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Component	Science
Grade Level	K-5
Lesson Title	Courageous Journey in a Graham Cracker Car
Focus	Courageous Journeys and Quests

Materials: Plenty of graham crackers, peanut butter, plastic knives, paper plates, straws (axles), assorted wheel-shaped candies or cookies, gum drops (headlights), pretzels (road),

Opening

State the Objective

In this activity, students will learn how to make a graham cracker car using various sizes of wheels.

Gain prior knowledge by asking students, "What do you know about _____

The wheel is a device that allows heavy objects to be moved easily through rotating on an axle through its center. The wheel was invented around 3500-3350 BC, possibly in Europe. Knowledge of the device spread across Asia, China and eventually to the Western Hemisphere.

	Content (the "Meat")	
	Instruction / Demonstration ("I do" – "We do")	*Activity → Teachable Moment(s) <i>throughout</i>
1.	Ask students, "What parts should we build on our cars?" (Body, wheels, axle, headlights, windshield wipers, antenna, and license plate.) Show them how the axle and wheel work.	Tip: Teachers, listen for questions that begin with "what" or "how."
۷.	thin, medium or thick layers of peanut butter. Which holds the crackers best?	
3.	Prepare the surface where students will be working.	Student: "How will I get the wheel to
	Students Practice ("You Do")	Leader: "Experiment
1.	Divide students into groups. Provide students with group materials on paper plates.	with different candies, cookies and
2.	Construct the cars. Construct the axle and wheels. Set the car onto the axle and wheels.	axles."
3.	Decorate the car with headlights, and other parts.	
4.	Share the cars. Take photos. Review how wheels work.	
5.	If desired, eat the cars.	

Closing
Review
Sample Review: "We built the cars using our own imagination."
Review:
Debrief
Three Questions
Ask the following three questions:
 What was your key learning from this activity? Were there any problems with the activity? If you were to try this activity again, what might you do differently?
Reflection (Confirm, Tweak, Aha!)
Sample Reflection: "The peanut butter didn't hold as well as hard white icing (Royal Icing). However, the cars lasted long enough for us to take photos."
Your Reflection:
Modification of Lesson: Teach students how to clean up after a messy lesson.





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Component	Science
Grade Level	K-5
Lesson Title	Journey to the Moon
Focus	Courageous Journeys and Quests

Materials: Aluminum foil baking pan (10x13), flour, cocoa powder, sifter, magnet, steel marbles or ball bearings, BB's. pellets, and photo of a crater on the moon.

Opening

State the Objective

In this activity, students will learn about man's journey to the moon. Students will learn how craters are formed and how some of the characteristic features of a crater are produced.

Gain prior knowledge by asking students, "What do you know about _____

In 1969, over forty years ago, three astronauts blasted into space aboard the Apollo 11 spacecraft. Their goal was to land on the moon. They were successful! Neil Armstrong said these famous words as he set foot on the moon. "One small step for man. One giant leap for mankind." Hundreds of thousands of people all over the world watched the event. With man able to land on the moon the dawning of a new age began. It took the planning and coordination of a workforce totaling 350,00 workers to accomplish this amazing task!

	Content (the "Meat")	
	Instruction / Demonstration ("I do" – "We do")	*Activity → Teachable Moment(s) throughout
1. 2.	 Talk about the moon with the students. What do they see when they look at the moon in the night sky? Can you see the moon in daylight? Discuss gravity on the moon. Gravity is only 1/6 as strong on the moon as it is on Earth. Ask these questions: Weightlifting – If you can lift a 10 pound weight on Earth. How many pounds can you lift on the moon? (60 pounds) Diving – Would you be able to dive into a pool of water on the moon? (No. There is no atmosphere or air pressure. Water would quickly boil away into space.) Golf – If you hit the ball 25 yards on Earth, how many yards would the ball go on the moon? (125 yards) 	 Tip: Teachers, listen for questions that begin with "what" or "how." Student: "How can you tell if the crater is old?" Leader: "The crater's rim is not as sharp. He is worn
3.	 Parachuting - Would a parachute work on the moon? (No. There is no air resistance. You would freefall slowly to the moon's surface.) Demonstrate Making a Crater. Ask for student helpers. Compare the flour craters with the actual moon crater photo. Students Practice ("You Do") Take the administrate of a base	down."



	or tap the pan until the flour is smooth.	
2.	Using the sifter, gently sprinkle cocoa on top until the flour is barely covered.	
3.	Drop the large steel ball (1/4 in. diameter) in the middle of the pan. Carefully	
	remove the ball with a magnet.	
4.	Now, take a few of the small objects (BB's, pellets), and drop them into the box	
	from straight overhead. Drop each one from a different height.	
5.	Take a few of the small objects and throw them very carefully into the box at an	
	angle.	
6.	Have students identify the features of a large crater (sharp rim; rays are visible),	
	small crater (sharp rim; few rays), the rim, the rays of the crater, center peak.	

