

FUTURELAB+

AG/ENVIRONMENTAL

*Plant to Pharmaceutical*

# Product Showcase

Developed in partnership with:

Discovery Education and Ignited

# In this Lesson Plan:

Print the **Teacher Section** → 

Print the **Student Section** → 

<b>01 For Teachers</b>	Page
Lesson Overview	<b>1</b>
Questions and Connections	<b>2-3</b>
Pedagogical Framing	<b>4</b>
<b>Procedure</b>	
Day 1	<b>5</b>
Day 2	<b>6</b>
Day 3	<b>7-8</b>
Day 4	<b>9</b>
Day 5	<b>10</b>
National Standards	<b>11-12</b>

<b>02 Student Resources</b>	Page
Project Team Member Review Capture Sheet	<b>1-2</b>
Peer Feedback Capture Sheet	<b>3</b>
Student Final Performance Review Capture Sheet	<b>4-6</b>
Individual Reflection Capture Sheet	<b>7-10</b>
Rubric for Biotech Unit Challenge	<b>11-13</b>

*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

The Solanaceae plant family is rich in bioactive metabolites and has played an essential role in traditional medicine.

## Product Showcase

### DRIVING QUESTION

*What supporting evidence do biotech companies use to determine which drugs to bring to market?*

### OVERVIEW

Students are showcasing their final products in an “external” communication format (video, brochure, slide deck, etc. ) to an audience each team identifies (regulators, doctors, patients, etc.) through a pitch. Each Project Team will share its molecular model showing how the compound acts to treat a condition, manufacturing plan, and pitch for why this drug is useful. Plant compounds can heal human conditions. Pharmaceutical companies have used this knowledge to expand access to treatment over time.

In this lesson, students will also have the opportunity to share their work with adult community members in a showcase (teacher choice here). This week is a celebration of the learning that students have done over the unit, connecting their personal growth to potential careers including roles in communications, product and supply chain management, and biochemistry. Additionally, students will explicitly connect their work developing a plant-based medicine product to prior learning on biodiversity, ethical collaboration, botanical collections, Indigenous TEK, and bioactivity.

### ACTIVITY DURATION

Five class sessions (45 minutes each)

### ESSENTIAL QUESTIONS

*How are external communication tools essential to the product life cycle?*

*How are prior lessons on biodiversity, ethical collaboration, and TEK related to the final products?*

### OBJECTIVES

*Students will be able to:*

**Describe** their individual growth, strengths, and content knowledge for the Project and for the unit as a whole.

**Communicate** their pitch to the class, clearly explaining their financial scaling plan, molecular model, and details about their medicine’s patient population.

**Analyze** and provide feedback on the contributions of other people on their team, and the work products of other project teams.

**Reflect** and celebrate work and collaboration throughout the project.

### Materials

Student Guide

Project Team Member Review Capture Sheet

Peer Feedback Capture Sheet

Student Final Performance Review Capture Sheet

Individual Reflection Capture Sheet

Posters

Sticky notes

## Have you ever wondered...

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### *What role does access to medical care play in raising the standard of living of all humans on Earth?*

Many humans live without access to clean water, secure food resources, or transport access to medical facilities that have electricity. Beyond drug products themselves, increasing access to well-trained medical professionals, clean water, and reliable food sources and housing all play a role in improving the standard of living of all humans on Earth. Thus, improving the availability of plant-based medicines that are affordable can have a further impact on the 60 percent of the human population that primarily treats conditions with plant-based medicines.

### *How can individual professionals help systems respond to global threats of biodiversity loss and climate change in different sectors of the economy?*

Researchers are key to documenting what biodiversity exists and exploring how to collaborate with local communities in biodiversity hotspots on Earth to prevent future extinction events, which result in a loss of genetic and chemical diversity that could be key to future plant-based medicines. Communications professionals connect cross functional teams to share information and systems, allowing different sectors to share best practices and respond to climate change. Finance Teams empower organizations to consider externalities, such as pollution and emissions, as they work to create manufacturing pipelines that provide equitable access to plant-based medicines. Considering broader factors that are impacted by steps in the product life cycle provides individual professionals an opportunity to revise processes and make improvements in collaboration that can benefit human and non-human occupants of Earth.

