DISCOVER

4-H FORCES OF NATURE CLUBS

EXTENSION
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Utah State University Extension

Description

The Discover 4-H Clubs series guides new 4-H volunteer leaders through the process of starting a 4-H club or provides a guideline for seasoned volunteer leaders to try a new project area. Each guide outlines everything needed to organize a club and hold the first six club meetings related to a specific project area.

Purpose

The purpose is to create an environment for families to come together and participate in learning activities that can engage the whole family, while spending time together as a multi-family club. Members will experiment with new 4-H project areas.

What is 4-H?

4-H is one of the largest youth development organizations in the United States. 4-H is found in almost every county across the nation and enjoys a partnership between the U. S. Department of Agriculture (USDA), the state land-grant universities (e.g., Utah State University), and local county governments.

4-H is about youth and adults working together as partners in designing and implementing club and individual plans for activities and events. Positive youth development is the primary goal of 4-H. The project area serves as the vehicle for members to learn and master project-specific skills while developing basic life skills. All projects support the ultimate goal for the 4-H member to develop positive personal assets needed to live successfully in a diverse and changing world.

Participation in 4-H has shown many positive outcomes for youth. Specifically, 4-H participants have higher participation in civic contribution, higher grades, increased healthy habits, and higher participation in science than other youth (Learner et al., 2005).

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Utah 4-H

4-H is the youth development program of Utah State University Extension and has more than 90,000 youth participants and 8,600 adult volunteers. Each county (Daggett is covered by Uintah County) has a Utah State University Extension office that administers the 4-H program.

The 4-H Motto

"To Make the Best Better!"

The 4-H Pledge

I pledge: My HEAD to clearer thinking, My HEART to greater loyalty, My HANDS to larger service and My HEALTH to better living, For my Club, my Community, my Country, and my world.

4-H Clubs

What is a 4-H Club? The club is the basic unit and foundation of 4-H. An organized club meets regularly (once a month, twice a month, weekly, etc.) under the guidance of one or more volunteer leaders, elects its own officers, plans its own program, and participates in a variety of activities. Clubs may choose to meet during the school year, only for the summer, or both.

Club Enrollment

Enroll your club with your local Extension office. Each member will need to complete a Club/member Enrollment form, Medical History form, and a Code of Conduct/Photo Release form (print these from the www.utah4h.org website or get them from the county Extension office).

Elect Club Officers

Elect club officers during one of your first club meetings. Depending on how many youth you have in your club, you can decide how many officers you would like. Typical officers will include a president, vice president, pledge leader, and secretary. Other possible officers or committees are: song leader, activity facilitator, clean-up supervisor, recreation chair, scrapbook coordinator, contact committee (email, phone, etc.), field trip committee, club photographer, etc. Pairing older members with younger members as Sr. and Jr. officers may be an effective strategy to involve a greater number of youth in leadership roles and reinforce the leadership experience for both ages. Your club may decide the duration of officers–six months, one year, etc.

A Typical Club Meeting

Follow this outline for each club meeting:

- ☐ Call to order–President
- ☐ Pledge of Allegiance and 4-H Pledge–Pledge Leader (arranges for club members to give pledges)
- ☐ Song–Song Leader (leads or arranges for club member to lead)
- ☐ Roll call–Secretary (may use an icebreaker or get acquainted type of roll call to get the meeting started)
- ☐ Minutes of the last meeting–Secretary
- ☐ Business/Announcements–Vice President
- ☐ Club Activity–arranged by Activity Facilitator and includes project, lesson, service, etc. These are outlined by project area in the following pages.
- ☐ Refreshments–arranged by Refreshment Coordinator
- ☐ Clean Up–led by Clean-up Supervisor

Essential Elements of 4-H Youth Development

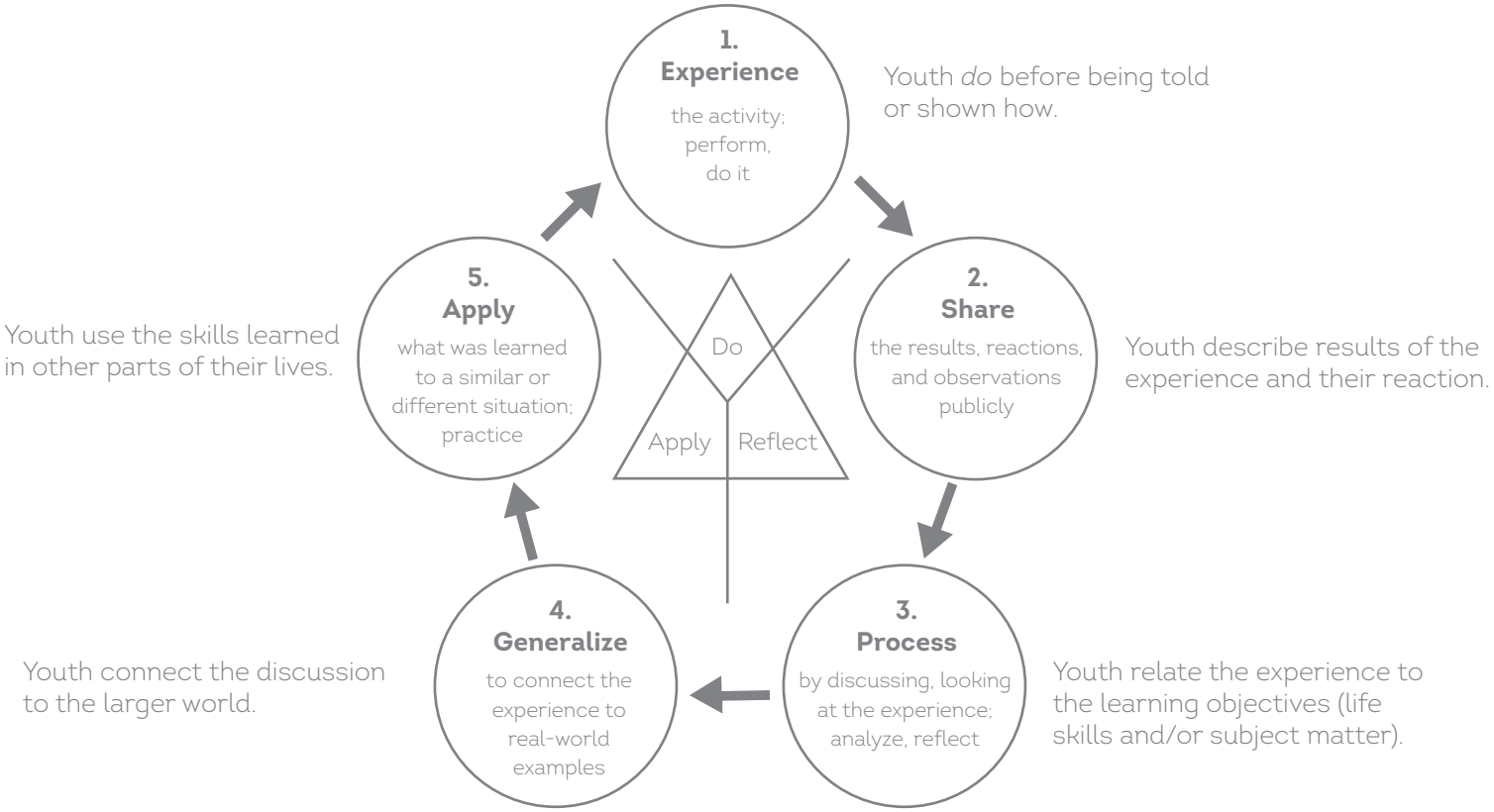
The essential elements are about healthy environments. Regardless of the project area, youth need to be in environments where the following elements are present in order to foster youth development.