Closing			
Review			
Sample Review: "We dropped round objects into the pan with flour. The larger objects made larger craters."			
Review:			
Debrief WHI?			
Ask the following three questions:			
 What did you like best about this activity? How did you include everyone in the activity? If you were to try this activity again, what might you do differently? 			

Reflection (Confirm, Tweak, Aha!)

Sample Reflection: "A few students really got the idea of moon craters. Other students didn't make the connection."

Your Reflection:

Modification of Lesson: Pour the flour into the pan before students come into the room. Flour dust can be inhaled.



1. Craters Have Distinct Features



2. Large and Small

Credit: NASA/GSFC/Arizona State University



3. Circular Craters Cover the Surface of Moon's North Pole

Credit: Lunar and Planetary Institute



4. Light and Shadow



5. Fresh and Ancient Craters



6. Bright Rays on Dark Mare



7. Ejecta Splashed Across Moon



8. Astronaut on Crater Rim



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Component	Science
Grade Level	K-5
Lesson Title	Mountain Climbing
Focus	Courageous Journeys and Quests

Materials: Photo of Mt. Everest, YouTube video – Mt. Everest Summit Video – Everest Peace Expedition

Opening

State the Objective

In this activity, students will learn some of the many challenges mountain climbers experience when climbing a tall mountain.

Gain prior knowledge by asking students, "What do you know about _____

The tallest mountain in the world is Mt. Everest. It is 29,029 feet tall, growing at approximately 5 inches per year. In 1953, the first two men to reach the top of Mt. Everest were Edmund Hillary and his Sherpa guide, Tenzing Norgay. Hillary was a beekeeper but wanted to take the challenge of the climb. Mt. Everest lies in the Himalaya Mountains on the border of China and Nepal. This was an amazing quest for both men. They set the bar for others to follow.

	Content (the "Meat")	
	Instruction / Demonstration ("I do" – "We do")	*Activity → Teachable Moment(s) <i>throughout</i>
1. 2.	Ask students, "What does it mean to be brave? Have you ever been exhausted? How is being exhausted different than being tired? Would a mountain climber be uncomfortable?" What are some decisions a mountain climber must make? (Which route to take, spending two years of his life training and preparing for the trip, forming a team, buying equipment, making arrangements with the government of Nepal)	Tip: Teachers, listen for questions that begin with "what" or "how." • Student: "How much
	Students Practice ("You Do")	money does it take to go on this journey?"Leader: "Make a
1. 2.	Divide students into groups. Ask students to brainstorm obstacles a mountain climber might face. (Extreme cold, carrying a heavy load, low oxygen, crevasse fields, avalanches, steep slopes, their bodies breaking down, losing fingers, toes, and the tip of your nose to frostbite	prediction and we'll talk about it."
3.	Use whiteboards to draw pictures of mountain gear climbers need to carry on their backs. (Backpack, clothing, tent, food, oxygen tank, rope, ladders, medicine, camera)	
4.	Act Out climbers using science on the mountain: thermometers, communication devices, experiments, creams, dried food, heat sources).	



Closing Review Sample Review: "Students brainstormed ideas about mountain climbing. They acted out how you would use science on the mountain." Review: Debrief Three Whats Ask the following three "what" questions: 1. What did you enjoy most about this activity?

- 2. What was the biggest challenge with this activity?
- 3. What did you learn from the group?

Reflection (Confirm, Tweak, Aha!)

Sample Reflection: "It would have been helpful to show a video of climbers actually on their way to the top of Mt. Everest."

Your Reflection:



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Component	Science
Grade Level	K-5
Lesson Title	Pilgrim Journey to America
Focus	Courageous Journeys and Quests

Materials:

<u>Butter</u> - Glass baby food jars with lids, heavy cream, salt, crackers, plastic knives, paper plates <u>Matching Items from the Past with Items from Today</u> - White boards, markers, erasing cloth.

Opening

State the Objective

In this activity, students will experience life and food as they would have during Pilgrim days.

