



Savory Seeds: Sources of Energy

OBJECTIVES

Students will be able to *identify* major macronutrients (proteins, carbohydrates, and fats) and *interpret* a nutrition label to quantify how much of each there is in different kinds of foods. Students will be able to *connect* the ideas of seeds as food for baby plants and seeds as a part of a balanced human diet. Students will be able to *write* clear and coherent procedural text.

HANDOUTS

- Savory Seeds Procedure Practice
- Nutrition Facts Packet (Seeds)
- Write Your Own Procedure Worksheet

MATERIALS

- Post-its
- Samples of all the seeds in the Nutrition Facts Packet (Seeds) OR Printed pictures of all the seeds
- Corn kernels to pop
- Oil
- Butter
- Salt
- Pot for popping popcorn
- Plug in stove
- Small folding table
- Napkins for popcorn
- Black markers
- 2 Tbsp of corn kernels in baggies/envelopes for take home
- Stapler

KEY TOPICS

- Data Collection
- Macronutrients (forms of energy)
- Components of seeds
- Nutrition labels
- Scientific Procedures

BACKGROUND INFORMATION

Energy is transferred from the sun into chemical bonds in plants through photosynthesis. The direct product of photosynthesis is simple sugar, a type of carbohydrate. However, through other plant and animal processes, that energy can also be stored in molecules known as proteins, fats and carbohydrates. Humans should eat a variety of these molecules to provide appropriate energy; they also need the accompanying vitamins, minerals and fiber to stay healthy, although these molecules do not provide energy. Whole foods, foods that come directly from a plant or animal, generally contain vitamins, minerals and fiber naturally (e.g.

whole wheat flour, potatoes, oranges). Highly processed and refined foods have often been stripped of many of the natural vitamins, minerals and fiber found in the whole food and may have extra fats and sugars (e.g. refined white flour, tater tots, orange soda). Many foods can be found somewhere between these two extremes (whole and heavily processed foods) and the consumer needs to understand nutrition labels, ingredients lists, and cooking processes in order to make wise decisions about what to eat and how much of it to eat.

VOCABULARY

Energy – The ability of an object to create change (work) in another object or environment

Calorie – A measurement of stored energy in food that animals can use to survive and grow

Embryo – baby plant contained within the seed

Cotyledon – stored energy (food) for the embryo to germinate

Independent variable – one that is changed by the scientist

Dependent variable – what is affected by the independent variable and can be measured

Photosynthesis – the process plants use to transform light energy from the sun into stored energy (sugar) for plant growth and reproduction

Carbohydrate – compounds of carbon, hydrogen, and oxygen (such as sugars, starches, and celluloses) that provide energy

Protein – chains of amino acids that build, maintain, and replace the tissues in your body.

Fat – compounds of carbon, hydrogen, and oxygen that do not dissolve in water and are very high in energy

Whole food – a food that came directly from a plant or animal

Processed food – food that was created through many steps, usually adding salt, sugar, fat and artificial ingredients

Vitamins – a group of organic compounds that are essential for normal growth and nutrition and are required in small quantities in the diet

Minerals – a group of inorganic compounds that are essential for normal growth and nutrition and are required in small quantities in the diet

Fiber – The parts of grains, fruits, and vegetables that contain cellulose and are not digested by the body. Fiber helps the intestines absorb water and move food through the intestines.

LESSON PLAN

1. Savory Seeds Procedure Practice (30 min)

- Briefly review the energy chain and discuss how the energy stored in seeds from the sun can both be used to feed germinating plants or human animals.
- Hand out **Savory Seeds Procedure Practice** and the **Nutrition Facts Practice (Seeds)**. You may choose to do this individually or in partners. Each person or group should also receive either a bag of actual examples OR pictures of all of the different seeds found in the nutrition packet.
- Tell students that this is a self-guided activity designed to evaluate how good they are at following a procedure (a very important part of being a scientist!).
- Circle the classroom clearing up misunderstandings and checking work as necessary.

