Science
Unit 2
Plant Growth

- Where does the energy in our food come from?
- Why do we experiment in science?

UBD-Unit Plan[1]

[1] Adapted from: *Understanding by Design, Unit Design Planning Template* (Wiggins/McTighe 2005). Each unit plan is designed for 6-8 weeks of instruction, depending on student levels and length and frequency of class periods. The unit is mapped out in more detailed in the Unit Guide.

OVERVIEW[2]

Introduction

In Unit 2, students will continue to study food, but with a focus on the energy in food and where that energy comes from. Students will learn that the sun's energy is responsible for the energy we rely on in our everyday lives, and how plants convert the sun's energy to food for themselves, which then gets passed on to animals and humans who eat them. The understanding of the sun and plants' role in providing the energy found in our food is a critical understanding for all science students.

Another critical understanding is the process of experimentation. Students will continue to build on the skills learned in Unit 1. New skills include measuring length and height with a ruler, setting up experiments, making hypotheses, and identifying control and experimental groups. Students will learn to represent and interpret information represented in different ways (e.g., data tables, bar graphs, images, drawings, writing). These are multiple literacies (emphasized in CCSS Reading standard 7) needed to communicate in everyday life and in science.

For the Performance Task, individual students will perform an experiment on seed germination. Students will be introduced to this project in Set 5, and will spend Sets 5 and 6 finalizing data and presenting their findings to the class in a form of a science fair poster presentation.

Texts

Type	Title	Author	Notes
Central (Print)	*From Seed to Plant*	Gail Gibbons	
Central (Print)	*Energy from the Sun*	Allan Fowler	pp. 8-17
Central (Print)	*What the World Eats*	Faith D'Aluisio	pp. 54-55, 76-77
Non-Print (Video)	"Photosynthesis : How plants make food : Science Videos : Photosynthesis Animation for Kids"	User: funza Academy	https://www.youtube.com/watch?v=_xeYNnzwpSE
Non-Print (Video)	Time-Lapse Video Germination of Seed	User: Entertainer	https://www.youtube.com/watch?v=E__rbDzNOZI
Supplemental (Website)	"What the World Eats"	*National Geographic*	http://media.education.nationalgeographic.com/assets/richmedia/0/226/project/
Supplemental (Print)	*Investigate Plants*	Sue Barraclough	

[2] This is a summary of the unit. The sections on the following pages describe the unit in more detail.

STAGE 1 – DESIRED RESULTS						
Unit Targets[3]	**SET 1**	**SET 2**	**SET 3**	**SET 4**	**SET 5**	**SET 6**
I can use tools of science to describe in more detail (e.g., hands lens, microscope, ruler, scale, thermometer). (NGSS P4, P5, CC3)				X	X	X
I can make observations about an object by comparing it with another object (using prior knowledge of objects and adjectives related to appearance and other traits). (NGSS P4, CC3)		X	X	X	X	X
I can use numbers to describe an object (e.g., counts, length, mass, temperature, density). (NGSS P4, P5, CC3)		X	X	X	X	X
I can use my observations and my background knowledge about objects to make inferences about their properties and processes. (NGSS P4, P6)		X	X		X	
I can use my observations and inferences to develop a question and define a problem. (NGSS P1, P6)			X		X	
I can use my observations to make inferences and predictions about relationships among objects and events. (NGSS P4, P5, P6, CC4)	X	X	X		X	
I can represent my observations (quantitative and qualitative) in both tables and graphs. (NGSS P4, P5)		X	X	X	X	X
I can explain the patterns and relationships (e.g. cyclical, cause and effect) that I see in these tables and graphs. (NGSS P4, P6, CC1, CC2)		X	X	X	X	X
I can use data to provide evidence for an observable event. (NGSS P4, P6, P7)	X	X	X	X	X	
I can convert my data from numerical/visual to textual/verbal form. (NGSS P4, P5)		X	X	X	X	
I can communicate results orally and textually. (NGSS P8)		X	X	X	X	X
I can use a model to describe and explain the function of an object or system. (NGSS P2, P8, CC4)	X		X			
I can plan and carry out an investigation based on my observations and questions. (NGSS P3)			X		X	X
I can answer questions about text and cite evidence. (SL.2, RI.1)	X	X	X	X	X	X
I can connect ideas represented in words, pictures, and other visuals. (SL.2, RI.7)	X	X	X	X	X	X

[3] Only targets new to this unit are included here.

