



DISCOVER



4-H PLANET ENERGY CLUBS





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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).



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.

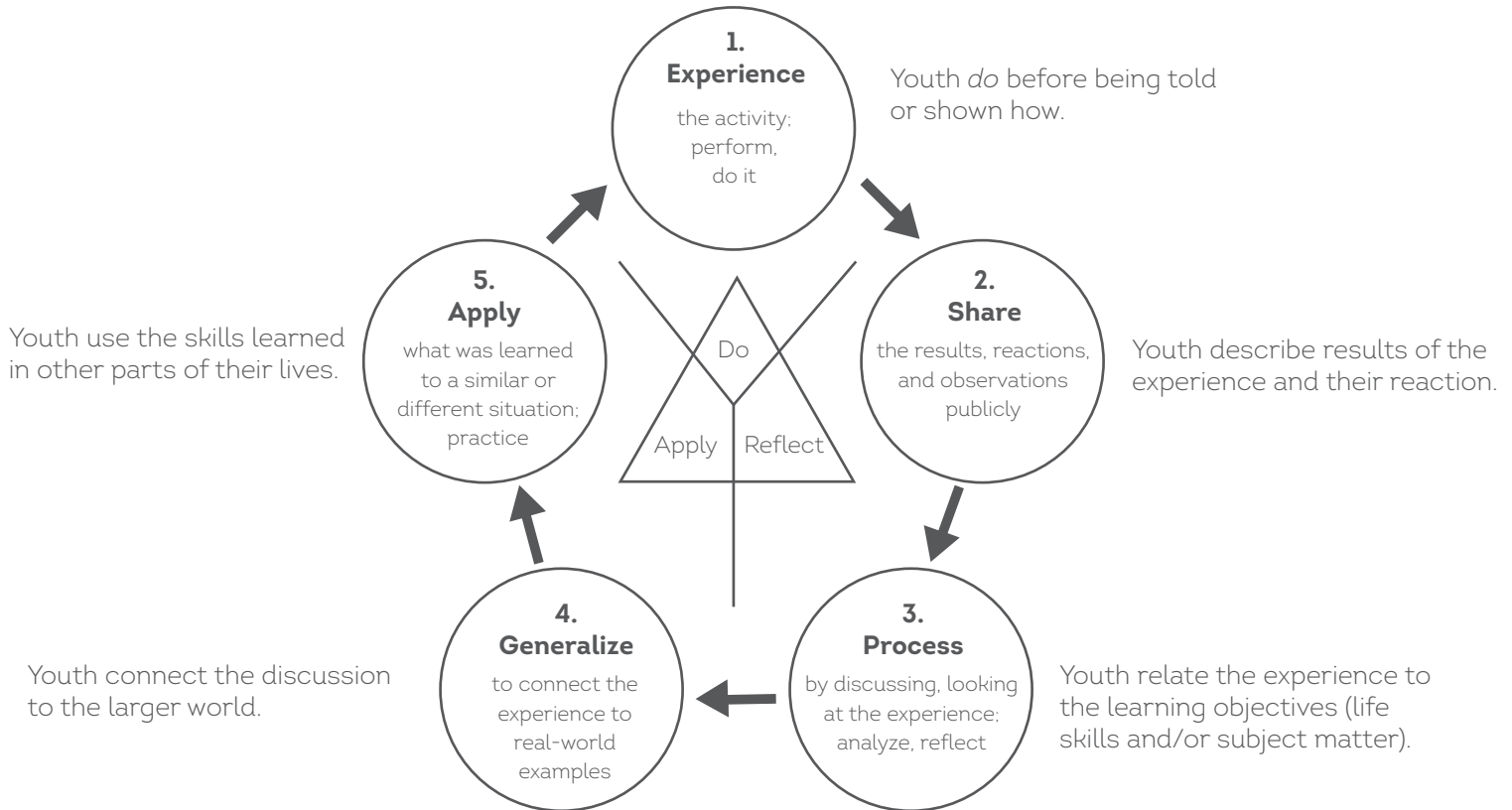
1. **Belonging:** a positive relationship with a caring adult; an inclusive and safe environment.
2. **Mastery:** engagement in learning; opportunity for mastery.
3. **Independence:** opportunity to see oneself as an active participant in the future; opportunity to make choices.
4. **Generosity:** opportunity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