## Make Connections!

### *How does this connect to the larger unit storyline?*

The work of many teams at a biotech firm goes into the pitch of a plant-based medicine as a result of the product life cycle. Strong collaborative efforts create a clear and focused pitch presentation to communicate the product to the target audience and public.

Personal review and reflection are key aspects of successful collaboration when creating a product. Materials provided in this lesson will allow students to evaluate their growth in their career role.

Reflection and synthesis of key ideas over the duration of the unit will allow students to explain the interconnectedness among human and non-human inhabitants on Earth, and the impacts of our actions on valuable genetic diversity for future generations.

### *How does this connect to careers?*

**Communications professionals** are in charge of communicating a diverse array of scientific materials to a wide range of audiences. Their creativity in messaging and close collaboration with researchers, medical professionals, the media, and legal leads to engaging and targeted communication products.

**Product and supply chain management professionals** are responsible for taking a process that might happen in one lab to a process that scales up in multiple labs to accommodate for hundreds, thousands, or even millions of patients, all while maintaining the quality and efficacy of the product. The skills needed include quantitative analysis, collaboration, communication with partners, an understanding of biochemical processes, and an understanding of logistics and supply chain issues.

**Biochemists** focus on how small molecules impact molecular processes within cells. They are amazing at figuring out direct and indirect ways to measure cellular changes that cannot be observed by eye or sometimes even with a microscope. They solve problems, create new methods to address questions without answers, and collaborate with other roles at the Biotech Firm to share their most promising work through presentations and written communication.

### *How does this connect to our world?*

Students will simulate a real-world product pitch to a target audience for their plant-based medicine and receive feedback from community members.

Students will reflect on their body of learning over the course of the unit, evaluating key takeaways and personal growth simulating a performance review.

This lesson series is designed for students to embody diverse career roles while also experiencing the product life cycle in a student-centered format.

# Pedagogical Framing

*Instructional materials are designed to meet national education and industry standards to focus on in-demand skills needed across the full product development life cycle—from molecule to medicine—which will also expose students and educators to the breadth of education and career pathways across biotechnology.*

*Through this collection, educators are equipped with strategies to engage students from diverse racial, ethnic, and cultural groups, providing them with quality, equitable, and liberating educational experiences that validate and affirm student identity.*

*Units are designed to be problem-based and focus on workforce skill development to empower students with the knowledge and tools to be the change in reducing health disparities in communities.*



## SOCIAL-EMOTIONAL LEARNING

During the reflection process, students will demonstrate self-awareness as they share growth and developed interests over the duration of the unit. Encouraging frequent reflection throughout the process will require curiosity, open-mindedness, responsible decision-making, and evaluation of personal impacts. While recognizing the strengths of others, students will continue to develop social awareness.

## CULTURALLY AND LINGUISTICALLY RESPONSIVE INSTRUCTION

Students will have an opportunity to reflect on their own cultural lens by exploring their thinking throughout the unit. Students will also connect their work on the development of a plant-based medicine to the real world by showcasing their product to an audience. The materials model high expectations for all students by allowing each individual student to document a skills and knowledge progression throughout the unit and highlighting collaborative growth.

## ADVANCING INCLUSIVE RESEARCH

Throughout the unit, students have explored sources of plant-based medicines and the role of Indigenous communities in identifying and protecting those ecosystems. Each step of this project has asked students to consider how the work of biotechnology impacts human and non-human inhabitants of Earth for present and future generations, from intellectual property to conservation, allowing students to set priorities and envision

futures in which work surrounding plant-based medicine drives ecosystem conservation and ethical collaboration with Indigenous communities and other local stakeholders in biodiversity hotspots around the planet.

## COMPUTATIONAL THINKING PRACTICES

In this lesson, students will showcase their learning from their Project Team's development a plant-based medicine for a particular patient population. They will select appropriate digital tools to create an original communication for a student-identified audience (patients, medical professionals, or news media). Students will repurpose and remix digital resources to create molecular models and communications strategies during this showcase.