1. **Belonging**: a positive relationship with a caring adult; an inclusive and safe environment.
2. **Mastery:** engagement in learning; opportunity for mastery.
3. **Independence:** opportunity to see oneself as an active participant in the future; opportunity to make choices.
4. **Generosity:** opportunity to value and practice service to others.

(Information retrieved from: http://www.4-h.org/resource-library/professional-development-learning/4-h-youth-development/youth-development/essential-elements/)

4-H "Learning by Doing" Learning Approach

The Do, Reflect, Apply learning approach allows youth to experience the learning process with minimal guidance from adults. This allows for discovery by youth that may not take place with exact instructions.



4-H Mission Mandates

The mission of 4-H is to provide meaningful opportunities for youth and adults to work together to create sustainable community change. This is accomplished within three primary content areas, or mission mandates, - citizenship, healthy living, and science. These mandates reiterate the founding purposes of Extension (e.g., community leadership, quality of life, and technology transfer) in the context of 21st century challenges and opportunities. (Information retrieved from: http://www.csrees.usda.gov/nea/family/res/pdfs/Mission_Mandates.pdf)

1. **Citizenship:** connecting youth to their community, community leaders, and their role in civic affairs. This may include: civic engagement, service, civic education, and leadership.
2. **Healthy Living:** promoting healthy living to youth and their families. This includes: nutrition, fitness, social-emotional health, injury prevention, and prevention of tobacco, alcohol, and other drug use.
3. **Science:** preparing youth for science, engineering, and technology education. The core areas include: animal science and agriculture, applied mathematics, consumer science, engineering, environmental science and natural resources, life science, and technology.

Getting Started

1. Recruit one to three other families to form a club with you.
    a. Send 4-H registration form and medical/photo release form to each family (available at utah4h.org)
    b. Distribute the Discover 4-H Clubs curriculum to each family
    c. Decide on a club name
    d. Choose how often your club will meet (e.g., monthly, bi-monthly, etc.)
2. Enroll as a 4-H volunteer at the local county Extension office (invite other parents to do the same)
3. Enroll your club at the local county Extension office
    a. Sign up to receive the county 4-H newsletter from your county Extension office to stay informed about 4-H-related opportunities.
4. Identify which family/adult leader will be in charge of the first club meeting.
    a. Set a date for your first club meeting and invite the other participants.
5. Hold the first club meeting (if this is a newly formed club).
    a. See *A Typical Club Meeting* section above for a general outline.
        i. Your activity for this first club meeting will be to elect club officers and to schedule the six project area club meetings outlined in the remainder of this guide. You may also complete a-d under #1 above.
    b. At the end of the first club meeting, make a calendar outlining the adult leader in charge (in partnership with the club president) of each club meeting along with the dates, locations, and times of the remaining club meetings.
6. Hold the six project-specific club meetings outlined in this guide.
7. Continue with the same project area with the 4-H curriculum of your choice (can be obtained from the County Extension Office) OR try another Discover 4-H Club project area.

Other Resources

Utah 4-H website: www.Utah4h.org
National 4-H website: www.4h.org
4-H volunteer training:
To set up login:
http://utah4h.org/htm/volunteers/get-involved/new-volunteer-training
To start modules: http://4h.wsu.edu/volunteertraining/course.html
(password = volunteer)

References

Information was taken from the Utah 4-H website (utah4h.org), the National 4-H Website (4h.org), the Utah Volunteer Handbook, or as otherwise noted.

Lerner, R., M. et al., (2005). Positive youth development, participation in community youth development programs, and community contributions of fifth grade adolescents: Findings from the first wave of the 4-H Study of Positive Youth Development. Journal of Early Adolescence, 25(1), 17-71.

We would love feedback or suggestions on this guide; please go to the following link to take a short survey:
http://tinyurl.com/lb9tnad

4-H FORCES OF NATURE CLUB *Meetings*

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4-H Club Meeting 1
Earthquakes

Supplies
- Paper
- Pens/pencils

Pushing Plates
- Graham crackers
- Wax paper
- Plastic knives
- Frosting/peanut butter

Engineering a Building
- Spaghetti noodles
- Stale marshmallows (left out overnight)
- Fake money (5's and 10's)
- Small stuffed animal (about 200 grams)
- Measuring stick

This club involves fun, hands-on activities that teach basic science principles. Earthquakes, floods, fires, and extreme weather conditions are all forces of nature found on Earth that we will explore. Today we will discover the science behind earthquakes and how they are formed!