Essential Questions & Enduring Understandings

Students will understand that ...

Where does the energy in our food come from?

Everything we do requires energy. Food provides the energy we need to live. Plants are the main source of food for all living things, including animals and humans. Each new plant grows from a seed. Plants can make their own food using the sun through a process called photosynthesis. Energy in the plant gets transferred to animals and people through the food cycle. Without plants, there is no life on earth.

Why do we experiment in science?

In science, we perform experiments to try to answer a question we have by testing one thing at a time. In experiments, we observe what happens when we change one thing (a variable) on something that we cannot change (a control). We can observe and record the effects of changing a variable in an experiment in written, oral, and visual format (graphs and data tables).

UNIT AT A GLANCE		
SET	**GUIDING QUESTIONS & KNOWLEDGE** *Students will know that ...*	**SKILLS** *Students will be able to ...*
1 5 lessons	**Where do the foods we eat come from?** *Our food comes from plants and animals, and is eaten in raw or processed forms. Food provides us with all the energy we need to grow and live. The energy in all food originates from the sun. Sunlight gets converted to energy by plants, and is then cycled through the food chain.*	• Explore the origins of the food groups. • Sort breakfast foods according to their origin (plant/animal) and form (processed/raw). • Interpret global consumption data and make claims using evidence. • Interpret energy flow in food chains.
2 5 lessons	**Why are seeds important for plant growth?** *Seeds are the start of plants. Seeds can be planted by people or dispersed by water, wind, or animals. Seeds need specific temperatures, air, and water to germinate. Seeds have all the food they need to begin to grow already stored inside them.*	• Observe seed germination and record qualitative and quantitative observations. • Draw and write procedures and materials needed for seed germination. • Organize and interpret data into a data table and bar graph. • Explain the conditions needed for a seed to germinate and the stages of growth.
3 8 lessons	**How do plants get the energy to grow?** *Plants need water, sunlight, nutrients, and air. Plants use photosynthesis to make their own food. Plants have parts that help with photosynthesis. All energy for plants comes from the sun.*	• Identify environmental conditions in which plants grow/don't grow. • Set up a class experiment using germinated seeds. • Describe and illustrate the process of photosynthesis. • Draw the flow of energy from the sun, to a plant, to an animal.
4 3 lessons	**Why do we measure and record plant growth?** *Measuring the growth of plants is important to make sure they are healthy and see how different conditions are affecting the growth of plants. We can measure the height of a plant with a ruler or count the number of leaves.*	• Collect data on plant (length of stem, roots number of leaves, height). • Create a data table. • Interpret, predict, and draw conclusions about data. • Communicate results on plant growth to the class.

5 5 lessons	**How can we use experiments to understand plant growth?** *We can only change one variable at a time in an experiment. There is always a control group and an experimental group. There are many variables that can be used for experiments with plants (e.g., temperature, light, water, nutrients, space).*	● Ask questions about seed germination that can be tested. ● Set up an experimental design to test one variable in seed germination to answer their questions. ● Draw their experimental setup. ● Choose one variable to test on seed germination. ● Predict what the results will be in the form of a hypothesis. ● Create a data table to collect results.
6 5 lessons	**How do we communicate our experimental results?** *The data and results from our experiment can be shared with others visually, orally, and textually. We can use this data as evidence to support our hypothesis and make conclusions.*	• Record data in the form of a data table and bar graph. • Write conclusions, connecting findings to concepts from class. • State whether the hypothesis was correct or incorrect. • Communicate findings to the class with a science fair style poster and presentation.

