

Math Connections in the STEM Classroom

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July 16th, 2019

Unit Development: Instructional Design and Development

Statement of purpose

The big idea of this unit is "health and well-being are shaped by personal choice". Students will learn about scientific knowledge in terms of food categories and their nutritional values, the MyPlate guidelines for a balanced diet, and various health problems that can result from poor nutrition. I use a MyPlate as an engaging context for the math concept I teach to students, as well as including a NASA connection "Space food" that allows students to learn about a day in the Life Aboard the International Space Station. The integrating math and science enhance my students' understanding of each. It helps them to acquire math concepts of fraction, measurement and collect, present & interpret data from studying MyPlate & NASA Space and language, scientific knowledge and skills related to the unit.

This unit developmentally appropriate for my second grade students because it relates to my students' experiences and includes their voice. The unit is organized largely around concepts that have broad importance in children's lives in terms of their daily meals and eating habit. Students will learn about the health and nutrition in the context of thematic units on

personal choice and balanced diet. By documenting their eating habit and share to the class, they have chance to voice their thought and feelings about the topic. It is essential that students develop a joy of curiosity and a lifelong habit of be healthy. Besides, the content of the unit is also interesting for them to engage and explore. Fundamental questions about personal choice, knowledge about nutrition and health and skills about applying math concepts into presenting healthy eating model. It's not a unit to cover content, but an opportunity for students to get challenge and develop their self-esteem.

In terms of skills students will learn through the unit, by learning about the proportion of each food groups in a meal, students will have chance to learn halves and quarters, as well as the fractional notations $\frac{1}{2}$ and $\frac{1}{4}$. Students will extend their learning to study what astronauts eat for three meals a day and learn about how to use standard units of once and kilograms to measure and estimate volumes and masses. By play the online game "Space Lunch Game", students figure out what astronauts need to eat to keep themselves healthy based on nutrition and food categories.

To provides students differentiation in content, process and product, I will use various delivery formats such as video, readings, lectures, or audio as well as providing different techniques for students to document their eating habit. When design a healthy meal, students may have opportunities to choose their favorite food based on their family tradition and eating habit. I will also incorporate various ways for students to make sense of the

content. Some strategies include think-pair-share, partner talk, literature circle...etc. For the final product, students are encouraging to have their own choices and pick from formats to present. They could also propose their own designs.

Instruction

A. **Title of the Unit:** Health & Nutrition

B. **Time needed:** The unit lessons will take place in my classroom in

September. It will take eight block periods (each period is 50 minutes),

and students will keep track of their eating habit for one month.

C. **CCSS and NGSS Standards addressed in the unit:**

<p><u>Common Core Standards</u></p>	<p>Math</p> <ul style="list-style-type: none"> • CCSS.MATH.CONTENT.3.MD.A.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l).¹ Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. • CCSS.MATH.CONTENT.3.NF.A.1 Understand a fraction $1/b$ as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size $1/b$. • CCSS.MATH.CONTENT.2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems¹using information presented in a bar graph. <p>Language Art</p> <ul style="list-style-type: none"> • CCSS.ELA-LITERACY.RI.2.7 Explain how specific images (e.g., a diagram showing how a machine works) contribute to and clarify a text. • CCSS.ELA-LITERACY.RI.2.9
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	<p>Compare and contrast the most important points presented by two texts on the same topic.</p> <ul style="list-style-type: none"> • W.2.8 Recall information from experiences or gather information from provided sources to answer a question.
NGSS	<p>Science and Engineering Practices</p> <ul style="list-style-type: none"> • Analyzing and Interpreting Data Analyzing data in K-2 builds on prior experiences and progresses to collecting, recording, and sharing observations. Analyze data from tests of an object or tool to determine if it works as intended. (2-PS1-2) • Developing and Using Models: Modeling in K-2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, storyboard) that represent concrete events or design solutions. • Obtaining, Evaluating, and Communicating Information: Obtaining, evaluating, and communicating information in K-2 builds on prior experiences and uses observations and texts to communicate new information. <p>Disciplinary Core Ideas</p> <ul style="list-style-type: none"> • ETS1.B: Developing Possible Solutions: Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. <p>Crosscutting Concepts</p> <ul style="list-style-type: none"> • Cause and Effect: Events have causes that generate observable patterns. • Energy and Matter: Objects may break into smaller pieces and be put together into larger pieces, or change shapes. (2-PS1-3)
National Health Education Content Standards:	<ul style="list-style-type: none"> • Students will demonstrate the ability to access valid health information and health promoting products and services.

