which you state your position, sequence your points, and note your supporting **evidence.**	Student meets expectations if he/she: • Creates an outline or organizer. • Supports opening position. • Uses evidence from texts and **images.**	• Provide and facilitate using an argumentative editorial paper organizer. • Invite students to generate questions in pairs about how the format works, and then take and answer questions.

MC IMPORT: Ethics of Genetic Testing and Bio-Engineering

PACING	SKILL AND DEFINITION	PRODUCT AND PROMPT	SCORING GUIDE	INSTRUCTIONAL STRATEGIES
			Identifies competing argument(s). Provides appropriate number of sound connections.	
	Additional Attachments: ArgumentativeEditorialWritingOutline20150430-3-13g4q1c[1] V2.pdf			
1 hr and 30 mins	**DEVELOPMENT**: Ability to construct an initial draft with an emerging line of thought and structure. L2 Analyze competing arguments. L3 Make clarifying connections and/or provide examples.	**LONG CONSTRUCTED RESPONSE** Initial Draft: "Write an initial draft complete with opening, development, and closing; insert and cite textual evidence." "Identifies competing argument(s)." "Provides appropriate number of sound connections."	Student meets expectations if he/she: • Provides complete draft. • Supports the stated position with evidence and citations in each section.	• Encourage students to re-read prompt partway through writing, to check that they are on-track. • Work with students on a logical, reasoned organization of the paper. • Ask students to provide their reasons for the organization of their paper. • Provide students with an opportunity to do peer review on each other's work. - Reference the Emotional and Social Wellness standards in the "Teacher Work Section" for establishing guidelines in the development of a safe, inclusive work environment.
25 mins	**REVISION**: Ability to refine text, including line of thought, language usage, and tone as appropriate to audience and purpose.	**LONG CONSTRUCTED RESPONSE - AUTHOR EDIT** Multiple Drafts: "Use strategies which refine the work's logic, reasoning, and organization of ideas/points. Use textual evidence carefully, with accurate citations. Decide what to include and what not to include."	Student meets expectations if he/she: • Provides complete draft. • Supports the opening in the later sections with evidence and citations. • Improves earlier edition.	• Timely feedback and conferencing • Feedback balances support for strengths and clarity about weaknesses. • Peer review to provide each other with feedback on strengths and weaknesses of the paper. - Reference the Emotional and Social Wellness standards in the "Teacher Work Section" for establishing guidelines in the development of a safe, inclusive work environment.
40 mins	**EDITING**: Ability to proofread and format a piece to make it more effective.	**LONG CONSTRUCTED RESPONSE - PEER EDITING** Correct Draft: "Revise draft to have sound spelling, capitalization, punctuation and grammar.	Student meets expectations if he/she: • Provides draft free from distracting errors. • Uses format that supports purpose.	As a class discuss the purpose and how to effectively peer edit. • Briefly review selected skills that many students need to improve. • Teach a short list of proofreading marks. • Assign students to proofread each other's texts a second time using the rubric as a guide.

MC IMPORT: Ethics of Genetic Testing and Bio-Engineering

PACING	SKILL AND DEFINITION	PRODUCT AND PROMPT	SCORING GUIDE	INSTRUCTIONAL STRATEGIES
	Additional Attachments: PeerEditingReviewSheet V2] .pdf			
35 mins	**COMPLETION**: Ability to submit final piece that meets expectations.	**LONG CONSTRUCTED RESPONSE - FINAL** Final Work: "Turn in your complete set of drafts, plus the final version of your work."	Student meets expectations if he/she: • Submits final work for evaluation.	Not Provided

Instructional Resources

Teacher Resource

- Genetic Ethics Videos-3.docx
- GeneticsUnitOutline.pdf

MC IMPORT: Ethics of Genetic Testing and Bio-Engineering

Section 4: What Results?