WHAT TO DO

First, everyone should write their predictions on a piece of paper about what will happen during the activities. This will be your science notebook.

Pushing Plates

ACTIVITY 1: PUSHING PLATES DIRECTIONS

Time: 15 minutes

1. Divide into small groups. Each group should have a sheet of wax paper covered with a thick layer of frosting or peanut butter.
2. Put two graham crackers very close to each other on the wax paper and slowly push them apart. When you do this you make a rift, or a big crack in the ocean floor. As the plates separate, magma oozes up from below forming a new ocean floor and creating underwater mountain ranges. This is called divergent plate movement.
3. Push two crackers toward each other, making one slide underneath the other. When this happens on the Earth, the bottom plate starts to melt from the extreme heat and pressure. It becomes new magma that flows up between the two plates, building up over time, until it causes a volcanic eruption! This type of plate action caused Mt. Saint Helens to erupt. This is called convergent plate movement.

ACTIVITY 1: PUSHING PLATES DIRECTIONS CONTINUED

4. Another form of convergent plate movement can be seen when you put two graham crackers side by side on the wax paper. Wet the edge of one graham cracker first and then slowly push them together. The ridge of pushed-up cracker is just like many mountain ranges around the Earth that were formed as two plates slowly crumpled together over millions of years. The mountain range of the Himalayas, where Mt. Everest is, was formed when India and Asia collided.
5. Put two crackers side by side and push one up away from you and the other down toward you. When plates move past each other in this way it is not a smooth motion. The plates usually get stuck on each other and send a great lurch as they move against each other, sending vibrations through the Earth's interior. These vibrations are so powerful that we have a special name for them- EARTHQUAKE! This type of movement is called lateral slipping plate movement.

Engineering a *Building*

ACTIVITY 2: ENGINEERING A BUILDING DIRECTIONS

Time: 35 minutes

1. Divide into small groups and brainstorm building designs.
2. The challenge is to build the tallest tower out of spaghetti noodles and marshmallows that can support a weight of 200 grams. The catch is you only have a budget of $400. Spaghetti noodles cost $5 each and marshmallows cost $10 each.
3. Each time you need materials, go to the banker. If you buy materials you did not use, you may return them to the banker for money.
4. Before you begin building or buying materials, draw your design. Figure out ways to make the tower taller and sturdier.
5. Using your sketches, start building your design.
6. Once the towers are built and measured for height, see how well they support the 200 gram stuffed animal or other object. If they can withstand the weight of the stuffed animal, try giving the table a little shake to simulate an earthquake.
7. In case you need to redesign your tower to support the weight, each team gets an extra $200 to buy new materials.
8. The tallest tower to support 200 grams is the winner.

Reflect

- Have you ever been in an earthquake?
- What is the place of initial rupture called where an earthquake occurs?
- What is a fault line and why does the Earth have them?
- What causes the shifting and moving of the Earth?
- Which design was the strongest?
- What are some ways you can make your structure stronger?
- Was it difficult to work with a budget?
- How important do you think it is for buildings to be ready for seismic activity?
- What do you think engineers do to make buildings strong enough to withstand earthquake activity?

Apply

- An earthquake's point of initial rupture is called its focus or hypocenter. The term epicenter refers to the point at ground level directly above the hypocenter. A crack in the Earth's crust is called a fault. The large crack where two huge Earth plates move against each other is called a fault line. Fault lines are where all action happens. Because of friction and the rigidity of the rock, the rocks cannot simply flow or glide past each other. Rather, stress builds up in rocks and when it reaches a level that exceeds the strain threshold, the accumulated potential energy is released as strain, which is focused into a plane along which relative motion is accommodated. The Earth's rocky outer crust solidified billions of years ago, soon after the Earth was formed. This crust is not a solid shell; it is broken up into huge, thick plates that drift atop the soft underlying mantle. The plates are made of rock and drift all over the globe; they move both horizontally (sideways) and vertically (up and down). Over long periods of time the plates also change in size as their margins are added to, crushed together, or pushed back into Earth's mantle. These plates are from 50 to 250 miles thick.
- When engineers design a building they not only need to think about how sturdy it is, but also how much it costs. All buildings have a skeleton, or frame, inside, which gives them their structure and form, just like what you created with your spaghetti and marshmallows. People have been building tall buildings for centuries, all the way back to the Great Pyramids dating 2560 BC, and their height was unsurpassed until the 14th century AD. The Great Pyramid of Giza was a height of 479 feet. Compare that to the skyscraper in Dubai standing at a height of 2,717 feet!

Belonging

Working together as a group to conduct and explore these science principles will create a sense of unity as youth work through failure and success.

Science

Youth will explore the basic principles behind earthquakes and use the scientific method to form hypotheses and make observations. They will learn how to use models to discover principles about the unknown.

Mastery

Not everything works the first time. Through trial and error youth can engineer a building that is strong and yet still within the budget.

Independence

The youth should make predictions and help conduct the experiments to find their own answers. Encourage them to problem solve.

References

Geology Rocks, pg. 50-51. Retrieved from

http://www.enchantedlearning.com/subjects/astronomy/planets/earth/Continents.shtml

http://pbskids.org/zoom/activities/sci/tallsturdybuilding.html

4-H Club Meeting 2
Water

Supplies

- Paper
- Pens/pencils

Prism

- Clear glass
- Water
- 2 sheets white paper
- Chair
- Flashlight (with a strong beam)

Rain Maker

- Clear mason jars
- Water
- Jar lids
- Ice cubes

This club involves fun, hands-on activities that teach basic science principles. Earthquakes, floods, fires, and extreme weather conditions are all forces of nature found on Earth that we will explore. Today we will discover the science behind rain and how rainbows are formed!

WHAT TO DO

First, everyone should write their predictions about what will happen during the experiments in their science notebook.

