Infectious Agent or Insufficient Diet 5E

Was pellagra caused by an infectious agent or lack of an adequate diet?

Performance Expectations
HS-LS2-3

Investigative Phenomenon
The pellagra epidemic disproportionately spread within institutionalized populations (orphanages and insane asylums) in the south.

Time
7-8 days

The pellagra epidemic lasted for approximately forty years and caused immense suffering across the southern United States.
In this 5E instructional sequence, students explore how and why this may have occurred. They consider why food, such as corn, may be industrially processed, and the impacts that processing had on institutionalized populations (and others) across the south, as well as the possible impacts of the processing of food on their own communities.

Engage	How can we use evidence to support a hypothesis on the cause behind the pellagra epidemic?	Students **identify evidence to support an explanation** of the **pellagra epidemic**.
Explore 1	What evidence can we analyze to explain the cause of the pellagra epidemic?	Students use **mathematical representations** of historical data to explain the **pellagra epidemic at the individual and population levels.**
Explain 1	Why did a more diverse diet prevent pellagra?	Students use a text to respond to student generated questions in order to **develop an initial explanation** of the **cause behind pellagra** in terms of **energy and matter.**
Explore 2	Why do different foods decompose differently?	Students **generate observations** on the **decomposition** of different types of foods to surface **how both energy and matter moves into and out of a system**.
Explain 2	How can the processing of food impact its nutrition and shelf-life?	Students **construct and revise a scientific explanation** on how the **processing of corn** to **limit decomposition** caused the pellagra epidemic.
Elaborate	Why didn't indigenous people, whose diet also relied heavily on corn, suffer from pellagra?	Students engage with a text and video on how indigenous people processed corn in order to **revise their scientific explanation** on the **causes behind the pellagra epidemic** and why some groups of people avoided becoming ill.
Evaluate	How can our communities have access to fresh, unprocessed food?	Using the lens of **energy and matter**, students revise their **scientific explanation** on why some populations suffered from **pellagra**, while others did not.

Science & Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts

Engage

How can we use evidence to support a hypothesis on the cause behind the pellagra epidemic?

Students **identify evidence to support an explanation** of the **pellagra epidemic**.

Preparation

Student Grouping	Routines	Literacy Strategies
None	❑ Rumors	None

Materials

Handouts	Lab Supplies	Other Resources
None	None	❑ Post-it notes ❑ Pellagra - A Medical Mystery

Surfacing Student Ideas

1. Prompt students to revisit the DQB and point out questions about if pellagra was caused by an infection, or something else (like being diet related). Let students know that we will investigate these questions in this learning cycle.

2. Remind students that we have started to talk about two different hypotheses (or claims) about the cause behind pellagra: an infection and diet related (something to do with eating corn). Let students know that they are going to watch a video about a scientist that was looking for evidence to determine which claim to support.

3. Prompt students to choose one claim and to provide what evidence they would look for or collect to support their claim on the cause behind pellagra – based on what they know so far. Students write their

Integrating Three Dimensions

In this task, students are working towards **SEP#6 Constructing Explanations and Designing Solutions,** as they are looking for additional evidence to support the revision of their explanation on the

best idea on a post-it note

4. Students share their ideas using the group learning routine, **Rumors.** Categorize student ideas

5. Watch the video, Pellagra - A Medical Mystery , stopping it at 4:15. While watching the video, prompt students to listen for evidence for both claims.

6. Return to the Rumors categories and prompt students to revise their ideas (or to discuss how the video supports their ideas)

Look & Listen For

- The researcher collected data on populations that had pellagra
- If it was infectious, the doctors at the asylum would also have pellagra
- Children and patients were eating different food than those that were not contracting pellagra
- If it was infectious and coming from immigrants, it would be found in the northeastern US (not just the south)
- People in the south survived on cornmeal and had the highest rates of pellagra
- Rarely affected rich people
- If it was infectious, controlled experiments could be used (on model organisms) to show it passed between individuals
- If it was diet related, it could be prevented or cured with dietary changes (controlled experiment)

cause behind the pellagra epidemic.

