Grain Science

Maryland Teaching Standards:

Standard 1.1 Biology
- The student will modify or affirm scientific ideas according to accumulated evidence.

Standard 1.2 Biology
- The student will pose meaningful answerable scientific questions.

Standard 6.0 Nutrition and Fitness
- Identify and define functions of nutrients.
- Analyze a Nutrition Facts Label.

Time: 30-45 Minutes, can be modified to meet scheduling needs.

Objectives:
Students will be able to identify and describe the minerals and nutrients provided by grains in order to explain how eating a diet including whole grain is beneficial to them and their body.

Lesson Plan Outline: 5E Model
- Engagement– Grainy Information
- Exploration– Grain Nutrients
- Explanation– Grains at Work
- Elaboration– Grain Gr-Ape
- Evaluation– Grain Brain Drain

Materials:
- Markers
- Grain Matching Cards
- Chart paper and markers
- Grain product container examples (grain containing products only, 1-2 per bag) in a paper bag with Grain Nutrient Cards
- Grain Nutrient Card (print cards as double sided with nutrient name on one side and information on the other)
- Organ System Picture Tags (print pictures on one side of a sheet, laminate and attach to sting to allow the pictures to be worn by a student)
Grainy Information—Engagement

**Time:** 5-7 Minutes

1. Distribute Organ System Picture Tags (print pictures on one side of a sheet, laminate and attach to string to allow the pictures to be worn by a student). Pair/group up students by using the grains matching cards.

2. Provide each pair/group with a piece of chart paper and markers. Ask them to write facts about grains, such as anything they know or have learned about grains. Stress that a fact is not an opinion. There should not be any “they are tasty” type comments as that is an opinion and some people may disagree. Encourage them to work with each other. Allow them approximately two minutes to work.

3. Have pairs/groups share their answers. Ask them to share only new answers, not to repeat previous answers shared by other groups. Accept all answers that are facts. Discuss questionable answers and have the group make the decision as to whether it is a fact or not. If they can’t decide, circle the “fact” and say they may be able to answer it at the end of the session. Allow approximately 5 minutes for sharing.

4. Hang chart paper around the room and move to the exploration piece.
Grain Ingredients–Exploration

Time: 10-15Minutes

1. Give each pair/group a paper grocery bag in order for them to complete the Great Grain Investigation.

   Investigation Procedures:
   
   The object is to use the product boxes included and the nutrient cards provided to identify the minerals and nutrients provided by grains.

   Helpful Hint: You may want to take a moment to ask the students where they might find this information on the product container.

   Answer—Nutrient chart near the ingredients list.

   Have each pair/group...
   
   - Empty the contents of the grocery bag onto the table.
   - Separate the product boxes from the nutrient cards.
   - Place the paper bag at the specified location (at least 5 paces from the table).

       Helpful Hint: Mark with masking tape a spot on the floor where each group is to put their grocery bag.

   - Select a product container and look at the nutrients list.
   - Compare the items on the product container with the nutrient cards. When you find a match, one member of the pair/group must WALK the card down to their grocery bag and deposit it and WALK back to the table.
   - Continue comparing items on the product container with the nutrient cards and WALKING them down to the grocery bag until there are no more matches.

       Helpful Hint: Not all of the nutrient cards will be used.

   - When they are all done with their investigation, ask them to signify they are finished by doing a specific action. (i.e. stand like a stalk of corn)

2. Have all pairs/groups move to their bag and create a circle to share their findings.

   Have them remove the cards from the bag and put the bag behind them outside of the circle.

3. Select a pair/group to start with and have them pull one of their nutrient cards out of the grocery bag and share it with the group. On a chart paper list the nutrient/mineral information and have all the other groups look in their bags to see if they have the same card. Most grain products should have similar nutrients or minerals with few exceptions. Consult the product containers if there are major discrepancies.

4. Ask the pair/group that shared what they think their nutrient does for the body. Stress that this is a prediction, which is an educated guess, therefore it is okay to get it wrong. If they don’t want to predict, ask another student/pair/group to predict.