Student Work Samples

Not Yet

- LDC Rubric Not Yet.docx
- Genetics LDC Not Yet Sample.docx

Approaches Expectations

- Genetics LDC Approaches Expectation.docx
- LDC Rubric Approaches Expectations.docx

Meets Expectations

- LDC Rubric Meets Expectation Sample.docx
- Genetics LDC Meets Expectation Sample V2.docx

Advanced

- Genetics LDC Module Sample Meets Expectation Plus.docx
- LDC Rubric Meets Expectataion Plus.docx

Teacher Reflection

Not provided

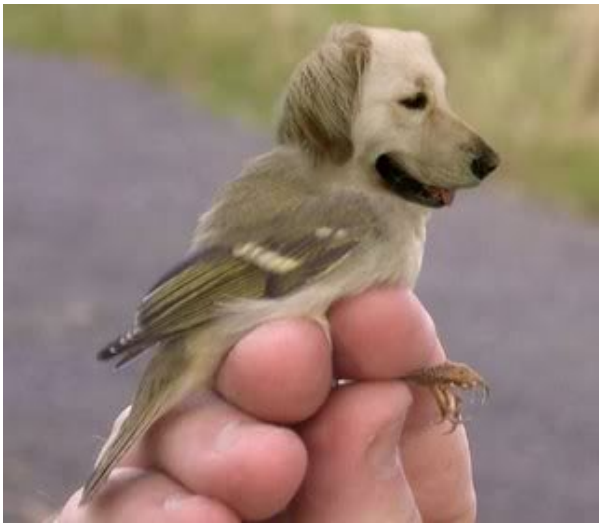
All Attachments

- To Stop Crimes, share your genes. CODIS New York Times article. (student) : https://s.ldc.org/u/7exx9wwz51oc3mf9fkqdj6gok
- My Medical Choice. Angelina Jolie opinion about her choice. (student) : https://s.ldc.org/u/6mbn58ta3muxmpueidigdcckt
- Seeking your genetic information pros and cons. Great resource for struggling students. (student/teacher) : https://s.ldc.org/u/e4hag3avn1hwyehq5vvl4uqb0
- Cracking Your Genetic Code. Link to NOVA movie (additional activities to accommodate the movie are in uploaded resources). (teacher) : https://s.ldc.org/u/3lzdk4rj6e8axl5refnbv58bo
- Predisposed Genetic Testing articles .docx : https://s.ldc.org/u/dvi2jooz8jdrjwtovakpplsyv
- Angelina Jolie.docx : https://s.ldc.org/u/eljnt3yo9svg71qlv66v8in5
- The DNA Dilemma.docx : https://s.ldc.org/u/94jqsh1oshhz58cdr3x5cggw
- DNA Profiling and CODIS Article.docx : https://s.ldc.org/u/134e7qqekiaaq0zz0j0mg7zom
- DNA and CODIS Solve Decade Old Crime - Missing and Exploited Children.pdf : https://s.ldc.org/u/lx7kvmx4s6uny6pko173hfh8
- Genetic Ethics Videos-3.docx : https://s.ldc.org/u/1o0pgpd5mnmx5jhtzw8qm6s6i
- designer_baby_articles_modified V2.docx : https://s.ldc.org/u/as600a2jbqf026dradbxp2hs1
- LDC Rubric Not Yet.docx : https://s.ldc.org/u/579wdblsafqg392hsiprgx7gs
- Genetics LDC Not Yet Sample.docx : https://s.ldc.org/u/3jekrlicwzt361o9zw6c8lke7
- Genetics LDC Approaches Expectation.docx : https://s.ldc.org/u/8v3y4wyiqc3koeupucltk0jxd
- Genetics LDC Module Sample Meets Expectation Plus.docx : https://s.ldc.org/u/8yyo73fuu2kup7nyx7pvafapt
- LDC Rubric Meets Expectataion Plus.docx : https://s.ldc.org/u/dhmgmhy3gs3ilru9siib7b05l
- LDC Rubric Meets Expectation Sample.docx : https://s.ldc.org/u/eo8co209kn4cu9160aczs6b2h
- Genetics LDC Meets Expectation Sample V2.docx : https://s.ldc.org/u/5o92ll58a9foo9q50zzlv2qyq
- LDC Rubric Approaches Expectations.docx : https://s.ldc.org/u/5boany6twoe0fi7ctnr9j9i5i
- Genetic Ethics Videos-3.docx : https://s.ldc.org/u/c25pe7a0c6n62lesnqjmowlv2
- GeneticsUnitOutline.pdf : https://s.ldc.org/u/cr8lfhye01w4c0rob2ejzpwgp

