Milk ^ Comes From A Cow and Ice Cream

A lesson based on the book, Milk Comes From A Cow? by Dan Yunk.

America's food supply is safe, affordable and abundant but misunderstood by the public. Kansas Farm Bureau seeks to improve consumer knowledge of the importance of farming and ranching through the *Kailey's Ag Adventure Series*, of which this book is a part.

Background Information:

Ask the students, "Where does milk come from?" *Anticipated responses: the refrigerator, the grocery store, a cow…* Listen to *Milk Comes From A Cow?* to find out! *Read aloud to the class.*

We followed Kailey in *Milk Comes From a Cow?* as she traveled to a dairy farm to learn that milk does come from a cow and is just sold at the grocery store. But, how does milk get from the farm to our cereal bowl?

After the cows are milked, the raw milk is pumped into refrigerated storage tanks, where it is cooled to 38°F. A truck comes to the dairy farm each day to haul the milk to the processing plant. Before the truck leaves the dairy farm, the milk is tested for safety and regulation purposes. Milk trucks have shiny metal tanks designed to keep the milk cold. The milk then arrives at a processing plant, where it goes through ***pasteurization*** and ***homogenization***. Pasteurization is heating the milk up to 162°F for 16 seconds to kill any bacteria, germs, or yeast in the milk. It is then cooled immediately back to 38°F. Homogenization is the process in which the butter fat, also known as the cream, is broken up and blended in with the rest of the milk. The milk is then bottled and shipped to grocery stores, schools, and restaurants. Dates are printed on the milk jugs to show how long the milk will stay fresh. On average, it only takes 2 days for milk to go from the cow to the grocery store shelves.

Did you know that ice cream comes from a cow, too? While it does not come straight from a cow, milk is the primary ingredient in ice cream. It just changes from a liquid to a solid. How does this happen? Let's do an investigation involving milk and ice cream to figure out!

Level: Pre K – Grade 3

Subjects/Standards:

Science: 2nd Grade
Physical Science
2-PS1.1
Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

Math: 3rd Grade
Measurement and Data
CCSS.Math.Content.3.MD.A.2
Measure and estimate liquid volumes and masses of objects using standard units.

Standards may be adjusted to fit other grade levels.

Student Learning Outcomes:

The students will:
- Describe the changes observed when liquids become solids and solids become liquids
- Explain the movement of heat energy and its effect on ice cream

Estimated Teaching Time:

60 minutes

ACTIVITY:

Start the investigation after asking, “How does milk change from a liquid to a solid?”

Pass out worksheet 1. Students line up to get each of the ingredients cafeteria-style. Teachers or helpers measure the milk, vanilla, and sugar into a quart sized plastic bag. Be sure to get as much air out of the bag as possible before sealing. Put that bag inside of a second quart sized bag to minimize the salt leaking into the milk mixture. Again, be sure to get as much air out of the bag before sealing.

Fill the big freezer bag with ice. Put the small bag into the big freezer bag and then sprinkle the salt on top of the ice. Using a hand towel or gloves, mix and shake the bag for approximately 5 minutes, making sure the ice surrounds the milk mixture.

While students shake the bags, facilitate discussion about observations in changes in the milk mixture and ice.
Anticipated responses:

The milk mixture is becoming a solid and is getting less flowing. The ice and salt are melting as time passes.

After 5 minutes, the milk mixture should be ice cream! Pass out spoons, wipe off the small bags with a paper towel or napkin, and let students enjoy their finished product!

Complete worksheets 1 and 2.

HOW DOES THIS HAPPEN?

Milk can change from a liquid to a solid with the help of ice and salt. It involves the exchange of heat. Cold does not exist by itself. It is simply the absence of heat. For example, a cold room is cold because some of its heat energy has escaped. Heat energy goes from places with more heat energy to places with less.

The milk mixture has more heat energy than the salt and ice does. Therefore, heat energy went from the milk mixture to the ice and salt. The milk mixture lost heat energy, which caused it to cool and freeze, eventually becoming ice cream, a solid. The ice gained heat energy, which caused it to melt, eventually becoming salt water, a liquid. The addition of salt lowers the freezing temperature, which caused the ice cream to freeze sooner.