Making a Prism

ACTIVITY 1: MAKING A PRISM DIRECTIONS

Time: 15 minutes

1. Fill the glass a little more than half-way full. Set the glass on the edge of the chair so that nearly half of the glass hangs over the edge. Be careful not to let it fall.
2. Lay both sheets of paper side by side on the floor next to the chair beneath where the glass is.
3. Turn on the flashlight and hold it near the outside of the glass at the level of the water, pointing toward the glass in the direction of the paper on the floor.
4. Look for a rainbow pattern to appear on the white paper. You might need to adjust where you are shining the flashlight or where your paper is in order to see the rainbow clearly. The rainbow is easiest to see in a dark room.
5. Depending on the glass and how much water is in it, you might see more than one rainbow.
6. You could also try this by putting the glass of water in the window where sunlight will shine through instead of using a flashlight.

ACTIVITY 2: RAIN MAKER DIRECTIONS

Time: 20 minutes

1. Pour enough water into the jar to cover the bottom. The water will simulate a lake or an ocean.
2. Place the lid firmly over the opening of the jar. Think of the lid as a cumulonimbus cloud.
3. Put four or five ice cubes on top of the lid. The ice acts like the cooler air found high in the Earth's atmosphere. Wait 10-15 minutes to see what happens. While you wait, reflect on what you think will happen.

Reflect

- How does a rainbow get its colors?
- How does a rainbow form and what shape is it?
- What colors make up the rainbow?
- What happened in the jar?
- How did you make it "rain"?
- How do raindrops form?

Apply

- Light usually looks white, but it is actually made up of colors: red, orange, yellow, green, blue, indigo, and violet. Those seven colors are the same ones you see in a rainbow! A prism is usually made of glass and is used to separate light into its colors. To see a rainbow, you need rain that is illuminated by bright sunshine, as well as be in a position that the rain lies on the circle 42° around the shadow of your head. So if you get rain from a shower that moves in a direction away from the sun relative to you, then you have a good chance of seeing a rainbow. You are more likely to see rainbows on days with scattered shower or storms than on dull overcast rain days. Rainbows are an arc at a constant angle from the anti-solar point (shadow of your head). For a primary bow, this angle is 42°, and for a secondary bow it is 51°. So the shape is an arc along the circumference of a circle. Since we can never reach the end of a rainbow we may never know if there is a pot of gold waiting at the end!
- You should have noticed that water formed on the inside of the lid, just like the rain forms in the clouds. This jar experiment shows some of the same processes that occur in nature. The warm air inside the jar rises, carrying moisture from the water at the bottom. On Earth, warm air carries moisture up from the lakes, oceans, and other water sources. As the air in the jar reaches the top, it cools because of the ice on the lid. In a similar way on Earth, the warm air cools the higher it rises in the atmosphere. When air cools it drops the moisture it is holding. In the jar we see this moisture collect on the inside of the lid. On Earth it is seen every time it rains. You made it rain! Rain is very important to Earth. Rain supplies Earth with water, one of the most important resources. You know that rain is formed by warm air rising from Earth and cooling in the clouds.

Belonging

Working together as a group to conduct and explore these science principles will create a sense of unity as youth work through failure and success.

Science

Youth will explore the basic principles behind earthquakes and use the scientific method to form hypotheses and make observations. They will learn how to use models to discover principles about the unknown.

Citizenship

Learning about the weather and environmental processes encourages youth to become more aware of their surroundings and protecting the environment.

Independence

The youth should make predictions and help conduct the experiments to find their own answers. Encourage them to problem solve.

References

Home Science Tools. Rainbow Science Projects. Retrieved from http://www.hometrainingtools.com/rainbow-science-projects-and-activities/a/1594/.

Science Library Adventures. Lightning and Other Wonders of the Sky: Rain Maker. Retrieved from http://www.eduplace.com/kids/sla/4/lightning_act.html.

4-H Club Meeting 3
Volcanoes

This club involves fun, hands-on activities that teach basic science principles. Earthquakes, floods, fires, and extreme weather conditions are all forces of nature found on Earth that we will explore. Today we will discover the science behind volcanoes and how they are formed!

Supplies
- Paper
- Pens/pencils

Magma Rising
- Squeeze bottle (dish soap bottle)
- Large clear container
- Water
- Red food coloring
- Cooking oil

Core Sampling
- Cupcakes (one per person)
- Foil baking cups
- Frosting
- Plastic knives
- Food coloring
- Transparent straws

Lava Layering
- Paper cups
- Large piece of cardboard
- Newspaper
- Tape
- Spoon
- Baking soda
- Vinegar
- Paper towels
- Food coloring
- Scissors
- Markers
- White paper

***Prior to Activity #2: Make cupcakes with at least 3 layers of colored batter, and for fun add colored sprinkles to the different layers. Use foil baking cups and frosting to prevent the youth from seeing the interior of the cupcakes. If making cupcakes is not an option, purchased cupcakes with cream filling inside can be substituted.

WHAT TO DO

First, everyone should write their predictions about what will happen during the experiments in their science notebook.

Magma Rising

ACTIVITY 1: MAGMA RISING DIRECTIONS

Time: 10 minutes

1. Fill the squeeze bottle full of cooking oil and add red food coloring to it.
2. Fill the large container with water.
3. Slowly squeeze the red oil into the container of water and watch what the oil does.