5. Continue sharing/comparing their nutrient cards until all cards have been exhausted. Share any remaining nutrients that should have been identified but were not if this is applicable.

   Nutrients should include: protein, fiber, iron, magnesium, phosphorus, zinc, copper, manganese, selenium, B vitamins (thiamin B1, riboflavin B2, niacin B3, pyridoxine B6, folic acid B9).
Grains at Work—Explanation

Time: 10-15 Minutes

1. Explain that everything we eat provides our body with valuable resources, but they can also provide us with some not so valuable resources. We should eat a balanced and healthy diet to help our body function properly. **Helpful hint: Have a short discussion with the students about resources (materials used to make and/or run things. Feel free to connect it to fuel for a car, energy for a lightbulb, etc.)**

2. Have students identify/list the different body systems necessary for their body to function. As they are identified have the student that said the organ system put on the Organ System Picture Tag. Share the function of each system and have the students identify the organs of each system.

   **Helpful Hint:** Students may need help getting started. Give pantomime type hints to get their thoughts moving in the right direction. Examples: breathe deeply, make a “lub-dub” sound like a heart, flex your muscles. They should be able to list most if not all of the organ systems in green listed below. These are the important systems to focus on for this activity:

   - **Cardiovascular:** transports nutrients and removes gaseous waste from the body. Includes the circulatory system.
   - **Circulatory:** transports nutrients and gases to cells and tissues throughout the body.
   - **Digestive:** breaks down food into smaller molecules to provide energy for the body.
   - **Muscular:** enables movement of the body.
   - **Nervous:** monitors and coordinates internal organ function and responds to changes in the external environment.
   - **Respiratory:** provides the body with oxygen via gas exchange between air from the outside environment and gases in the blood.
   - **Skeletal:** supports and protects the body while giving it shape and form.
   - **Urinary/Excretory:** removes wastes and maintains water balance in the body.
   - **Integumentary (skin):** protects the internal structures of the body from damage, prevents dehydration, stores fat and produces vitamins and hormones.
   - **Reproductive:** enables the production of offspring
   - **Endocrine:** helps to maintain growth and homeostasis within the body
   - **Immune**
   - **Limbic**
   - **Lymphatic**

Additional Information can be found at: [http://www.biology.about.com/od/organisms/a/aa031706a.htm](http://www.biology.about.com/od/organisms/a/aa031706a.htm)
Grains at Work—Explanation

Time: 10-15 Minutes

3. Distribute Nutrient Cards to each pair/group. Have each pair/group read the information on their cards. Have them decide which organ system they believe it belongs to and have them give the card to the person wearing that organ system. Verify their answers. The following matches should have been made:

- **Protein**—muscular
- **Fiber**—digestive, excretory
- **Iron**—circulatory
- **Magnesium**—nervous, skeletal, muscular, cardiovascular, immune
- **Phosphorus**—skeletal
- **Zinc**—immune
- **Copper**—circulatory, cardiovascular, integumentary
- **Manganese**—skeletal
- **Selenium**—immune
- **Thiamin**—nervous
- **Riboflavin**—integumentary (skin)
- **Niacin**—nervous, digestive, integumentary
- **Pyroiodixine**—circulatory
- **Folic Acid**—all systems due to new cell formation
Grain Gr-Ape: Elaborate

**Time:** 5-7 Minutes

1. Explain that it is recommended that you eat **3-6 servings** of grains each day and that you include **whole grains** rather than refined grains. We follow these recommendations and we know what grains can do for our body because they give us nutrients to help our organ systems based on what we learned in the activity/lesson. We will now demonstrate how eating or not eating grains can affect our body.

