

FUTURELAB+

AG/ENVIRONMENTAL

Alternative Proteins

Project Notebook

Developed in partnership with:

Discovery Education and Ignited

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

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

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

Single Pages (use a comma): T3, T6

Page Range (use a hyphen): T3-T6

Cover Image

This model of a protein in cow's milk is a common allergen. Could a genetically engineered modification help?

Project Notebook Outline**Do not share with students****1. Project Phase Chart Capture Sheet**

Used throughout the different lessons:

Project Phase		Lesson to be added:
Discover	Problem Descriptions	Lesson 7
	Industry Spotlights	Lesson 6
	Current GE Products	Lesson 6
	Solution GE Product	Lesson 7
Develop	Community Background	Lesson 8
	GE Technology	Lesson 3
	Protein Products	Lesson 3
	Safety	Lesson 5
Manufacture	Farm-to-Store Process	Lesson 9
	Sustainability	Lesson 9
	Equity	Lesson 9
Commercialize	Community Impact	Lesson 8

2. Final Project Outline

The outline will be used in Lesson 7, but will help students see where they are going throughout the unit.

3. Daily Goal Capture Sheet

You may want to include multiples of these pages (if you are passing out the notebook as one packet of papers for students), as students will be directed to complete it in Lessons 7–10 and will need one per day as they are working in groups.

4. Final Project Rubric

As part of the final assessment, each group will receive peer feedback using one copy of the Final Project Rubric: Unit 6. After incorporating this feedback, you will use another copy of the Final Project Rubric: Unit 6 to assess the full website.

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Project Notebook

PURPOSE

To create a website for the public that educates and advocates the need for a new genetically engineered product that will solve a specific community challenge. This notebook includes:

1. Project Phase Chart Capture Sheet

This capture sheet will be filled in during each lesson as an at-a-glance organizational tool. Your teacher will provide guidance on when to fill this out. In this document, you will record a) a brief overview of knowledge gained, b) careers and associated skills, and c) probing questions that are present at the end of each lesson. The intention of the Project Phase Chart is for you to track learning as you move through the unit and use it as a tool to help complete your final project.

2. Final Project Outline

This outline will be introduced in Lesson 7 and will carry through Lesson 10. No one can complete this work on their own. The expectation is that you will work through this project as a group and will achieve a common goal together. The knowledge from these sheets will be transferred onto a final project website.

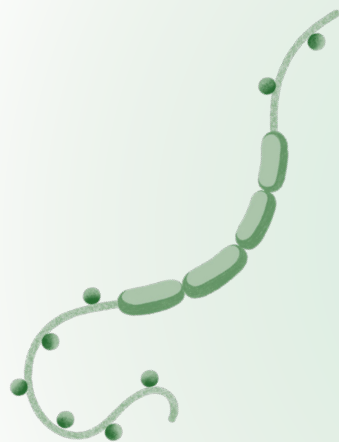
- a) Discover (Part 1)—Completed during Lesson 7
- b) Develop (Part 2)—Completed during Lesson 8
- c) Manufacture (Part 3)—Completed during Lesson 9
- d) PSA Campaign—Community Education (Part 4)—Completed during Lesson 10

3. Daily Goal Capture Sheet

This capture sheet can be utilized by your group to monitor daily and weekly goals. You can assign, track, and collaborate using this sheet to ensure group goals are established and met throughout the lesson. Each student will individually complete a Daily Goal Capture Sheet each project work day.

4. Final Project Rubric

This document is how you will be graded on your final project. Be sure to reference this rubric as you complete your project. There will be opportunities to peer review your classmates' work and to self-evaluate your progress.