Core *Sampling*

ACTIVITY 2: CORE SAMPLING DIRECTIONS

Time: 15 minutes

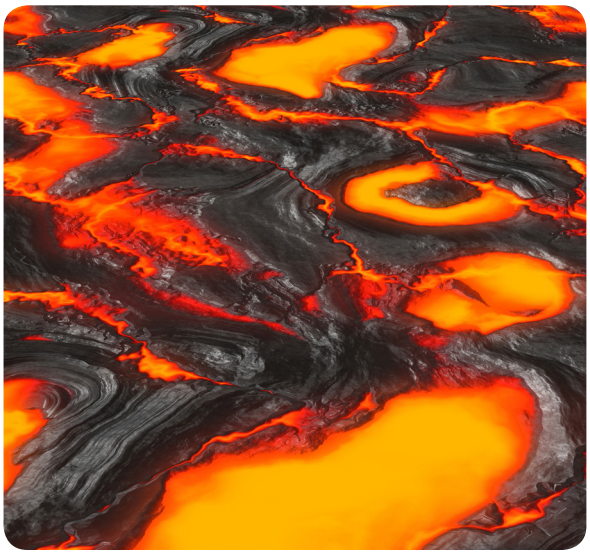
1. Everyone should have a pencil, paper, and a cupcake. Fold the paper into four different sections. In the first section draw what you think the inside of the cupcake looks like without peeling back the foil or cutting the cupcake open with a knife.
2. Have the youth brainstorm ways they could find out what the inside looks like.
3. Someone may suggest using the straw to take a core sample. If not, show them how to push the straw into the cupcake and pull out a sample. (Fresh cupcakes do not work as well as cupcakes that are dryer.)
4. Make a second drawing of the cross section of the cupcake based on the information from three core samples. Each new drawing should be carefully labeled and placed in a new section of the drawing paper.
5. Finally, use your knife to cut open the cupcake and compare the inside to your drawings.

Lava *Layering*

ACTIVITY 3: LAVA LAYERING DIRECTIONS

Time: 25 minutes

1. Cover the table with newspaper to protect from spills.
2. Cover one side of the cardboard piece with white paper. Use tape to keep it in place.
3. Take one paper cup and cut it down to a height of 2.5 cm. Tape the cup right side up in the center of the piece of cardboard. This cup will be your eruption source.
4. Place 1 heaping spoonful of baking soda in the eruption cup.
5. Pour a small amount of vinegar into a second paper cup. Add food coloring.
6. You are now ready to create an eruption. Slowly pour the colored vinegar into the source cup and watch the eruption of simulated lava.
7. When the lava stops, quickly draw around the flow edge with a pencil or marker.
8. Wipe up the fluid using a paper towel.
9. On a sheet of paper, record information about the flow's color, shape, direction of flow, and thickness.
10. Repeat the eruption sequence three more times using a different color of food coloring if possible. Record all the results and compare.
11. Adjust baking soda and vinegar quantities as needed.



Reflect

- What happened to the cooking oil when you added it to the water?
- How is magma formed?
- What causes magma to rise to the surface?
- Why do geologists use core sampling?
- Did you make a mess while coring your cupcake?
- Do you think that rock coring also produces material that has to be cleaned up?
- What steps can be taken to minimize the environmental impact of drilling?
- Did the lava flow the same direction every time?
- What do you think influences the path that lava takes?
- Did you change the amount of vinegar or baking soda each time?

Apply

- The cooking oil rises through the water because oil is less dense than water. The same process causes magma in the Earth to rise from the bottom of the mantle to the Earth's crust causing volcanism. Volcanism is the eruption of material from deep within the Earth. Usually eruptions build up a pile of material, or a mountain called a volcano. Volcanism recycles the material that goes through plate tectonics.
- Trying to see what is beneath the surface of the Earth is the job of a geologist. Rather than digging up vast tracks of land to expose an oil field or to find some coal bearing strata, core samples can be taken and analyzed to determine the likely composition of the Earth's interior. Geologists also take core samples to test for groundwater sources, or even to discover oil or gas below the surface.
- Volcanoes and lava flow are prominent features on all large, rocky planetary bodies. Even some asteroid fragments show evidence of lava flows. Volcanism is one of the major geologic processes in our solar system. Mars has a long history of volcanic activity from the ancient volcanic areas of the southern highlands to the more recent major volcanoes of the Tharsis bulge. Olympus Mons is a volcanic mound over 20 kilometers. That one volcano would cover the state of Arizona. Where volcanic heat and water interact here on Earth, scientists are finding life. In the hot springs of Yellowstone Park they have found abundant life forms including some very small bacteria. There is a possibility that life may have found a place in the ancient volcanic terrain of Mars. Some of the volcanoes on Mars are basaltic shield volcanoes like Earth's Hawaiian Islands. Scientists believe that basalt is a very common rock type on all the large bodies of the inner solar system, including Earth.

Belonging

Working together as a group to conduct and explore these science principles will create a sense of unity as youth work through failure and success.

Science

Youth will explore basic principles behind volcanoes and use the scientific method to form hypotheses and make observations. They will learn about density, lava flow, and the work of a geologist in core sampling.

Citizenship

Learning about the weather and environmental processes encourages youth to become more aware of their surroundings and protecting the environment.

Independence

The youth should make predictions and help conduct the experiments to find their own answers. Encourage them to problem solve.

References

Women in Mining Education Foundation. Cupcake Core Sampling. Retrieved from http://files.dnr.state.mn.us/education_safety/education/teachers/activities/soudan_mine/cupcakecore_sampling.pdf.

National Aeronautics and Space Administration. Lava Layering. Retrieved from http://ares.jsc.nasa.gov/education/activities/destmars/destmarsLes3.pdf.

4-H Club Meeting 4
Ice

Supplies
- Paper
- Pens/pencils

Ice Spikes
- Ice cube trays
- Distilled water
- Freezer

Ice Cream
- Sugar
- Milk or half & half
- Vanilla extract
- Rock salt
- Measuring cup & spoons
- Ziplock bags (pint sized)
- Large plastic container
- Ice
- Cups
- Spoons
- Duct tape

This club involves fun, hands-on activities that teach basic science principles. Earthquakes, floods, fires, and extreme weather conditions are all forces of nature found on Earth that we will explore. Today we will discover the science behind ice and how to use our own energy to make ice cream!

WHAT TO DO

First, everyone should write their predictions about what will happen during the experiments in their science notebook.

Ice Spikes

ACTIVITY 1: ICE SPIKES DIRECTIONS

Time: 15 minutes

1. Fill the ice trays with distilled water.
2. Put trays in freezer, making sure that each tray has nothing on top of it. Do not stack trays.

Tip: If you are limited on time, prepare by having ice cube trays already frozen so they can be removed from the freezer when you put the unfrozen ice cube trays in.

