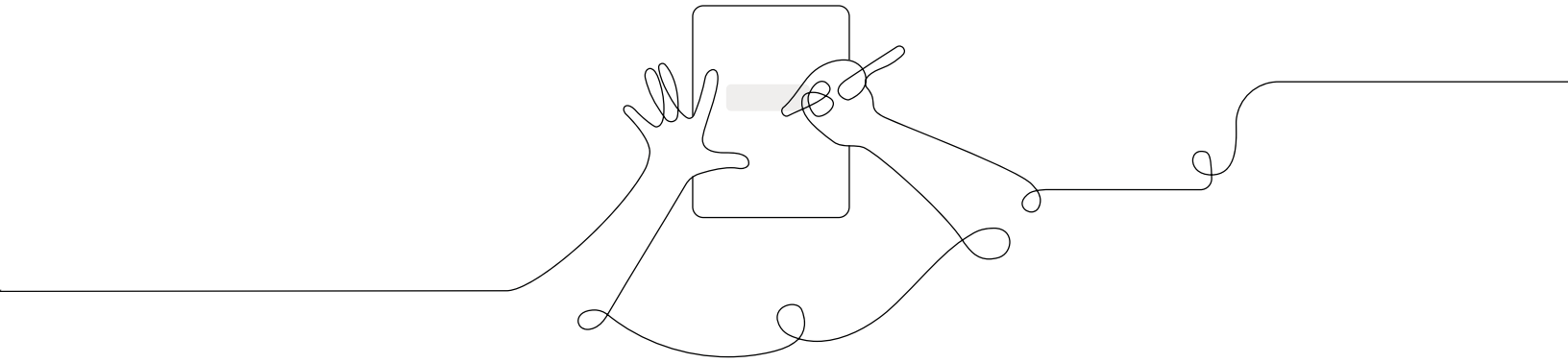
AmplifyScience

Participant Notebook

Unit Internalization and Guided Planning

Grade 6, Metabolism Engineering Internship



Unit Map

How can we design health bars that meet the metabolic needs of patients or rescue workers?

Students act as food engineering interns to design a health bar to feed people involved in natural disasters, with a particular emphasis on two populations who have health needs beyond what can be provided by emergency meals: patients and rescue workers. These plans must meet three design criteria: 1) addressing the metabolic needs of a target population; 2) tasting as good as possible; and 3) minimizing costs so as many people can be served as possible. Students focus on the practice of considering trade-offs while designing solutions to deepen their understanding of metabolism; students also learn about questions of scale, proportion, and quantity involved as different proportions of types of molecules affect a body's health and metabolism.

Research Phase:

They review information from the *Metabolism* unit, and learn new related content about carbohydrates and glycemic index (a measure of the rate at which different carbohydrates release glucose into the blood) by reading detailed supporting articles in the project Dossier. They work with the digital Design Tool, RecipeTest, to conduct iterative tests and better understand how different ingredients affect each criterion.

Design Phase:

They use the RecipeTest Design Tool as a part of the Design Cycle. They design health bar recipes for either patients or rescue workers, analyzing the results, and conducting further iterations. Students learn the value of iterative tests, how to balance trade- offs, and how to make sense of the results in order to inform their next decisions. They submit an early version of their recipe to the project director for feedback. They then have a chance to refine these designs in order to create an optimal design that addresses all the project criteria.

Proposal Phase:

They gather evidence and write proposals, supporting their claim about an optimal solution. They focus on the types of evidence for the design decisions that helped them address each criterion. They submit an outline of the proposal to their project director for feedback. They use the feedback letter, proposal rubric, review of the Dossier, and peer discussion to improve the body of their proposals so it is clear how and why each decision led to the proposed optimal design.

Students apply science content:

To design successful health bars, students apply their understanding of digestion of food molecules, the role of glucose in cellular respiration, and the role of protein in growth and repair of the body from the *Metabolism* unit. They also learn about a new related concept: how different types of carbohydrates are broken down into glucose at different rates. After completing the proposal, students apply their new engineering skills to a define new problem related to food engineering.

