

Eighth Grade Instructional Segment on Matter

In our day-day life we depend on our understandings of the nature of energy and matter to make healthy decisions about the foods we consume. This instructional segment makes connections to this big idea while focusing on how food breaks down to the basic elements that are organized into the modern periodic table.

Student Science Performance

Grade 8

Topic – Matter: Periodic Table

Title:

You are What you Eat

GSE Performance Expectation

S8P1. Obtain, evaluate, and communicate information about the structure and properties of matter.

- e. Develop models (e.g., atomic-level models, including drawings, and computer representations) by analyzing patterns within the periodic table that illustrate the structure, composition, and characteristics of atoms (protons, neutrons, and electrons) and simple molecules.
- f. Construct an explanation based on evidence to describe conservation of matter in a chemical reaction including the resulting differences between products and reactants. (Clarification statement: Evidence could include models such as balanced chemical equations.)

Lesson Performance Expectations:

- Analyze patterns within the periodic table
- Develop models of atomic structure(s) and molecules

[Additional notes on student supports](#)

Engage

Phenomenon-



Obtaining Students **obtain information** from nutritional labels associated with what is seen on the dinner plate. Students investigate the nutritional categories and breakdown for each food. Students then record the items from their last meal and similarly obtain information about the nutritional categories and breakdowns.

Resources for Obtaining Information:

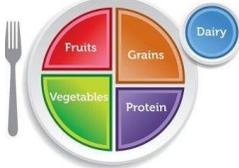
[Choose My Plate](#)

[Chicken and Turkey Nutrition Facts](#)

[Healthy Foods](#)

Communicating In small groups, students share what they have discovered. Students discuss and record what they know about the different nutrients.

Teacher Hint: Some students would benefit from a discussion guide. A suggested organizer provided below:

Food Item 	Nutritional Category 	Least Abundant Nutrients (bottom 3) 	Most Abundant Nutrients (top 3)
Chicken			
Fries			
Spinach			
Water			

Communicating In whole group discussion students then share obtained information.

Teacher Hint: As students engage in whole group discussion purposefully elicit prior knowledge about the history of the FDA recommendations (pyramid – my plate), current conceptions about healthy versus unhealthy, sources of different nutrients, and that all matter –including their food- is made of atoms.

(Prompts for Writing or Discussion: Why do you think the labels only list a few vitamins and minerals? What do these different nutrients do for you? What do all the proteins have in common? What about the vegetables? What kind of atoms make up Vitamin A?...Potassium? ...Carbohydrates?)

Obtaining/Reasoning/Communicating Students provided samples and/or images (infographics) about some of the elements (nutrients) identified from ‘dinner.’ In small groups students generate a list of observable properties, surprising properties, and questions.

Teacher Hint: List student questions in a way that allows you to reference and mark through as they are answered. Some students may benefit from an organizer to help facilitate their discussions. A sample is provided below:

	What did you observe?	What was the same as what you expected?	What was different than what you expected?	What questions do you have?

