Activity Title: Energy from the Sun

Recommended Grades

Kindergarten, Grade 1, Grade 2, Grade 3, Grade 4, Grade 5

Curriculum Connections

Matter
- 1 – properties of objects (measurements, e.g., size of transparent paper)
- 2 – properties of materials (combine materials to create an object, transparency)

Energy
- 2 – sources of light (the Sun)
- 5 – renewable energy (solar)

Earth Systems
- K – changes in environment (sunlight)
- 3 – Earth is heating up from natural and human causes (relate to greenhouse effect, clean energy)
- 4 – Earth's surface is warmed by the Sun, conservation (electricity)

Computer Science
- K – instructions to be followed, have steps
- 1 – instructions to be followed, have steps

Time

10-20 minutes

Skills Focused On

- Creativity
- Decision-making
- Innovation
- Resourcefulness

Materials Needed

- Clear (transparent) adhesive paper
- Tissue paper, many colours
- Scissors
- Tape
- Hole punch
- Piece of string

- *Optional:* Template (create with paper and a marker)

Background Information

What is energy? Energy is the ability to do work and it is all around us - in the food we eat, in the car driving down the street, in the lights in your house. We all use energy everyday.

Most of the energy we use starts with the Sun. The Sun shines and makes plants grow. These plants are eaten by animals, including us humans, to give us energy. But a long long time ago, some plants died, were buried for millions of years and turned into fossil fuels, and now we can use the sunlight they captured all those years ago to run our cars, industries and much more. But can we use energy directly from the Sun?

Yes! One of the most promising technologies for a greener future are solar panels. These panels are capable of turning sunlight directly into the electricity we use to power our houses, schools, and even our phones. But what is electricity and what is it made of?

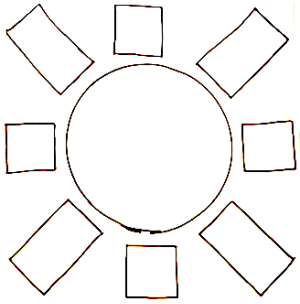
Everything you see – a chair, a tree, a wall – is made of atoms. These tiny little pieces contain a nucleus and electrons. Electrons are little charged particles that orbit the nucleus. Normally these electrons are stuck circling the nucleus, but some atoms like to share their electrons with their neighbours and this allows electrons to move from one atom to the next. This movement of electrons from one atom to the next is what happens in the wire that charges your computer. Electrons travel from the plug on the wall along the wire and to your computer.

But, what makes these electrons move? A soccer ball in the grass doesn't move until you kick it – you have to use the energy from your foot to push the ball to get it to move. This is what a solar panel is able to do! Solar panels are made of atoms. When light shines on a solar panel, the sunlight gives the electrons enough energy to be able to move. Solar panels provide the driving force to push the electrons along the wire. One day we might use sunshine to power entire cities!

Today, we aren’t going to make a solar panel at home, as cool as that would be. We are going to make stained glass windows to catch the rays of the Sun, something that will remind us of the amazing power of the Sun.

Experimental Steps

1. Before you start, draw your template on a piece of paper. I chose to draw a sun that looks like this:



2. Tape your template down to the table.
3. Cut or rip your tissue paper into small pieces.
4. Cut a piece of transparent paper about the same size as your template.
5. Remove the backing of your transparent paper and tape it over the template with the sticky side up.
6. Fill in the template with little pieces of tissue paper. You could do all one colour or lots of colours.
7. When you have filled the whole image, take another piece of transparent paper about the same size and remove the backing. Lay it on your completed image to make a sandwich.
8. Remove the tape holding the window to the table. If you can't get the tape off, you can just trim the edges to remove any sticky bits where it didn't meet perfectly.
9. *Optional:* use coloured tape to make a border.
10. Use the holepunch to make a hole at the top of the stained glass window and tie a piece of string to make a hanger.
11. Find a big window full of sunlight to hang up your masterpiece! Don't forget to keep learning about all the energy around you!

Discussion/Experimental Extensions

Discuss the benefits and challenges of solar energy.

Benefits - There are a lot of great things about solar energy and solar panels. Solar energy never runs out – so long as the Sun exists, we'll have solar energy! Because it is not a fossil fuel, solar energy can also reduce greenhouse gas emissions which contribute to climate change. This can be done on a small scale by individuals, like using solar panels on your roof to power your house, or on a large scale, like using entire fields of panels to power a city. Solar panels are quiet and relatively cheap compared to other renewable methods.

Challenges - Can you think of any challenges with solar energy? Well, the Sun doesn't always shine. Sometimes it is cloudy, sometimes it's night. Especially in the winter here in Edmonton, it is dark a lot of the time. Sunlight is intermittent, which means solar panels can't produce electricity all the time - however, we need to know that we have electricity whenever we need it.

One way to deal with this is through energy storage! We can store any extra energy we don't use so it can be used later. But energy storage can be expensive and take up a lot of space. It may be okay for your house, but how do we deal with it for an entire city? There are researchers looking for those solutions. Another challenge is efficiency. The amount of sunlight turned into electricity is generally between 11-19% according to Clean Energy BC, which means a lot of wasted sunlight. Again researchers are searching for ways to improve efficiency so that we can collect more energy from solar panels!

Additional Resources

Energy From the Sun experimental video produced by Future Energy Systems - provides background information and instructions for experiment: https://youtu.be/FnojVFJ9bPw.

This video was produced as part of Future Energy Systems Learning Resources, by Valerie Miller, Future Energy Systems Outreach and Engagement Lead, with the assistance of Aaron Kirkey, MSc.

Additional references:
Clean Energy BC https://www.cleanenergybc.org/
Craft Reference: https://www.cbc.ca/parents/play/view/easy-contact-paper-sun-suncatcher

This activity was developed by Future Energy Systems as part of a larger collaboration with WISEST (Women in Scholarship, Engineering, Science and Technology) and Cybermentor to provide meaningful STEM (science, technology, engineering and mathematics) activities to the Girl Guides of Alberta. This collaboration was made possible through the support of the Natural Sciences and Engineering Research Council of Canada (NSERC) Promoscience Grant.

Learn more about Future Energy Systems (https://www.futureenergysystems.ca/) and access more learning content, including storytimes, lab tours, ask an experts and more (https://www.futureenergysystems.ca/engage/learning https://www.youtube.com/channel/UCJr8N9KyFJ6d-t36TPtUlwg).