## CONNECTION TO THE PRODUCT LIFE CYCLE

Students are completing an external communication that might be used in sharing the news of a plant-based medicine with a specific audience. In general, this type of communication follows many years of clinical trials and FDA approval, which is not included in this lesson. However, including authentic communication toward a particular target audience is an essential part of the **commercialize** phase of the product life cycle and this lesson provides the opportunity for students to experience this piece.

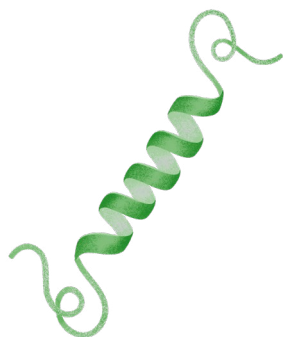
# Day 1

## LEARNING OUTCOMES

Students will be able to:

**Present** Project Team product presentations to peers and possibly community members.

**Analyze** necessary components of the presentation for finances, model, and details.



# Procedure

**Teacher Note** > *If you are interested in giving your students a more authentic presentation experience, it might be useful to reach out to medical professionals, local media, or parents and family members of students who are patients or in adjacent biotech fields. This option is encouraged but not mandatory for student learning throughout this week.*

## Whole Group (45 minutes)

- 1 Student groups sign up for a presentation time slot. Teacher introduces guests (if inviting community members) and student group feedback options.

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- 2 Suggested schedule for Project Team presentations: ten minutes plus two minutes for questions for three groups to present per day.

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- 3 Remind students of the rubric they have been using to shape the development of their projects. Their progress will be evaluated using this rubric at the end of this lesson.

## Day 2

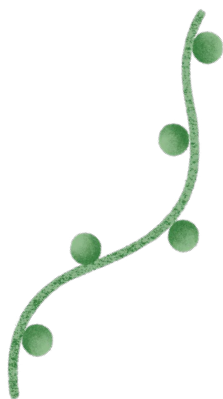
## Procedure

### LEARNING OUTCOMES

*Students will be able to:*

**Present** Project Team product presentations to peers and possibly community members.

**Analyze** necessary components of the presentation for finances, model, and details.



### Whole Group (45 minutes)

- 1 Teacher introduces guests (if inviting community members) and reminds students of group feedback options.
- 2 Student Project Team presentations.

**Teacher Note** > *Career connections continue as students communicate and collaborate to present their final product presentations. Each Sub-Team represents a different career.*

- *Biochemist: Modeling Sub-Team*
- *Communications: Communications Sub-Team*
- *Manufacturing and Supply Chain Management: Finance Sub-Team*



## Day 3

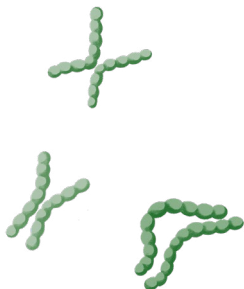
## Procedure

### LEARNING OUTCOMES

Students will be able to:

**Reflect** on Project Team collaboration, creativity, and progression.

**Provide** feedback to presenting Project Teams and reflect upon their own Project Team and Sub-Team and role for evaluation.



**Teacher Note** > *There is flex time here if you have additional showcase presentations.*

### Whole Group (5 minutes)

- 1 Introduce feedback steps:
  - a. Peer review within group for collaboration feedback.
  - b. Peer review across groups celebrating the creativity and innovation in each pitch.
  - c. Individual performance review prep. As students finish this step, they will meet individually with the teacher for +/- five minutes to share their reflections on skill progression during the project piece.
  - d. Individual review of unit materials, identifying key takeaways, celebrations, and unanswered questions remaining from the unit.
- 2 Remind students that they have practiced giving and receiving feedback from previous lessons, and that feedback should be kind, specific, and helpful.
- 3 Invite students to locate and use the **Student Guide** to provide specific examples of their learning throughout the unit.

**Teacher Note** > *Students have used different feedback protocols and communication norms during Lesson 2 (Ethical Collaboration), Lesson 4 (Medicinal Plant Garden), and throughout Lessons 6–8 (Medicinal Plant Product Development Project). It may be helpful to remind students that they have experience with different forms of feedback from many parts of this unit.*

### Individual Work Time (40 minutes)

**Teacher Note** > *Each Project Team will rotate through stations to complete each activity. This will stagger completion times to allow the Project Team Lead (teacher) to meet with individual students. Each step takes 20–30 minutes.*

- 1 Station 1: Peer review within Project Team for collaboration feedback.
  - a. Using the *Project Team Member Review Capture Sheet*, each student will provide kind, specific, and helpful feedback to each other member of their Project Team using the capture sheet.