Gain prior knowledge by asking students, "What do you know about ____

Ask students, "What does the word "pilgrim" means? (Someone who goes on a special journey.) "What do you know about pilgrims in America?"

The Pilgrim's journey to America began in 1608. They were forced to leave England and went to Holland looking for religious freedom. After a time they returned to England and prepared to depart for America. Finally, after many problems including a leaky boat, 102 passengers set sail for America. After a journey of 66 days, they landed in America more than 600 miles off their course. Ask students, "What does it mean to have courage and be courageous?"

Just the Facts! Heavy cream is an emulsion. The fat is spread throughout the cream in very tiny drops. The protein in the fat keeps the fat droplets suspended. When you shake the cream, you force the fat droplets to come together. If they come together with enough force, they'll stick to each other and form bigger and bigger globs of butter.

Content (the "Meat")

	Instruction / Demonstration ("I do" – "We do")	*Activity → Teachable Moment(s) <i>throughout</i>
1.	Write this list of <i>Items from the Past</i> on the white board: outside game, girl's coif/ boy's hat, hornbook, made own candles, made own, leather mug, wooden trencher, and shells.	Tip: Teachers, listen for questions that begin with
2.	Divide students into two teams. Ask students to work with a partner. Say an <i>Item from Today</i> . Ask students to match the <i>Item from Today</i> with the <i>Item from the Past</i> . Have them draw a picture of the <i>Item from Today</i> on their white boards. Give points to the winning team.	 "what" or "how." Student: "Why isn't the butter yellow?"
3.	<i>Items from Today</i> : spoon, electronic game, plate, baseball cap, glass cup, story book, soap, and light bulb or small lamp.	Teacher: "Butter is yellow if cows are fed
4.	Answers: spoon (shells), plate (wooden trencher), glass cup (leather mug), soap (made own), light bulb/small lamp (made own candles), story book (hornbook), baseball cap (girls coif/boys hat), and electronic game (outdoor game)	bright-green hay."
5.	Demonstrate how to make Pilgrim Butter.	



Students Practice ("You Do")

- 1. Give each student a baby food jar with lid.
- 2. Fill each jar half full of heavy or whipping cream.
- 3. Screw lid on tightly.
- 4. Students shake jar for 5-10 minutes or until a ball of butter forms.
- 5. Pour off buttermilk.
- 6. Add a little salt.
- 7. Spread butter on crackers to taste.

Closing			
Review			
Sample Review: "We shook and shook until the cream thickened and became buttery. Everyone liked the taste of Pilgrim butter rather than store-bought butter."			
Review:			
Debrief WHI?			
Ask the following three questions:			
 What did you like best about this activity? How did you include everyone in the activity? If you were to try this activity again, what might you do differently? 			

Reflection (Confirm, Tweak, Aha!)

Sample Reflection: "This lesson was very meaningful for kids."

Your Reflection:

Modification of Lesson: For younger students, use one pint jar. Unlike plastic, talk about glass being a breakable object. Remind students of safety during the project. Pass the jar around the room so each child gets a chance to shake the jar. You may have to go around the room more than once.



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Component	Science
Grade Level	K-5
Lesson Title	Rafting the Grand Canyon
Focus	Courageous Journeys and Quests

Materials:

<u>Making a Fossil Print</u> – 2 cups flour, ³/₄ cup warm water, ¹/₂ cup salt, measuring cup, mixing bowl, waxed paper, objects for fossil prints (leaves, shells, plastic dinosaurs)

<u>Canyon Carver</u> – 1.9-L milk carton, 2.0-L water bottle, source of sediment (sand or potting soil), ruler, scissors, source of water, garden trowel.

Opening State the Objective

In <u>Making a Fossil Print</u>, students will learn how fossils were made many years ago. In <u>Canyon Carver</u>, students will learn basics of the erosion process and how they form the landscape of the Grand Canyon.

Gain prior knowledge by asking students, "What do you know about ____

The Grand Canyon, located in the state of Arizona, is a steep-sided canyon formed by the Colorado River. It was established as a National Park many years ago. Its powerful immense size (277 miles long and 1 mile deep) and natural beauty inspires tourists from around the world. At the bottom of the canyon runs the muddy Colorado River which continues to erode and form the canyon even to the present day. Fossils may be found in Grand Canyon National Park. White water rafting and hiking are two of the many attractions to the Park. It has been said that the Grand Canyon is one of the Seven Wonders of the Modern World.