Guided Engineering Internship Unit Internalization Planner

Part 1: Unit-level internalization

Unit title:

What is the phenomenon students are investigating in your unit?	
Unit Question:	**Student role:**
What do students figure out in each phase of the Engineering Internship?	
Research Phase:	**Design Phase:** / **Proposal Phase:**
What science ideas do students apply from the core unit to solve the engineering problem?	

Part 2: Lesson-level internalization

Multi-day planning, including planning for differentiation and evidence of student work

<table>
<tr><td colspan="4">Day 1:_____</td></tr>
<tr><td colspan="2">Minutes for science: _____

Instructional format:
☐ Asynchronous
☐ Synchronous</td><td colspan="2">Minutes for science: _____

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<tr><td colspan="2">Lesson or part of lesson:

Mode of instruction:
❏ Preview
❏ Review
❏ Teach live
❏ Students work independently</td><td colspan="2">Lesson or part of lesson:

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<tr><td></td><td></td><td></td><td></td></tr>
</table>

Look at the Students will columns from Part C. What are students working in the lesson(s) above that you could collect, review, or provide feedback on?
See Some Types of Written Work in Amplify Science to the right for guidance.

If there isn't a work product listed above, do you want to add one? Make notes below.

Some Types of Written Work in Amplify Science

- Daily written reflections
- (6-8) Homework tasks
- (K-5) Investigation notebook pages
- Written explanations (typically at the end of Chapter)
- Diagrams
- Recording pages for Sim uses, investigations, etc

How will students submit this work product to you?
See the Completing and Submitting Written Work tables to the right for guidance on how students can complete and submit work.

Completing Written Work	Submitting Written Work
• Plain paper and pencil (videos include prompts for setup) • (6-8) Student platform • Investigation Notebook • Record video or audio file describing work/answering prompt • Teacher-created digital format (Google Classroom, etc)	• Take a picture with a smartphone and email or text to teacher • Through teacher-created digital format • During in-school time (hybrid model) or lunch/materials pick-up times • (6-8) Hand-in button on student platform

How will you differentiate this lesson for diverse learners? (Navigate to the lesson level on the standard Amplify Science platform and click on differentiation in the left menu.)

Multi-day planning, including planning for differentiation and evidence of student work

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Guided Engineering Internship Unit Internalization Planner

Part 1: Unit-level internalization

Unit title: Metabolism Engineering Internship

What is the phenomenon students are investigating in your unit?

Design a health bar to feed people involved in natural disasters, with a particular emphasis on two populations who have health needs beyond what can be provided by emergency meals: patients and rescue workers

Unit Question:

How can we design health bars that meet the metabolic needs of patients or rescue workers?

Student role:

Food engineers

What do students figure out in each phase of the Engineering Internship?

Research Phase:	Design Phase:	Proposal Phase:
Relationship between carbohydrates and glycemic index Better understand how different ingredients affect each criterion through iterative tests.	Value of iterative tests, how to balance trade- offs, and how to make sense of the results in order to inform their next decisions	Gather and use multiple pieces of evidence to improve their proposals so it is clear how and why each decision led to the proposed optimal design

What science ideas do students apply from the core unit to solve the engineering problem?

Students apply their understanding of digestion of food molecules, the role of glucose in cellular respiration, and the role of protein in growth and repair of the body from the Metabolism unit.

Remote and hybrid instruction note catcher

	Ideas for synchronous instruction	Ideas for asynchronous instruction
Research phase		
Design phase		
Proposal phase		

Name: _____ Date: _____

Day 2: Researching Ingredients

Welcome back, interns!

We will continue researching metabolism today. You will focus on making connections between metabolism and FuturaBar ingredients by researching and making predictions about how various ingredients are metabolized and meet people's specific needs, including your own.

By understanding the relationship between nutrients and metabolic function, you'll be able to design a better FuturaBar that helps many different kinds of people function in disaster areas. While you are working today, think about how specific nutrients on the small scale (cellular level) affect your body's ability to grow, breathe, think and move. You'll need to figure this out before you can start designing your FuturaBar. After hours, please reread Chapters 2–3 of the Dossier and add to or revise your annotations.

Deliverables:

- Researching Ingredients sheet
- After Hours: Reread Chapters 2 and 3, and revise annotations for Chapter 2, thinking about how different nutrients affect your metabolic needs
- Complete any additional tasks your internship coordinator has asked you to do

Hope you learn a lot today!