- Citizenship:** connecting youth to their community, community leaders, and their role in civic affairs. This may include: civic engagement, service, civic education, and leadership.
- 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.
- 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.Utah4-h.org

National 4-H website: www.4-h.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 PLANET ENERGY CLUB *Meetings*



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4-H *Club Meeting 1*

Pizza Box Solar Oven



Supplies

- Paper
- Pens/pencils

Pizza Box Solar Oven

- Pizza box
- Newspaper
- Tape
- Scissors
- Black construction paper
- Clear plastic wrap
- Aluminum foil
- Ruler/stick
- Marshmallows
- Graham crackers
- Chocolate bars

In this club we will discover the power of light, motion, and heat energy. Today we will explore solar energy and how to make your very own solar oven out of a pizza box!

WHAT TO DO

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

Pizza Box *Solar Oven*

EXPERIMENT 1: PIZZA BOX SOLAR OVEN DIRECTIONS

Time: 40 minutes

1. Make sure the lid on the pizza box is closed. Place a piece of notebook paper in the center of the lid of the box and trace its outline onto the lid. Set the piece of paper aside.
2. Carefully cut the two long edges and one of the short edges of the rectangle that you just traced on the lid of the box, forming a flap in the cardboard.
3. Gently fold the flap back along the uncut edge to form a crease.
4. Wrap the underside (inside) face of the flap with aluminum foil. Tape the foil to the other side so that it is held firmly. Try to keep the tape from showing on the foil side of the flap.
5. Open the box and cover the bottom of the box with black construction paper.
6. Roll up newspaper and fit it around the inside edges of the box. It should be 1-1½ inches thick. Use tape to hold the newspaper in place, but only tape it to the bottom of the box and not to the lid.



EXPERIMENT 1: PIZZA BOX SOLAR OVEN CONTINUED

7. Cut two pieces of plastic wrap an inch larger than the flap opening on the top of the box. Open the box and tape one piece of plastic wrap to the underside of the flap opening. After taping one side, **BE SURE TO PULL THE PLASTIC WRAP TIGHT**, and tape down all four sides so the plastic is sealed against the cardboard. Then close the box and tape the other piece of plastic wrap to the top opening. Again, be sure the wrap is tight and tape down all four edges to form a seal.
8. Use the S'mores ingredients or find another treat to warm up in your solar oven. Open the box and put the treat in the center, then close the box.
9. Now open the flap and rotate the box so the foil is facing the sun. The shadow of the flap should go straight back from the box. Move the flap up and down and note how it reflects the sunlight.
10. Use a ruler or a stick to prop up the flap so that it reflects the sunlight directly into the box.
11. If it is cold outside, put a towel or blanket under the box so the bottom doesn't get cold.
12. Wait about a half hour for the box to warm in the sun, and then enjoy the warmed treat!

At the end of the experiments, everyone should write down their observations and the results of the experiment and then discuss them as a group.



Reflect

- How long did it take the solar oven to warm your treat?
- How do you think the weather affected this experiment?
- What was the purpose of the aluminum foil?
- Do you think this experiment would still work if you used a different color of construction paper?
- What is the purpose of the rolled up newspaper?
- Why was it important to have the plastic wrap tightly sealed?

Apply

- Solar energy is the technology used to harness the sun's energy and make it usable. The foil on the flap reflects the sunlight into the box and directs it onto the treat inside. The black paper on the bottom helps to absorb the heat from the sun. Darker colors, especially black, absorb heat from the sun, while lighter colors reflect the sun. The rolled up newspaper insulates the heat inside the box. The plastic wrap works as air insulation, which is why it is important that the wrap is sealed tightly.



Science

Youth will explore different kinds of energy and use the scientific method to form hypotheses and make observations. They will discover basic science principles found in creating a solar oven.

Belonging

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

Mastery

Not every experiment works the first time. Make sure you are following the directions precisely. Keep trying until you are satisfied with the results.

Independence

The youth should make predictions and help conduct the experiments to find their own answers. Encourage them to look for solutions if there are any problems with the experiments.

Citizenship

Learning about different energy forms will help youth become more aware of the environment and learn how to conserve energy by looking for alternate energy solutions.

References

Solar Now. Making a Pizza Box Solar Oven. Retrieved from <http://www.al-solar.org/newsletters/2009-03/Making%20a%20Pizza%20Box%20Solar%20Oven.pdf>.