Routine

The goal of the **Rumors** routine is to have students exchange ideas while listening for similarities and differences in thinking. It's meant to be low stakes, so it is frequently used to surface initial student ideas about phenomena during the Engage phases. Please read the Biology Course Guide for detailed steps about this routine.

Explore 1

What evidence can we analyze to explain the cause of the pellagra epidemic?

Students use **mathematical representations** of historical data to explain the **pellagra epidemic at the individual and population levels.**

Preparation

Student Grouping	Routines	Literacy Strategies
❑ Table groups	❑ Consensus-Building Share	None

Materials

Handouts	Lab Supplies	Other Resources
❑ Goldberger's Investigation Part 1 ❑ Goldberger's Research Summaries ❑ Goldberger's Investigation Part 2 ❑ Making Sense of Goldberger's Investigation ❑ Goldberger's Investigation Rubric	None	

Launch the Investigation

1. Revisit the ideas surfaced at the end of the Engage phase, especially around the types of evidence (data) the researcher would need to justify his claim that pellagra was caused by a diet deficiency and not an infectious agent.

2. Similarly to students' ideas, highlight that Dr. Goldberger did experiments and collected data on populations that were impacted by the disease. Provide students with *Goldberger's Investigation Part 1* and *Goldberger's Research Summaries*. Jigsaw the four research summaries by assigning each to a different student in the group.

Integrating Three Dimensions

In this investigation students are focused on the using **SEP#5 Using Mathematics and Computational Thinking** and

Differentiation Point

Create expert groups for students that may struggle to independently create a representation of the data provided in their assigned research summary.

CCC#3 Scale, Proportion, and Quantity, in service of the storyline. Students will use the appropriate disciplinary core ideas in upcoming phases as they explain the causes behind the pellagra epidemic.

3. Pause and facilitate students sharing and discussing the data from their assigned research summary. Provide students with *Making Sense of Goldberger's Investigation* to record their ideas

4. Provide students with *Goldberger's Investigation Part 2* as additional data sources. Students record their ideas using the *Making Sense of Goldberger's Investigation*.

Making Sense of the Data

1. In table groups, students review all of the data they have engaged with and their ideas from the See-Think-Wonder graphic organizer.

2. Use the group learning routine, **Consensus Building Share** to highlight their key ideas and questions about all of the data that Goldberger collected as he investigated the pellagra epidemic

Look & Listen For

- More diverse diets resulted in the virtual elimination of pellagra from the orphanages
- Women at the mental health hospital on a more diverse diet did not show signs of pellagra
- Jailed men given a less diverse diet showed signs of pellagra
- None of the volunteers given secretions or bodily fluids or feces from people with pellagra contracted pellagra (so its most likely not infectious)
- Households that consumed the most milk had the least pellagra
- Inverse relationship between household income and prevalence of pellagra
- More women had pellagra than men
- Some factors had larger effects than others (e.g. income or diverse diet vs gender) and the impact depended on the scale at which it occurred in causing a pandemic (rather than isolated cases of pellagra)

Routine

The **Consensus-Building Share** routine is a way to make sensemaking visible and move towards a class-wide consensus around a new idea. As the whole-class activity for this Explore, it is important to surface as many of the ideas in the Look and Listen For section as possible. Be sure to look at the Biology Course Guide for the action pattern for this routine.

- Why did switching to a diverse diet ‘cure’ or prevent pellagra?
- Why do households with more money have less pellagra?
- Why do poor women have more pellagra then poor men?

3. If students don’t surface any of the important observations named in the Look and Listen For, direct students back to appropriate investigation resources and use conferring questions to support them in making those observations before moving on, as they will be key to success in the Explain phase that follows.