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Project Phase Chart Capture Sheet

Project Phase		What I learned	Career (soft and technical skills)	Questions I still have
Discover	Problem Descriptions			
	Industry Spotlights			
	Current GE Products			
	Solution GE Product			
Develop	Community Background			
	GE Technology			
	Protein Products			
	Safety			
Manufacture	Farm-to-Store Process			
	Sustainability			
	Equity			
Commercialize	PSA Campaign			

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Final Project Outline—Discover

Part 1

Suggested Group Roles

Community Liaison

Bridges the gap between production and community; you are always keeping the community's best interest in mind when it comes to safety, equity, inclusion, affordability, etc., and communicating this to the public.

Industry Expert

Shows how this product fits into the bigger industry picture

Genetic Engineer

Explains the scientific information about genetic engineering in a way the public can understand

Product Designer

Focuses on the image of the final GE product

During Lesson 7, you will be adding the information described below (1. Community Challenge Description, 2. Industry Spotlight, 3. Anchoring GE Product, 4. Solution-Novel GE Product Background) to your website. This information will come from your learning and research during the full unit. You are assigned to a specific subsection of the **Discover** portion of the website. Make sure you are helping other group members if they need help, or you finish your section early.

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Final Project Outline—Discover

Part 1

Continued

Directions

Check off each box as completed.

1. Community Challenge Description

- Describe the community challenge you are focusing on for this project.
- State why your collaborative team selected this community challenge and mention any personal experience with this challenge.
- Display data that your community is dealing with this challenge. Link all sources.
- Which other areas of the United States or the world are also dealing with this community challenge?
- State which populations are most impacted by this community challenge (impoverished, BIPOC due to systematic racism, etc.). Provide data and sources.
- State what has been tried in the past to solve this challenge in your community.

2. Industry Spotlight

- State what industry connects with your novel GE product concept.
- State what the industry is currently making and why this is the best industry for the challenge.
- State what careers exist within this industry.
- State what GE technology innovations exist currently in this industry.
- Identify what large companies are driving innovation within this industry, if any.
- State how this industry receives funding. Are funding sources private entities or government agencies?
- What questions do you have about this industry? If you could interview an expert, what questions would you ask? Put these questions under a possible “public questions” section.

3. Anchoring GE Product

- Describe the anchoring GE product you are using to guide your production.
Remember: this is a product that has already been produced or is already being tested. It will be used as a guide for your research.
- State what GE technology was used to produce this product and when it was introduced.
- Describe how the community was impacted by this product—what are its advantages and disadvantages?

4. Solution—Novel GE Product Background

- State what novel GE product your group will promote.
- What community challenge is the product aiming to solve or mitigate?
- Describe how your novel GE product compares to the anchoring GE product. In other words, is your novel product unique compared to what is currently on the market?
- Complete the Summary of Our Development Process (discover, develop, manufacture, and commercialize) to provide credibility to the new product in the eyes of the public.

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Final Project Outline—Develop

Part 2

Suggested Group Roles

Community Liaison

Bridges the gap between production and community; you are always keeping the community's best interest in mind when it comes to safety, equity, inclusion, affordability, etc., and communicating this to the public.

Industry Expert

Shows how this product fits into the bigger industry picture

Genetic Engineer

Explains the scientific information about genetic engineering in a way the public can understand

Product Designer

Focuses on the image of the final GE product

During Lesson 8, you will be adding the following information (1. Community Background, 2. GE Technology, 3. Gene and Protein Product, 4. Safety) to your website. This information will come from your learning and research during the full unit. You are assigned to a specific subsection of the **Develop** portion of the website. Make sure you are helping other group members if they need help, or you finish your section early.

1. Community Background

- Identify your target audience—describe it in detail.
- Explain how the target audience connects to the community challenge. Why should the members of this audience care about your product?
- What solutions do they want to see for the community challenge? This information will come from your surveys.
- How does the local community or the local challenge connect to global issues?
- Present stakeholders' feedback and survey data—publish surveys, interviews, survey results, etc., and add to the Interview Summaries Capture Sheet.

2. GE Technology

- Summarize the types of genetic engineering techniques used to produce GE products.
- After sharing the big picture, state which technology you think is best for your novel GE product and share how it works.
- State why you believe this type of technology is best for your product, using evidence from other products in your industry.

