

Innocent at Birth?

Genetics and Ethics

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Grade Level	8th – 12th Grade	**Time Frame**	150 minutes
		Duration	2-3 class periods

Essential Question

Is everything that is legally acceptable always ethically acceptable? What are the ethical dilemmas surrounding genetic information?

Summary

In this lesson, students will research the concepts of differential treatment based on genetics and discuss the ethics involved. Then, students will use the information to make an informed decision about genetic science and its role in today's society.

Snapshot

Engage

Students discuss what it means to be human.

Explore

Students work in groups and act as either a prosecution team or defense team. Students rotate through stations to gather research about genetically modified organisms.

Explain

Students prepare their opening and closing statements, including claims and citing evidence, as well as questions for the opposition.

Extend

Students present their debates. Students listening to debates evaluate each case they hear according to a rubric.

Evaluate

Students reflect on the essential questions of the lesson.

Standards

ACT College and Career Readiness Standards - Science (6-12)

EMI403: Determine which models imply certain information
EMI503: Identify the strengths and weaknesses of models
EMI504: Determine which models are supported or weakened by new information
EMI602: Determine whether presented information, or new information, supports or weakens a model, and why

Next Generation Science Standards (Grades 6, 7, 8)

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

Next Generation Science Standards (Grades 6, 7, 8)

HS-LS3-1: Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
HS-LS3-2: Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.

Oklahoma Academic Standards (8th Grade)

8.LS4.5 : Gather and synthesize information about the practices that have changed the way humans influence the inheritance of desired traits in organisms.*

Oklahoma Academic Standards (8th Grade)

B.LS3.1 : Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
B.LS3.2 : Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.

Attachments

- Case Evaluation Rubric—Innocent at Birth.docx
- Case Evaluation Rubric—Innocent at Birth.pdf
- Case Evaluation—Innocent at Birth.docx
- Case Evaluation—Innocent at Birth.pdf
- Case Preparation Notes - Teacher's Guide—Innocent at Birth.docx
- Case Preparation Notes - Teacher's Guide—Innocent at Birth.pdf
- Case Preparation Notes—Innocent at Birth.docx
- Case Preparation Notes—Innocent at Birth.pdf
- Lesson Slides—Innocent at Birth.pptx
- Source Collection—Innocent at Birth.docx
- Source Collection—Innocent at Birth.pdf

Materials

- Lesson Slides (attached)
- Source Collection (attached; one per student)
- Case Preparation Notes (attached; one per student)
- Case Preparation Notes - Teacher’s Guide (attached)
- Case Evaluation (attached; one per student)
- Case Evaluation Rubric (attached; one per student)
- Articles that cover topics such as genetic engineering, the human genome project, genetic defects, genetic diseases, etc. (optional sources linked)
- Speakers

10 minutes

Engage

Begin by using the attached Lesson Slides and review the essential question and learning objectives on **slides 3–4.**

Move to **slide 5** and pass out a blank piece of paper to each student. Review the Sketchnotes instructional strategy and explain to students that they will be listening to the beginning of a podcast. Ask students to take out a blank piece of notebook paper and tell them to take visual notes while they listen to represent what they are hearing. Encourage students to create a variety of sketches including symbols, lines, shapes, handwriting, diagrams, and more.

Play the beginning of the Radiolab podcast, "Mutant Rights." Stop the podcast at 4:18 and move to **slide 6**. Pose the following question and have them respond to it on their Sketchnotes: "What does it mean to be human?"

Teacher's Note: Defining the Question

Make sure students understand that the question is regarding classifiable traits and/or physical characteristics of humans, not the philosophical aspect of humanity.

40 minutes

Explore

Display **slide 7**. Play the clip from *The Great Debaters*, stopping it at 4:03:

Embedded video
https://youtube.com/watch?v=Ve7WKzFBiKo

Explain to students that they will be participating in a "mock trial," in which they will be debating the issue of genetic engineering and the ethics involved.

Place students into groups of 4–5. Tell students they will be conducting research to use in their debate. They need to locate and cite evidence from a range of sources to support their conclusions. This will give them perspective to analyze the information they will be reviewing.

Display **slide 8**. Assign half of the groups to serve as prosecution teams, and the other half to serve as defense teams. Using the information provided on the slide, explain what it means to be a part of each team.