Amina

Amina Reid, Project Director
Futura | Food Engineering Division

Daily Message Notes

_____

_____

_____

_____

_____

_____

_____

Chapter 2:

Meeting Your Metabolic Needs

The food you eat is mostly made of nutrients like proteins and carbohydrates. Along with oxygen, carbon dioxide, and water, these foods play an essential role in human metabolism. That is the process in which your body uses molecules like glucose and amino acids for energy and growth. On a small scale (molecular level), when your metabolic needs are met, it means that your body has everything it needs in order to grow and repair your cells, as well as release energy from glucose through the process of cellular respiration. On a large scale (whole body level), it means that your body has everything it needs to perform required activities like breathing, thinking, and moving. Different people have different metabolic needs depending on their health, activity level, and age.

Health bars may contain many different combinations of ingredients to meet the needs of many different people.

Growth and Repair Needs

Your body is constantly repairing and replacing old and damaged cells and tissues, a process which requires both energy and protein. Bodies that are stressed, either by injury or strenuous activity, are especially occupied with the growth and repair process. When we take in proteins through the foods we eat, our bodies break down the proteins into amino acid molecules. Then our bodies chemically rearrange the amino acids to form specific molecules needed by the cells and tissues for growth and repair.

Energy Needs

Your body uses carbohydrates like starch to release energy that it needs to move, think, stay warm, and grow. The digestive system breaks down starch into glucose. During cellular respiration, glucose and oxygen molecules are chemically rearranged to form carbon dioxide and water molecules, releasing energy in the process.

Carbohydrates break down at different rates, and the rate of metabolism affects how the body functions. Glycemic index is a measure of how quickly carbohydrates break down into glucose. (The word *glycemic* refers to glucose.) Carbohydrates that break down slowly, such as the carbohydrates found in broccoli, have a low glycemic index. Foods with a lower glycemic index are better for providing energy that lasts over a longer period of time. Some carbohydrates that break down quickly, such as the carbohydrates found in watermelon, have a high glycemic index. Foods with a higher glycemic index are better for providing energy that is available almost immediately.

Chapter 3:

Ingredient Information

raisins

pumpkin seeds

nonfat milk powder

puffed wheat

puffed rice

soy beans

nutritional yeast

dark chocolate chips

prunes

Several different ingredients are available for your health bar recipes.

Ingredients Table

Ingredient	Protein Content	Carbohydrate Content	Glycemic Index
raisins	low	high	high
pumpkin seeds	high	low	medium
nonfat milk powder	medium	medium	medium
puffed wheat	low	high	high
puffed rice	low	high	high
soy beans	medium	medium	low
nutritional yeast	high	low	low
dark chocolate chips	low	high	low
prunes	low	high	low

The information listed above is based on the following value ranges:

Protein (%): low= 0-33, medium= 34-66, high= 67-100.
Carbohydrate (%): low= 0-33, medium= 34-66, high= 67-100.
Glycemic Index: low= 0-30, medium= 31-60, high= 61-80.

Name: _____ Date: _____

Ingredients Analysis

1. In your group, decide which four ingredients each pair of students will test. Circle each ingredient that you and your partner are responsible for investigating.

2. In your pair, decide which partner will test for Rescue Workers and which partner will test for Patients.

3. Test 1 ingredient at a time by selecting 100 grams of the same ingredient and click SEND TO LAB.

4. Compare the results with your partner to see how the target populations are similar or different.

5. In the table below, record notes on the results for each criterion for both target populations.

6. Share your findings with your group members, and answer the questions that follow.

Type	Metabolic Needs Patients	Metabolic Needs Rescue Workers	Taste Score	Cost per Bar
Raisins	Notes on Growth & Repair and Energy needs:	Notes on Growth & Repair and Energy needs:		
	Notes on Patients vs. Rescue Workers:			
Pumpkin Seeds	Notes on Growth & Repair and Energy needs:	Notes on Growth & Repair and Energy needs:		
	Notes on Patients vs. Rescue Workers:			
Nonfat Milk Powder	Notes on Growth & Repair and Energy needs:	Notes on Growth & Repair and Energy needs:		
	Notes on Patients vs. Rescue Workers:			
Puffed Wheat	Notes on Growth & Repair and Energy needs:	Notes on Growth & Repair and Energy needs:		
	Notes on Patients vs. Rescue Workers:			