*Continues next page >*

## Day 3

Continued

## Procedure

- 
- 2 Station 2: Peer review across Project Teams celebrating the creativity and innovation in each pitch.
- 
- a. Using the *Peer Feedback Capture Sheet*, students will provide kind, specific, helpful feedback to each other Project Team on sticky notes. Each Project Team will have a poster with its product name on it.

**Teacher Note** > *Remind students to consider the skills and connections using the Career Profile Role Capture Sheet from Lesson 6.*

- 
- 3 Station 3: Individual performance review preparation.
- 
- a. Invite students to complete the *Student Final Performance Review Capture Sheet*.
- 
- b. Students will use their core competency identified in Lesson 6 and reflected upon in Lessons 7 and 8 to describe their growth during the project.
- 
- c. Students will prepare to communicate with evidence of this growth to their Project Team Lead (teacher).
- 
- d. As students finish this step, they will meet individually with the teacher for about five minutes to share their reflections on skill progression during the project piece.
- 
- 4 Station 4: Individual review of unit materials: identifying key takeaways, celebrations, and unanswered questions from the unit.
- 
- a. Invite students to complete the *Individual Reflection Capture Sheet*.
- 
- b. As students complete other review steps, students will complete and turn in a reflection on the learnings from Lesson 2.

**Teacher Note** > *These activities will not be completed in 40 minutes and students will likely finish at different times, extending into Days 4 and 5.*

## Day 4

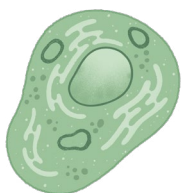
## Procedure

### LEARNING OUTCOMES

*Students will be able to:*

**Reflect** on group collaboration, creativity, and progression.

**Provide** feedback to presenting groups and reflect upon their own group and role for evaluation.



### Individual Work Time (40 minutes)

- 1 Each group will rotate through stations to complete each activity. This will stagger completion times to allow the Project Team Lead (teacher) to meet with individual students. Each step takes 20–30 minutes.
  - a. Station 1: Peer review within Project Team for collaboration feedback.
    - Using the *Project Team Member Review Capture Sheet*, each student will provide kind, specific, helpful feedback to each other member of their Project Team using the capture sheet.
  - b. Station 2: Peer review across Project Teams celebrating the creativity and innovation in each pitch.
    - Using the *Peer Feedback Capture Sheet*, students will provide kind, specific, helpful feedback to each other Project Team on sticky notes. Each Project Team will have a poster with its product name on it.
  - c. Station 3: Individual performance review preparation.
    - Invite students to complete the *Student Final Performance Review Capture Sheet*.
    - Students will use their core competency identified in Lesson 6 and reflected upon in Lessons 7 and 8 to describe their growth during the project.
    - Students will prepare to communicate with evidence of this growth to their Project Team Lead (teacher).
    - As students finish this step, they will meet individually with the teacher for about five minutes to share their reflections on skill progression during the project piece.
  - d. Station 4: Individual review of unit materials: identifying key takeaways, celebrations, and unanswered questions from the unit.
    - Invite students to complete the *Individual Reflection Capture Sheet*.
    - As students complete other review steps, students will complete and turn in a reflection on the learnings from Lesson 2.
- 2 Continue station rotation to finish the project review process.