2. Popcorn! (20 min)

- Hand out **Write Your Own Procedure Worksheet**. Explain that students are going to write a procedure for making pop-corn. Remind them that good procedures need to contain specific instructions, including precise language and exact quantities.
- As you set up, introduce the activity. What part of the plant is popcorn? The seed! (Review the 3 parts of a seed?) Explain why pop-corn pops. *A reaction occurs in the kernel when heated.*

Moisture, combined with the structure of the popcorn kernel, makes the way corn pops unique. Other grains, like quinoa and millet will pop when heated, but not quite like popcorn. As the kernel heats up, the moisture inside the kernel turns to steam, but can't escape! As the pressure builds, the steam softens the outer layer of the kernel (the pericarp). When the steam finally bursts out the pericarp explodes with a "pop!" The starchy endosperm bursts out and it looks like the popcorn we all know and love!

- c. Slowly go through all of the pop-corn making procedure and help students write down each step and quantity. Have a helper write them on the board if there are learning disabilities.
 - d. Hand out paper towels, antibacterial gel and popcorn samples!
3. **Conclusion (5 min)** – Hand out envelopes or bags of un-popped corn and staple them to students' procedures. They may take these envelopes home to make their own pop-corn! If time, hand out post-its and have students write down a question, something they enjoyed, or something they learned.

SAVORY SEEDS EVALUATION ACTIVITY (or THE ULTIMATE TRAIL MIX CHALLENGE)

OBJECTIVE

Students will be able to *synthesize* and *display* their knowledge of macronutrients, ability to interpret nutrition labels and measuring skills to build a trail mix and recipe (or, procedure).

HANDOUTS

- Trail mix recipe/procedure
- Trail Mix Nutrition facts packet

MATERIALS

- Trail mix ingredients
- Snack baggies (1 per student)
- Bowls
- Antibacterial gel
- Measuring devices
- Sharpies
- Paper towels

LESSON PLAN (45 minutes):

Build your own trail mix:

- a. Leader passes out trail mix challenge, nutrition facts, baggies and paper towels. Measuring devices are in the center of the table with bowls of the different ingredients.
- b. Everyone writes their names on their bags and then washes their hands with antibacterial gel.
- c. Students complete the challenge on their own. The leader can facilitate and answer questions when necessary.
- d. Collect the recipes and check for understanding (or do this as they are completing the activity).
- e. Set aside the bags of trail mix until the end of class.

STANDARDS

Next Generation Science Standards

5-PS3-a. Use models to describe that energy animals use to maintain body warmth, body repair, and for motion was once energy from the sun. [Clarification Statement: Energy is not transferred by the digestion of food in the digestive system but in the cells after digested food has been absorbed. Care must be taken to avoid creating the misconception that the energy from food is released in the stomach and intestines.]

MS-LS1-k. Develop a model to support the explanation that within an individual organism, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules to support growth, or to release energy. [Clarification Statement: Emphasis is on a conceptual understanding of the cycling of food and the release of energy and how it is used in organisms. The energy released from the food is used by the organism for life processes.] [Assessment Boundary: The assessment should provide evidence of students' abilities to use a model to explain the cycling of matter in an organism, the input and output of that matter, and that some of those molecules become part of the organism. Details of cellular respiration or the chemical reactions describing photosynthesis or respiration are not assessed.]

Cross-Cutting Concepts:

- Energy and Matter: Energy may take different forms (e.g. energy in fields, thermal energy, energy of motion); within a natural system, the transfer of energy drives the motion and/or cycling of matter.
- Scale, Proportion and Quantity: Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.

Language Arts

Literacy.W.5.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

Literacy.RI.5.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 5 topic or subject area.

Literacy.W.5.4 Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience.

Literacy.L.5.6 - Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases, including those that signal contrast, addition, and other logical relationships.

Literacy.W.6.1a Introduce claim(s) and organize the reasons and evidence clearly.

Literacy.W.6.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Literacy.L.6.6 Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.

RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS3-3)

WHST.6-8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS1-6)

Math:

CCSS.MP.2 Reason abstractly and quantitatively (MS-PS1-5).

CCSS.MP.4. Model with mathematics (MS-PS1-5).

Peanut butter



Oats



Lima beans



Black pepper



Sunflower seeds



Edamame



Cumin



Barley



Whole wheat flour



Brown rice



Quinoa





Savory Seeds Procedure Practice

Procedure:

1. Use the Nutrition Facts packet to fill in the grams of proteins, carbohydrates and fats found in 100 grams of each of the seed examples listed below.