STAGE 2 – ASSESSMENT EVIDENCE	
Major Assessments	
Beginning Assessment On Demand[4] - Individual	**Interpreting Data and Illustration on Seed Germination** (NGSS P4, P6, CC1, CC2, CC4) At the beginning of Set 1 (Lesson 1), students will use their own prior experience and knowledge to annotate a data table and bar graph about plant growth. Students will also be asked to annotate an image of seed germination. These responses will be compared with the Final Assessment.
Mid-Unit Assessment On Demand - Collaborative and Individual	**Why Are Plants Important?** (NGSS P6, P8, CC4, CC6) At the end of Set 3 (Lesson 17), students will work in groups to create a chart that lists the things that plants *have, need,* and *give.* Then, individually, students will use key vocabulary from this chart to guide them in writing sentences or a paragraph about why plants are important.
Performance Task[5] Over Time - Collaborative	**Seed Germination Experiment** (NGSS P1, P2, P3, P4, P5, P6, P7, P8, CC1, CC3, CC4, CC7) In Set 5, students will work on setting up the foundation for the Performance Task. They will design an experiment of germinating seeds by changing one variable. They will predict the expected results in the form of a hypothesis, illustrate the methods to set up their experiment, show their results in a data table and bar graph, communicate their results, and connect what was learned to concepts learned in this unit. The final presentation of the experiment will take place in Set 6, in the form of a science fair poster.
Final Assessment On Demand - Individual	**Interpreting Data and Illustration on Seed Germination** (NGSS P4, P6, CC1, CC2, CC4) At the end of Set 6 (Lesson 30), students will use what they have learned and experienced in the class to re-answer questions based on data provided in a table and bar graph about seed germination. These responses will be compared with their Beginning Assessment to evaluate growth.

[4] On Demand refers to an assessment completed in one sitting, without teacher support.

[5] See the Performance Task Description and Student Model for more details on this assessment.

STAGE 3 – LEARNING PLAN	
SET 1	**Where do the foods we eat come from?**
1	Beginning Assessment: Origins of Breakfast Foods
2	Oral Language Building: Global Consumption Patterns
3	Reading/Representing: Energy Flow in Food Chains
4	Writing: Identifying Parts of the Food Chain
5	Reviewing/ Assessing Skills: Energy from the Sun
SET 2	**Why are seeds important for plant growth?**
6	Kinesthetic Experience: See-Think-Wonder: Seed Germination
7	Oral: Seed Physical Characteristics
8	Reading/Representing: Seed Stages of Growth
9	Writing: Seed Germination Data Collection
10	Reviewing/Assessing Skills: Life Cycle of Plants
SET 3	**How do plants get the energy to grow?**
11	Kinesthetic Experience: The Effects of Location on Plant Growth
12	Oral: Setting up an experiment on plant growth
13	Reading/Representing: How plants make their own food
14	Writing: The function of plant parts for plant growth
15	Representation: The process of photosynthesis
16	Writing: Photosynthesis diagram annotation
17	Reviewing/Assessing Skills: Mid-Unit Assessment
SET 4	**Why do we measure and record plant growth?**
18	Science Practice: Measuring Skills, Part I
19	Science Practice: Measuring Skills, Part II
20	Reviewing/Assessing Skill: Interpreting Plant Growth Data
SET 5	**How can we use experiments to understand plant growth?**
21	Kinesthetic Experience: Formulating A Seed Germination Research Question
22	Oral: Seed Germination Experimental Design
23	Reading/Representing: Seed Germination Experimental Setup
24	Writing: Seed Germination Experimental Procedure
25	Reviewing/Assessing Skills: Seed Germination Data Collection
SET 6	**How do we communicate our experimental results?**
26	Kinesthetic Experience: Seed Germination Data Collection
27	Oral: Seed Germination Summarizing Results
28	Reading/Representing: Seed Germination Poster Creation
29	Reviewing/Assessing Skills: Presentation of Performance Task, Day 1
30	Reviewing/Assessing Skills: Presentation of Performance Task, Day 2 and Final Assessment