**Teacher Note** > *These activities will not be completed in 40 minutes and students will likely finish at different times, extending into Day 5.*

## Day 5

## Procedure

### LEARNING OUTCOMES

*Students will be able to:*

**Reflect** on group collaboration, creativity, and progression.

**Provide** feedback to presenting groups and reflect upon their own group and role for evaluation.

### Individual Work Time (35 minutes)

- 1 Each group will rotate through stations to complete each activity. This will stagger completion times to allow the Project Team Lead (teacher) to meet with individual students. Each step takes 20–30 minutes.
  - a. Station 1: Peer review within Project Team for collaboration feedback.
    - Using the *Project Team Member Review Capture Sheet*, each student will provide kind, specific, and helpful feedback to each other member of their Project Team using the capture sheet.
  - b. Station 2: Peer review across Project Teams celebrating the creativity and innovation in each pitch.
    - Using the *Peer Feedback Capture Sheet*, students will provide kind, specific, helpful feedback to each other's Project Team on sticky notes. Each Project Team will have a poster with its product name on it.
  - c. Station 3: Individual performance review preparation.
    - Invite students to complete the *Student Final Performance Review Capture Sheet*.
    - Students will use their core competency identified in Lesson 6 and reflected upon in Lessons 7 and 8 to describe their growth during the project.
    - Students will prepare to communicate with evidence of this growth to their Project Team Lead (teacher).
    - As students finish this step, they will meet individually with the teacher for about five minutes to share their reflections on skill progression during the project piece.
  - d. Station 4: Individual review of unit materials: identifying key takeaways, celebrations, and unanswered questions from the unit.
    - Invite students to complete the *Individual Reflection Capture Sheet*.
    - As students complete other review steps, students will complete and turn in a reflection on the learnings from Lesson 2.

### Whole Group (10 minutes)

- 1 Invite students to share one key takeaway from their learning over the course of *Plants to Pharmaceuticals*, and then call on a peer. Repeat until each student has shared.
- 2 As a teacher, share celebrations of the class community's growth and skills progression.

# National Standards

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## Next Generation Science Standards

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### LS1-2 From Molecules to Organisms: Structures and Processes

Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

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### LS1-6 From Molecules to Organisms: Structures and Processes

Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.

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### ETS1-2 Engineering Design

Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

### Science and Engineering Practices

**Constructing Explanations and Designing Solutions**  
Design, evaluate, and/or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.

### Obtaining, Evaluating, and Communicating Information

Communicate scientific and/or technical information or ideas (e.g. about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically).

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## Career and Technical Education (CTE)

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### A2.6

Prepare a presentation comparing the benefits and harm that can be the result of biotechnology innovations in both the research and application phases and which course of action will result in the best outcomes.

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### A4.5

Discuss the structure and function of the macromolecules that compose cells, including carbohydrates, lipids, DNA, RNA, and protein molecules.

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# National Standards

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**Career and  
Technical  
Education  
(CTE)**

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**A7.3**

Describe intellectual property.

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**A7.6**

Articulate issues of ethical concern, including plagiarism, copyrights, trademarks, and patents and use online data resources and searchable databases to investigate a copyright, trademark, or patent.

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**A9.4**

Cite examples of plant parts or extracts used as pharmaceuticals.

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**A9.5**

Use the Internet to find information about traditional pharmaceuticals, herbal remedies, and recombinant pharmaceuticals.

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**A2.5**

Communicate information and ideas effectively to multiple audiences using a variety of media and formats.

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**A9.5**

Understand that the modern world is an international community and requires an expanded global view.

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**A11.4**

Create a portfolio, or similar collection of work, that offers evidence through assessment and evaluation of skills and knowledge competency as contained in the anchor standards, pathway standards, and performance indicators.

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## Project Team Member Review Capture Sheet

### Directions

You will provide feedback and reflect on your own contributions and those of your peers below. This is confidential feedback between you and your Project Team Lead (teacher).

Some descriptors: Always, most of the time, sometimes, occasionally, rarely

	Self:	Peer Name:	Peer Name:	Peer Name:
<b>Role</b> <i>Communications, Finance, or Modeling</i>				
<b>How did (Name) contribute to progress on the work?</b> <i>List specific contributions of each team member.</i>				
<b>How did (Name) contribute ideas clearly? Listen to and seek out ideas of others?</b>				
<b>How did (Name) seek feedback on ideas from peers and incorporate the feedback into the work?</b>				

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## Project Team Member Review Capture Sheet

*Continued*

	Self:	Peer Name:	Peer Name:	Peer Name:
<p>One thing (Name) could work on in the next collaborative project is...</p> <p><i>Fill in for each team member</i></p>				
<p>One thing (Name) did really well that I am proud of is...</p> <p><i>Fill in for each team member</i></p>				
<p>One thing my teacher should know is...</p> <p><i>May not be applicable</i></p>				

Any notes here:



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## Peer Feedback Capture Sheet

### Directions

Each individual student needs to provide presentation feedback for three other Project Teams.