4. Provide students with *Goldberger’s Investigation Rubric*. Ask students to use the investigation rubric to self and peer assess their progress on engaging with the investigation individually and as a group.

Explain 1

Why did a more diverse diet prevent pellagra?

Students use a text to respond to student generated questions in order to **develop an initial explanation** of the **cause behind pellagra** in terms of **energy and matter.**

Preparation

Student Grouping	Routines	Literacy Strategies
❑ Table Groups	❑ Domino Discover	❑ Text Annotation

Materials

Handouts	Lab Supplies	Other Resources
❑ Pellagra Text ❑ The Role of Niacin ❑ Niacin Deficiency Cause and Effect Model Student Work	None	

Reading a Complex Text

1. Review or highlight student questions raised during the Explore 1 phase. Prompt students to choose 1-2 of those questions as their purpose for reading a text on Pellagra. Ensure that at least some students are focusing on a question that highlights the role of a diverse diet in eliminating pellagra or what the cause of the pellagra epidemic was.

2. Provide students with *Pellagra Text* and prompt students to annotate the text based off of their guiding questions.

Integrating Three Dimensions

In this task, students demonstrate their understanding of the cellular respiration portion of **DCI LS2.B**

3. In table groups. students discuss what information in the text helped them better understand their guiding question(s). Provide students with *The Role of Niacin* and have students respond to the prompts individually based on their discussions.

4. Use the group learning routine **Domino Discover** to surface student ideas and questions on what they understand so far about the cause(s) behind the pellagra epidemic.

Look & Listen For

- Confirmed that pellagra is NOT caused by an infectious agent
- Scientists had determined that the people with pellagra were niacin deficient
- Niacin is crucial for the process of cellular respiration, without it ATP (energy) cannot be produced thus cells cannot function properly and people get sick – for example, a lack of ATP energy lead to neurological system disruption because neurons could not send electrical messages
- The epidemic worsened after they discovered the cause
- After the government mandated the addition of niacin in milled corn and wheat the number of cases decreased

Questions:

- Why did more women suffer from pellagra than men?
- Why did pellagra start in the early 1900's when people ate corn before that time?
- Why is niacin found in other foods, but not the corn they were eating?
- If they knew what the problem was in 1937, why were there still so many cases of pellagra for another 10 years?

Cycles of Matter and Energy Transfer in Ecosystems. The portion of the element referring to photosynthesis is discussed in the previous 5E, The SuperFood that Changed the World.

Routine

The **Domino Discover** is an opportunity to surface students' thinking to the whole class and the teacher. It allows students to learn from each other and for the teacher to assess whether the class is ready to move to the next phase of instruction. Refer to the Biology Course Guide for support with this routine.

Explore 2

Why do different foods decompose differently?

Students **generate observations** on the **decomposition** of different types of foods to surface **how both energy and matter moves into and out of a system**.

Preparation

Student Grouping	Routines	Literacy Strategies
❑ Table Groups	❑ Domino Discover	None

Materials

Handouts	Lab Supplies	Other Resources
❑ Decomposition Investigation ❑ Making Sense of the Decomposition Investigation ❑ Decomposition Investigation Rubric	None	❑ Time Lapsed Fruit and Vegetable Decomposition Video ❑ The Decomposition Of McDonald's Burgers And Fries

Launch the Investigation

1. Highlight remaining student questions from the Explain 1 phase, such as: Why is niacin found in other foods, but not the corn they were eating? Let students know that we can compare different types of food to get a better understanding of why something like niacin might be missing from some types of food. One variable we can compare is the rate of, and general process of, decomposition in different types of food.

2. Provide students with *Decomposition Investigation*. Prompt students to make predictions about how decomposition may differ in whole fruits and vegetables and in fast food items such as hamburgers and french fries.

3. Show each of the following videos, with pause time for students to record their ideas in the See-Think-Wonder graphic organizer. As students watch Time Lapsed Fruit and Vegetable Decomposition Video and The Decomposition Of McDonald's Burgers And Fries they generate observations and questions. Provide time for students to discuss their observations and questions with their table mates.