D. Essential questions:

- a. Interpretation:
 - i. What does it mean to be healthy?
 - ii. What does it mean to be balanced?
- b. Explanation: How personal decision-making affects well-being?
- c. Application:

- i. How do you use the knowledge of health and nutrition to promote habit of healthy eating?
 - ii. How do you present a model of healthy eating choice?
 - iii. How do you track your eating choice and present the result?
 - d. Self-Knowledge:
 - i. How do you know yourself eating healthy and balanced?
- E. Measurable lesson objectives:**
 - a. Students are able to explain the how to eat healthy and balanced based on their knowledge of health and nutrition.
 - b. Students are able to analyze and evaluate their own choice of eating by collecting, interpreting and presenting data from their daily meal for one month.
 - c. Students are able to recognize and name halves and quarters, as well as naming and writing half and forth as fractions.
 - d. Students are able to design three balanced meals a day for an astronaut based on their knowledge of health and nutrition.
- F. List of materials:
 - a. Worksheet of "See-Think-Wonder"
 - b. Photos of "Fat King and Skinny Queen"
 - c. Project
 - d. Laptop
 - e. Diet Journal
 - f. Storybook "Fat King and Skinny Queen"
 - g. Food photos
 - h.
- G. Description of activities
 - a. Learn and memorize nutrition vocabulary
 - b. Read "nutrition" article from the non-fiction book set.
 - c. Learn about the My HealthyPlate and the food groups
 - d. Watch video "Nutrition and You"
 - e. Create a class cookbook
 - f. Listen to a guest speaker (nutritionist)
 - g. Learn to read food labels for nutrition information
 - h. Plan healthy menu for class party
 - i. Take final unit test

Description of activities. In the 5E Inquiry Model, describe the activities in which students will engage. Where appropriate, identify what teacher is

doing to facilitate lesson. Include the copies of any teacher-made or reproduced materials

Engage

The purpose for the ENGAGE stage is to pique student interest and get them personally involved in the lesson, while pre-assessing prior understanding.

- Thinking routine-See-Think-Wonder: in provocation, students observe photos of the “Fat king and skinny queen” and go through a thinking routine--- “See, Think, Wonder” to formulate their questions about this unit. They will describe what they see on the photos, explain how they think and ask questions about those photos.
- Document eating habit: Students will start to document their eating habit for one month. They are encouraging to use various ways to document, such as photo taking, running record or drawing, by using a diet journal.
- Assess students’ prior knowledge: By listening to students’ record and see their record of first week, I could get to know their prior knowledge and interests. It’s interesting to see how their thinking evolves over course of unit.

Explore

The purpose for the EXPLORE stage is to get students involved in the topic; providing them with a chance to build their own understanding.

From the previous activity, students have a good start. To follow up questions from students, there are two activities for students to explore:

A. Story-telling: Fat King and Skinny Queen

- a. I will introduce a storybook “Fat King and Skinny Queen” that mentions about healthy problem when someone does not have balanced diet. During the story-telling, teacher will ask questions to facilitate and helps students make connection to their own experience. Students are encouraging to share their thoughts by think-pair-share or partner talk. It allows students the foundation to explore later the relationship between personal choice and well-being and see the need and their own responsibility to change their life habit.