ACTIVITY 2: MAKING ICE CREAM DIRECTIONS

Time: 30 minutes

1. Fill the plastic container half full with ice. Add 6 tablespoons of rock salt.
2. In the Ziploc bag, put in ½ cup milk or half & half. Then add ¼ teaspoon of vanilla and 1 tablespoon of sugar.
3. Seal the bag and put duct tape around the opening of the bag to ensure that there will be no leaks.
4. Place the Ziploc bag inside the container and close the lid.
5. Shake vigorously until the mixture becomes ice cream. (Approximately 5 minutes.)
6. When the ice cream is done, wipe off the outside of the bag, open it, and enjoy!

Tip: To make a larger amount, try doubling the recipe. Anything larger might be too big for kids to pick up because the ice is quite heavy.

Reflect

- What is an ice spike and how does it form?
- Why do ice spikes form with distilled water, but not with tap water?
- What other factors affect the growing of ice spikes?
- When making the ice cream, why do you add salt to the ice?
- Do you think the mixture would still turn to ice cream if you just let it sit and did not shake it?
- What ingredients could you add to give the ice cream flavor?
- What does this activity teach you about physical changes of state?
- How would it change the ice cream if you left out one of the ingredients?

Apply

- Ice spikes are odd structures that occasionally grow out of ice cube trays. Unlike some of the strange things you might find growing in your refrigerator, ice spikes are made only of ice. Ice spikes are the result of physics, not biology. Ice spikes grow as the water in an ice cube tray turns to ice. The water first freezes on the top surface, around the edges of what will become the ice cube. The ice slowly freezes in from the edges, until just a small hole is left unfrozen in the surface. At the same time, while the surface is freezing, more ice starts to form around the sides of the cube. Since ice expands as it freezes, the ice freezing below the surface starts to push water up through the hole in the surface of the ice. If the conditions are just right, the water will be forced out of the hole in the ice and it will freeze into an ice spike, a bit like lava pouring out of a hole in the ground to form a volcano. But water does not flow down the sides of the spike. Rather the water freezes around the rim of the tube, thus adding to its length. The spike can continue growing taller until all the water freezes, cutting off the supply, or until the tube freezes shut. Very little ice is needed to kill ice spikes. All tap water contains relatively high concentrations of various mineral salts, so apparently different impurities have different effects on ice spike formation. Temperature is certainly a factor when growing ice spikes. Experiments show that ice spikes are most likely to form when the temperature is just below freezing.

Apply Continued

- Ice has to absorb energy in order to melt, changing the phase of water from a solid to a liquid. When you use ice to cool the ingredients for ice cream, the energy is absorbed from the ingredients and from the outside environment (like your hands if you are holding the container of ice). When you add salt to ice it lowers the freezing point, so even more energy has to be absorbed from the environment in order for the ice to melt. This makes the ice colder than it was before, which is how your ice cream freezes. Ideally you should make your ice cream using "ice cream salt," which is sold as large crystals instead of the small crystals in table salt. The larger crystals take more time to dissolve in the water around the ice, which allows for even more cooling of the ice cream.

Belonging

Working together as a group to conduct and explore these science principles will create a sense of unity as youth work through failure and success.

Science

Youth will explore chemical reactions and use the scientific method to form hypotheses and make observations. They will learn about physical changes of state and how to use their own energy to make ice cream.

Independence

The youth should make predictions and help conduct the experiments to find their own answers. Encourage them to problem solve.

References

Snow Crystals. Ice Spikes. Retrieved from http://www.its.caltech.edu/~atomic/snowcrystals/icespikes/icespikes.htm

4-H Club Meeting 5
Erosion/Flooding

Supplies

- Paper
- Pens/pencils

Wash and Wear

- Shallow baking pan
- Soil/sand
- Leaves and grass
- Popsicle sticks
- Markers
- Ruler
- Watering can
- Water
- Straw

Build a Dam

- 2 large plastic totes (the bigger the better)
- Sand
- Gravel
- Rocks
- Small sticks
- Leaves
- Tape

This club involves fun, hands-on activities that teach basic science principles. Earthquakes, floods, fires, and extreme weather conditions are all forces of nature found on Earth that we will explore. Today we will discover the science behind ice and how to use our own energy to make ice cream!

WHAT TO DO

First, everyone should write their predictions about what will happen during the experiments in their science notebook.

Wash and Wear

ACTIVITY 1: WASH AND WEAR DIRECTIONS

Time: 15 minutes

1. Fill the baking pan with a thin layer of sand or soil. On one end of the pan, build up a mound of soil. Give the mountain some elevation by tilting the mountain side of the pan on a book.
2. Using a marker, mark the popsicle sticks in ½ inch intervals. Place a few popsicles around different parts of the mountain, burying them at least 1 ½ inches deep.
3. Cover only one side of the mountain with leaves and grass clippings.
4. Using a straw, try blowing away both sides of the mountain. Then use the watering can to make it rain on both sides of the mountain.
5. Record your observations.

ACTIVITY 2: BUILD A DAM DIRECTIONS

Time: 20 minutes

1. Cut several strips of tape. Place them 1 inch apart on one corner on the outside of each tote. The tape marks will be used to measure the water level.
2. Divide into two groups and divide the materials equally between the two groups.
3. The challenge is to build a dam that can withstand the most amount of water with the provided materials.
4. Brainstorm building strategies before starting.
5. When the dams are ready, slowly pour water into one side of the tub until the dam gives way or leaks.
6. The team who has the highest water level before the dam bursts or leaks is the winner.
7. The second challenge is to create dams and landforms to channel the flow of water in a certain direction. You can choose to snake the water through the mountains or even try to make a design with the water flow. Get creative!

Reflect

- What is erosion?
- Which side of the mountain eroded more?
- How can humans and animals contribute to erosion?
- How can erosion harm an ecosystem?
- What can be done to prevent erosion?
- Which materials made the strongest dam?
- How high did the water level get before the dam gave way?
- Are humans the only ones that build dams? Do any animals build dams?