Whole-Class Investigation Summary

4. Provide students with *Making Sense of the Decomposition Investigation*. Have them work independently to complete it, then use these completed pages to discuss the findings from the investigation with their group.

5. Ask groups to come up with one important idea to share with the whole class, from their discussion.

6. Use the group learning routine **Domino Discover** to surface important trends, inferences, and questions from groups. Plan forward based on the various understandings that students or student groups have articulated. It is appropriate to go onto the next phase once students have had a chance to make sense of the data, and have had the opportunity to clarify what they have figured out about the phenomenon.

Look & Listen For

- The fruit and vegetables decayed at a much faster rate than the mcdonalds hamburger and fries
- The fruit and vegetables decomposed into 'mush' whereas the burger and fries looked almost new
- New plants began to grow on on the decayed mass of the fruit and vegetables (matter & energy was transferred to the new plants and recombined to create new tissues)
- Originally the energy was from the sun captured during photosynthesis
- The fruit and vegetables seemed to 'lose' mass (although this is discussed further in the Explain phase)
- Gasses (as source of mass) were released into the system
- Decomposers (bacteria, fungi) broke down the food, to create ATP for their own life processes
- Why didn't the burger and fries visibly decompose like the fruit and vegetables did?
- Will the burger and fries ever decompose? Do they need specific conditions to decompose? Does it make a difference that they are cooked and the fresh food is not?

Routine

The **Domino Discover** is an opportunity to surface students' thinking to the whole class and the teacher. It allows students to learn from each other and for the teacher to assess whether the class is ready to move to the next phase of instruction. Refer to the Biology Course Guide for support with this routine.

- How does decomposition help us explain the issue with the corn and the niacin?

7. If students don't surface any of the important observations named in the Look and Listen For, direct students back to appropriate investigation resources and use conferring questions to support them in making those observations before moving on, as they will be key to success in the Explain phase that follows.

8. Provide students with *Decomposition Investigation Rubric*. Ask students to use the investigation rubric to self and peer assess their progress on engaging with the investigation individually and as a group.

Explain 2

How can the processing of food impact its nutrition and shelf-life?

Students **construct and revise a scientific explanation** on how the **processing of corn** to **limit decomposition** caused the pellagra epidemic.

Preparation

Student Grouping	Routines	Literacy Strategies
❑ Pairs	❑ Class Consensus Discussion	❑ Chunking with partner reading ❑ C-E-R graphic organizer

Materials

Handouts	Lab Supplies	Other Resources
❑ Decomposition Text ❑ C-E-R Graphic Organizer ❑ C-E-R Rubric ❑ Summary Task	None	

Accessing a Text

1. Remind students of their observations and questions that were surfaced at the end of the Explain 1 and Explore 2 phases. Highlight ideas or questions about why the niacin was missing from cornmeal and why the fruit and vegetables decomposed at a much faster rate than the fast food.

2. Provide students with *Decomposition Text*. Chunk the text by heading or paragraph. Prompt students to read with a partner, pausing after each chunk to discuss the guiding questions (why the niacin is missing and/or why the vegetables decomposed quickly)

Constructing a Scientific Explanation

1. Provide students with *C-E-R Graphic Organizer*. Prompt students to first individually, use the graphic organizer to respond to the prompt:

Construct a scientific explanation, using appropriate evidence and reasoning, that addresses why there was a pellagra epidemic in the early 1900's in the southern United states.

2. After students have had the opportunity to write their initial draft, provide students with *C-E-R Rubric* so they can do a peer review, using the rubric.

3. Provide students time to revise as needed, after receiving feedback from their peer.

Class Consensus Discussion

1. Orient the class to the purpose and the format of a Class Consensus Discussion. You may say something like this:
    - "We are going to use a **Class Consensus Discussion**, just like we did in the last 5E, to learn about all the thinking in the room and come to some decisions about the causes behind the pellagra epidemic in the southern United States."

