P R O J E C T P L A N N I N G & O V E R V I E W

Subject/Course:	Biology and English	**Grade Level:**	9

Content Standards and Learning Outcomes

What content standards and learning outcomes will you cover with this unit? What do you want students to know and be able to do as a result of this project? What 21st skills are you addressing in the PBL?

Summary:

Biology

- Identify and illustrate changes in DNA and evaluate the significance of these changes.
- Predict possible outcomes of various genetic combinations such as monohybrid crosses and sex-linked inherited traits.
- Recognize the significance of meiosis to sexual reproduction.

English

- Read and analyze the development of a theme throughout a text and how it is shaped by specific details and events.
- Think critically about diverse perspectives and justify or change my own views in light of new ideas and information.
- Research, using credible sources, to answer a specific question.
- Present important findings and supporting evidence so listeners can follow the line of reasoning.
- Use evidence from literature to support analysis, reflection, and research in writing.

21 Century Skills:

- Critical Thinking and Problem Solving
- Collaboration
- Professional Ethics
- Communication
- Creativity

Project Scenario *Where are the concepts/skills used in the real world? What scenario/role could you put the students in to create a need-to-know for the content?*	Students will be presented with a case study on a family that has a certain genetic disease that runs in the family. These case studies will be parallel to the scenario the family in *Double Helix* by Nancy Werlin faces. Students will research information about the disorder and prepare a pedigree of the family or create a karyotype explaining how the disorder was inherited. Students will use a Punnett square and provide an explanation of the pattern of inheritance. They will need to advise "the family" of the probabilities that their future children may inherit the disorder. They need to advise the family of the effects of genetic engineering on the child in comparison to Eli Samuels in *Double Helix.* This information will be presented in a letter and a presentation style of their choice (PechaKucha or Infographic). Students will then work individually to create a blog post addressing if designer babies were allowed, what the long term effects would be. Finally, a classroom debate about whether or not "designer babies" are ethical.
Problem Statement / Driving Question *What is the challenge, investigation, scenario, problem, or issue?*	How can we, as genetics counselors, determine to what extent people can design the perfect baby, and whether or not this is the best choice for our society so that couples can ensure the health and well-being of their new child yet prevent harmful consequences of disrupting the human genome?

Reality Check!			
Does your project cover important standards for state testing?	Does your project pose an authentic problem with multiple solutions?	Does your project require core subject knowledge?	Have you considered your time frame for this project?

P R O J E C T P L A N N I N G & O V E R V I E W

Culminating Products & Performances *What will students be expected to produce that will allow them to demonstrate their knowledge and skills?*	Group:	Letter to parents, presentation to parents (PechaKucha or Infographic), Class Debate
	Individual:	Blog Post
Project Name:	Designer Babies	
Entry Event *How will you present the problem to students?*	Give students their case study.	

Literacy Integration *How will you increase rigor in the project via reading and writing?*	• Student will read *Double Helix* by Nancy Werlin where they will be introduced to the concept of a designer baby in the form a fictional story. The novel gives students an opportunity to empathetically consider the psychological effects of hereditary disease and genetic engineering. The novel offers diverse perspectives on the idea of genetic engineering that the students need to consider • Students will be researching, using credible sources, including different laws and reading other published persuasive pieces about this issue to address the issues presented in their case study. • Students will synthesize information to create a clear and informative presentation of the case study.

SCAFFOLDING

*What scaffolding might be needed to support the students' development of the **content**, **learning outcomes**, and **literacy skills?***

Anticipated **Need to Know**	Anticipated **Next Step**	**Assignment**/activity/action to address NGSS.	**Assessment** used to gauge understanding
• How are traits inherited? Why do we look more like one parent and not the other?	• Mastery of the steps of meiosis and gamete production	• Blended learning lesson	• **Quiz**
• How exactly can a doctor choose the traits for a baby?	• WORKSHOP- biotechnology	• **Ms. Zipper will explain in-vitro fertilization and genetic screening**	
• Why do people inherit diseases? Which diseases can you inherit?	• Structure of DNA • DNA replication • DNA mutations- frame-shift, point, insertion, deletion	• Students will practice identifying mutations and showing the effects of each type • Students will research several diseases such as cystic fibrosis, sickle-cell anemia, etc. as they are related to the project	• Students will be able to determine the severity of a DNA mutation by looking at the nitrogenous bases and subsequent mutation.
• How do we determine the chances of a child inheriting a certain trait?	• Punnett squares! • Sex-linked traits	• Students will use monohybrid crosses to show the likelihood of our couple passing on	• Students will correctly identify the likelihood of each trait that the

		certain traits • Students will use sex-linked crosses to show the likelihood of our couple passing on certain traits. • Research on which genes are on the X chromosome…If your mom's got it, the son will always have it.	couple is concerned with • Sex linked diseases are sex-linked…students will show the odds of having a boy and a girl with the disease vs a normal girl, normal boy etc
• Who in their family has been affected by this disease? • How do we know if a disease is dominant or recessive?	• Pedigree	• Students will make a pedigree of the family history and determine whether the diseases in the family are dominant, recessive, or sex-linked	• Students' pedigrees will be graded for accuracy
• If designer babies are allowed…what will the long term effects be?	• Literacy activity including articles, videos, and the movie GATTACA to find both reasons for and against the concept of designing a baby.	• **Students will write a blog post using at least three of the topics listed below:** • **Finance**- who could afford it? How would this change social classes in Colombia? • **Geography**- if different countries have different laws for this, how could world powers change? • **Healthcare**- could we get rid of diseases altogether? Is this a good thing? Consider what resources would be available if the population grows exponentially. • **Opportunity**- if people are engineered a certain way…could they still have choice in what jobs they have or lives they lead? (Consider Aldous Huxley's *Brave New World* where people are genetically modified to fit the job they will need to do in this dystopian world.)	• Blogs will be graded using a rubric.

		• **Opportunity in Sports –** would genetically modified athletes be allowed to participate in all games? (Consider that steroids/doping are not allowed). **Students will also have to reply to 2 other students' blog post.**	
• Are designer babies entirely possible? Can you completely create your own child? • Should we allow designer babies as an option to couples- should we recommend this to our couple??	• Culminating question!	• **Students must respond in groups via a debate for the class** • **Students will be assigned which side of the argument they must support.**	• **This is the final product!**
• How might a designer baby feel once s/he learns s/he has been genetically modified?	Discussion based on the protagonist of *Double Helix* and the emotional turmoil he faces when realizing he is genetically engineered.	Literature Circle Discussion and Socratic Smackdown.	Assessment, through rubrics, of students' preparation and participation in discussion.
• How does the case study compare to the case presented in *Double Helix?*	Read to understand the case study and assess the ramifications of the genetic engineering on the protagonist of the novel.	Comparison of literature to real life situation through the PBL.	Assessment of comparison in letter and presentation.