Student Material

Designer Genes



The Human Genome Project (HGP) was an international scientific investigation, funded by numerous organizations including the United States government under the National Institutes of Health, that successfully sequenced and mapped the entire human genome, giving us the ability to read the blueprints in our DNA.

This team of researchers was able to determine the genetic roots of diseases and genetic variants, which led to the discovery of more than 1,800 disease genes. HGP is continually advancing, as the project's objective is to identify the genetic abnormalities in major types of cancer through gene therapy.

Although the HGP will lead to many benefits for humankind, its genetic findings have also led to many social, legal, and ethical issues. The term *designer baby* became an official entry in the *Oxford English Dictionary* in 2004. It defines the term as "a baby whose genetic makeup has been selected in order to eradicate a particular defect, or to ensure that a particular gene is present."

Designer babies are genetically modified for beauty, intelligence, or to be free of disease, but there are many other implications, and many controversies surrounding them. Science Repository, an open-access journal publisher, shared an article in 2021 that stated, " If gene editing were misused on embryos to produce more boys than girls, we would arrive at the territory of designer babies. Choosing the best traits in babies will hamper the baby's normal growth in some way or another. It might be a dangerous tool in the hands of helicopter parents with the aim to create the perfect child that will create a class difference between designer and non-designer babies."

Do the pros of genetic engineering outweigh the cons? What would be the positive and negative impacts this could have on our society in the future?

After investigating and gaining a deeper understanding of genetic manipulation, develop a strong argument advocating or prohibiting the genetic engineering of babies. Share your views with the National Institutes of Health or someone in a position to make a difference. Prepare to justify and defend your opinions in a debate.

Let's have an informed discussion about the concept of "Designer Genes."

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Designer Genes *Rubric*

	Novice	Apprentice	Practitioner	Expert
Genetics Research	explains: • basic principles of heredity • the Human Genome Project history and developments	explains: • basic principles of heredity • the Human Genome Project history and developments plus 1 of the following: • genetic disorders • the following terms: ○ DNA ○ cloning ○ chromosome ○ gene	explains: • basic principles of heredity • the Human Genome Project history and developments • genetic disorders • the following terms: ○ DNA ○ cloning ○ chromosome ○ gene	*all of Practitioner plus:* investigates similar scientific advancements and related controversial issues
Key Issues	• develops an argument for/against gene therapy, cloning, and genetic testing • supports each argument	• develops an argument for/against gene therapy, cloning, and genetic testing • supports each argument plus 1 of the following: • argument includes cited details and examples • integrates quantitative or technical information with text features (e.g., in a flowchart, diagram, model, graph, or table)	• develops an argument for/against gene therapy, cloning, and genetic testing • supports each argument with cited details and examples • integrates quantitative or technical information with text features (e.g., in a flowchart, diagram, model, graph, or table)	*all of Practitioner plus:* predicts how gene therapy, cloning, and genetic testing will impact the next generation
Argumentative Essay	• writes arguments to support claims with reasons and evidence • supports claim • includes domain-specific vocabulary • conclusion supports argument	• writes arguments to support claims with clear reasons and relevant evidence • acknowledges counterclaims • supports claim with cited evidence • includes appropriate domain-specific vocabulary • conclusion supports argument	• writes arguments to support claims with clear reasons and relevant evidence • introduces claim and acknowledges counterclaims • supports claim with cited evidence • uses transitions to create cohesion in writing • includes all appropriate domain-specific vocabulary • conclusion supports argument and calls the reader to action	*all of Practitioner plus:* defends opposing side of argument with a counterargument

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Debate	• opening and closing statements are organized • addresses the opposing team's points	• opening and closing statements are well organized • addresses the opposing team's points with supportive evidence • includes a visual component to clarify claims	• opening and closing statements are well organized • claims and findings are focused • addresses all the opposing team's points with supportive evidence • includes multimedia/visual components to clarify claims	*all of Practitioner plus:* shares initial debate via podcast

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Teacher Material

Designer Genes *Scaffold for Learning*

Benchmark Video and Discussions

- Unit launch to create a felt need
- Genetics
- Argumentative Writing
- What's in a Debate?



Instructional Activities: Learning

Instructional Texts/Websites

- Chromosomes and genes (I, P)
- Opening/closing statements (I)
- Write an argument/claim (I, HW)
- Write support claims/counter (I)
- Understand heredity/genes (I, P)
- Human Genome Project history (I, P)
- Text features — graphic org. (I, P)
- Writing conclusions (IV)
- Citing evidence (I)
- Research on biotechnology (I, P)
- Understanding debate (I, P, SG)

Instructional Videos

- Chromosomes and genes (I, P)
- Opening/closing statements (I)
- Write an argument/claim (I, HW)
- Write support claims/counter (I)
- Understand heredity/genes (I, P)
- Human Genome Project history (I, P)
- Text features — graphic org. (I, P)
- Writing conclusions (IV)
- Citing evidence (I)
- Research on biotechnology (I, P)
- Understanding debate (I, P, SG)

How-to Sheets

- Steps for making a claim
- Research
- Analyze a rubric
- Write an argument
- Write a claim
- Cite evidence

Interactive Websites

- Brainpop (I, P)
- IXL (I, HW)
- Khan Academy (I, P)
- Freerice (science) (I, HW)

Learning Centers

- Analyzing speeches (P, SG)
- Claims and Evidence (I, P)
- Determining claims/supports (I, P)
- Genes match (P, SG)
- Watching debates (P, SG)