<p><i>Explore</i></p>	<p>Obtaining Information Students obtain information about the atomic/molecular structure of the different nutrients from ‘dinner’ and their last meal.</p> <p>Suggested Resources for Obtaining Information: Vitamin Structures Vitamin Structures Graphic</p> <p>Reasoning From the obtained information, students use the modern periodic table to locate the most common elements that are part of the molecular/atomic structure of foods consumed at ‘dinner.’</p> <p>Communicating Students share identified patterns from obtained information. (For example, Mg and Ca are in the same column.) Students conjecture what each of the different columns, rows, numbers, and symbols represent.</p> <p>Obtaining/Reasoning/Communicating Students obtain information for how the modern periodic table is organized.</p> <p><i>Teacher Hint: Myriad instructional approaches allow students to obtain/reason/communicate an understanding of the organization of the modern periodic table. Students can work abstractly using paint chips, work from a history of science perspective to create a timeline, etc.</i></p> <p>General Background Information with Multiple Suggestions</p> <p>Suggestion for Virtual Simulation</p> <p>Suggestion for History of Science approach</p> <p>(Teaching Suggestions and Discussion Questions included)</p> <p>Ted-Ed: Solving the Puzzle of the Periodic Table</p> <p>Suggestion for Kinesthetic/Nature of Science Approach:</p>
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	<p><u>“The Paint Chip Lab”</u></p> <p>Reasoning/Communicating Students construct an explanation for the organization of the periodic table and summarize all the data that can be acquired by knowing how to read it.</p> <p>Options for Constructing an Explanation:</p> <ol style="list-style-type: none"> 1. How to book/15 steps or less with pictures 2. Create a web page/infographic (Show the following as an example) 3. Student comparison of alternate tables, identifying strengths and weaknesses for each, with final claim (supported by evidence) as to why the modern periodic table is the better choice. <p><i>Teacher Hint: Consider providing a checklist and rubric</i></p>
<i>Explain</i>	<p>Obtaining Specifically students obtain information from the Periodic Table and other resources to make sense of one common element found in their food. Students obtain information about the physical/chemical properties of the element, typical atomic structure, family information, bonding preferences, other uses, etc.</p> <p>Potential Resource for Obtaining Information: How to understand the periodic table Periodic Table Interactive</p> <p>Reasoning/Communicating Students choose approach for presenting model of the Periodic table with focus on assigned element.</p> <p><i>Teacher Hint: Provide student choices with a rubric (e.g. singing, creating a new product made with the element, telling a sci-fictional narrative, dating profile, social media page, etc.</i></p> <p><i>Teacher Hint: Group students with same elements together (3 or less students should be grouped together) and allow them to collaborate on their presentation, but require each complete a model or visual representation of some sort.</i></p>
<i>Elaborate</i>	<p>Phenomenon: From the Farm Back to the Earth: Farm → Grocery → Table → Digestion → Growth/Development → Excretion</p>



Obtaining Students choose one of the foods that were part of their last meal. Students obtain information about how that food is farmed, processed for the grocery, bought/consumed, digested, broken down to molecular/atomic states, used by the human body for life, and then returned back to Earth.

Reasoning Students generalize the sequence of events and develop a model as evidence to construct an argument about the conservation of matter as it pertains to the food we eat.

Teacher Hint: Provide students a guide and set of resources for obtaining/reasoning information.

Communicating Students generate a claim supported by evidence that proves conservation of one element/molecule found in one food (from farm to earth).

Teacher Hint: Provide students a CER framework and writing rubric.

Evaluate

Assessment of Student Learning

Reasoning Students use obtained information about a “new” element to determine its atomic structure, family, period, potential bonding preferences, etc.

Teacher Hint: Develop descriptions that range from difficult to easy to categorize. Provide appropriate difficulty level based on student needs.

Communicating Students must write from a unique perspective (e.g the scientist who discovered it, family or group member, another element from which it may be bonded with, etc.) to develop the main character (i.e. new element) to reflect its eventual placement in a family, properties, “friends,” etc.

Suggested mediums:

- 1) Breaking News: Special TV Report
- 2) Personal Journal Entries
- 3) Science Peer Reviewed Journal

	4) Graphic Novel/Short Story
<i>SEP, CCC, & DCI Featured in Lesson</i>	Science Essentials
Science Practices	<ul style="list-style-type: none"> ● Developing and using models ● Analyzing and interpreting data ● Constructing explanations (science) ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information
Crosscutting Concepts	<ul style="list-style-type: none"> ● Matter and Energy ● Structure and Function ● System and System Models
Disciplinary Core Ideas	<p>From <i>A Framework for K-12 Science Education</i>:</p> <p><i>By the end of grade 8</i></p> <p>PS1.A: STRUCTURE AND PROPERTIES OF MATTER</p> <ul style="list-style-type: none"> ● All substances are made from some 100 different types of atoms, which combine with one another in various ways. ● Atoms form molecules that range in size from two to thousands of atoms. ● Pure substances are made from a single type of atom or molecule ● Pure substances are made from a single type of atom or molecule ● Each pure substance has characteristic physical and chemical properties that can be used to identify it. ● Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. ● Liquids are constantly in contact with each other. ● Gases are widely spaced except in collisions. ● Solids are closely spaced atoms and vibrate in position. ● Changes of state occur with variations in temperature or pressure. <p>PS1.B: CHEMICAL REACTIONS</p> <ul style="list-style-type: none"> ● Substances react chemically. ● In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. ● The total number of each type of atom is conserved and this mass does not change. ● Some chemical reactions release energy, others store energy. <p>PS3.D: ENERGY IN CHEMICAL PROCESSES AND EVERYDAY LIFE</p> <ul style="list-style-type: none"> ● Plants and animals require an energy input from chemical reactions involving digestion and respiration.