*Reviewer Name*

*Peer Names*

*Product Name*

---

1. Positive feedback: What did the presenters do well?

3. Specific feedback: How could the presentation target their specific audience more clearly?

---

2. Positive feedback: What was most memorable about their presentation?

4. Write a summary describing the reasons that the medicine meets the needs of the patient, and the production of the medicine creates benefits for all stakeholders:

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## Student Final Performance Review Capture Sheet

### Directions

Thinking back to Lesson 6, reflect on your professional growth in the key skills areas listed below. What project tasks were particularly challenging? What project tasks were directly related to your strengths?

As an individual, reflect and use the list below or *Proficiency Levels for Leadership Competencies* from the U.S. Office of Personnel Management for ideas about your own strengths.

21 <sup>st</sup> Century Skill	Project tasks related to your strengths	Project tasks related to your areas of growth
<b>Creativity</b> (referred to as decisiveness on page 14 of the document)  <b>Self-Direction</b> (referred to as accountability on page 11 of the document)		
<b>Problem Solving</b> page 16		
<b>Communication and Collaboration</b> oral: page 25, written: 27 Pages 7, 8, and 10		
<b>Flexibility and Adaptability</b> page 3 page 4		
<b>Creativity and Innovation</b> page 1		

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## Student Final Performance Review Capture Sheet

*Continued*

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*In collaboration with the Project Team Leader (teacher), complete the following:*

---

1. My greatest challenge during this project was:

---

3. The aspect of my team's collaboration for which I am most proud is:

---

4. One thing my teacher should know about this process is:

---

2. Some strategies I used to address that challenge were:

---

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## Student Final Performance Review Capture Sheet

*Continued*

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5. One career I would consider after this work is:

---

8. If I had to rate my performance on a 10-point scale (10 being the highest, 1 being the lowest)

I think I earned a ..... because:

---

6. One technical skill I would like to continue to improve is:

---

9. My teacher's key celebrations and suggestions for future improvement:

---

7. One professional skill I would like to continue to improve is:

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## Individual Reflection Capture Sheet

### Directions

After our presentations this week, we will reflect on our process, and on what we have learned over the course of the unit.

This reflection is intended to be completed individually, using artifacts created during prior lessons.

*Essential Questions:*

Please take a moment to think about your answers to the three essential questions. Write your answers below:

**1** How are plants essential to human life?

**2** How can plants and plant compounds help treat specific human conditions?

**3** How can stakeholder groups ethically collaborate to produce a better product with benefits for all?

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# FUTURELAB+

## Individual Reflection Capture Sheet

*Continued*

### Individual Unit Reflection

- 1 *Now, let's think of the different parts of this unit. First, we learned about how the changing climate, how humans impact the distribution of biodiversity over time, and how different stakeholder groups can collaborate to change the possible futures for ecosystems over time. We made a map of a specific biodiversity hotspot and created a class protocol for ethical collaboration.*
- 2 *We then learned about how scientists study and document biodiversity in our botany lab and how Indigenous communities define health and healing. In Project Teams, we created garden designs to utilize whole plant medicine in our communities.*

.....  
 How did these artifacts help prepare your Team to collaborate ethically to create a plant medicine in our project?  
 .....

.....  
 How are plants essential to human life?  
 .....

.....  
 How do museum collections play a role in our ability to document biodiversity and protect it from human threats and climate change?  
 .....

.....  
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## Individual Reflection Capture Sheet

*Continued*

- 3** *Our class then conducted a Kirby-Bauer Assay to understand bioactivity in plants. This assay focused specifically on the antibiotic properties of plants in our communities.*

.....  
 What evidence was used to decide whether or not a plant was a potential antibiotic?  
 .....

.....  
 How does antibiotic activity relate to the medicinal compounds you explored further in your Project Team?  
 .....