3. Gene and Protein Product

- State the target gene and alternative protein product using a model GE product as a guide. Cite your sources.
- Describe where the target gene could come from (if it is inserted) or why you want to change the gene (if it is altered).
- Identify why you are focused on this protein product and provide an image if possible.

4. Safety

- Highlight relevant clinical data of similar GE products, if there are any.
- What safety concerns does your community have about this product? This will come from the surveys and interviews.
- Describe some solutions to ease community concerns.

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Final Project Outline—Manufacture

Part 3

Suggested Group Roles

Community Liaison

Bridges the gap between production and community; you are always keeping the community's best interest in mind when it comes to safety, equity, inclusion, affordability, etc., and communicating this to the public.

Industry Expert

Shows how this product fits into the bigger industry picture

Genetic Engineer

Explains the scientific information about genetic engineering in a way the public can understand

Product Designer

Focuses on the image of the final GE product

During Lesson 9, you will be adding the following information (1. Sustainability and Equity Practices, 2. Regulatory Approval, 3. Farm-to-Store Process, 4. Final Product Prototype) to your website. This information will come from your learning and research during the full unit. You are assigned to a specific subsection of the **Manufacture** portion of the website. Make sure you are helping other group members if they need help, or you finish your section early.

1. Sustainability and Equity Practices

- What sustainability practices need to be considered?
- Does your product help solve any current sustainability issues of prior products? If not, what next steps in GE production would you suggest for this product to help solve sustainability issues as well as the community challenge?
- What equity considerations should be highlighted to avoid unintended consequences?

2. Regulatory Approval

- Describe what process you should go through with the regulatory committee (FDA, EPA, USDA). Information can be found on the FDA's [How GMOs Are Regulated for Food and Plant Safety in the United States](#).
The challenge here is to organize the regulatory process into a way that makes sense to the public. Consider ways to simplify the information. Use images and cite all sources.

3. Farm-to-Store Process

- The purpose of this process is to highlight how your product could be made from beginning to end.*
- What production process, from lab to consumer, could be implemented to produce the final GE product?
 - What will the farmer (or lab scientist) need to know about the new crop?
 - Are there any new or different handling instructions for preparation or transit?
 - What different instructions or handling information will the store or storage facility need to know?
 - Do there need to be any special labeling or instructions for the consumer?

4. Final Product Prototype

- Draft out an image of your final GE product—what will it look like? Upload the image to your website.
- Label the important parts of the final product.
- Make a list of all career fields that may come in contact with this product.

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Final Project Outline—Commercialize

Part 4

During Lesson 10, you will be adding all the following information to your website. This information will come from your learning and research during the full unit. You are assigned to a specific subsection of the **Commercialization** portion of the website. Make sure you are helping other group members if they need help, or you finish your section early.

PSA Campaign

- One Print Ad
- One TV or Radio Ad
- One Social Media Ad
- One Endorsement

Prior to starting this assignment, reflect together as a group to guide your Public Service Announcement (PSA) creation:

What are the three main points you are trying to pitch about your GE product to get public buy-in?

1. _____

2. _____

3. _____

How can you best illustrate your GE product—talk to concept designers about their prototype.

Summarize your target audience.

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Final Project Outline—Commercialize

Part 4

Continued

Create a slogan that could fit your product.

Create a logo for your product.

What are some anticipated concerns from the public and what information could you share to ease these concerns?