Modified LDC Rubric

SCORING DOMAIN	NOT YET	E/D	APPROACHING EXPECTATIONS	D/P	MEETS EXPECTATIONS	P/A	ADVANCED
Focus	Attempts to address prompt, but lacks focus or is off task.		Addresses prompt appropriately and establishes a position, but focus is uneven.		Addresses prompt appropriately and maintains a clear, steady focus. Provides a generally convincing position.		Addresses all aspects of prompt appropriately with a consistently strong focus and convincing position.
Reading/Research	Attempts to reference reading materials to develop response, but lacks connections or relevance to the purpose of the prompt.		Presents information from reading materials relevant to the purpose of the prompt with minor lapses in accuracy or completeness.		Accurately presents details from reading materials relevant to the purpose of the prompt to develop argument or claim.		Accurately and effectively presents important details from reading materials to develop argument or claim.
Development	Attempts to provide details in response to the prompt, but lacks sufficient development or relevance to the purpose of the prompt. (L3) Makes no connections or a connection that is irrelevant to argument or claim.		Presents appropriate details to support and develop the focus, controlling idea, or claim, with minor lapses in the reasoning, examples, or explanations. (L3) Makes a connection with a weak or unclear relationship to argument or claim.		Presents appropriate and sufficient details to support and develop the focus, controlling idea, or claim. (L3) Makes a relevant connection to clarify argument or claim.		Presents thorough and detailed information to effectively support and develop the focus, controlling idea, or claim. (L3) Makes (a) clarifying connection(s) that illuminates argument and adds depth to reasoning.
Content Understanding	Attempts to provide details in response to the prompt, but lacks sufficient development or relevance to the purpose of the prompt. (L3) Makes no connections or a connection that is irrelevant to argument or claim.		Presents appropriate details to support and develop the focus, controlling idea, or claim, with minor lapses in the reasoning, examples, or explanations. (L3) Makes a connection with a weak or unclear relationship to argument or claim.		Presents appropriate and sufficient details to support and develop the focus, controlling idea, or claim. (L3) Makes a relevant connection to clarify argument or claim.		Presents thorough and detailed information to effectively support and develop the focus, controlling idea, or claim. (L3) Makes (a) clarifying connection(s) that illuminates argument and adds depth to reasoning.

Genetic Testing and Bio-Engineering: Just because we *can*, does it mean we *should*?



You are a journalist for *Science Scholar Magazine,* a monthly periodical that presents facts and opinions about current events and trends in the science community. The next edition will highlight ethical decision-making in science and will be titled "Genetic Testing and Bio-Engineering: Just because we *can,* does it mean we *should?*"

Your task for this month's magazine is to research current events and opinions in genetics and write an editorial that addresses the following question: What role should ethics play in [insert field of science you are researching]? For example: What is the role of ethics in genetically engineering "Designer Babies"?

When you write your editorial, be sure to use evidence and examples from research to back up your claims and reinforce your position. Address any opposing viewpoints. A fabulous research-based editorial on a controversial topic should allow our magazine to receive national recognition and increased money in magazine sales.

The Prompt for the Editorial

L1: What role should ethics play in genetic testing or bio-engineering? After reading informational texts addressing a selected topic, write an editorial that addresses the question and support your position with evidence from the text(s). **L2:** Be sure to include and address competing viewpoints. **L3:** Give examples from past or current events or issues to illustrate and clarify your position.

Common Assignment 3

Genetically Modified Food Lobbyist Project

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Genetically Modified Food Lobbyist Project

Learning Targets

Students will:

- Select a company to represent in the Genetically Modified Foods Debate, and take on the perspective of that client.
- Review and analyze the proposed legislation on whether Genetically Modified Foods need to be identified for consumers.
- Gather and analyze evidence from texts and videos to support or refute a specific position on the legislation.
- Make a claim with evidence, and address any counterclaims.
- Make an oral presentation with visuals or video for their congressional representatives to urge them to either support or vote against the proposed legislation.