Transition to **slide 9** and assign one prosecution and one defense team to each of the following or similar topics related to ethics in genetics:

Topic: Human Genome Project and Differential Treatment based on Genetics

Prosecution Teams Research Questions:

- How has information from the Human Genome Project been used against individuals in employment or insurance?
- How could access to someone's genome lead to a violation of privacy or consent?

Defense Research Questions:

- How has the Human Genome Project advanced medical research and improved healthcare outcomes?
- Are there examples where the HGP has helped identify and prevent inherited diseases in families or communities?

Topic: Mutations, Genetics, and Genetic Influence

Prosecution Teams Research Questions:

- How could genetic modification lead to a new class system based on genetic traits or enhancements?
- What dangers arise when society labels someone as a "mutant"?

Defense Teams Research Questions:

- How can genetic manipulation be used to eliminate deadly diseases and improve quality of life?
- What ethical guidelines exist to prevent the misuse of gene editing technologies?

Encourage students to use these questions to start but to also dig deeper into the research and find more key points to strengthen their arguments.

Move to **slide 10** and pass out the attached **Source Collection** handout to each student. First, have students write out their research question in the space provided on the handout.

Next, explain to students that their group will rotate through different stations to gain a broad perspective on the assigned topic, but encourage them to focus on their concentrated area of research. Have students spend about 15 minutes at each station. Be sure to circulate the room and monitor students' progress.

Teacher's Note: Station Preparation

Set up each of the source collection stations that students will use to support their stances. Include multiple sources at each station, such as: news articles, research papers, podcasts, or other pieces of information regarding genetic information and differential treatment based on genetics. Ensure that at each station there is information presented for both sides of the debate, support or opposition.

Teacher's Note: Source Collection

Source collection can be done as a gallery walk where students rotate to each station or all the resources could be provided directly to each group for independent research.

Optional Resources

Consider using the provided articles and resources or ones similar to the ones linked below:

Human Genome Project and differential treatment based on genetics:

- Medline Plus: "Genetics"
- Huffington Post: "Tenth anniversary of the mapping of the human genome: What it means for us all"

Mutants, genetic manipulation, and differential treatment based on genetics:

- Students may finish listening to the short podcast on "Mutant Rights" from Radiolab
- Fox News: "Sorry, Avengers: US gov't says mutants aren't human"
- Google Scholar: "Toy Biz, Inc. v. United States (2003)"
- NPR: "Critics lash out at Chinese scientists who edited DNA in human embryos"
- "Not So Weird Science: Why Tracker Jackers and Other Mutts Might Be Coming Soon to a Lab Near You" by Cara Lockwood, a print essay found in *The Girl Who Was On Fire: Your Favorite Authors on Suzanne Collins' Hunger Games Trilogy*

Students may also independently research topics using available resources (i.e., the library or internet).

25 minutes

Explain

Display **slide 11** and show students the following debate format so they can plan and be familiar with how the debate will proceed:

- Opening Statement (Affirmative: 1 minute)
- Opening Statement (Negative: 1 minute)
- Rebuttal (Negative: 1 minute)
- Rebuttal (Affirmative: 1 minute)
- Cross Examination (Affirmative: 2-3 minutes)
- Cross Examination (Negative: 2-3 minutes)
- Second Rebuttal, or Second Statement (Negative: 1 minute)
- Second Rebuttal, or Second Statement (Affirmative: 1 minute)
- Closing Statement (Negative: 1 minute)
- Closing Statement (Affirmative: 1 minute)
- Audience Questions (Optional: 2-5 minutes. Can be moved before Closing Statements.)

You will act as moderator during the debates to keep students confined to the time limits set. Explain to students the format and the time allotted for each portion of the debate. You may want to show them sample debates via video clips to prepare them to review this.

Teacher's Note: Debate Tutorials

Consider showing students the following two-part tutorial for a public debate:

- "*YFD Mock Debate Tutorial Part 1*"
- "*YFD Mock Debate Tutorial Part 2*"

Tell students that during the debate the rest of the class will serve as the jury and will evaluate the arguments based on the rubric you will provide.