Apply

- Erosion happens most quickly on bare sand, soil, or rocks. Wind, water, sun, even our footsteps, can cause things to wear away. Whether we are talking about farm crops in a field, beach grass on the dunes, or the lawn in our backyard, plants do an excellent job of holding soil in place. When vegetation is removed (construction, road building, agriculture, wildfires, over-grazing, etc.), the rate of erosion is increased. Or if we divert surface water or concentrate its flow, the rate of erosion is increased. If builders increase slope angles (again usually some form of construction) there is increased potential for erosion. Erosion can be harmful when nutrient-rich soil is lost or when the eroded materials are deposited somewhere we wouldn't necessarily want them, like gravel in a stream bed where fish spawn. There are numerous ways to prevent or reduce erosion. Better land use decisions help us determine areas we shouldn't disturb, and help to control erosion and deposition. Preventing human-caused wildfires also helps to reduce the potential for erosion.

Apply Continued

- Engineers build dams to stop the flow of water in a river. The water trapped by a dam forms a reservoir that can supply water to a city. The dam can also generate electricity for a city. Water from the reservoir flows through tunnels inside the dam, which contain turbines. The turbines are turned by the water flow and drive generators to create electricity. A dam must be strong enough to withstand the huge pressure of the water behind it. The deeper the water, the stronger the dam needs to be. People are not the only creatures to build dams. Beavers chop over large trees with their teeth to block a stream. The lake formed behind the dam makes an excellent fishing ground for the beaver family.

Belonging

Working together as a group to conduct and explore these science principles will create a sense of unity as youth work through failure and success.

Science

Youth will explore the science behind erosion and use the scientific method to form hypotheses and make observations. They will learn benefits and uses of building dams.

Independence

The youth should make predictions and help conduct the experiments to find their own answers. Encourage them to problem solve.

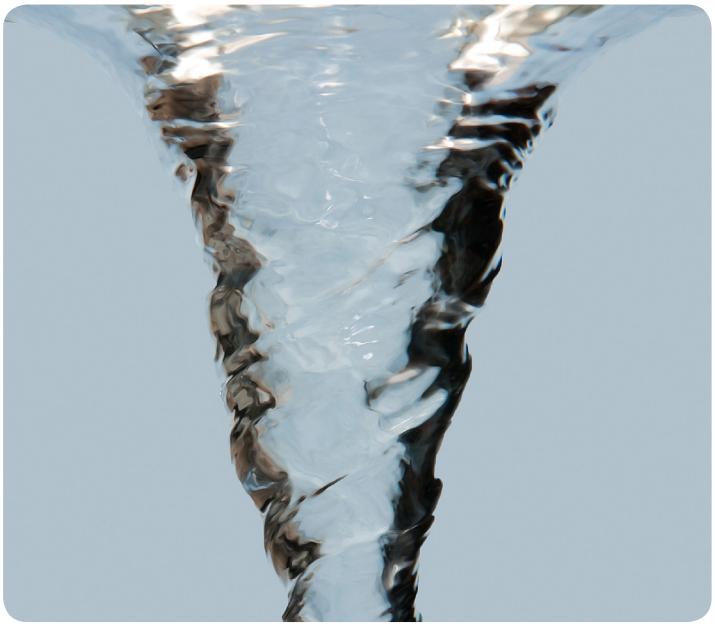
Citizenship

Learning about the weather and environmental processes encourages youth to become more aware of their surroundings and protecting the environment.

References

Blobaum, Cindy (1999.) Geology Rocks: 50 Hands-On Ways to Explore the Earth, pg. 68.

4-H Club Meeting 6
Weather



Supplies

- Paper
- Pens/pencils

Tornado Tubes

- 2 plastic soda bottles (per group)
- Pitcher of water
- Stopwatch
- Tornado tube connectors (purchased from steves-panglerscience.com)
- Glitter
- Beads

Barometer

- Scissors
- Balloon (uninflated)
- Mason jar
- Rubber band
- Straw

This club involves fun, hands-on activities that teach basic science principles. Earthquakes, floods, fires, and extreme weather conditions are all forces of nature found on Earth that we will explore. Today we will discover the science behind tornadoes and build a barometer to forecast the weather!

WHAT TO DO

First, everyone should write their predictions about what will happen during the experiments in their science notebook.

Tornado Tubes

ACTIVITY 1: TORNADO TUBE DIRECTIONS

Time: 25 minutes

1. Fill the soda bottle to the top with water. Connect it to the other soda bottle using the tornado tube connector.
2. Here's the challenge: How long will it take to empty all of the water from one bottle into the other? Record your predictions in your notebook.
3. Without squeezing the sides of the bottle, turn it over and time how long it takes to empty all of the water. Do the test three times and average your results. Keep a table of your results and call this method the glug-glug method. Be sure to use the same amount of water for each trial.

ACTIVITY 1: TORNADO TUBE DIRECTIONS CONTINUED

4. Fill the bottle to the top with water and connect the two bottles just as you did before. However, this time swirl the water by moving the bottle in a clockwise or counter-clockwise motion while the water is pouring out. Keep swirling the water until you see the formation of what looks like a tornado. The water begins to swirl in the shape of a vortex and flows out of the bottle very quickly. This method is called the vortex method. Time this method as you did before and repeat the step several times and average the results.
5. Compare your results from the different tests.
6. Try adding glitter and beads and swirling the water to see what the tornado does.

Barometer

ACTIVITY 2: BAROMETER DIRECTIONS

Time: 20 minutes

1. Cut off the neck of the balloon. Then cut off the tip of the straw diagonally so it comes to a point.
2. Stretch the balloon around the mouth of the jar very tightly so the surface is flat. Put the rubber band around the mouth of the jar and balloon to keep the balloon from slipping.
3. Tape the uncut end of the straw to the center of the balloon, so the pointed tip extends far out from the jar. Try pushing on or pulling the balloon to see how the pointed end of the straw moves.
4. To measure the straw's position exactly, put the jar near a vertical piece of paper so the straw is very close to the paper. You can draw a line on the paper to mark exactly where the straw is today, and then check back after one week to see how it changes.
5. The higher the straw rises, the higher the air pressure; the lower the straw, the lower the air pressure.