Type	Metabolic Needs Patients	Metabolic Needs Rescue Workers	Taste Score	Cost per Bar
Puffed Rice	Notes on Growth & Repair and Energy needs:	Notes on Growth & Repair and Energy needs:		
	Notes on Patients vs. Rescue Workers:			
Soy Beans	Notes on Growth & Repair and Energy needs:	Notes on Growth & Repair and Energy needs:		
	Notes on Patients vs. Rescue Workers:			
Nutritional Yeast	Notes on Growth & Repair and Energy needs:	Notes on Growth & Repair and Energy needs:		
	Notes on Patients vs. Rescue Workers:			
Chocolate Chips	Notes on Growth & Repair and Energy needs:	Notes on Growth & Repair and Energy needs:		
	Notes on Patients vs. Rescue Workers:			

Type	Metabolic Needs Patients	Metabolic Needs Rescue Workers	Taste Score	Cost per Bar
Prunes	Notes on Growth & Repair and Energy needs:	Notes on Growth & Repair and Energy needs:		
	Notes on Patients vs. Rescue Workers:			

Name: _____ Date: _____

Ingredients Analysis (continued)

Based on your research:

1. Which ingredients do you think will make the best tasting bar? Why?

_____

_____

_____

2. Which ingredients do you think would produce the best bar for meeting growth and repair needs? Why?

_____

_____

_____

3. Which ingredients do you think would produce the best bar for getting an immediate burst of energy? Why?

_____

_____

_____

4. Which ingredients do you think would produce the best bar for storing energy to use later?

_____

_____

_____

Name: _____ Date: _____

Ingredients Analysis (continued)

5. Which ingredients do you think will be best for keeping the cost of the bar low?

_____

_____

_____

Adapting the Amplify Science Approach for Remote Learning

In Amplify Science units, students figure out phenomena by using science and engineering practices. They gather evidence from multiple sources and make explanations and arguments through multiple modalities: doing, talking, reading, writing, and visualizing. They also make their learning visible by posting key concepts on the classroom wall. While we have retained this core approach in the @Home Lessons, enacting it at home will require adaptations.

The @Home Lessons provide general guidance for these adaptations, but you may need to set up expectations for specific routines or provide additional support to your students. Below are ideas for how different aspects of the Amplify Science approach might be adapted for your learners' particular contexts.

Student talk options

- Talk to a member of their household about their ideas.
- Call a friend or classmate and discuss their ideas.
- Talk in breakout groups in a video class meeting.
- Use asynchronous discussion options on technology platforms.

Student writing options

- Write in a designated science notebook.
- Photograph writing and submit digitally.
- Complete prompts in another format. (Teachers can convert prompts so they are completed in an on-line survey or an editable document so students can submit digitally.)
- Submit audio or video responses digitally, rather than submit a written response.
- Share a response orally with a family member or friend with no submission required.
- For students with technology access, complete written work in the students' Amplify accounts (links to corresponding student activities are provided in the @Home Slides).

Student reading options

- Read printed version of article, included with @Home Packets. (Note: although the articles are originally in color, they are provided in the @Home Packets in grayscale for ease of copying. Most articles translate well into grayscale but there will be some exceptions).

- Read printed or PDF version of article, included with @Home Student Sheets.
- Listen to the article being read aloud using the audio feature in the Amplify Science Library or read articles in digital format via the Amplify Science Library (links are provided in the @Home Slides).
- Read with a partner, classmate, or someone from their home.

Hands-on activity options

- Do the activity with simple materials students are likely to have at home. (For activities where this is feasible, instructions are provided.)
- Watch a video. (For some hands-on activities in the @Home Units, a video / images of the investigation are provided.)
- Do the activity using kit materials if available. For example,
    - If possible, send home materials to students who need them.
    - If you have access to your Amplify Science kit, and have opportunities to teach synchronously, demonstrate some hands-on activities with student input.

