



NASA Food Technology Commercial Space Center

Space Shake Lesson Plan

OBJECTIVE

1. To prepare a nutritious snack similar to foods required for space travel.
 2. To formulate a highly nutritious shake that is thick like an ice cream shake that tastes great.
 3. To evaluate a food for nutrient content, thickness, and flavor.
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BACKGROUND

Foods are needed for long-term space habitation on the moon and Mars. NASA has identified 15 foods to be grown in space that will make up the majority of astronauts' diets on long-term space missions:

- cabbage
- carrots
- chard
- dry beans
- lettuce
- onions
- peanuts
- potatoes
- radishes
- rice
- soybeans
- spinach
- sweet potatoes
- tomatoes
- wheat

For more information on eating in space, visit the NASA Food Technology Commercial Space Center website <http://www.ag.iastate.edu/centers/ftcsc/>.

SUPPLIES

Space Shake sheets (one per student)
Shake Evaluation sheets (one per student)
Line Measurement sheets (one per group)
Pencils/pens (one per student)
Large zipper-lock baggies (one per group)
Snack size zipper-lock baggies (one per student)
Straws (one per student)
Small cups (6 oz.)
Plastic spoons (one per group, plus extras for yogurt)

Paper towels
Handi-wipes
Garbage bags for clean up

**SHAKE
INGREDIENTS**

Three alternative milks (rice milk and 2 soymilks)
Plain and Vanilla flavored Yogurt (enough for 3oz per group)
Instant pudding (enough for 1oz per group)
Tang (enough for 1oz per group)
Kool-Aid (enough for 1oz per group)
Gatorade (enough for 1 oz per group)
Nestle Quik (enough for 1oz per group)

PREPERATION

Before starting this activity, measure the ingredients. Use either little plastic sweetheart cups with lids or sandwich baggies and stapled them shut. Label each of the packages.

Set-up an ingredients table, arrange by milks, thickeners, and flavorings. This helps so students can find their chosen ingredients faster.

A couple of adult or older peer helpers at this table can make things go faster

PROCESS

1. Form students into groups of three and assign duties. Each group needs:
Mission Supply Specialist (obtain the ingredients)
Mission Communication Specialist (write the information)
Mission Food Science Specialist (mix the ingredients)
2. The team should select one product from each of the following groups and the Mission Supply Specialist should obtain the ingredients.

Milk	Thickener	Flavoring
Soymilk – Option 1	Plain yogurt	Tang
Soymilk – Option 2	Vanilla yogurt	Kool-Aid
Rice Milk	Instant pudding	Gatorade
		NestleQuik

3. Pass out a large baggie to each of the groups.
4. Pour the milk and thickener into the large baggie and knead the bag until mixed. Add the flavoring and knead more. (Hint: after all the ingredients are mixed, let the shake set to thicken up)
5. Rate the space shakes according to the worksheets provided. The

teacher should provide the nutritional information from the product labels.

6. While the shake is thickening, have the teams **name their space shake**. At this time, pass out the line spread measurement sheets and a plastic spoon to each of the groups.
7. Test the space shake's thickness. Have one person in each group take a spoonful of the space shake, then all at the same time pour the spoonful of the shake onto the center of the line spread measurement sheet. (Sheets can be covered with Plastic-wrap or put into a sheet protector) Wait 15 seconds and then look to see how far the shake spread from the center at all four axes. Calculate the average spread.
8. Have the Mission Communication Specialist record the measurement number on the recording worksheet.
9. Pass out a snack size baggie and a straw to each student. Have the students pour a little of the shake into each baggie, zip it up with the straw coming out on one end. At this point the students will taste and rate the space shakes. Record the score on the worksheet.
10. Pass out an **Evaluate Your Space Shake** worksheet to each student. Have students transfer the scores onto the worksheet, and calculate a total score. (Scoring is on the bottom of the worksheet.)
11. Each team will report their final score was and what they named their shake.

EVALUATION

How did the space shake rate?

How could you improve the nutritional content of your shake?

How could you improve the thickness and flavor of the shake?

QUESTIONS FOR DISCUSSION

Why are we concerned with calories, protein, and calcium?

What makes a regular milkshake thick? Why won't this work in space? (Hint: There is no refrigeration)

What are the potential problems for drinks in the Space Station?

Why did you use a zipper-lock bag instead of a blender or bowl?



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Space Shake Lesson Plan – Student Worksheet

MISSION

Your mission is to formulate a highly nutritious shake that is thick like an ice cream shake that tastes great.

MAKE A SHAKE!

1. Meet your team! Be sure you know everyone's name and assign duties for your team members.

Mission Supply Specialist (obtain the ingredients) _____

Mission Communication Specialist (write the information) _____

Mission Food Science Specialist (mix the ingredients) _____

2. Select one substitute for cow's milk (either soy or rice milk) and pour into zipper-lock bag.
 3. Choose one thickener: plain yogurt, vanilla yogurt, and instant pudding. Mix the thickener with the milk by closing the bag and kneading.
 4. Choose one flavoring: Tang, Kool-Aid, Gatorade, Nestle Quik. Open the bag and add the flavoring. Close the bag and mix again.
 5. Name your Space Shake _____
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RATE YOUR SHAKE

1. Determine the nutrient content of your shake by looking at the chart provided by your teacher and adding the values for the ingredients you selected.

Protein (g) per 1 cup:

Milk _____ + Thickener _____ + Flavor _____ = Total _____

Calcium (mg) per 1 cup:

Milk _____ + Thickener _____ + Flavor _____ = Total _____

Calories per 1 cup:

Milk _____ + Thickener _____ + Flavor _____ = Total _____

2. Measure the thickness of your shake by placing one spoonful onto the center of the line spread chart. Measure how much the shake spreads in 15 seconds by measuring the lines at the four numbered locations. Add the four numbers and divide by four for the average score: _____

1 = Our shake was between the 10-15 mark

2 = Our shake was between the 5-10 marks

3 = Our shake was between the 1-5 marks

3. Pour some of the shake into small zipper-lock bags so each of your group members have a sample to taste. Insert a straw. Close the bag. Taste your shake and mark the sensory evaluation scorecard with your score: _____

1 = I'd never drink this shake again,

2 = I might drink this shake again, OR

3 = I love this shake! I'd make it again.

**EVALUATE YOUR
SPACE SHAKE**

1. Score for protein content

- 1 point 1-3 g protein
2 points 4-7 g protein
3 points 8-10 g protein

2. Score for calcium content

- 1 point 50-100 mg calcium
2 points 100-200 mg calcium
3 points >200 mg calcium

3. Score for calorie content

- 1 point 100-149 kcal
2 points 150-200 kcal
3 points >200 kcal

4. Score for thickness

- 1 point Shake was between 10-15 mark
2 points Shake was between 5-10 mark
3 points Shake was between 1-5 mark

5. Score for flavor

- 1 point I'd never drink this shake again.
2 points I might drink this shake again.
3 points I love this shake! I'd make it again.

Total Score

- 13-15 points Your team is out of this world! Send food to Mars!
9-12 points Your team can send food to the moon!
5-8 points Your team is in Houston working on foods for space!
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Line Spread Measurement

