

Title

Eating in Space

Description

This lesson encourages students to identify the components of a well-balanced diet and create a nutritional eating plan based on the food and beverage items provided for astronauts flying on Space Shuttle missions. Students also consider the problems associated with bringing food into space and the health demands on astronauts in the weightless environment of space.

Purpose

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Curriculum Match

Alberta, Health, Grade 5

Students will:

- identify the factors that influence personal food choices (Body Knowledge and Care)
- identify nutrition needs related to their maturation (Body Knowledge and Care)
- compare and contrast the components of a healthy versus unhealthy nutrition program; e.g., Guide to Healthy Eating and “fad diets” (Body Knowledge and Care)
- relate the components of a healthy nutrition program to personal food choices (Body Knowledge and Care)
- identify the lifestyle factors that promote heart health; e.g., active living, healthy eating, relaxation (Body Knowledge and Care)

British Columbia, Personal Planning, Grade 5

It is expected that students will:

- give examples of how people can achieve balance in their lives (Healthy Living)
- identify factors that influence their attitudes regarding healthy living (Healthy Living)
- describe Canadian health issues (Healthy Living)

British Columbia, Personal Planning, Grade 6

It is expected that students will:

- explain the benefits of good nutrition and exercise as part of a balanced life (Healthy Living)
- demonstrate an awareness of cultural influences on attitudes toward healthy living (Healthy Living)

Ontario, Health and Physical Education , Grade 6

By the end of Grade 6, students will:

- determine the influence of various factors on personal food choices, body image, and self-esteem (Healthy Living--Healthy Eating)
- analyse personal eating habits in a variety of situations (Healthy Living--Healthy Eating)
- describe the benefits of healthy eating for active living (Healthy Living--Healthy Eating)

Time

2-3 hours

Materials

- N/A

Resources

Associated Feature(s)

- “Liftoff --Virtual Tour”

Lesson Resources

- student handout: Astronaut Menu Plan
- student handout: Space Shuttle Food and Beverages (optional)
- assessment tool: A Typical Meal in Space
- assessment tool: Healthy Eating in Space

Additional Resources

- Canada’s Food Guide to Healthy Eating

Preparation

Please review the feature, procedures, and handouts used in this activity. Obtain copies of *Canada’s Food Guide to Healthy Eating* (preferable one per student). [Note that this resource is available online <http://www.hc-sc.gc.ca/hppb/nutrition/pube/foodguid/>].

Procedure

1. Begin by asking students what makes a “balanced diet.” Have them suggest the different kinds of food one might include in a balanced diet (e.g., meat, fruit, vegetables, whole grains, nuts, dairy) and write these on the board. Then ask them what different types of nutrients are commonly associated with these foods (e.g., protein, carbohydrates, fibre, fat, vitamins, minerals).
2. Ask students to think of situations where it might be difficult to find, keep, or cook the different kinds of foods needed to make up a balanced diet (e.g., going camping or travelling, during a power failure, or after an earthquake). What kind of foods would they want to have with them in such situations? What kind of factors would they have to take into consideration when choosing such food (e.g., can be eaten without being cooked, does not require refrigeration, isn’t too heavy to carry, has high nutritional content per mass or volume)?