National Geographic. Solar Energy. Retrieved from http://environment.nationalgeographic.com/environment/global-warming/solar-power-profile/?rptregcta=reg_free_np&rptregcampaign=20130916_rw_membership_r1p_w#register.



4-H Club Meeting 2

Sun Paper Printing



Supplies

- Paper
- Pens/pencils

Sun Paper Printing

- Sun sensitive paper (purchased from stevespanglerscience.com)
- Water
- Clear container
- Cardboard
- Push pins
- Clear plastic wrap
- Small objects to be printed on paper (For example, leaves work great!)

In this club we will discover the power of light, motion, and heat energy. Today we will explore the nature of sunlight and how light-sensitive chemicals work!

WHAT TO DO

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

Sun Paper *Printing*



EXPERIMENT 1: SUN PAPER PRINTING DIRECTIONS

Time: 30 minutes

1. Place your sun print paper, blue side UP, onto the piece of cardboard and use push pins to keep it in place.
2. Place the objects you wish to "print" on top of the paper. If your objects are particularly lightweight, you can hold them in place by using clear plastic wrap.
3. Expose the paper to the sun for 2-4 minutes, until the sun paper turns a very pale blue.
4. While the paper is sitting in the sun, fill the clear container with water.
5. Take the objects off the paper and remove it from the cardboard. Soak the paper in the water for 1 minute. The clear container allows you to better observe the change that happens when the paper is placed in the water.
6. Remove the paper from the water and let it dry flat. The image will sharpen as it dries.

At the end of the experiment, everyone should write their observations and the results of the experiment, then discuss them as a group.





Reflect

- What happened when you placed the paper in the sun?
- How do you think the paper works?
- Do you think you could make your own light-sensitive paper?
- What objects worked the best on the paper?
- Will this paper still work on a cloudy day?

Apply

- The sun print paper is coated with light-sensitive chemicals, which react to light waves and particles when exposed to light. When you place objects on the paper, they block the light and turn white while the paper around them turns blue. Water stops the process and fixes the images on the paper. In the lab, photosensitive paper is made by coating a sheet of paper with a water-soluble, bluish-green compound called iron III hexacyanferrate III. The common name for this chemical is Berlin green, a well-known photosensitive chemical. When exposed to ultraviolet light (UV), a chemical reaction takes place where the water-soluble Berlin green changes into a water-insoluble chemical called iron III hexacyanferrate II. The common name for this chemical is Prussian blue. When you rinse your print in water, the water-soluble Berlin green washes away, but the water insoluble Prussian blue remains fixed on the paper. The intensity of the Prussian blue depends on the amount of time the paper is exposed to the light source and the intensity of the light source. For example, the sun paper will not work nearly as well on a cloudy day as it will on a sunny day.



Science

Youth will explore different kinds of energy and use the scientific method to form hypotheses and make observations. They will discover the nature of sunlight and how light-sensitive chemicals work.

Belonging

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

Independence

The youth should make predictions and help conduct the experiments to find their own answers. Encourage them to look for solutions if there are any problems with the experiments.

Citizenship

Learning about different energy forms will help youth become more aware of the environment and learn how to conserve energy by looking for alternate energy solutions.

References

Steve Spangler Science. Sun Sensitive Paper. Retrieved from <http://www.stevespanglerscience.com/>.



Supplies

- Paper
- Pens/pencils

Soap Powered Boat

- Markers
- Styrofoam plates (4)
- Styrofoam bowls (2)
- Styrofoam cups (2)
- Flexible straws (2)
- Glue
- Liquid dish soap
- Water
- Inflatable kiddy pool

In this club we will discover the power of light, motion, and heat energy. Today we will explore water molecules and surface tension and find out how to construct a boat that is powered by soap!

WHAT TO DO

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

Soap Powered *Boat*



EXPERIMENT 1: SOAP POWERED BOAT DIRECTIONS

Time: 20 minutes

1. Fill the inflatable pool with water.
2. To make a boat, glue two plates together face to face so the top edges meet.
3. Glue the bowl upside down on top of one of the plates.
4. Poke a hole near the bottom of the cup and then glue the bottom of the cup to the bottom of the bowl. Put the short end of the flexible straw through the hole in the cup.
5. Make two boats. When the glue dries, decorate the boats with markers.
6. To make the boat move, just set it in the water, pour water into the cup, and watch it go.
7. Now here is where things get sudsy. Mix liquid dish soap with water and pour it into the cup on top of the boat.