Suggested Implementation Strategies

1. Introduce the scenario, companies, and discuss roles. Teachers can use local, appropriate companies to provide authentic contexts for students. We created companies to be used if you do not have any applicable local companies. See the description of each company in this document.
2. Assign two to four students to one of the five companies listed in this document or write descriptions of local companies to make the assignment more relevant to your students. Distribute your students so they represent a diverse group in terms of their chosen topic for the LDC project. Only provide company information to the group representing the given company; they should only know their own company background.
3. Discuss the role of a lobbyist—what they do, how they help to support the interests of a specific group and/or company.
4. Spend time with your students unpacking the proposed legislation. This is the URL for the full legislation proposal: http://www.govtrack.us/congress/bills/113/hr1699/text. A brief summary of the highlights of the proposed legislation is included in this document. Students will need to understand what the bill is asking for in order to know how their company will benefit from or be penalized by the proposed legislation.
5. Review basic vocabulary that the students will encounter as they conduct their research. See suggested vocabulary list in this document.
6. Based on roles, students generate questions to guide their research. Teachers can provide research resources to begin with and then allow students to find their own sources.
7. From research, each student generates three claims with evidence and reasoning that supports the position of the group. Remind students about the importance of using credible sources.
8. Students peer assess each other's claims, evidence, and reasoning within groups.
9. Students turn in an outline of their claims, evidence, and reasoning for teacher feedback and check in.
10. Using their research findings, students create multimedia presentations that clearly state and explain their position on genetically modified foods.

The Task

Company X (see outline of developed companies/organizations) has recently been made aware of the following legislative proposal. The CEO of your company has gathered your group together to analyze the proposed piece of legislation and its effect on Company X. She has used her contacts to get a 10-minute meeting with the district's congressional representative. Your team is the lead in charge of the proposal. Create a dynamic proposal to lobby your congressional representative on this proposed legislation during this meeting.

Helpful Vocabulary

- Cross breeding refers to the reproduction between two unrelated strains of a particular species.
- Genetically modified organisms (GMOs) refers to plants and animals with an altered genetic make-up. GMOs are generally altered or manipulated by non-natural means in order to incorporate genes from another organism. Usually genetic engineering is done to achieve a trait not normally held by an organism, such as longer shelf life, disease resistance, or different colors or flavors.
- Transgenic organisms are organisms that have inserted DNA from a different species.
- Genetic code is the sequence of nitrogen bases (A,G,C,T) that determines the specific amino acid sequence in the synthesis of proteins.
- Biotechnology is the manipulation (as through genetic engineering) of living organisms or their components to produce useful, usually commercial products (like pest-resistant crops, new bacterial strains, or novel pharmaceuticals).
- Selective breeding is the process of breeding plants and animals for particular traits.
- Gene splicing refers to cutting a gene from one organism and pasting it into the DNA of another so that a characteristic can be transferred from one plant or animal to another.
- Recombinant DNA refers to DNA sequences that result from the use of laboratory methods to bring together genetic material from multiple sources, creating sequences that would not otherwise be found in biological organisms.

Suggested Search Engine Phrases To Get Students Started

- Pros and cons of genetically modified organisms
- Genetic engineering of plants
- Genetic engineering of animals
- Consumer rights and GMOs

AgBioTech (Agriculture and bio-technology company)

People around the world depend on agriculture and the hard work of farmers for their most basic needs. With global population expected to grow by 40 percent in the next few decades, agriculture will need to become more productive and more sustainable in order to keep pace with rapidly increasing demands.

We are focused on empowering farmers to produce more from their land while conserving more of our world's natural resources such as water and energy. We do this with our leading seed brands in crops like corn, cotton, oilseeds, and fruits and vegetables.

We use bio-technology, like genetically modified (GM) organisms, to give plants desirable traits that often cannot be developed through breeding practices. The traits we develop help farmers produce more of their crops and conserve resources. GM traits, such as insect and herbicide tolerance, help to increase yields by protecting yields that would otherwise be lost due to insects or weeds.