3. Now, have students consider where, of all the places people travel, it might be difficult to bring and prepare healthy food. Elicit suggestions until someone mentions space (e.g., the space shuttle, the international space station). Ask students what problems might be associated with bringing food into space. As a hint, tell them that some of the problems are the same as one experiences when hiking into the bush to go camping. After students have offered their ideas, tell them that the main problems with feeding astronauts in space have to do with:
 - Weight: it takes a lot of energy to send a shuttle into space, and so it is important to make sure that the items brought on to the shuttle weigh as little as possible.
 - Lack of refrigeration: again, this has to do with weight in part—refrigerators are heavy, and require energy in order to run.
 - Storage: the area set aside in the shuttle for the astronauts to work and live is very small; therefore, the food they bring must take up as little space as possible.
 - Bacteria: tiny microbes such as bacteria have been shown to multiply very quickly in an enclosed, weightless environment, such as the shuttle or the international space station. As these microbes may carry illnesses, they pose a dangerous threat to the astronauts on board. Astronauts cannot afford to get sick while on a space shuttle mission.
4. Inform students that they will now have the opportunity to discover how space scientists have prepared different forms of food to solve these problems and find out what kinds of food space shuttle astronauts bring with them on their trips. Have students explore the [Mid-Deck](#) section of the feature, [Liftoff --Virtual Tour](#), to find out what the astronauts' living environment is like. Direct their attention particularly toward the [Galley](#) and the [Workout Gym](#) for important nutrition and health information. After they have explored the [Shuttle Food and Beverage List](#), have students use the feature's [Meal Planner](#) to practise creating a day's worth of well-balanced meals with the foods provided.
5. Once they have practised with the [Meal Planner](#), bring the class back together to discuss what they have learned about eating in space. Distribute copies of *Canada's Food Guide to Healthy Eating* to each student, and review the nutritional requirements and suggested servings of each food type. Emphasize the importance of providing a wide variety of foods, including fruits, nuts, grains, and vegetables in addition to meat, fish, and dairy.
6. Distribute the handout, [Astronaut Menu Plan](#), and have students create a three-day meal plan using the foods provided on the Shuttle Food and Beverage List from the feature (note: this list is also provided in the optional student handout, Space Shuttle Food and Beverages, which may be used if there is limited access to computers).
7. If time and computer access allows, have students when finished go back to the feature and use the [Meal Planner](#) to assess the nutritional balance of the eating plan they've created. Allow them to revise it accordingly.
8. When students have completed their menu plans, review what they learned about nutrition. Was there anything that surprised them, or made it difficult to determine to which food category a menu item belonged? During the course of the debrief, you may want to address the following:
 - Proportions: According to Canada's Food Guide, healthy eating means eating more whole grains than any other food, followed by fruits and vegetables, followed by smaller amounts of protein foods such as meat, seafood, beans, and dairy.
 - Combination foods: Many dishes contain more than just one type of food. This is a great way to meet a wide variety of nutritional needs with just one dish. For example, spaghetti with meat

sauce, macaroni and cheese, and blueberry muffins are all examples dishes that combine nutrient types.

- On the space shuttle, fresh foods must be eaten in first couple of days; otherwise they will spoil.
9. Engage students in a brief discussion about how the nutritional needs of astronauts compare with those of young people. Ask them if they think young people should pay as much attention to the nutritional value of the foods they eat as astronauts do. Why is it so important for astronauts to follow a healthy eating plan? What physical stresses does the weightless environment of space put on their bodies? What physical stresses do young people face as they mature? Include the following information in your discussion:
- Astronauts *need* to have a lot of exercise while in space; otherwise, their bodies will grow weak very quickly. In the microgravity of space, body fluids are shifted upward to cavities in a person's head and torso. Because of all the extra liquid pressure in their upper bodies, astronauts drink less and urinate more. Their bodies lose liquid, which means that their hearts have less fluid to pump through the body. As a result, their hearts don't have to work as hard. If the astronauts don't get regular cardiovascular exercise, their hearts will become weak.
 - An astronaut's muscles and bones don't have to work as hard, since they aren't pushing against gravity. When they aren't being used, a person's muscles and bones begin to shrink. The bones lose calcium and density while the muscles start to waste away. Because of all the extra exercising astronauts must do, they need to eat a lot of healthy food for energy.
 - Astronauts' bodies also lose other vitamins and minerals while in space. This is another reason why it's important for them to eat foods high in nutrient value.
 - Astronauts must be alert and good health while on the job. They have to be able to think while in space, and during the difficult stages of lift-off and re-entry. This is just another reason why they need "brain food" in the form of high-nutrient meals.
 - Young people's bodies also have important nutritive needs, since their bones, muscles, and organs are still developing. This means their bodies require a lot of extra energy. Youth between 11-13 years of age need more food than most people. It's essential that they include a wide variety of high-nutrient foods in their diet to get the vitamins and minerals they need.
 - Like astronauts, young people should balance their intake of nutritional food with energy output in the form of physical exercise. The healthier people are while young, the healthier they'll be when they grow older.
10. To conclude, have students write a one-two page evaluation of their own nutritional practices, comparing their average eating habits with the menu plan they've just created for their astronaut. Instruct them to address the social and cultural factors that influence their eating habits, either negatively or positively (e.g., advertising, parental eating habits, availability), and to list ways in which they might improve their eating habits.