At the end of the experiment, everyone should write their observations and the results of the experiment, then discuss them as a group.





Reflect

- How do you think the boat moved forward?
- What kinds of things affected the speed of the boat?
- Did the boat move faster with the water or soapy water?
- What other liquids could you try to move the boat with?

Apply

- When you put water into a cup without a hole, the water pushes on the cup in all directions. When you put a hole in the cup, part of the cup is missing, so the water can no longer push there, but the water can still push on the other parts of the cup. That's what moved the cup and the boat along.
- The attraction between water particles at the water's surface produces surface tension. This gives the surface a skin-like quality. Think of this thin, skin-like quality like a balloon. Adding liquid soap is like popping the balloon. You break the surface tension; the thin "skin" breaks away and pulls to the sides. If there is something floating on these water particles, like the boat, it goes along for a ride!



Science

Youth will explore different kinds of energy and use the scientific method to form hypotheses and make observations. They will learn about water molecules and surface tension.

Belonging

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

Independence

The youth should make predictions and help conduct the experiments to find their own answers. Encourage them to look for solutions if there are any problems with the experiments.

Mastery

Not every experiment works the first time. Make sure youth are following the directions precisely, then keep trying until they are satisfied with the results.

References

PBS Kids. Soap Powered Boat. Retrieved from <http://pbskids.org/zoom/activities/sci/soappoweredboatii.html>.



4-H Club Meeting 4

Hot Air Balloon



Supplies

- Paper
- Pens/pencils

Hot Air Balloon

- Garbage bags (lightweight)
- Straws
- Tape
- Thread
- Cereal box
- "Trick" birthday candles
- Matches/lighter
- Scissors

In this club we will discover the power of light, motion, and heat energy. Today we will explore heat energy and how it powers a hot air balloon!

WHAT TO DO

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

Hot Air *Balloon*



EXPERIMENT 1: HOT AIR BALLOON DIRECTIONS

Time: 20 minutes

1. Find a suitable plastic bag. Garbage bags work, but they need to be lightweight. If you cannot find a light weight trash bag then you can try a plastic grocery bag.
2. Attach straws together to form a circle with a diameter of about 10 inches. Do this by twisting the end of a straw and inserting it into the end of another straw and so on. Do this without using tape or glue.
3. Tape the opening of the bag to the circle of straws. Use lightweight tape and use it sparingly.
4. Cut a 2-inch square out of the cereal box. Poke four small holes that are equidistant near the center. The holes should be slightly smaller than the candles that will be put in them, for a snug fit.
5. Tie a 12-inch piece of thread to each corner of the cardboard square.
6. Insert four candles into the holes. You may need to adjust the center of gravity for the cardboard candle holder to hang properly.
7. Connect the candle holder to the balloon's opening with the four threads so that it hangs down below the balloon. Make sure it is about a foot away from the balloon.





EXPERIMENT 1: HOT AIR BALLOON CONTINUED

8. Light the candles and let it float away!

Tip: Be careful not to do this around trees or anything that might catch fire! Make sure to find your balloon and dispose of it so as not to litter.

At the end of the experiment, everyone should write their observations and the results of the experiment and then discuss them as a group.



Reflect

- How high did your balloon float?
- Did you encounter any problems while making the hot air balloon?
- Why is it important to keep the balloon lightweight?
- Why is it better to use trick candles instead of regular ones?
- What causes the balloon to stay up in the air?
- Have you ever been in a real hot air balloon before?

Apply

- Hot air balloons are based on the basic scientific principle that warmer air rises in cooler air. Since hot air is lighter and less dense than the cool air around the balloon, the heated air causes the whole balloon to rise. When the air inside the balloon cools down, or when the hot air is let out, the balloon goes down. In a real hot air balloon, a gas burner is used to heat the air to a temperature of about 212°F.



Science

Youth will explore different kinds of energy and use the scientific method to form hypotheses and make observations. They will learn about air density and heat energy.

Belonging

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

Independence

The youth should make predictions and help conduct the experiments to find their own answers. Encourage them to look for solutions if there are any problems with the experiments.