We strongly believe that authorized GM crops are as safe as conventional (non-GM-derived) food. Hundreds of millions of meals containing food from GM crops have been consumed since the first GM crops were developed in 1966. There has not been a single confirmed instance of illness or harm associated with GM crops.

PharmaSci (A major pharmaceutical company)

At PharmaSci, our corporate promise is “science for a better life.” We push the boundaries of what science can do with a passion for solving agriculture’s toughest challenge: to make sure everyone gets enough to eat. Even today, hunger is a daily threat to more than 1 billion people worldwide.

At PharmaSci, we have deep expertise and particular innovative strength in one of the world's most important staple crops—rice. It’s our mission to protect this crop and enable farmers to increase rice production at a rate of 8–10 million tons every year to keep up with the population growth.

Our first step is to make plants better at coping in tough conditions like drought—so they can still produce high yields. For example, our scientists are trying to unlock the secrets genes hold about plants’ stress tolerance.

And while farmers need herbicides to kill off weeds, how can they stop killing off their rice while spraying? We help make their plants strong enough to resist and even break down herbicides—thanks to genetic engineering that makes crops tolerant of herbicides.

We have even been working to increase the nutrition in rice by genetically modifying the rice to produce beta-carotene (or vitamin A). This rice, called Golden Rice, has been shown to be as good as vitamin A supplements and to be better than the natural vitamin A in spinach.

YummiFoods

We are a large food manufacturing company that makes hundreds of different food brands that are loved the world over. We produce three main groups of foods:

- Good-for-You foods and beverages are made of fruits, vegetables, whole grains, nuts, and key nutrients. They are lower in levels of sodium, sugar, and saturated fats.
- Better-for-You foods and beverages are some of our favorite snacks in which we have lowered the levels of sodium and saturated fats. We also have increased the number of baked offerings and whole-grain choices. In beverages, we are increasing the number of low- and zero-calorie choices and reducing added sugar.
- Fun-for-You foods and beverages include treats that are enjoyed all over the world as well as regional favorites.

As a company, we provide clear nutrition information on our products and sell and market them appropriately to our consumers. We want to make sure all information on our labels is clear, easy for consumers to understand, and not misleading about health and safety.

We use innovation in our packaging to make it increasingly sustainable, minimizing our impact on the environment. We carefully think about any changes to our packaging as to not create excess waste.

The company is committed to all-natural foods.* Over half of our foods will soon be made with all-natural ingredients—no chemical additives to the foods themselves.

We support environmental sustainability through sustainable agriculture by expanding best practices with our growers and suppliers. We help to protect and conserve global water supplies, especially in water-stressed areas, and provide access to safe water. Many of our food comes from crops (like corn) that use the latest genetic technologies to increase the amount of food produced on the smallest amount of land and can withstand conditions like drought.

**Foods that have been genetically modified are considered all-natural foods.*

Natural and Organic Market

We are a nationwide chain of grocery stores that seek out the finest natural and organic foods available, maintain the strictest quality standards in the industry, and have an unshakeable commitment to sustainable agriculture.

We have high standards, and our goal is to sell the highest quality products we possibly can. We define quality by evaluating the ingredients, freshness, safety, taste, nutritive value, and appearance of all of the products we carry.

We support organic farmers, growers, and the environment through our commitment to sustainable agriculture and by expanding the market for organic products. We are committed to greater production of organically and bio-dynamically grown foods in order to reduce pesticide use, reduce the use of genetically modified crops, and promote soil conservation.

We are supporters of naturally raised meat and poultry. In addition to telling consumers our concerns about added hormones and antibiotics, we work with ranchers and producers to develop hormone- and antibiotic-free alternatives for our customers to buy.

We work tirelessly in educating our customers about the value of foods produced without harmful or questionable food additives. We have worked with manufacturers to supply our stores with foods that meet our strict quality standards, which only allow naturally grown crops. In general, we avoid any foods or products that contain genetically modified crops.

Since 1992, long before it became a hot issue, we actively advocated for mandatory labeling of foods containing genetically modified ingredients. At the heart of this is our belief that consumers have the right to choose their food based on the knowledge of what is in it, how it is produced, and the safety concerns involved. When asked, over 90 percent of U.S. citizens want to know what's in their food.