Assessment

- Distribute the self-assessment tool, "A Typical Meal in Space" and have students complete it to review what they've learned in this lesson.
- Collect [product assessment] students' menus and self-assessments and, using pre-determined criteria such as those outlined on the assessment tool, Healthy Eating in Space, assess students' work in terms of their abilities to:
 - create a balanced diet

- identify the nutrients associated with different types of food
- demonstrate awareness of the principles of good nutrition
- critically assess their own eating habits.

Adaptations

- To have students practise their team-building and co-operation skills, have them work in groups or pairs to develop their eating plans.
- If time is limited, have students a menu plan for one day only.

Extensions

- To teach students more about the physical effects of life in space, conduct the science lesson, Bodies in Space.
- Have students conduct a media analysis of the types of foods advertised on television. Have them watch television at different times of the day, and record how many food commercials are shown during different types of programs (e.g., during a children's program, during a sports program, and during a prime-time program). How many food commercials are shown in each? What kinds of foods are being advertised? What kinds of "messages" do the commercials convey? Who do they think the audience is for each kind of commercial? How healthy are the foods being shown? Alternatively, students can conduct a similar analysis of foods advertised in different types of magazines (e.g., magazines for young children, teenagers, sports magazines, news magazines, special interest).
- Have students assess the available foods in relation to special dietary requirements. For example, would a vegetarian be able to create balanced menus from the foods available? Would someone with a dairy allergy be able to get enough calcium? Have students suggest additional items that could be used to supplement the astronauts' available foods to allow for more choice and flexibility.

Astronaut Menu Plan

	Day One		Day Two		Day Three	
	Food Item	Nutrient(s)	Food Item	Nutrients(s)	Food Item	Nutrients(s)
Breakfast						
Snack						
Lunch						
Snack						
Dinner						
Snack						

Nutrients include protein, carbohydrates, fibre, fat, minerals, and vitamins.

Space Shuttle Food and Beverages

The following food items are offered on a typical seven-day Space Shuttle mission.

Food

- Beef, Dried
- Beef Goulash
- Beef Patty
- Beef Steak
- Beef Stroganoff w/Noodles
- Beef Tips w/Mushrooms
- Bread
- Breakfast Roll
- Brownies
- Candy
 - Coated Chocolates
 - Coated Peanuts
 - Gum
 - Life Savers
- Cereal
 - Bran Chex
 - Cornflakes
 - Granola
 - Granola w/Blueberries
 - Granola w/Raisins
 - Oatmeal w/Brown Sugar
 - Oatmeal w/Raisins
 - Rice Krispies
- Cheddar Cheese Spread
- Chicken
 - Chicken à la King
 - Chicken Cacciatore
 - Chicken Patty
 - Chicken Salad Spread
 - Chicken, Sweet 'n Sour
 - Chicken, Sweet 'n Sour
 - Chicken, Teriyaki
 - Chunky Chicken Stew
- Cookies
 - Butter
 - Chocolate Covered
 - Shortbread
- Crackers
 - Butter
 - Graham
- Eggs
 - Scrambled
 - Mexican Scrambled

Seasoned Scrambled
Frankfurters
Fruit
 Apple, Granny Smith
 Apple, Red Delicious
 Applesauce
 Apricots, Dried
 Banana
 Cocktail
 Orange
 Peach Ambrosia
 Peaches, Diced
 Peaches, Dried
 Pears, Diced
 Pears, Dried
 Pineapple
 Strawberries
 Trail Mix
Granola Bar
Ham
Ham Salad Spread
Jelly
 Apple
 Grape
Macaroni & Cheese
Meatballs in Spicy Tomato Sauce
Noodles and Chicken
Nuts
 Almonds
 Cashews
 Macadamia
 Peanuts
 Trail Mix
Peanut Butter
Potatoes au Gratin
Puddings
 Banana
 Butterscotch
 Chocolate
 Tapioca
 Vanilla
Rice and Chicken
Rice Pilaf
Salmon
Sausage Patty
Shrimp Cocktail
Soups
 Chicken Consommé
 Mushroom
 Rice & Chicken
Spaghetti with Meat Sauce