- 4** *In Project Teams, we used knowledge from previous lessons and collaborated to create final products.*

.....  
 If you were on the Modeling Team, what key learning helped you create your molecular model and describe how the medicinal compound interacts with the body to treat disease?  
 .....

.....  
 If you were on the Communications Team, what key learning helped you define your patient population and market your product to your audience?  
 .....

.....  
 If you were on the Finance Team, what key learning helped you decide which production method to use? How did incorporating a Benefits Sharing Agreement influence your decision?  
 .....

.....  
 .....

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# FUTURELAB+

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## Individual Reflection Capture Sheet

*Continued*

**5** *Based on your work on your Project Team experience:*

.....  
What professional roles are you now interested in learning more about?

.....  
If you were to do this project again and were asked to take on a different role, which one would you choose and why?  
.....



# FUTURELAB+

## Rubric for Biotech Unit Challenge

### Constructing Explanations and Designing Solutions

#### Directions

The Medicinal Plant Products (Financial Plan, Communication Plan, and Medicinal Plant Model) should be assessed after presentations during this lesson.

Observable Features of Medicinal Plant Model, Financial Plan, and Communications Plan	Meets Expectations 8–10 points	Progressing 5–7 points	No attempt 0 points
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#### Constructing explanations

a. Students explain if and/or how a disruption in cellular processes allows a plant-based compound to treat a described disease or condition in a particular patient population, making a claim about a <i>cause and effect relationship</i> .			
b. Students use <i>quantitative</i> reasoning to explain how a particular production method is appropriate for their plant compound based on evidence from research and the unit as they plan to <i>scale production from the lab to the public consumer</i> .			
c. Students use <i>patterns</i> to identify the connections among the target audience, financial plan, molecular model, and target patient population in a format that meets the needs of the identified target audience.			

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## Rubric for Biotech Unit Challenge

### Constructing Explanations and Designing Solutions

Continued

Observable Features of Medicinal Plant Model, Financial Plan, and Communications Plan	Meets Expectations 8–10 points	Progressing 5–7 points	No attempt 0 points
<b>Designing Solutions</b>			
<p>a. Creation of a detailed <i>system model</i> including:</p> <ul style="list-style-type: none"> <li>— prototype sketch</li> <li>— 2-D or 3-D engineering prototype model</li> </ul> <p>Students can explain how the model illustrates the mechanism of action of their plant-based medicine.</p>			
<p>b. Creation of a detailed financial analysis that uses <i>scale, proportion, and quantity</i>.</p> <p>Students utilize a spreadsheet to illustrate:</p> <ul style="list-style-type: none"> <li>— environmental impacts</li> <li>— stakeholder benefits sharing</li> <li>— production efficiency</li> <li>— cost of their plant-medicine compound</li> </ul>			
<p>c. Presentation product illustrates a <i>system model</i> of the plant-based medicine and its production scaling plan for a specific target audience.</p> <p>With teacher approval, format choices may include:</p> <ul style="list-style-type: none"> <li>— video</li> <li>— slide deck</li> <li>— newspaper article</li> <li>— brochure</li> </ul> <p>The communications product is:</p> <ul style="list-style-type: none"> <li>— professional</li> <li>— targeted to a specific audience</li> <li>— accurate</li> <li>— representative of the science described by other team members</li> </ul>			

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# FUTURELAB+

## Rubric for Biotech Unit Challenge

### Constructing Explanations and Designing Solutions

Continued

Observable Features of Medicinal Plant Model, Financial Plan, and Communications Plan	Meets Expectations 8–10 points	Progressing 5–7 points	No attempt 0 points
<b>Peer Feedback and Iteration</b>			
a. Students give and receive kind, specific and helpful feedback throughout the project to refine their understanding of: <ul style="list-style-type: none"> <li>— <i>patterns</i> used to identify a patient population</li> <li>— <i>system models</i> to describe the cellular process of a particular plant medicine</li> <li>— <i>scale, proportion, and quantity</i> to analyze which production method best suits their particular plant medicine</li> </ul>			
b. Students integrate peer feedback into all project iterations.			
c. Students document their revision process and the choices they make about what feedback to consider.			
<b>Final Score</b>			
<b>Grade</b>			