	Content (the "Meat")			
	Instruction / Demonstration ("I do" – "We do")	*Activity → Teachable Moment(s) <i>throughout</i>		
Canyor	n Carver:			
1.	Use scissors to cut out the side panel of the carton under the spout, leaving the spout intact.	Tip: Teachers, listen for questions that begin with		
2.	Lay the carton on its side with the cut out panel facing up. Fill the container about half full with the sediment. Smooth the surface.	"what" or "how."		
3.	Set one end of the carton approximately 1 cm. higher than the other end, using something to prop it up. Be sure that the lower end of the carton is the one with the spout.	 Student: "How long does it take for the river to carve the 		
4.	Place the mouth of the water bottle on the higher end and slowly pour the water out. The water should flow steadily down and out the spout end.	canyon?" ● Leader: "Do you		
5.	Have a bucket ready to catch the water.	think the hardness of the canyon wall		
	Students Practice ("You Do")	would make a difference?"		
1.	Mix the flour, salt and water to make dough, or a thick, stick mixture. Roll dough on a clean countertop until it is smooth.			



2.	Pull off a small piece of dough and form a ball. Place the dough ball on a piece of waxed paper.	
3.	Flatten the dough ball. It should be slightly bigger than the object you want to use to make a fossil print.	
4.	Press the object into the dough for about five seconds. Carefully remove the object from the dough.	
5.	Let your fossil print dry for 24-48 hours.	

Closing			
Review			
Sample Review : "First we watched as the 'Colorado River' eroded the canyon walls. Then we imagined seeing a fossil print exposed on the canyon wall. Finally, we made our own fossil prints."			
Review:			
Debrief			
Three Questions			
Ask the following three questions:			
1. What was your key learning from this activity?			
 Were there any problems with the activity? If you were to try this activity again, what might you do differently? 			

Reflection (Confirm, Tweak, Aha!)

Sample Reflection: "I think we should have added dry coffee grounds to the dough so it would look more like dirt."

Your Reflection:

Modification of Lesson:

Canyon Carver: For younger students, cut the milk carton ahead of time. You may want to do this activity outside.



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Component	Science
Grade Level	K-5
Lesson Title	Shrink a Potato
Focus	Courageous Journeys and Quests

Materials: One potato for each group of 3 or 4 students, two saucers or plastic bowls, salt, water.

Opening

State the Objective

The purpose of this lesson is to make a potato shrink and shrivel,

Gain prior knowledge by asking students, "What do you know about _____

Potatoes are known as a root vegetable. This means that they grow from the roots of the plants under the ground. The salt water draws the water out of the potato, causing it to shrivel and become dehydrated. Dehydrated means when the water is removed. This often happens to humans when they sweat a lot and don't drink enough water. Your body can be like the potato is you don't drink enough water to replace what you sweat out!

Content (the "Meat")		
1. 2. 3. 4. 5. 6.	Instruction / Demonstration ("I do" – "We do") Fill both of the saucers with water. Mix some salt into one saucer. Leave the other one with just plain water. Mark the one with salt water so you remember which one it is. Place one half of the potato into each saucer, with the flat side facing down. Leave for about half an hour. What has happened after this time?	*Activity → Teachable Moment(s) throughout Tip: Teachers, listen for questions that begin with "what" or "how." • Student: "What
1. 2.	Students Practice ("You Do") Divide students into groups. Students follow directions above.	 other vegetables grow under the ground?" Leader: "Which of these is a root vegetable: carrot, turnip or radish?" Answer: All of the above.



Closing Review Sample Review: "First we added salt to one of the saucers of water. Then we placed one cut potato in each saucer. After one hour we looked at our experiment." **Review:** Debrief WHI? Ask the following three questions: 1. What were some of the questions that came up in your group? 2. How did you go about including everyone? 3. If you were to try this again, what might you do differently? Reflection (Confirm, Tweak, Aha!) Sample Reflection: "This activity taught the students that it is important to drink more water after exercising!" Your Reflection: **Modification of Lesson:** Using a knife, the leader should cut the potatoes in half.



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Component	Science
Grade Level	K-5
Lesson Title	Sunspots – View Images of the Sun Safely
Focus	Courageous Journeys and Quests

Materials:

For each student you will need one 4 x 6 index card, a piece of white card stock, cut in half, and a sharp pencil.

Opening

State the Objective

The purpose of this lesson is to safely view dark sun spots on the white card stock.