MATERIALS NEEDED:

- *Milk Comes From A Cow?* by Dan Yunk
  ISBN 978-0-9797653-0-8
- Copies of Worksheets 1 & 2 for each student

EQUIPMENT:

- 2 quart sized bags per student
- 1 gallon sized freezer bag per student
- Hand towel or gloves for each student
- Plastic spoons, 1 each
- Paper towels/napkins

INGREDIENTS:

For each student:

1/2 cup milk
1/2 teaspoon vanilla
1 tablespoon sugar
4 cups crushed ice
4 tablespoons salt

PREPARE AHEAD:

Set up the ingredients and materials on a long table for the students to get cafeteria-style at the instructed time.

Have the ice in the individual freezer bags before instruction. Keep in a cooler or a freezer to prevent melting.

Additional Activities:

Students measure their own ingredients to practice using measuring cups and spoons accurately.

Groups of students use multiplication to make one batch of ice cream per group with enough servings for each member. Share shaking the bag among group members.

Does adding salt make a difference? Experiment by not using salt in one bag. Compare the two samples.

Create different ice cream flavors by adding fruit or other toppings or by using flavored milks instead.

Put the milk mixture in the freezer without shaking it. After it's frozen, how does its texture compare to the ice cream in a bag? Why is this?

Additional Resources & Literature:

The Milk Makers
by Gail Gibbons
ISBN 0-02-736640-5

Dairy Ag Mag
Contact Kansas Farm Bureau or your county office for copies.

Moo Milk
www.moomilk.com
An interactive adventure into the dairy industry

Virginia Cooperative Extension
www.ext.vt.edu/resources/4h/virtualfarm/
Visit a virtual dairy farm

USDA Animal Improvement Programs Laboratory
http://aipl.arsusda.gov/kc/kcindex.html
Facts and games about the dairy industry for children

Best Food Nation
www.bestfoodnation.com/dairy.asp
Facts about the dairy industry

America's Dairy Farmers
www.dairyfarmingtoday.org
Take an inside look on real dairy farms

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Name_____

How to make ice cream!

1/2 cup milk	2 quart sized bags
1/2 teaspoon vanilla	1 gallon sized freezer bag
1 tablespoon sugar	Hand towel or gloves
4 cups crushed ice	Plastic spoon
4 tablespoons salt	Serves one (1)

With the help of an adult, add the milk, vanilla, and sugar to one of the small bags. Seal it and put it in the other quart sized bag. Add the ice and salt to the large freezer bag. Put the small bag in the large bag. Mix and shake for 5 minutes or until the milk mixture becomes ice cream! Wipe off the bag and enjoy!

What changes do you see or feel in the milk as you shake?

_____

_____

_____

What is happening to the ice and salt mixture?

_____

_____

_____

Circle one of the underlined words in each pair to complete the sentence below.

Heat energy moves from places with __more or less__ heat energy to places with __more or less__ .

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Name ANSWER KEY

How to make ice cream!

1/2 cup milk	2 quart sized bags
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What changes do you see or feel in the milk as you shake?

Students should observe the milk mixture becoming more solid as time lapses.

What is happening to the ice and salt mixture?

Students should observe the ice and salt mixture melting as time lapses.

Circle one of the underlined words in each pair to complete the sentence below.

Heat energy moves from places with __more or less__ heat energy to places with __more or less__ .

Name_____

Find and circle each of the words in the word search!

l e z d z r i h d g a n
a z a e p m s o l i d h
a d l p a a e l r s z o
i e s s s a n s h o s m
p c m e t a e t e t g o
l o i c e c r e a m m g
z l l s u e g i t s p e
t d k a r c y n a i l n
a a r l i q u i d o f i
m i c t z a r a s h a z
g r o c e r y s t o r e
w y w r p y r e r e m o

ice cream
solid
heat
dairy
Holstein
milk
liquid
cold
pasteurize
grocery store
cow
energy
salt
homogenize
farm

Name_____

Find and circle each of the words in the word search!

ice cream	milk	cow
solid	liquid	energy
heat	cold	salt
dairy	pasteurize	homogenize
Holstein	grocery store	farm