Classroom wall options

The classroom wall, which provides an important reference for students to track and reflect on their developing understanding of the unit's anchor phenomenon and content, has been reimagined as an @Home Science Wall. A complete list of Chapter Questions, key concepts, and vocabulary that have been introduced so far are provided in the last lesson of each chapter. To enhance students' experience of the @Home Science Wall, you could have students:

- Draw a picture or write their ideas on their @Home Science Wall pages.
- Highlight each question, key concept, or word that is introduced.
- Cut out each question, key concept, or word. These can be then posted on a wall, large sheet of paper, or refrigerator at home.

Additionally, if you are meeting with your class remotely, you could create a virtual @Home Science Wall.

Adaptations of other Amplify Science routines

- **Reading support.** In Amplify Science 6–8, support for student reading includes: teacher modeling; structured paired and whole group discussion of texts; multiple readings of text; an audio feature in the Amplify Library; as well as suggestions for additional

strategies for students who need more reading support. Some suggestions to offer similar supports with the @Home Lessons are:

    - Meet virtually as a class or in small groups and read the first part of the article with students, modeling how you would read the text.
    - Ask student pairs to meet after reading to discuss their annotations.
    - Have each student meet with someone in their home to read at least some of the text together and/or discuss their annotations after reading.

- **Talk routines.** In Amplify Science units students periodically talk in small groups using routines such as Word Relationships and Write and Share. You may consider including and adapting these routines by having students meet and talk to their peers in small groups or asking each student to conduct the routine with someone in their home.

- **Science Seminar.** Each core unit in Amplify Science 6–8 culminates with a Science Seminar, which is a whole-class, student-led argumentation routine. An adapted version of the Science Seminar has been included in the @Home Units. Some suggestions for implementing this are:
    - Hold your Science Seminar in class, if you are meeting in person some of the time.
    - Hold Seminars with your whole class, remotely. Students can participate all at the same time, or you might break the group up in thirds or in half and have the students who are not talking take notes using the Science Seminar Observations sheet.
    - Hold Seminars with pairs or small groups meeting on the phone, on video calls, or in virtual breakout rooms.
    - Have students talk to someone in their household about the Science Seminar evidence and claims.

@Home Units assessment considerations

Each Chapter Outline contains considerations for assessment and feedback in the Amplify Science units, and in some cases, the pre-unit and end-of-unit assessments. Generally, we recommend the following:

- You may need to adapt the format in which you collect student work. See the “Student writing options” above.

- When providing feedback to students, you may wish to focus on how students are attending to the Investigation and/or the Chapter Questions, if they are using evidence they have gathered to support their responses to questions, and if they are using appropriate unit vocabulary in their responses.

@Home Units guidance for synchronous and in-person learning

Each @Home Lesson contains suggestions for using these asynchronous resources in conjunction with virtual or in-person class sessions. If you are able to choose particular lessons to conduct together with students, we recommend:

- Holding discussions to engage students in figuring out the unit phenomenon.
    - At the beginning of each chapter so students can share their initial ideas or evolving ideas about the unit phenomenon.
    - At the end of the chapter so students can talk as they make sense of evidence, and/or synthesize various sources of information, and make an explanation or argument about the phenomenon.
- If you have access to kit materials, you can conduct hands-on demonstrations when hands-on materials are unavailable to students. Solicit student input as you demonstrate.
- If students do not have access to technology at home, when in-person, you can provide time for them to make observations and discuss ideas related to the simulations and digital tools.

Suggestions for synchronous time

The following are some ideas for making the most of synchronous time with your students. As a general rule, the best way to use your synchronous time is to provide students opportunities to talk to one another, or to observe or visualize things they could not do independently.

Online synchronous time	Notes
Online discussions: It's worthwhile to establish norms and routines for online discussions in science to ensure equity of voice, turn-taking, etc. **Digital tool demonstrations:** You can share your screen and demonstrate, or invite your students to share their screen and think-aloud as they use a Simulation or other digital tool. **Interactive read-alouds**: Screen share a digital book or article, and pause to ask questions and invite discussion as you would in the classroom. **Shared Writing:** This is a great opportunity for a collaborative document that all your students can contribute to. **Co-constructed class charts:** You can create digital charts, or create physical charts in your home with student input.	

Notes