Tortillas

Tuna

Tuna

Tuna Creole

Tuna Salad Spread

Turkey

Turkey Salad Spread

Turkey Tetrazini

Vegetables

Asparagus

Broccoli au Gratin

Carrot Sticks

Cauliflower w/Cheese

Celery Sticks

Green Beans & Broccoli

Green Beans with Mushrooms

Italian Vegetables

Spinach, Creamed

Tomatoes and Eggplant

Yogurt

Blueberry

Peach

Raspberry

Strawberry

Beverages

Apple Cider

Cherry Drink with Artificial Sweetener

Cocoa

Coffee

black

with artificial sweetener

with cream

with cream & artificial sweetener

with cream & sugar

with sugar

Coffee, Decaffeinated

black

with artificial sweetener

with cream

with cream & artificial sweetener

with cream & sugar

with sugar

Coffee, Kona

black

with artificial sweetener

with cream

with cream & artificial sweetener

with cream & sugar

with sugar

Grape Drink

Grape Drink with Artificial Sweetener
Grapefruit Drink
Instant Breakfast
 Chocolate
 Strawberry
 Vanilla
Lemonade with Artificial Sweetener
Lemon-Lime Drink
Orange Drink
Orange Drink with Artificial Sweetener
Orange Juice
Orange-Grapefruit Drink
Orange-Mango Drink
Orange-Pineapple Drink
Peach-Apricot Drink
Pineapple Drink
Strawberry Drink
Tea
 Plain
 with Artificial Sweetener
 with Cream
 with Lemon
 with Lemon & Artificial Sweetener
 with Lemon & sugar
 with Sugar
Tropical Punch
Tropical Punch with Artificial Sweetener

Condiments

Ketchup
Mayonnaise
Mustard
Pepper (Liquid)
Salt (Liquid)
Tabasco Sauce
Taco Sauce

A Typical Meal in Space

Here is a typical meal selected by an astronaut while working on board the space shuttle. In the spaces provided, assess the nutritional value of this meal.

Food Item	Food Type (e.g., meat, poultry, seafood, dairy, nuts, grains, fruits, vegetables, starchy carbohydrates)	Nutrients (e.g., protein, carbohydrates, fibre, minerals, vitamins, fat)
Teriyaki Chicken		
Rice Pilaf (two servings)		
Broccoli au Gratin		
Tortilla (three servings)		
Peach Ambrosia		
Almonds		
Apple Cider		
<p>How nutritionally balanced is this meal? Are there any nutrients you'd recommend this astronaut to obtain in his or her next meal? If yes, what food might you suggest he or she eat to get these nutrients?</p>		

Healthy Eating in Space

1. Does Not Meet Expectations	2. Fair	3. Good	4. Excellent
menu does not contain a variety of different foods and nutrient types	menu includes minimal variety of different foods and nutrient types	menu includes variety of different foods and nutrient types	menu includes items from all food groups and nutrient types
menu is dominated by fatty and/or sugary foods	menu includes an excess of fatty and/or sugary foods	menu includes moderate amount of fatty and/or sugary foods	menu includes minimal amount of fatty and/or sugary foods
menu does not include fruit, vegetables and/or grains	menu includes minimal amount of fruit, vegetables and/or grains	menu includes variety of fruit, vegetables and/or grains	menu is dominated by grains, vegetables, and fruit
menu reflects weak understanding of nutrients found in different foods	menu reflects partial understanding of nutrients found in different foods	menu reflects good understanding of nutrients found in different foods	menu identifies nutrients not mentioned in lesson (e.g., identifies specific vitamins and minerals)
evaluation does not reflect understanding of positive and negative eating habits	evaluation reflects weak understanding of positive and negative eating habits	evaluation identifies several positive and negative eating habits	evaluation identifies many positive and negative eating habits
evaluation does not identify impact social and cultural factors has on eating habits; may contain irrelevancies	evaluation identifies few social and cultural factors has on eating habits; may contain irrelevancies	evaluation identifies some social and cultural factors that impact eating habits	evaluation identifies many social and cultural factors that impacting eating habits
evaluation does not identify ways to improve eating habits	evaluation suggest few ways in which to improve eating habits	evaluation suggests several practical ways to improve eating habits	evaluation suggests many practical ways to improve eating habits; student demonstrates intention to implement them
self-assessment reflects weak understanding of different food groups	self-assessment reflects partial understanding of different food groups	self-assessment reflects good understanding of different food groups	self-assessment reflects excellent understanding of different food groups
self-assessment does not reflect nutrients found in different food groups	self-assessment reflects partial understanding of nutrients found in different food groups	self-assessment reflects good understanding of nutrients found in different food groups	self-assessment accurately identifies all nutrient types and some not mentioned in lesson (e.g., specific minerals and vitamins)
Teacher Comments:			