Small-Group Mini-Lessons

- Chromosomes and genes
- Opening/closing statements
- Write an argument/claim
- Write support claims/counter
- Understand heredity/genes
- Human Genome Project history
- Text features — graphic org.
- Writing conclusions
- Citing evidence
- Research on biotechnology
- Understanding debate

Instructional Activities: Additional

Practice

- **Individual reading of materials (I, HW)**
- **Review argumentative essays (I, P)**
- **Research material for claim supp. (I, HW)**
- **Research heredity/genes (I, P)**
- **Review Human Genome Project (I, HW, P)**

Application

- **Draft a claim (I)**
- **Determine supporting evidence (I)**
- **Include a counterclaim (IV)**
- **Prepare materials for a debate (P, SG)**
- **Analyze speeches (P, SG)**
- **Meet in a group to plan for debate (SG)**

Assessment

- **Self-assess identify a claim (I)**
- **Self-assess identify supportive details (I)**
- **Self-assess Human Genome Project (I)**
- **Use rubric to peer edit task (P)**
- **Use rubric to self-assess task (I)**

Reflection

- **How has your opinion grown about this topic?**
- **What "ahas" did you have?**
- **Do you have a firm stance on this?**
- **What might you continue to do now that you have this information?**
- **What was challenging for you with this task?**

Key: Individual **(I)**, Pairs **(P)**, Small Groups **(SG)**, Activities suitable for homework **(HW)**, Insights Video **(IV)**

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Designer Genes *Sample Content Facilitation Grid*

	ELA										Science			
M – Mastered HW – Needs homework ML - SGML P – peer tutoring needed **Student Name**	Conducts research from several sources	Identifies relevant and credible sources	Cites textual evidence	Identifies a claim	Supports claim with relevant evidence	Writes an introduction	Develops a clear argument	Recognizes relevant evidence	Uses domain-specific vocabulary	Acknowledges opposing claims	Identifies relevant evidence	Identifies basic principles of heredity	Explains the theory behind the Human Genome Project	Explains genetic disorders

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Designer Genes *Facilitation Questions*

COMPREHENSION *Ask questions that ensure students understand content and skills needed to solve the problem.*	• What is a claim? • Where can you go to research the information for this task? • What is evidence? • What is genetic manipulation?
APPLICATION *Ask questions that ensure the ability of students to apply learning to new situations.*	• Why should you support your claim with evidence? • What is the impact of biotechnology on this generation? • What is the importance of learning more about scientific discoveries? • How has the HGP deepened our understanding of genes?
CONNECTION *Ask questions that ensure the ability of students to apply learning to their lives.*	• What if we didn't use evidence to support arguments? • In what other fields is using evidence to support arguments important? • How do these discoveries in science impact your life?
SYNTHESIS *Ask questions that encourage students to create new information from existing data.*	• How do you know which evidence is relevant? Or reliable? • Why is it important to view the opposing side of an argument? • How will you structure your essay so that others agree with your point of view? • How are genetics and evolution linked?
METACOGNITION *Ask questions that prompt students to think about their own thinking process.*	• Would you change your view based upon the debate from class? • Which part of this task was most difficult? • How did you arrive at your argument? • Which evidence convinced you?

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Designer Genes: *Transfer Task* Student Material

For decades, scientists have been debating over how a person's identity is shaped. Which is more important: their genetics (nature) or their life experiences (nurture)? Read an article on the "Nature vs. Nurture debate" to learn more about this topic. Then, using evidence from the article to support your claim, write an argument essay showing why you feel one aspect is more impactful than the other.

Be sure to include the following:

- A claim with 3 clear, supportive reasons
- A counterclaim
- Reasons supported with text evidence
- A basic principle of heredity
- Transitions for each paragraph
- 3 examples of domain-specific vocabulary
- A conclusion that supports the claim and calls the reader to action

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Designer Genes *Teacher Notes Guide*

Unit Overview

Students will research hereditary information and genetic engineering. Students will write an argumentative essay for or against the topic of genetic engineering, citing evidence to support their claim. Students will create teams to debate their argument.

Enduring Understandings	Essential Questions
• People rely on a variety of resources to obtain information. • New information may result in a new idea or a change of stance. • Writing is a process. • Genes may be altered and combined to create genetic variation within a species. • Chemical and structural properties of DNA specify the characteristics of an organism.	• Why should we evaluate what we read? • How does each step in the writing process impact your writing? • How can we use evaluation and reflection to improve our writing? • How have human technological advances increased our knowledge of genetics and influence on inheritance?

Common Core State Standards Addressed

ELA:
RI.6-8.1, RI.6-8.2, RI.6-8.3, RI.6-8.4, RI.6-8.7, RI.6-8.8, RI.6-8.9, RI.6-8.10
W.6-8.1, W.6-8.2, W.6-8.4, W.6-8.6, W.6-8.7, W.6-8.8, W.6-8.9
SL.6-8.1, SL.6-8.4
RST.6-8.1, RST.6-8.4, RST.6-8.7, RST.6-8.8, RST.6-8.9
WHST.6-8.1, WHST.6-8.2, WHST.6-8.4, WHST.6-8.6, WHST.6-8.7, WHST.6-8.8, WHST.6-8.9, WHST.6-8.10

MATH:
6.RP.A.1
7.RP.A.2
6.EE.B.6
6.SP.B.5

21st Century Skills Addressed

Core Content and Interdisciplinary Themes

- Global Awareness
- Civic Literacy

Learning and Innovation

- Critical Thinking and Problem Solving
- Communication
- Collaboration

Information and Media Literacy

- Information Literacy
- Media Literacy

Life and Career

- Productivity and Accountability
- Leadership and Responsibility
- Flexibility and Adaptability

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