2. You may decide to walk students through the entire poster, or take them through the steps as you facilitate it.

Class Consensus Discussion Steps

1. We select a few different groups' ideas.
2. The first group shares out their work.
3. One person repeats or reiterates what the first group shared.
4. Class members ask clarifying questions about the work.

Repeat steps 2-4 for each group that is sharing work.

5. Everyone confers in table groups.
6. Engage in whole-class discussion about the ideas that were shared, in order to come to

Routine

Class Consensus Discussions are so important for the Explain phase across this unit. This routine is a way to ensure that the accurate scientific ideas students are figuring out are made public and visible for all students to access. It requires skillful teacher facilitation, as it is important to not tell students what they need to know, instead supporting students as a class in using the information they have from investigations, their models and texts in order to figure out and state those important ideas. Refer to the Biology Course Guide for support with this routine.

agreement.

3. Select two or three student explanations to share with the class. At this point, do not select them randomly. The point of this discussion is to elevate ideas that move the class towards greater understanding of why the germ was removed and why removing the corn germ led to a severe illness in specific populations of people. The decision about which explanations to share with the class should be based on both the ideas circulating in the classroom and the goals of this part of the 5E sequence.

4. Ask the first student or group to share their explanation. You can do this by:
    - Projecting using a document camera; OR
    - Copying the written explanation to be shared and passing them out to the class; OR
    - Taking a picture of each explanation and projecting them as slides.

5. Proceed through the steps in the Consensus Discussion Steps. During the whole-class discussion, there will be opportunities to identify important terms and concepts that emerge in the discussion. Sometimes, important points get buried in student talk; use the guidelines below to ensure the class focuses on ideas that will drive the lesson and unit forward.

Take Time for These Key Points

- Niacin is a required part of the diet, as it facilitates cellular respiration (the creation of ATP)
- Without niacin, people will suffer from pellagra because their cells do not have sufficient ATP to complete cellular processes
- Most of the niacin found in corn is in the germ layer.
- The germ of the corn was removed (de-germinated) to slow down decomposition (the recycling of matter)
- Whole foods (like a whole corn kernel) decompose faster because they provide optimal food for decomposers
- By removing the germ, and slowing decomposition, the corn was more shelf-table and was easier to store and transport without spoiling
- People eating a monotonous diet, mainly consisting of the processed corn, were not getting sufficient niacin

Classroom Supports

Post the steps to the class consensus discussion in the room, as a reference you can return to in future lessons.

Integrating Three Dimensions

The depth of this discussion will really depend on what you've observed in the room and how you respond. Be sure to make **CCC #5 - Energy and Matter** explicit for students by elevating and probing for ideas related to how energy drives the flow of matter and how energy and matter are flowing within and between systems. This is an important element **CCC #5 - Energy and Matter** at the high school level.

Summary

1. Have students complete the *Summary Task* individually.

Implementation Tip

This summary is really important! It's an opportunity to check in on each student's thinking at this point in the unit in a few different areas: 1) **understanding how they are using the three dimensions** to make sense of a phenomenon, 2) ideas about how they and their peers are building knowledge together, and 3) how they think the class consensus discussion went. It's important to get all of this from individual students so you know these things on a student-by-student basis.

Elaborate

Why didn't indigenous people, whose diet also relied heavily on corn, suffer from pellagra?

Students engage with a text and video on how indigenous people processed corn in order to **revise their scientific explanation** on the **causes behind the pellagra epidemic** and why some groups of people avoided becoming ill.

Preparation

Student Grouping	Routines	Literacy Strategies
None	❑ Domino Discover ❑ Read-Generate-Sort-Solve	None

Materials

Handouts	Lab Supplies	Other Resources
❑ RGSS Organizer	None	❑ Malnourished: Cultural ignorance paved the way for pellagra ❑ What is Nixtamalization?