Transition to **slide 12**. Have students work with their team to prepare for the presentation of the case. Pass out the **Case Preparation Notes** handout. Use the attached **Case Preparation Notes - Teacher's Guide** to help you facilitate this part of the lesson.

Have students prepare their opening and closing statements and then construct an opening and closing statement for the opposition. They will use the statement they created for the opposition to help prepare and anticipate the argument that will be constructed against them.

Then, have students list the five main points for their argument, including claims and citing evidence, and the opposition's argument. Students will also need to begin to compose a rebuttal to the opposition's argument and construct questions they will use during the debate to either strengthen their argument or weaken the opposition's argument.

30 minutes

Extend

Display **slide 13** and pass the attached **Case Evaluation** and **Case Rubric** handouts to each student.

Review the rubric and evaluation with students. Before each debate, name the debate as Case #1 or Case #2. Tell students that they will serve as the jury and they are to take notes as they listen to the debates. These notes will support the scores they give each debate team and help them form questions to ask at the end. After each debate, you may take a poll of the class to get the total number of points awarded to each team and determine the winner of each debate.

Display **slide 14**. Using the debate format outlined in the Explain section, instruct students to present their arguments for their case. Remind the opposing side that they should fill out the rebuttal section of the Case Preparation Notes during the debate.

10 minutes

Evaluate

Display **slide 15**. On the back of their Case Evaluation Notes handout, have students answer the essential questions in light of what they know now.

- Overarching: Is everything that is legally acceptable always ethically acceptable?
- Topical: What are the ethical dilemmas surrounding genetic information?

At the end of the lesson, have students turn in their response to the essential questions, the evaluation forms, the evidence collection handout, and the Case Preparation Notes.

Teacher's Note: Possible Differentiation

The research that students will be looking at may need to be scaled back or highlighted in order to help students find relevant information. You may choose groups that will compliment each other in the various roles needed to complete the research and the debate.

Resources

- ColumbiaYFD. (2013, April 16). *YFD mock debate tutorial part 1* [Video]. YouTube. https://www.youtube.com/watch?v=oN6Z1WKVh8g
- ColumbiaYFD. (2013, April 16). *YFD mock debate tutorial part 2* [Video]. YouTube. https://www.youtube.com/watch?v=zeposE11lrg
- K20 Center. (n.d.). Sketchnotes. Strategy. https://learn.k20center.ou.edu/strategy/2870
- Klitzman, R. (2013, June 16). *Tenth anniversary of the mapping of the human genome: What it means for us all*. HuffPost. https://www.huffpost.com/entry/human-genome-project_b_3081121
- Lockwood, C. (2017). Not So Weird Science: Why Tracker Jackers and Other Mutts Might Be Coming Soon to a Lab Near You. In L. Wilson (Ed.), *The Girl Who Was On Fire: Your Favorite Authors on Suzanne Collins' Hunger Games Trilogy*. Smart Pop.
- Pen English. (2022, November 30). *The hot spot - The Great Debaters* [Video]. YouTube. https://www.youtube.com/watch?v=Ve7WKzFBiKo
- Radiolab. (2011, December 26). *Mutant rights* [Podcast episode]. https://www.radiolab.org/episodes/177199-mutant-rights
- Stein, R. (2015, April 23). *Critics lash out at Chinese scientists who edited DNA in human embryos*. NPR. https://www.npr.org/sections/health-shots/2015/04/23/401655818/critics-lash-out-at-chinese-scientists-who-edited-dna-in-human-embryos?utm_source=facebook.com&utm_medium=social&utm_campaign=npr&utm_term=nprnews&utm_content=20150423%2F
- Tenney, G. (2015, June 22). *Sorry, Avengers: US Gov't says mutants aren't human*. Fox News. https://www.foxnews.com/science/sorry-avengers-us-govt-says-mutants-arent-human
- Toy Biz, Inc. v. U.S., #248 F.Supp.2d 1234 (2003), https://scholar.google.com/scholar_case?case=18171183470766960868&q=Toy%2BBiz%2C%2BInc.%2Bv.%2BUS%2B%28248%2BF.Supp.2d%2B1234%2C%2B2003%29&hl=en&as_sdt=40000006&as_vis=1&scilh=0
- U.S. National Library of Medicine. (n.d.). *Genetics*. MedlinePlus. https://medlineplus.gov/genetics/