- i. Fat King and Skinny Queen

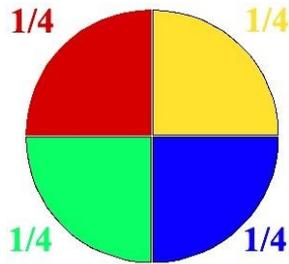
https://www.youtube.com/watch?v=tfTTC_yTevA

B. Learn about the food groups and MyPlate

- a. To promote a healthy eating habit, it is important to learn about MyPlate that allows them to build up the knowledge of health and nutrition in terms of how to eat healthy and balanced.
- b. Therefore, I will provide students food photos, and they will investigate how to distinguish each food category of the MyPlate. First, I will put students three or four in a

group and provide them various food photos. By providing them the definition of each food categories, student will have chance to regroup the food photos.

- c. Students will learn about basic knowledge of nutrition by studying MyPlate and proportion of all food groups in MyPlate.
- d. To engage them applying the concept of “fraction into learning the proportion of food categories in MyPlate and”, teacher will draw a fraction model on the white board, and write “ $\frac{1}{4}$ ” By showing to students how to cut a circle into four pieces to represent $\frac{1}{4}$, they will get the actual meaning of $\frac{1}{4}$ and represent the proportion of food categories as $\frac{1}{4}$.



“1” means that one of the four pieces.

“4” means that a “whole” divides into four pieces.

Explain

The purpose for the EXPLAIN stage is to provide students with an opportunity to communicate what they have learned so far and figure out what it means.

- Group discussion: After exploring food categories and MyPlate, I will invite each group to come up with a meal by using food photos that represent their idea of healthy eating. Students will work with a group to develop their model. By discussing with a group, they have chance to develop their explanation and reasoning and come up with a group statement.
- Model of healthy eating: Students are encouraging to use various way to represent their model, such as pie graph, table, list, equation or drawing.
- Document thoughts by writing and ipad recording: During discussing, each group will come up with group consensus and recorded their explanation on a paper to display in the classroom. It is a way to assess their knowledge by building up a model. Once they are done with their model, they could also record their thoughts by using ipad and seesaw app.

Elaborate / Extend

The purpose for the EXTEND stage is to allow students to use their new knowledge and continue to explore its implications.

To extend students’ understanding of health and nutrition, students will study about how an astronaut eat healthy by incorporating NASA resource “Space food”.

- A. NASA Video: students will watch a video and learn about how astronauts live in a space station and their ways of living.
 - a. Eating on the Space Station
 - b. Train Like an Astronaut: You are what you eat...so what do Astronauts eat?
- B. Space Lunch Game: students will play the online game “Space Lunch Game” and figure out what astronauts need to eat to keep themselves healthy based on nutrition and food categories.
- C. Small group discussion: Students will compare the similarity and difference of food proportion in each food categories between the MyPlate and Space Lunch. After discussion, students are encouraging to share their thoughts by using various ways, such as creating a poster, giving speech, drawing or role play.

Evaluate

The purpose for the EVALUATION stage is for both students and teachers to determine how much learning and understanding has taken place.

- Formative assessment: Teacher will design a worksheet and have students to create one meal for an astronaut. The result of the activity will show their knowledge of nutrition and food categories. By asking them to note specific portion of food for three meals, it will allow them to apply concept of measurement and stand units in this activity.
- Self-reflection: students go back to see their diet journal and reflect on their own choice in eating through the lens of MyPlate. They will present how data from the first day to the last day represent their healthy choice and if their choice has been changed by the learning of healthy and nutrition. They could create two model to represent the first day and the last day of choice of eating by using various ways, such as a list, drawing or a bar and pie graph.

Assessment

How will we know what our students have learned? How will they demonstrate they have learned? Your assessments should link back to your objectives and measure the extent to which students achieved the lesson objectives. Provide summaries of assessment(s) you plan to use with this unit. Include the following:

- 1) *Diagnostic assessment*: Summary of pre-assessment you could use prior to beginning instruction of this unit;

- 2) *Formative assessment: Summary* of assessment(s) you plan to use during the unit while teaching and learning are going on written using Webb's Depth of Knowledge; and
- 3) *Summative assessment: Summary* of post-assessment you plan could use at the end of the unit.

A. Diagnostic assessment:

- a. Students uncover their prior knowledge by sharing their initial thought about healthy and nutrition through the activity of

See-Think-Wonder.