Mastery

Not every experiment works the first time. Make sure youth are following the directions precisely, then keep trying until they are satisfied with the results.

References

Harris, Tom (2001, February 16.) How Hot Air Balloons Work. Retrieved from <http://www.howstuffworks.com/transport/flight/modern/hot-air-balloon.htm>.

WikiHow. How to Make a Mini Flyable Hot Air Balloon with Candles. Retrieved from <http://www.wikihow.com/Make-a-Mini-Flyable-Hot-Air-Balloon-with-Candles>.

PBS Kids. Hot Air Balloon. Retrieved from <http://pbskids.org/zoom/activities/sci/hotairballoon.html>.



Human Conductor of Electricity/Energy Stick



Supplies

- Paper
- Pens/pencils

Human Conductor of Electricity

- Florescent light tube
- Wool sweater
- Balloon

Energy Stick

- Energy stick (purchased from stevespanglerscience.com)

In this club we will discover the power of light, motion, and heat energy. Today we will explore the nature of electricity and how you can be a human conductor of it!

WHAT TO DO

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

Human Conductor of *Electricity*



EXPERIMENT 1: HUMAN CONDUCTOR OF ELECTRICITY DIRECTIONS

Time: 25 minutes

1. Darken the room. Hold the florescent tube in one hand and the balloon in the other. Rub the balloon vigorously on your hair or sweater.
2. Bring the balloon near the bulb and watch what happens. Move the balloon up and down the florescent tube without it touching the bulb. The light should follow the balloon.
3. Touch the balloon to the glass and see if you can get a spark to jump.

At the end of the experiment, everyone should write down their observations and the results of the experiment and then discuss them as a group.



EXPERIMENT 1: ENERGY STICK DIRECTIONS

1. The energy stick will buzz and flash lights when the electric circuit is completed.
2. To complete the circuit, put one hand on each side of the stick.
3. Try creating a larger circuit by having everyone in a circle hold hands. Experiment with holding hands, touching fingers, touching noses, etc. Be creative!
4. Try using the energy stick to test conductors and insulators. Cover the electrodes on the end of the stick with different materials and then grip the material around the end of the stick. You might be surprised with some of the materials you test.

At the end of the experiment, everyone should write down their observations and the results of the experiment and then discuss them as a group.



Reflect

- What happened when you rubbed the balloon on your hair?
- What happened when the balloon touched the light bulb?
- How does the balloon create electricity?
- How does the energy stick work?
- How many people were in your largest circuit? Did it still work?
- What different materials did you test as conductors and insulators?
- Were you surprised at the materials that conducted electricity?

Apply

- Electrons are relatively free to jump from one to the next, and they are attracted to some materials more than others. When you rub a balloon on your hair, electrons from your hair jump over to the balloon and stay there.
- The inside of a fluorescent tube is coated with a white material made up of phosphors. If you bombard phosphors with ultraviolet light, the tube will emit visible light. In normal operation, the fluorescent tube is connected to a source of electrical current. The current supplies electrons that slam around the inside of the tube. Inside the tube there is also mercury vapor. When the electrons collide with the mercury vapor, they cause the vapor to emit ultraviolet light, which hits the phosphors and the tube lights up. Bringing a negatively charged balloon near a fluorescent tube stirs up the electrons in the mercury vapor. This produces an electrical current, which excites the mercury atoms. The excited mercury atoms emit ultraviolet light and cause the phosphors to glow. When a spark jumps, you get a big release of energy and a correspondingly brighter glow.



Apply Continued

- The Energy Stick's sensing circuit is so sensitive that it can detect even the smallest amount of electricity that travels across your skin. It is completely safe and is a great way to learn about conductors of electricity. The Energy Stick teaches about the science of electricity and circuits. Electricity is defined as the flow of electrons through a circuit. In order for the stick to become activated, the two ends must be connected in a circle by something that allows electrons to flow through it.



Science

Youth will explore different kinds of energy and use the scientific method to form hypotheses and make observations. They will learn about the nature of electricity and how to form circuits to create energy.

Belonging

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

Independence

The youth should make predictions and help conduct the experiments to find their own answers. Encourage them to look for solutions if there are any problems with the experiments.

Mastery

Not every experiment works the first time. Make sure youth are following the directions precisely, then keep trying until they are satisfied with the results.