Public Concern	Information/Phrases to Address This Concern

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Final Project Rubric

Observable features of student performance	Meets Expectations 8-10 points	Progressing 5-7 points	No attempt 0 points
Discover			
a. Community Challenge Description <ul style="list-style-type: none"> • Describes the community challenge • Identifies reason for selecting the challenge • Includes community data • Identifies other US communities dealing with the challenge • Provides data and sources for all of the above 			
b. Industry Spotlight <ul style="list-style-type: none"> • States industry that would produce novel GE product • Identifies what the industry is currently doing to address challenge • Identifies relevant careers • Describes companies working on challenge within industry • Includes possible questions from the public for industry experts 			
c. Anchoring GE Product <ul style="list-style-type: none"> • Describes the anchoring GE product used to guide production • Explains what GE technology was used for production • Connects community impact to anchoring GE product 			
d. Solution—Novel GE Product Background <ul style="list-style-type: none"> • Describes novel GE product • Connects community challenge to novel GE product • Describes how novel GE product is unique • Summarizes the development process 			

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Final Project Rubric

Continued

Observable features of student performance	Meets Expectations 8-10 points	Progressing 5-7 points	No attempt 0 points
Develop			
a. Community Background <ul style="list-style-type: none"> • Describes target audience in detail • Identifies impact of product on target audience • States stakeholders' desired solution • Identifies how this local audience connects on a global scale • Uses stakeholders' feedback and survey data to support the above 			
b. GE Technology <ul style="list-style-type: none"> • Summarizes the types of genetic engineering techniques used • Describes how the novel GE product fits into the large GE landscape • Explains the GE technology used for creation of the GE product • Defends use of this specific technology 			
c. Gene and Protein Product <ul style="list-style-type: none"> • States the target gene and alternative protein product • Cites sources for finding gene and alternative protein product • Identifies where the target gene comes from (if it is inserted) • Identifies why the gene is changed (if it is altered) • Describes the function of the protein product • Provides an image, if possible 			
d. Safety <ul style="list-style-type: none"> • Highlights relevant clinical data of similar GE products, if any • Identifies local community's concerns about novel GE product • Describes solutions to ease community concerns 			

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Final Project Rubric

Continued

Observable features of student performance	Meets Expectations 8-10 points	Progressing 5-7 points	No attempt 0 points
Manufacturing			
a. Sustainability and Equity Practices <ul style="list-style-type: none"> Identifies which sustainability practices need to be considered Describes how the product helps solve a current sustainability issue or identifies next steps for the product to become more sustainable Identifies equity considerations needed to avoid unintended consequences 			
b. Regulatory Approval <ul style="list-style-type: none"> Describes what process the product should go through with the regulatory committee (FDA, EPA, USDA) 			
c. Farm-to-Store Process <ul style="list-style-type: none"> Describes the process needed to get the product from lab to consumer Identifies the needed prior knowledge for farmers Describes packaging and handling concerns for transportation Describes packaging and handling concerns for stores or storage facilities Identifies labeling needs for consumers 			
d. Final Product Prototype <ul style="list-style-type: none"> Provides an image of the novel GE product on the website Labels the important parts of the final product Identifies all career fields that may come in contact with the product 			

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Final Project Rubric

Continued

Observable features of student performance	Meets Expectations 8-10 points	Progressing 5-7 points	No attempt 0 points
Marketing			
a. Target Audience <ul style="list-style-type: none"> Audience is clear and consistent throughout all advertisements. 			
b. Three Main Points <ul style="list-style-type: none"> Each point is well made in all advertisements. All advertisements adhere to intended talking points. 			
c. Slogan <ul style="list-style-type: none"> Makes target audience want to repeat it Used across all ads in appropriate manner 			
d. Logo <ul style="list-style-type: none"> Easily identifiable Used across all PSAs in appropriate manner 			
e. One Print Ad <ul style="list-style-type: none"> Visually appealing and grabs attention Contains factual and emotional evidence to persuade reader 			
f. One TV or Radio Ad <ul style="list-style-type: none"> Information is clear and concise (maximum of 30 seconds) 			
g. One Social Media Ad <ul style="list-style-type: none"> Uses best practices for chosen platform to gain attention 			
h. One Endorsement <ul style="list-style-type: none"> Includes who endorses the novel GE product and why 			
Final Score			