Seed	Proteins	Fats	Carbohydrates
Sunflower Seeds	_____ grams	_____ grams	_____ grams
Cumin	_____ grams	_____ grams	_____ grams
Peanut Butter	_____ grams	_____ grams	_____ grams
Edamame (Soy Beans)	_____ grams	_____ grams	_____ grams
Black Pepper	_____ grams	_____ grams	_____ grams
Brown Rice	_____ grams	_____ grams	_____ grams
Oats	_____ grams	_____ grams	_____ grams
Lima Beans	_____ grams	_____ grams	_____ grams
Whole Wheat Flour	_____ grams	_____ grams	_____ grams
Quinoa	_____ grams	_____ grams	_____ grams
Barley	_____ grams	_____ grams	_____ grams

2. Use the nutrition facts information to line up all of your seed examples in order from least to most **proteins** on your desk.
3. Raise your hand to ask a teacher to check the order of your seeds.
4. If it is correct, ask the teacher or volunteer to initial here: _____. If not, return to step 2.

5. Use the nutrition facts information to line up all of your seed examples in order from least to most **carbohydrates** on your desk.
6. Raise your hand to ask a teacher to check the order of your seeds.
7. If it is correct, ask the teacher or volunteer to initial here: _____. If not, return to step 5.
8. Use the nutrition facts information to line up all of your seed examples in order from least to most **fats** on your desk.
9. Raise your hand to ask a teacher to check the order of your seeds.
10. If it is correct, ask the teacher or volunteer to initial here: _____. If not, return to step 8.
11. Great job! Silently work on the task written on the board until the time for this activity is over.



Savory Seeds Procedure Practice

KEY:

Proteins:

Peanut butter – 25 grams
Lima beans – 21 grams
Sunflower seeds – 19 grams
Cumin – 18 grams
Whole Wheat Flour – 14 grams
Quinoa – 14 grams
Oats - 13 grams
Black pepper – 11 grams
Edamame – 10 grams
Barley – 10 grams
Brown rice – 8 grams

Fats:

Sunflower seeds – 50 grams
Peanut butter – 50 grams
Cumin – 22 grams
Oats – 7 grams
Quinoa – 6 grams
Edamame – 5 grams
Black pepper – 3 grams
Brown rice – 3 grams
Whole wheat flour – 2 grams
Lima beans – 1 gram
Barley – 1 gram

Carbohydrates:

Barley – 78 grams
Brown rice – 76 grams
Whole wheat flour – 73 grams
Oats – 69 grams
Black pepper – 65 grams
Quinoa – 64 grams
Lima beans – 63 grams
Cumin – 44 grams
Sunflower seeds – 24 grams
Peanut butter – 20 grams
Edamame – 10 grams



Write Your Own Procedure

How to make Popcorn:

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

Popcorn Kernels:

Nutrition Facts	
Serving Size 100 grams (100 grams)	
Amount Per Serving	
Calories 375	Calories from Fat 39
% Daily Value*	
Total Fat 4g	7%
Saturated Fat 1g	3%
Trans Fat	
Cholesterol	0%
Sodium 7mg	0%
Total Carbohydrate 74g	25%
Dietary Fiber 13g	51%
Sugars 1g	
Protein 11g	
Vitamin A 0% • Vitamin C 0%	
Calcium 1% • Iron 17%	
*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.	
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The Ultimate Trail Mix Challenge

You **MUST** follow all instructions if you want to take home your trail mix. Read carefully! You may use the same ingredient for more than one category.

1. Choose one ingredient that has mostly fat: _____ . Add one teaspoon to your bag.
2. Choose one ingredient that has mostly carbohydrates _____ . Add one tablespoon.
3. Choose one ingredient that has at least 10 grams of protein: _____ . Add one tablespoon.
4. Choose one ingredient that is very processed: _____ . Add one teaspoon.
5. Choose one ingredient that is a little processed: _____ . Add one tablespoon.
6. Choose one whole food: _____ . Add two tablespoons.
7. Add one tablespoon of any ingredient you want, but you must write below why it is a healthy choice for your trail mix:

Now, write the recipe:

Name of your ultimate trail mix: _____

Ingredients (hint: don't forget the amount):

_____	_____
_____	_____
_____	_____
_____	_____

Procedure:

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

I completed this activity correctly: _____ my initials _____ teacher initials