2. Nutritional Pantomime:
   - Pick a nutrient card and show it to the group.
   - Ask them to identify the organ system it affects. Ex. Protein affects the muscular system. Ex. Flexing your arm muscles.
   - Remind them that eating grains is beneficial to their body. If something is beneficial to your body or to you, it or you would have a positive reaction.
   - Ask them how their arm muscle would work/feel if they ate the recommended number of servings (3-6) each day, Ask them to show how their muscles would feel/work. Ex. Flex their arm muscles fast.
   - Ask them how their arm muscle would work/feel if they did not eat the recommended number of servings (3-6) each day. Ex. Flex their arm muscles slow.
   - Continue with picking a nutrient card and reviewing the organ system it affects and demonstrating through pantomiming the action (fast or slow) for each system. Examples of actions for each system may include:
     - Cardiovascular—tapping chest to a lub-dub beat
     - Circulatory—make a whooshing sound and serpentine motion with hand
     - Digestive—make a braaop (burping) sound and squiggle hands around their abdomen
     - Muscular—flex arm muscle
     - Nervous—making zapping noise and point fingers outward from body
     - Skeletal—stand tall with hands on hips
     - Excretory—say ahh
     - Immune—sneeze
**Grain Brain Drain: Evaluate**

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<th>Time: 5-7 Minutes</th>
<th>Distribute take home evaluation worksheet.</th>
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<td>2. Have the students identify different parts of the body that grains benefit and at least four things grains do for their bodies.</td>
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<td>3. Have the students share their answers, time permitting.</td>
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**Resource: Video Clips**

[http://www.youtube.com/watch?v=XB6eWpKwTAU](http://www.youtube.com/watch?v=XB6eWpKwTAU)
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A healthy daily diet is made of foods that contain the following nutrients. All of these nutrients help your body function appropriately.

Directions: Circle those nutrients you discovered to be provided by grains.

### Daily Recommended Nutrition

**Macronutrients**
- Total Carbohydrate
- Dietary Fiber
- Protein

**Minerals**
- Calcium
- Chromium
- Copper
- Fluoride
- Iodine
- Iron
- Magnesium
- Manganese
- Molybdenum
- Phosphorus
- Selenium
- Zinc

**Vitamins**
- Vitamin A
- Vitamin C
- Vitamin D
- Vitamin E
- Vitamin K
- Thiamin
- Riboflavin
- Niacin
- Pantothenic Acid
Write the word “grains” on or over the parts of the body that grains help.
In each corner of the paper identify at least four things grains do for your body.
Protein

Fiber
Surprised to learn that many whole grains are a good source of protein? The proteins in grains mesh with those in beans and other plants to form complete proteins. Your body can’t store protein, so you need to eat some every day.

**Helps with body growth and repair body cells.**

**Helps our muscles and tissues.**

Dietary fiber helps you feel full faster and longer; it also aids digestion and helps prevent constipation. Fiber comes only from plant foods (fruits, vegetables, beans, whole grains), and grain fiber is thought to protect against digestive cancers more than other forms of fiber.

**Assists with excretory system functioning, can help maintain a healthy weight and may lower risk of certain diseases.**
Iron helps our bodies make hemoglobin (for red blood cells) and myoglobin (for muscles), both of which help carry and store oxygen. Iron also plays a role in many other routine bodily functions.

Part of the protein hemoglobin (carries oxygen throughout body’s cells).

**Helps our circulatory system.**

An essential mineral required for hundreds of biochemical reactions, including transmission of nerve impulses, converting food into energy, body temperature regulation and maintaining a strong immune system. Magnesium also helps us absorb calcium, for healthy bones and teeth.

**Supports bone mineralization, protein building, muscular contraction, nerve impulse transmission, immunity.**
Phosphorus

Zinc
Another essential mineral, phosphorus is present in every cell in your body, making up 1% of your body weight. It’s main function is the formation of bones and teeth, but it’s also key to the synthesis of protein for cell repair, growth, and maintenance; for heartbeat regularity; and nerve conduction.

**Formation of cells, bones and teeth, maintains acid-base balance.**

The mineral zinc helps your immune system fight off bacteria and viruses, and helps wounds heal. It also helps your body make proteins and DNA. Zinc is also essential to proper functioning of your sense of taste and smell.