Sunflower Bio-Dynamic Farms

We are a group of small family farms situated in a large agriculture valley. Many of us have been farming for nearly 80 years. We have long been committed to using sustainable practices to raise our crops and livestock.

All of the farms in our group have committed to NOT using pesticides or genetically modified crops. Many of us grow heirloom crops from seeds passed down through generations of family farmers. We believe the public should know where their food comes from and how it is produced. Most of our food is sold within 200 miles of our farms, at farmers markets where we interact with our customers.

We also participate in educational events across the state related to sustainable food practices. Some of our food is also sold to food manufactures that share our vision about how food should be raised and about educating the public.

As agriculture has boomed in our area, we have experienced an increased number of large farmers using practices very different from ours. They use conventional methods of farming that rely upon pesticide use and genetically modified crops.

Some of these practices have produced “superweeds,” weeds that cannot be killed using our organic methods. In recent years, many of the farmers in our group have found that these plants are making their way into their farms. Many of us are concerned about the spread of these weeds and of the genetically modified crops into our own fields.

Farm Workers United

We are a group of individuals dedicated to providing farm workers and other working people a chance for empowerment and innovation. Most of our workers come from the fields. They have experienced first hand the low wages, back-breaking labor conditions, and below-standard living conditions. They know how hard it is to organize a union but build on their experience to advocate for the issues that are important to the farm workers.

One of our main goals is safe working conditions for all workers. We support farm practices that create sustainable food choices for the environment and for the health of the workers.

Many farms use practices that prioritize creating more food above the health of the workers and the land. Many genetically modified crops, such as corn, require an increased use of pesticides to kill weeds. This increased exposure to pesticides is impacting the health of the workers in these fields. We believe it is our job to educate the American public about these working conditions and their causes.

Summary of Proposed Legislation

The Genetically Engineered Food Right-to-Know Act would amend the Federal Food, Drug, and Cosmetic Act to deem misbranded any food that has been genetically engineered or contains one or more genetically engineered ingredients, unless such information is clearly disclosed.

This legislation is exempt from this legislation is any food that:

1. is served in restaurants or other similar eating establishments,
2. is a medical food,
3. would be subject to such requirement solely because it was produced using a genetically engineered vaccine, or
4. would be subject to such requirement solely because it includes the use of a genetically engineered processing aid (including yeast) or enzyme.

This legislation defines "genetically engineered" as a material intended for human consumption that is:

1. an organism produced through the intentional use of genetic engineering, or
2. the progeny of intended sexual or asexual reproduction (or both) of one or more organisms that is the product of genetic engineering.

This legislation defines "genetically engineered ingredient" as an ingredient in a food that is derived from any part of an organism that has been genetically engineered, without regard to whether:

1. the altered molecular or cellular characteristics of the organism are detectable in the material, and
2. the organism is capable for use as human food.

This legislation excludes from penalties for misbranding of genetically engineered food or ingredients any recipient that establishes a guaranty or undertaking that:

1. is signed by, and contains the name and address of, a person residing in the United States from whom the recipient received the food in good faith (including the receipt of seeds to grow raw agricultural commodities); and
2. contains a statement to the effect that the food is not genetically engineered or does not contain a genetically engineered ingredient.

This legislation applies this exclusion from penalties without regard to the manner in which the recipient uses the food.

This legislation excludes an agricultural producer also from such penalties when a violation occurs because food the producer has grown, raised, or otherwise produced, which neither contains nor was produced with a genetically engineered material, is subsequently contaminated with a food that does contain or was produced with a genetically engineered material, and the agricultural producer has not intended any such contamination nor was negligent in the matter.