Reflect

- How does the tornado tube work?
- Which method allowed the water to exit the bottle more quickly?
- How does a real tornado start?
- What does a barometer do?
- Did the straw show there was high pressure or low pressure?
- How much did the air pressure fluctuate over time?
- Did you test the barometer in different rooms and temperatures? What happened?

Apply

- If you have ever seen a dust devil on a windy day or watched the water drain from a bathtub, you've seen a vortex. A vortex is a type of motion that causes liquids and gases to travel in spirals around a center line. A vortex is created when a rotating liquid falls through an opening. Gravity is the force that pulls the liquid into the hole and a continuous vortex develops. Swirling the water in the bottle while pouring it out causes the formation of a vortex. The vortex looks like a tornado in the bottle. The formation of the vortex makes it easier for air to come into the bottle and allows the water to pour out faster. If you look carefully you will be able to see the hole in the middle of the vortex that allows the air to come up inside the bottle. If you do not swirl the water and just allow it to flow out on its own, then the air and water have to essentially take turns passing through the mouth of the bottle, thus the glug-glug sound. Real tornadoes can sometimes form beneath a super-cell thunderstorm cloud when the upward rising air slowly rotates at mid-levels of the storm. Winds that vary in direction and speed in the layer below the clouds help generate this rotation. Other tornadoes form along small-scale fronts when winds shift directions across them. These shifting winds become the source of rotation when they are drawn closer together by the air that flows into the updraft.
- A barometer measures the pressure of the air around it. When air pressure drops, clouds and rain form. Higher pressure leads to clear skies. Barometers can help us forecast the weather in days ahead. Air is trapped in the jar, pushing outward, and air in the room is pushing inward. When the air pressure in the room changes, it will push harder or less hard on the balloon. If the pressure increases, it pushes harder on the balloon. If the pressure decreases, it won't be pushing down on the balloon as much as the air inside the jar is pushing up. The straw will move one way or another. The change in barometric pressure will help you to forecast the weather. Decreasing air pressure often indicates the approach of a low pressure area, which often brings clouds and precipitation. Increasing air pressure often means that a high air pressure area is approaching, bringing with it clear or fair weather.

Belonging

Working together as a group to conduct and explore these science principles will create a sense of unity as youth work through failure and success.

Science

Youth will explore science behind the weather and use the scientific method to form hypotheses and make observations. They will learn about tornadoes and how a barometer works to forecast the weather.

Independence

The youth should make predictions and help conduct the experiments to find their own answers. Encourage them to problem solve.

Citizenship

Learning about the weather and environmental processes encourages youth to become more aware of their surroundings and protecting the environment.

References

Steve Spangler Science. Tornado Tube. Retrieved from http://www.stevespanglerscience.com.

Nauticus. Make a Barometer. Retrieved from http://www.nauticus.org/activities/pon/pon_barometer.html.

More to Discover

Congratulations on completing your Discover 4-H club meetings! Continue with additional curriculum in your current project area, or discover other 4-H project areas. Check out the following links for additional 4-H curriculum.

1. http://utah4h.org/htm/discover4hclubs
2. http://www.4-h.org/resource-library/curriculum/
3. http://utah4h.org/htm/resource-library/view-all-curriculum

Become a 4-H Member or Volunteer

To **register** your Utah club or individuals in your club visit:

http://www.utah-4.org/htm/staff-resources/4-h-online-support

http://utah4h.org/htm/about-4-h/newto4h/

Non-Utah residents please contact your local 4-H office:

http://www.4-h.org/get-involved/find-4-h-clubs-camps-programs/

Stay Connected

Visit Your County Extension Office

Stay connected with 4-H activities and news through your county Extension office. Ask about volunteer opportunities and don't forget to register for your county newsletter. Find contact information for counties in Utah here:

http://extension.usu.edu/htm/counties

Enjoy the Fair!

Enter your project or create a new project for the county fair. Learn about your county fair and fair judging here:

http://utah4h.org/htm/events-registration/county-fairs

Participate in Local or State 4-H Activities, Programs, Contests or Camps

For Utah state events and programs visit:

http://utah4h.org/htm/events-registration

http://www.utah4h.org/htm/featured-programs

For local Utah 4-H events and programs, visit your county Extension office.

http://extension.usu.edu/htm/counties

Non-Utah residents, please contact your local 4-H office.

http://www.4-h.org/get-involved/find-4-h-clubs-camps-programs/

Discover *Service*

Become a 4-H Volunteer!

http://www.youtube.com/watch?v=UBemO5VSyK0

http://www.youtube.com/watch?v=U8n4o9gHvAA

To become a 4-H volunteer in Utah, visit us at:

http://utah4h.org/htm/about-4-h/newto4h/

Serve Together as a 4-H Club or as an Individual 4-H Member

Use your skills, passions, and 4-H to better your community and world. You are needed! Look for opportunities to help in your area or participate in service programs that reach places throughout the world (religious groups, Red Cross, etc.).

Hold a Club Service Project

USU Collegiate 4-H Club hosted "The Gift of Giving" as a club activity. Club members assembled Christmas stockings filled with needed items for CAPSA (Community Abuse Prevention Services Agency).

http://tinyurl.com/lu5n2nc

Donate 4-H Projects

Look for hospitals, nursing homes, or other nonprofit organizations that will benefit from 4-H projects. Such projects include making quilts for CAPSA or Primary Children's Hospital, or making beanies for newborns. During Utah 4-H State Contests, 40 "smile bags" were sewn and donated to Operation Smile.

Partner with Local Businesses

92,000 pounds of processed lamb, beef, and pork were donated to the Utah Food Bank in 2013 by multiple companies.

http://tinyurl.com/pu7lxyw

Donate Money

Clubs or individuals can donate money gained from a 4-H project to a worthy cause. A nine-year-old 4-H member from Davis County donated her project money to help a three-year-old battle cancer.

http://tinyurl.com/mqtfwxo

Give Us Your *Feedback*

Help us improve Discover 4-H curriculum. We would love feedback or suggestions on this guide; please go to the following link to take a short survey:

http://tinyurl.com/lb9tnad