Gain prior knowledge by asking students, "What do you know about _____

The sun is a small star. It is made of intensely hot gases. We could not live without the Sun. The sun provides sunlight to sustain life on Earth. Explosions known as flares and magnetic storms happen without warning on the sun's surface. These storms usually occur when sunspots are forming. Sunspots or dark spots come and go. These sunspots are dark because they are much cooler than the gas around them. Astronomers have been curious about sunspots for a very long time.

Content (the "Meat")	
Instruction / Demonstration ("I do" – "We do") WARNING! Never stare directly at the Sun as it will cause damage to your eves.	*Activity → Teachable Moment(s) <i>throughout</i>
 Teach students to never stare directly at the sun. In this lesson, the sun will be behind the students. Have students make a small hole with the sharp pencil in the index card. 	Tip: Teachers, listen for questions that begin with "what" or "how."
Students Practice ("You Do")	 Student: "What can we use to see an eclipse?"
 Students take their two pieces of paper outside. Stand with your back to the Sun. Hold the index card with the hole in it up to the Sun. Hold the piece of cardstock about 8 inches below the index card. Observe what is happening. Move the two papers further apart. Observe what is happening. 	• Leader: "Use these cards to view an eclipse."



CONSULT

Remind students that sun glasses WILL NOT protect their eyes if they look directly at the sun!





Sunspot Images September 2011



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Component	Science
Grade Level	K-5
Lesson Title	Underwater Adventure
Focus	Courageous Journeys and Quests

Materials: 8 coins, tape, modeling clay, 2 wide rubber bands, water, large clear bowl, scissors, 12 oz. clear plastic water bottle, flexi drinking straw, and a permanent marker.

Opening

State the Objective

In this activity, students will learn how to make an underwater vessel or submarine.

Gain prior knowledge by asking students, "What do you know about _____

Jacques Yves Cousteau (1910-1997) was a French filmmaker and undersea explorer. He invented the Aqua Ling, a mechanism that allows divers to swim underwater while breathing compressed air. He traveled the world's oceans in his boat, the Calypso. Jacques Cousteau made underwater adventures popular world-wide.

In 1620, a Dutchman named Cornelius van Drebbel, was the first to build a submarine in which he remained submerged under the ocean.

	Content (the "Meat")			
	Instruction / Demonstration ("I do" – "We do")		*Activity → Teachable Moment(s) <i>throughout</i>	
1.	Talk about the ocean. What is under the ocean? Are there mountain ranges under the sea? (Yes) What can you learn by being in a submarine?	Tip: Te	eachers, listen for	
2.	2. Sing the song, "Yellow Submarine."	questic "what"	uestions that begin with what" or "how."	
	Students Practice ("You Do")	٠	Student: "How can	
1.	Take the aluminum pan. Fill it with flour to a depth of about an inch. Gently shake or tap the pan until the flour is smooth.	•	old?" Leader: "The	
2.	Using the sifter, gently sprinkle cocoa on top until the flour is barely covered.	•	crater's rim is not as	
3.	Drop the large steel ball (1/4 in. diameter) in the middle of the pan. Carefully remove the ball with a magnet.		sharp. He is worn down."	
4.	Now, take a few of the small objects (BB's, pellets), and drop them into the box from straight overhead. Drop each one from a different height.			
5.	Take a few of the small objects and throw them very carefully into the box at an angle.			
6.	Have students identify the features of a large crater (sharp rim; rays are visible), small crater (sharp rim; few rays), the rim, the rays of the crater, center peak.			



Closing Review Sample Review: "We dropped round objects into the pan with flour. The larger objects made larger craters." Review: Debrief WHI? Ask the following three questions: 1. What did you like best about this activity? 2. How did you include everyone in the activity? 3. If you were to try this activity again, what might you do differently?

Reflection (Confirm, Tweak, Aha!)

Sample Reflection: "A few students really got the idea of moon craters. Other students didn't make the connection."

Your Reflection:

Modification of Lesson: Pour the flour into the pan before students come into the room. Flour dust can be inhaled.



Yellow Submarine by the Beatles

In the town where I was born, Lived a man who sailed to sea, And he told us of his life, In the land of submarines.

So we sailed on to the sun, Till we found the sea green, And we lived beneath the waves, In our yellow submarine.

We all live in a yellow submarine, Yellow submarine, yellow submarine. We all live in a yellow submarine, Yellow submarine, yellow submarine.

And our friends are all aboard, Many more of them live next door, And the band begins to play.

We all live in a yellow submarine, Yellow submarine, yellow submarine. We all live in a yellow submarine, Yellow submarine, yellow submarine.