Using Multimedia to Understand a Process

1. In this learning cycle, students figure out that the processing of corn to remove the germ left the food less nutritious. Also, students may have lingering questions about why indigenous populations in South and North America relied on corn but did not get ill with pellagra. Introduce the idea to students that indigenous people also processed corn, but in a very different way.

2. Provide students with *RGSS Organizer*, and What is Nixtamalization? , and Malnourished: Cultural ignorance paved the way for pellagra . Use the **Read-Generate-Sort-Solve** routine to facilitate student collaboration as they respond to the guiding prompt: How did indigenous knowledge protect many

Routine

The **Read-Generate-Sort-Solve** routine promotes collaborative engagement in problem-solving and supports students in

populations from diet related diseases such as pellagra?

articulating their thinking and making it transparent, before considering solutions. Refer to the Biology Course Guide for planning support.

Evaluate

How can our communities have access to fresh, unprocessed food?

Using the lens of **energy and matter**, students revise their **scientific explanation** on why some populations suffered from **pellagra**, while others did not.

Preparation

Student Grouping	Routines	Literacy Strategies
None	None	None

Materials

Handouts	Lab Supplies	Other Resources
❑ Ultra-processed Food Data ❑ Revised Explanation ❑ Revised Explanation Mini Rubric	None	

Making Connections

1. At the end of Explain 2, students discussed one negative outcome (pellagra) of processing corn. In order to surface student connections to the food available in their community, provide students with *Ultra-processed Food Data*.

2. Remind students that Dr. Goldberger recommended that leaders make a diversity of foods “cheap and readily accessible” to prevent or cure pellagra as early as 1916. Prompt students to consider whether or not we follow that advice today? What types of foods are cheap and readily available in your community?

Implementation Tip

Unit 3 introduces the concepts of whole, processed, and ultra-processed food and the health impacts associated with eating a lot of processed/ultra-processed food. If students need clarity on these terms, pause to define them and post them in the classroom.

3. After students have had time to reflect on their own community, transition to the data table that represents the % of the American diet that is from processed foods. Students use the graphic organizer to record their ideas and questions.

4. Use the group learning routine **Domino Discover** to share out student ideas

Look & Listen For

- Cheap and easily available food may include things like: chips, snacks, fast food, frozen food, fried food, breads (mostly ultra-processed foods)
- Fresh, whole foods are often not as cheap or easily available (or not prepared in a way that is perceived as tasting good)
- Americans as a whole are eating more processed food from 2007 to 2012
- In 2012, americans on average get about 60% of their calories from ultra-processed food

Revisit the Performance Task

1. Prompt students to consider where they currently stand on the question category from the Driving Question Board that they have been investigating throughout this 5E instructional sequence. This will be something like: Why were people getting sick with pellagra? Why did some populations suffer disproportionately from pellagra than others? Why didn't indigenous people that ate a diet heavy in corn not suffer from pellagra? A few students can share their thoughts, use examples of student work from the Explain phase to review or clarify any remaining questions.

Implementation Tip

When returning to the Driving Question Board, be sure to change these suggested teacher notes so that they match your class' actual questions!

2. Provide students with *Revised Explanation*. Allow time for students to record new ideas they have on the cause behind the pellagra epidemic, and how a similar lack of fresh, unprocessed foods may be impacting their communities or the US as a whole.

Revisit the Driving Question Board

1. Use the **Driving Question Board Routine** to discuss which of the class's questions have been answered.

2. Have students identify which categories or questions they have not figured out yet. Prompt students to share out these questions, and document new questions that arise based on what they have been learning.

3. Add new questions to the Driving Question Board.

4. One question category still unanswered relates to questions about why only specific groups seemed to get ill from pellagra and it did not impact everyone. Tell students that, in the next sequence of lessons, they will investigate this question further.