Additional Genetically Modified Foods Resources for the Teacher

1. **Book:** *Tomorrow's Table: Organic Farming, Genetics, and the Future of Food* by Pamela C. Ronald, R. W. Adamchak, January 8, 2010

2. **Videos**

- "GM food and you," uploaded June 13, 2007
  The story in the film "GM food and you" is a journey through the maze of complexities surrounding genetic modification. New technologies have a great influence on our daily lives, and plant bio-technology is no exception. After all, plants provide us with the food we need to survive. However, plant bio-technology is a controversial area where both the basic research and its application to our daily lives are viewed with suspicion by members of the public. Legitimate concerns have been raised. The content of the film addresses the role genetic modification and plant bio-technology play and are likely to play in our society. Is GM food safe to eat? What about the impact on our environment? Do we need it? Is all the truth told about GM crops? What about our right to choose?
- Can GM crops help the third world?
  http://www.youtube.com/watch?v=B8p7M0WF_7A (5:48)
- "Bill Gates tackles controversy over genetically-modified crops at UC Berkeley"
  http://www.youtube.com/watch?v=sxsf4MGDRVk (4:28)
- "Eyes of Nye - GM foods - HTS2100 edition"
  http://www.youtube.com/watch?v=8z_CqyB1dQo (7:57)
- "Farmers and Experts Discuss Genetically Modified Food Crops"
  http://www.youtube.com/watch?v=3bEnFiujn30 (6:29)

3. **Articles**

- "The Truth about Genetically Modified Food," David H. Freedman
  http://www.scientificamerican.com/article/the-truth-about-genetically-modified-food/?page=2
- "The Debate Over Genetically Modified Foods," Kerryn Sakko
  http://www.actionbioscience.org/biotechnology/sakko.html
- "Frequently asked questions on genetically modified foods," World Health Organization
  http://www.who.int/foodsafety/publications/biotech/20questions/en/
- "Viewpoints: Harvest of Fear," PBS Learning (may need account)
  http://www.pbslearningmedia.org/resource/tdc02.sci.life.gen.viewpoints/viewpoints-harvest-of-fear/
- "Scientists worry over disappearing monarch butterflies," McClatchy Foreign Staff
  https://newsela.com/articles/monarch-crisis/id/3427/
- "The GMO Labeling Battle Is Heating Up—Here's Why," Laura Parker for *National Geographic*
  http://news.nationalgeographic.com/news/2014/01/140111-genetically-modified-organisms-gmo-food-label-cheerios-nutrition-science/

4. **Websites**

- https://gmoanswers.com/
- Food Dialogues: GMO
  http://www.fooddialogues.com/foodsource/gmo?gclid=Cj0KEQjw3cKeBRDG-KKqqIj4qJgBEiQAOamX_Y8_IjlKa_txX5cZqZL1r5mtUP9PAtOA7jvxQrUVn_4aAm-B8P8HAQ

Advanced Pathways Performance Assessment Common Rubrics: *EFFECTIVE COMMUNICATION- ORAL PRESENTATION*

SCORING DOMAIN	EMERGING	E/D	DEVELOPING	D/P	PROFICIENT	P/A	ADVANCED
CLARITY *What is the evidence that the student can present a clear perspective and line of reasoning?*	• Presents an **unclear** perspective • Line of reasoning is **absent, unclear, or difficult to follow**		• Presents **a general** perspective • Line of reasoning **can be followed**		• Presents a **clear** perspective • Line of reasoning is **clear and easy to follow** • **Addresses alternative or opposing perspectives** when appropriate		• Presents a **clear and original** perspective • Line of reasoning is clear and **convincing** • Addresses alternative or opposing perspectives in a way that **sharpens one's own perspective**
EVIDENCE *What is the evidence that the student can present a perspective with supportive evidence?*	• Draws on facts, experience, or research in a **minimal way;** • Demonstrates **limited** understanding of the topic		• Draws on facts, experience, and/or research **inconsistently**; • Demonstrates an **incomplete or uneven** understanding of the topic		• **Draws on** facts, experiences and research to support a perspective • Demonstrates an **understanding** of the topic		• Facts, experience and research are **synthesized** to support a perspective • Demonstrate an **in-depth** understanding of the topic
ORGANIZATION *What is the evidence that the student can organize a presentation in a way that supports audience understanding?*	• A **lack of organization** makes it difficult to follow the presenter's ideas and line of reasoning		• **Inconsistencies in** organization and **limited use of transitions** detract from audience understanding of line of reasoning		• Organization is **appropriate** to the purpose, audience, and task and **reveals** the line of reasoning; t**ransitions guide audience understanding**		• Organization is appropriate to the purpose and audience and **supports** the line of reasoning; **effectively hooks and sustains audience engagement**, while providing a **convincing conclusion**.