A part of many enzymes, involved in production of genetic materials and proteins, transports vitamin A, taste perception, wound healing, and reproductive system

**Helps our immune system.**
Copper Manganese
Copper (another mineral) helps us absorb iron, and also helps regulate blood pressure and heart rate. Copper is also needed for the production of melanin, which colors our hair and skin.

Necessary for the absorption and utilization of iron, supports formation of hemoglobin and several enzymes.

Helps regulate blood pressure and heart rate.

The mineral manganese helps us handle oxidative stress. It activates many important enzymes in the body that are crucial to metabolism of carbohydrates, amino acids, and cholesterol. Manganese is also essential to the formation of healthy cartilage and bone.

Facilitates many cell processes.

Helps regulate our body enzymes and our skeletal system.
Selenium

Thiamin
Selenium is a trace mineral. Although we only need small amounts of it, it’s essential to helping prevent cellular damage from free radicals, to regulate thyroid function, and for a healthy immune system.

Is an Antioxidant. Works with vitamin E to protect body from oxidation.

Helps our immune system.

The many B vitamins help with metabolism, the process your body uses to make energy from the food you eat. While each has its own functions, in general they also help maintain healthy skin, hair and muscles; form red blood cells; and promote healthy immune and nervous system function. Some research shows that B vitamins also prevent mood swings.

Thiamin (B1) supports energy metabolism and nerve function.
Riboflavin

Niacin
The many B vitamins help with metabolism, the process your body uses to make energy from the food you eat. While each has its own functions, in general they also help maintain healthy skin, hair and muscles; form red blood cells; and promote healthy immune and nervous system function. Some research shows that B vitamins also prevent mood swings.

**Riboflavin (B2)** supports energy metabolism, normal vision and skin health.

**Helps with metabolism.**

The many B vitamins help with metabolism, the process your body uses to make energy from the food you eat. While each has its own functions, in general they also help maintain healthy skin, hair and muscles; form red blood cells; and promote healthy immune and nervous system function. Some research shows that B vitamins also prevent mood swings.

**Niacin (B3)** supports energy metabolism, skin health, nervous system and digestive system.

**Helps with metabolism.**
Pyridoxine

Folic Acid
The many B vitamins help with metabolism, the process your body uses to make energy from the food you eat. While each has its own functions, in general they also help maintain healthy skin, hair and muscles; form red blood cells; and promote healthy immune and nervous system function. Some research shows that B vitamins also prevent mood swings.

**Pyridoxine (B6)** Amino acid and fatty acid metabolism, red blood cell production.

The many B vitamins help with metabolism, the process your body uses to make energy from the food you eat. While each has its own functions, in general they also help maintain healthy skin, hair and muscles; form red blood cells; and promote healthy immune and nervous system function. Some research shows that B vitamins also prevent mood swings.

**Folic acid (B9)** Supports DNA synthesis and new cell formation

**Helps with metabolism.**
URINARY/EXCRETORY SYSTEM
URINARY/EXCRETORY SYSTEM

removes wastes and maintains water balance in the body
CARDIOVASCULAR SYSTEM
CARDIOVASCULAR SYSTEM

TRANSPORTS NUTRIENTS AND REMOVES GASEOUS WASTE FROM THE BODY
CIRCULATORY SYSTEM
CIRCULATORY SYSTEM

TRANSPORTS NUTRIENTS AND GASES TO CELLS AND TISSUES
DIGESTIVE SYSTEM

Breaks down food into smaller molecules to provide energy for the body.
MUSCULAR SYSTEM

ENABLES MOVEMENT OF THE BODY
Nervous System
Nervous system monitors and coordinates internal organ function.
RESPIRATORY SYSTEM
RESPIRATORY SYSTEM

PROVIDES THE BODY WITH OXYGEN
SKELETAL SYSTEM

Supports and protects the body