Standards in Infectious Agent or Insufficient Diet 5E

Performance Expectations

HS-LS2-3 **Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.**
Clarification Statement: Emphasis is on conceptual understanding of the role of aerobic and anaerobic respiration in different environments.
Assessment Boundary: Assessment does not include the specific chemical processes of either aerobic or anaerobic respiration.

In NYS the entire PE has been edited as follows: Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in ecosystems. [Clarification Statement: Emphasis is on conceptual understanding of the role of aerobic and anaerobic respiration and photosynthesis within ecosystems.] [Assessment Boundary: Assessment does not include the specific chemical processes of aerobic respiration, anaerobic respiration, and photosynthesis.]

Aspects of Three-Dimensional Learning

Science and Engineering Practices

Developing and Using Models

- Develop, revise, and/or use a model based on evidence to illustrate and/or predict the relationships between systems or between components of a system. SEP2(3)

Constructing Explanations and Designing Solutions

- Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. SEP6(2)

Disciplinary Core Ideas

LS1.C Organization for Matter and Energy Flow in Organisms

- As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products. LS1.C(3)

LS2.B Cycles of Matter and Energy Transfer in Ecosystems

- Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes. LS2.B(1)

- When matter is cycles through organisms and ecosystems, some of the matter reacts

Crosscutting Concepts

Scale, Proportion, and Quantity

- The significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs. CCC3(1)

Energy and Matter

- Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. CCC5(2)
- Energy drives the cycling of matter within and between systems. CCC5(4)

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
	to release energy for life functions, some is stored in newly made structures, and some is eliminated as waste LS2.B(4)NYS	

Assessment Matrix

	Engage	Explore/Explain 1	Explore/Explain 2	Elaborate	Evaluate
Developing and Using Models		*The Role of Niacin*	*Summary Task*		
Constructing Explanations and Designing Solutions		Domino Discover Discussion [material:BIO.U5.L3.Explain1.H2]	*C-E-R Graphic Organizer* Class Consensus Discussion	*RGSS Organizer*	*Revised Explanation* *Revised Explanation Mini Rubric*
LS1.C Organization for Matter and Energy Flow in Organisms			*Decomposition Investigation* *Making Sense of the Decomposition Investigation* Domino Discover *C-E-R Graphic Organizer*	*RGSS Organizer*	*Revised Explanation* *Revised Explanation Mini Rubric*
LS2.B Cycles of Matter and Energy Transfer in Ecosystems		Domino Discover Discussion *The Role of Niacin*	*Decomposition Investigation* *Making Sense of the Decomposition Investigation* Domino Discover *C-E-R Graphic Organizer* *Summary Task* Class Consensus Discussion		*Revised Explanation* *Revised Explanation Mini Rubric*

	Engage	Explore/Explain 1	Explore/Explain 2	Elaborate	Evaluate
			Summary Task		
Scale, Proportion, and Quantity		*Making Sense of Goldberger's Investigation* Consensus Building Share Discussion *The Role of Niacin*			
Energy and Matter		Domino Discover Discussion	*Decomposition Investigation* *Making Sense of the Decomposition Investigation* Domino Discover *C-E-R Graphic Organizer* [material: BIO.U5.L3.Explain2.H4] *Summary Task*	*RGSS Organizer*	*Revised Explanation* *Revised Explanation Mini Rubric*

Common Core State Standards Connections

	Engage	Explore/Explain 1	Explore/Explain 2	Elaborate	Evaluate
Mathematics		MP4 HSS-ID.A.1 MP3	MP4 HSS-ID.A.1 MP3		
ELA/Literacy	RST.9-10.1 SL.9-10.1	RST.9-10.1 RST.9-10.2 WHST.9-10.4 WHST.9-10.5	RST.9-10.1 RST.9-10.2 WHST.9-10.4 WHST.9-10.5		SL.9-10.1

	Engage	Explore/Explain 1	Explore/Explain 2	Elaborate	Evaluate
		SL.9-10.4	SL.9-10.4		