Advanced Pathways Performance Assessment Common Rubrics: *EFFECTIVE COMMUNICATION - ORAL PRESENTATION*							
SCORING DOMAIN	**EMERGING**	**E/D**	**DEVELOPING**	**D/P**	**PROFICIENT**	**P/A**	**ADVANCED**
USE OF DIGITAL MEDIA / VISUAL DISPLAYS *What is the evidence that the student can use digital media/visual displays to engage and support audience understanding?*	• Digital media or visual displays are **confusing, extraneous, or distracting**		• Digital media or visual displays are **informative and relevant**		• Digital media or visual displays are **appealing,** informative, and **support audience engagement and understanding**		• Digital media or visual displays are **polished,** informative, and support audience engagement and understanding
PRESENTATION SKILLS *What is the evidence that the student can control and use appropriate body language and speaking skills to support audience engagement?*	• Makes **minimal use** of presentation skills: lacks control of body posture; does not make eye contact; voice is unclear and/or inaudible; and pace of presentation is too slow or too rushed • Presenter's energy and affect are **unsuitable** for the audience and purpose of the presentation		• Demonstrates a command of **some aspects** of presentation skills, including control of body posture and gestures, language fluency, eye contact, clear and audible voice, and appropriate pacing • Presenter's energy, and/or affect are **usually appropriate** for the audience and purpose of the presentation, with minor lapses		• Demonstrates a **command** of presentation skills, including control of body posture and gestures, eye contact, clear and audible voice, and appropriate pacing • Presenter's energy and affect are **appropriate** for the audience and **support engagement**		• Demonstrates **consistent** command of presentation skills, including control of body posture and gestures, eye contact, clear and audible voice, and appropriate pacing **in a way that keeps the audience engaged** • Presenter maintains a **presence and a captivating energy** that is appropriate to the audience and purpose of the presentation

Genetically Modified Food Lobbyist Project

Scenario

You are a lobbyist who has been hired to present to a government panel that will decide whether or not to ban genetically modified foods. You will be part of a team who will research the issue and create an eight to 10 minute presentation persuading the panel to take the position that is in the best interest of your clients. Your clients have provided a list of potential resources to assist you in the preparation of this presentation. (Your teacher will provide a list for you.) You may use additional resources to build your argument as needed, but the clients have also asked that you look at the reliability of all sources used.

As a lobbyist, your job is to persuade the panel that your clients' position is the way to go. Your lobbying team is comprised of an economist, an environmental expert, a farmer, and a doctor. Each member of the team will be expected to address their area of expertise in the presentation and explain how it specifically will be impacted by the panel choosing your clients' position. Remember to use the training you have received in persuasion as you prepare your arguments.

Team Roles

Environmentalist: The lobbyist lens/point of view is that genetically modified food has positive effects on the environment. (Environmentalists seek to improve and protect the quality of the biotic and abiotic parts of nature. They also identify and educate the public on the ways to reduce the impacts of harmful human activities.)

Farmer: The lobbyist lens/point of view is that a farmer should either have the choice or opportunity to grow genetically modified food.

Doctor: The lobbyist lens/point of view concerns what effects consuming genetically modified foods has on human health.

Economist: The lobbyist lens/point of view is that of the effect genetically modified foods have on the economy. (Economists are concerned with financial issues. They study the impact of a specific activity or product on communities [cities, states, nations, global].)

Research Notes

Each time you read a new article/webpage, make sure to cite the appropriate source information so you will be able to produce a quality bibliography and return to the page should you need to.

Source

Notes

Should genetic modification of organisms be allowed to continue? Why or why not?

As you do your research, keep a list of pro's and con's below. You should choose the position that you can **best support with evidence.** Make sure you cite the sources you use.

Pro	Con
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.
10.	10.