- b. Students document what they eat in a table for four weeks. Data from the first day is the pre-assessment for their healthy choice.

For the last week, they will reflect on their own choice in eating through the lens of MyPlate.

B. Formative assessment: Students will be assessed through quizzes and

a final test to assess their knowledge of nutrition, specific nutrition vocabulary, the food groups and the MyPlate guidelines.

C. Summative assessment:

- a. Students analyze & evaluate their own choice of eating through the lens of MyPlate. Their evaluation report will be a summative

assessment of their learning.

- b. student will use their knowledge of health & nutrition to design one meal for an astronaut.

Reference

Photo of MyPlate. Retrieved June, 2019, from

<https://www.choosemyplate.gov/>

More to Explore: Space Food: Health and Nutrition. Retrieved June 30th, 2019, from

https://www.nasa.gov/audience/forstudents/k-4/more_to_explore/Space-Food.html

Train Like an Astronaut: You are what you eat...so what do Astronauts eat?
Retrieved July 10th, 2019, from <https://www.youtube.com/watch?v=fnmA35ibSMY>

Eating on the Space Station. Retrieved July 10th, 2019, from
<https://www.youtube.com/watch?v=4aWoZPEd2w&list=PLiuUQ9asub3TmweK0ARjo4jLfvnVA4uP8>

Lesson material 1: Images of fat king and skinny queen



Lesson material 3:
Diet Journal

Name: _____ **Date:** _____

	Monday	Tuesday	Wednesday	Thursday	Friday
	____/____	____/____	____/____	____/____	____/____
Breakfast					
Lunch					
Dinner					

Lesson material 4:
Food photos





Lesson material 5:
MyPlate

Choose **MyPlate**.gov



Grilled Salmon
Spinach with Pine Nuts
Brown Rice
Salad with Raspberries
and Pineapple
Vanilla Pudding

Good Nutrition Starts With **MyPlate**

The infographic features a central plate divided into five sections: Fruits (red), Grains (orange), Dairy (blue circle), Vegetables (green), and Protein (purple). A fork is on the left. Below the plate is the text 'ChooseMyPlate.gov'. Surrounding the plate are five colored boxes with tips: a red box for fruit, a green box for vegetables, a blue box for dairy, an orange box for grains, and a purple box for protein.

Choose fresh, frozen, or canned fruit without added sugar.

Eat a variety of veggies, especially dark-green, red & orange ones.

Switch to fat-free or low-fat milk & other dairy products

Make at least half your grains whole grains.

Vary your protein food choices. Try beans, peas, nuts, soy, and seafood.

Choose**MyPlate**.gov

Lesson material 6:
What do astronauts eat?

Each day you need:

Oils: Oils are not a food group, but you need some for good health.

Roll over parts of the pyramid to learn more.

2 1/2 cups of vegetables

PLAY
HELP

Each day you need:

Oils: Oils are not a food group, but you need some for good health.

Roll over parts of the pyramid to learn more.

1 1/2 cups of fruit

PLAY
HELP

Each day you need:

Oils: Oils are not a food group, but you need some for good health.

Roll over parts of the pyramid to learn more.

6 ounces of grains

PLAY
HELP

Each day you need:

Oils: Oils are not a food group, but you need some for good health.

Roll over parts of the pyramid to learn more.

3 cups of milk

PLAY
HELP

Each day you need:

Oils: Oils are not a food group, but you need some for good health.

Roll over parts of the pyramid to learn more.

5 ounces of meat and beans

PLAY
HELP

1. Base your meals on starchy foods – at each meal
2. Eat lots of fruit and vegetables – eat at least 2 1/2 a day
3. 6 ounces of grains a day
- 3 cups of milk a day
- 5 ounces of meat and beans a day

Lesson material 7:

Design a meal for an astronaut

Name: _____ Date: _____

A large, empty rectangular box with a thin black border, intended for a student to draw or write their meal design for an astronaut.

- | | |
|--|---|
| | <p>courses and a drink.</p> <ul style="list-style-type: none">• Be attractive and tasty |
|--|---|