Additional Supports for struggling learners:

The following supports are suggestions for this lesson and are not the only options to support students in the classroom. These supports target students that struggle with science material, this lesson or a previous lesson. These are generalized supports and do not take the place of IEP accommodations as required by each student’s Individualized Education Program.

General supports for the following categories:

<u>Reading:</u>	<u>Writing:</u>	<u>Math:</u>
<ol style="list-style-type: none"> 1. Provide reading support by reading aloud or doing partner reads 2. Have the teacher model what they are thinking when reading the text 3. Annotate the text with students so that they may refer to it as they work through the lab 	<ol style="list-style-type: none"> 1. The teacher can provide a sentence starter for the students. 2. The teacher can give students an audience to write to (i.e. Write a letter to your sibling explaining this topic). 3. The teacher can provide constructive feedback during the writing process to help students understand the expectations. 	<ol style="list-style-type: none"> 1. Provide assistance analyzing patterns.

Supports for this specific lesson if needed:

Performance expectations for instruction:

1. The teacher should provide information to students in various formats to reach as many students as possible.
2. The students should be given adequate time to complete each part of the lesson.
3. The students should be allowed to express their knowledge in various formats.
4. The teacher should be sure to provide multiple ways for the students to communicate their knowledge of the material.

Engage:

1. The students should be given the form to record their information on. It should include the questions that they need to answer and specifically what they are looking for on the nutrition labels.
2. Have some nutrition labels on hand for the students that find it stressful to work with the labels online.
3. Use intentional grouping to help students complete this lesson to the best of their ability. Best Practice is to use data to drive the grouping.
4. The teacher should have clear rules and guidelines to guide the whole group discussion. It is beneficial for students to feel safe and comfortable sharing in the classroom.
5. The teacher should attempt to ensure that no student gets too much “floor” time and no student gets too little “floor” time. This can be accomplished by providing warning, answers (only if needed) and questions to students to allow them to feel prepared and ready to participate.

6. The students should have the opportunity to express their knowledge in various formats. These formats could include writing their argument, drawing a cartoon, designing a play or making a power point.
7. The teacher should be sure to give the organizer below to help struggling students record their information.
8. It might be beneficial for students for the teacher to give an example of what should fill in each column.

Exploring:

1. The teacher can provide resources to students to obtain the information that they need for this part of the lesson.
2. The students may benefit from an organizer to keep their research and information in order.
3. The students should be allowed to express their prediction in multiple formats. This could include drawing, verbally explaining or writing an explanation.
4. The students may benefit from the why of grouping. Frequently, struggling students will more easily understand the material if they have context. So, discussing why the periodic table should be organized would be appropriate here.
5. It would be beneficial to provide a data sheet to the students for “The Paint Chip Lab” with questions that correspond to the lab.
6. Providing a checklist and rubric for students will be beneficial for struggling students. This will allow them to self-monitor and self-assess as they work.

Explaining:

1. Struggling students may have difficulty picking an element that was in their food. They may benefit from some assistance choosing an element.
2. The teacher should provide the resources to students and give them an organizer to record their research and thoughts on.
3. The students should be allowed to express their prediction in multiple formats. This could include drawing, verbally explaining or writing an explanation.
4. Struggling students are not always willing or able to share their thoughts in a whole group setting. The teacher should provide clear guidelines and rules for whole group sharing/discussion in class. This will help students feel safe. The teacher should have an alternate format for students to share their work if they do not feel safe enough to share with the entire class.

Elaborating:

1. Struggling students may have difficulty picking a food. They may benefit from some assistance choosing a food.
2. The teacher should provide a set of resources and an organizer to help with their research.
3. The students should be allowed to express their knowledge in multiple formats. This could include drawing, verbally explaining or writing an explanation.

Evaluating:

1. Students should be allowed to express their knowledge in various ways. This could include writing their argument, drawing a cartoon, designing a play or making a power point.

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