References

Steve Spangler Science. Energy Stick. Retrieved from <http://www.stevespanglerscience.com/>.

4-H Club Meeting 6

UV Beads and Sunscreen



Supplies

- Paper
- Pens/pencils

UV Beads and Sunscreen

- Color changing UV beads
- Sunscreen (various brands, SPF, etc.)
- Ziploc bags
- Marker

In this club we will discover the power of light, motion, and heat energy. Today we will explore ultraviolet light and use UV beads to test the sun protection power of different sunscreens!

WHAT TO DO

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

UV Beads and Sunscreen

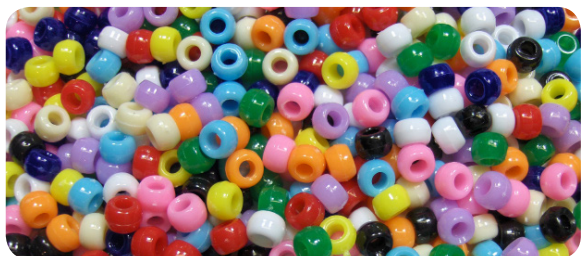
EXPERIMENT 1: UV BEADS AND SUNSCREEN DIRECTIONS

Time: 25 minutes

1. Place a hand full of beads in each Ziploc bag. Use the marker to label each bag with each type of sunscreen you are using. Make sure to leave one bag blank so that you can use it for comparison.
2. Apply a layer of sunscreen to each corresponding Ziploc bag.
3. Expose the beads to direct sunlight for 5 minutes and look for any changes in color.
4. The beads will always change color regardless of how well the sunscreen blocks UV- the beads are very sensitive!
5. The key is to rate the color of beads on a scale from 1-5, with 5 showing the most color or "burning" and 1 showing the least amount of color.
6. The bag without sunscreen is an automatic 5.
7. You can also test the difference between new and old sunscreens. Sunscreen manufacturers suggest you throw away old sunscreen because it does not block out harmful UV light.

At the end of the experiment, everyone should write their observations and the results of the experiment and then discuss them as a group.





Reflect

- Which sunscreen worked the best?
- How can the sun be harmful to our skin?
- What did you learn from doing this experiment?
- Did you get the results you expected?
- Why is it important to use sunscreen?

Apply

- UV beads have a chemical substance embedded in the plastic that will change color when exposed to UV radiation (sunlight). The beads will remain white indoors as long as they are kept away from windows or doors where UV light can leak into the room.
- The UV beads contain different pigments that will change color when exposed to ultraviolet light from any source, including the sun. The beads are all white in visible light. In UV light, depending on the pigment, they will change colors. Each bead will change color about 50,000 times before the pigment will no longer respond to UV light.
- The term "light" is often used as a generic word to describe many different forms of light such as incandescent light, florescent light, or sunlight for instance. However not all light is made up of the same energy. Using energy beads youth will be able to uncover an invisible form of light energy called ultraviolet light. None of the energy in the ultraviolet region of the light spectrum is visible to the naked eye. Just as there are many different colors of wavelength in the visible spectrum (red, yellow, green, blue, etc.), there are also many wavelengths of ultraviolet light.
- UV beads are the perfect tool for understanding how solar radiation can be harmful and to recognize preventive measures that can be taken to reduce the risks associated with exposure to sunlight. When you expose bare skin to sunlight, it will either burn or tan, which doctors warn is still not healthy for your body. UV radiation wavelengths are short enough to break chemical bonds in your skin tissue, and with prolonged exposure, your skin may wrinkle or skin cancer may appear. These responses signal that the cells under your skin are being assaulted by UV radiation.



Science

Youth will explore different kinds of energy and use the scientific method to form hypotheses and make observations. They will learn about UV light and about the sun protection factor of different sunscreens.

Belonging

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

Independence

The youth should make predictions and help conduct the experiments to find their own answers. Encourage them to look for solutions if there are any problems with the experiments.

Mastery

Not every experiment works the first time. Make sure youth are following the directions precisely, then keep trying until they are satisfied with the results.

Healthy Living

It is important to take care of your body and protect your skin from harmful UV rays. This experiment will help you find a sunscreen that is powerful enough to protect your skin.

References

Steve Spangler Science. Color Changing UV Beads. Retrieved from <http://www.stevespanglerscience.com/>.



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>