Ida and Markus

make things happen

Teacher Guide

scanpartner.no • 10-2012

IDA AND MARKUS MAKE THINGS HAPPEN

Learning about energy and energy conservation is an important way for young children to understand and explore positive environmental behaviours and attitudes. We know that young children acquire a lot of information during their early years, and it is therefore important that learning about energy finds its place in everyday preschool life.

In many countries, there has been little focus on environmental education in preschools. This activity pack is designed to help preschool staff in their efforts to teach young children about energy and energy conservation.

The teaching programme is the result of collaboration between Trondheim municipality's Children's Green City project, the Trondheim Science Centre, and various preschools in Trondheim, Norway. The local network of Green Flag-certified preschools in Trondheim has been crucial to this work, both in highlighting the need for this type of teaching aid, and coming up with great ideas for activities and testing them in practice. Children's Green City would like to thank everyone who has contributed to making this training pack possible.

Good luck with the important environmental work in your preschool!

LINKS TO THE NORWEGIAN CURRICULUM

Ida and Markus make things happen is based on the goals set out in Norway's national curriculum for preschools. In particular, the curriculum emphasises importance of both formal and informal learning, and how these forms of learning should fit together.

In working toward these goals, staff are required – through word and deed – to promote an understanding of sustainable development, and to select literature and activities that promote such an understanding that builds on and further develops children's everyday experiences with technical toys and technology.

We hope the this activity pack can help to achieve these goals.

This activity pack is also suitable for primary school children.

ACTIVITY 1)
WE SOW CRESS

AIM:
The aim for this activity is to focus on the sun as our main energy source.
All life on Earth depends on the sun. The sun makes things grow.

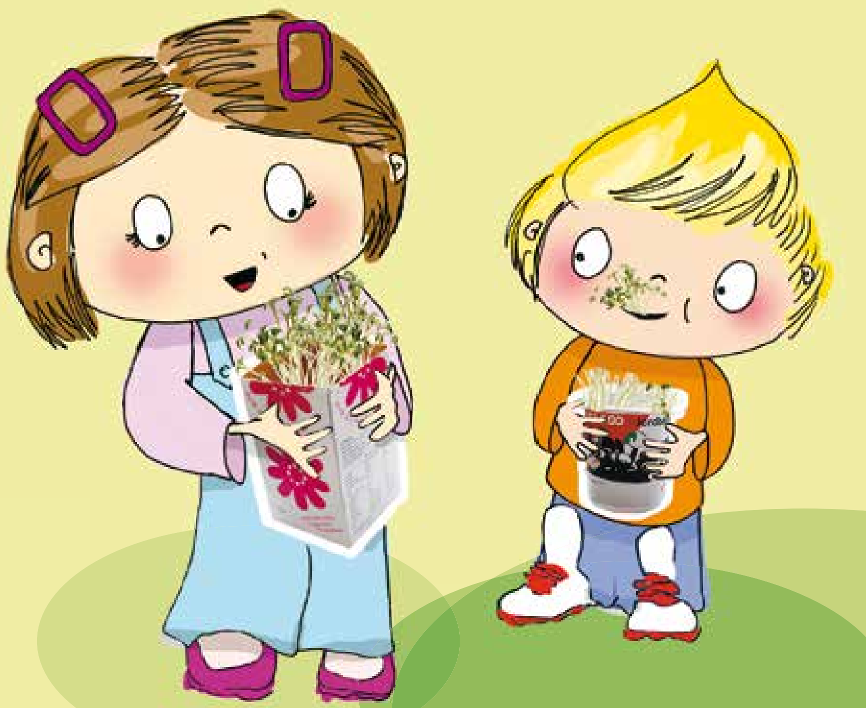
TIME REQUIRED:
Approximately 30 minutes to sow the seeds
First seedlings: A few days
Finished cress: Approximately one week

EQUIPMENT:
Cress seeds
Soil or cotton wool
Clipped milk cartons or bowls
Paper hats to put over some of the “pots” to block out sunlight

INSTRUCTIONS:
Start by collecting empty milk cartons and rinsing them thoroughly. Cut off and discard the top of the carton, approx. 10 cm from the base. Write the children’s names on the cartons. Fill them with soil or cotton, and sow the cress seeds. Remember: Always water after sowing. NB! Cress seeds are very eager and do not need deep soil to germinate. The seeds also germinate well on cotton. Too little soil, on the other hand, will dry out quickly – over the weekend, for example. Bear these two things in mind when choosing how much soil to use.

IDEAS TO DISCUSS:
Compare the cress plants that got plenty of light with those that had less access to light. How many days did it take until the seeds began to germinate? When did you see the first sprouts appear? Do the plants smell of anything? How long was it before the first leaves began to appear? How tall are the plants after a week? What does cress taste like? What can you use it for?

WHAT WE CAN LEARN:
Seeds are totally dependent on light from the sun in order to both germinate properly and to grow to be big and green plants. If they do not get enough sun, they are thin and almost colourless. The sun is our main source of energy.



ACTIVITY 2)
WHIPPED CREAM

AIM:
The purpose of this activity is to show that when our bodies are supplied with energy in the form of food, we get new power / energy and can do work. This work may be to produce new food: here we will whip cream.

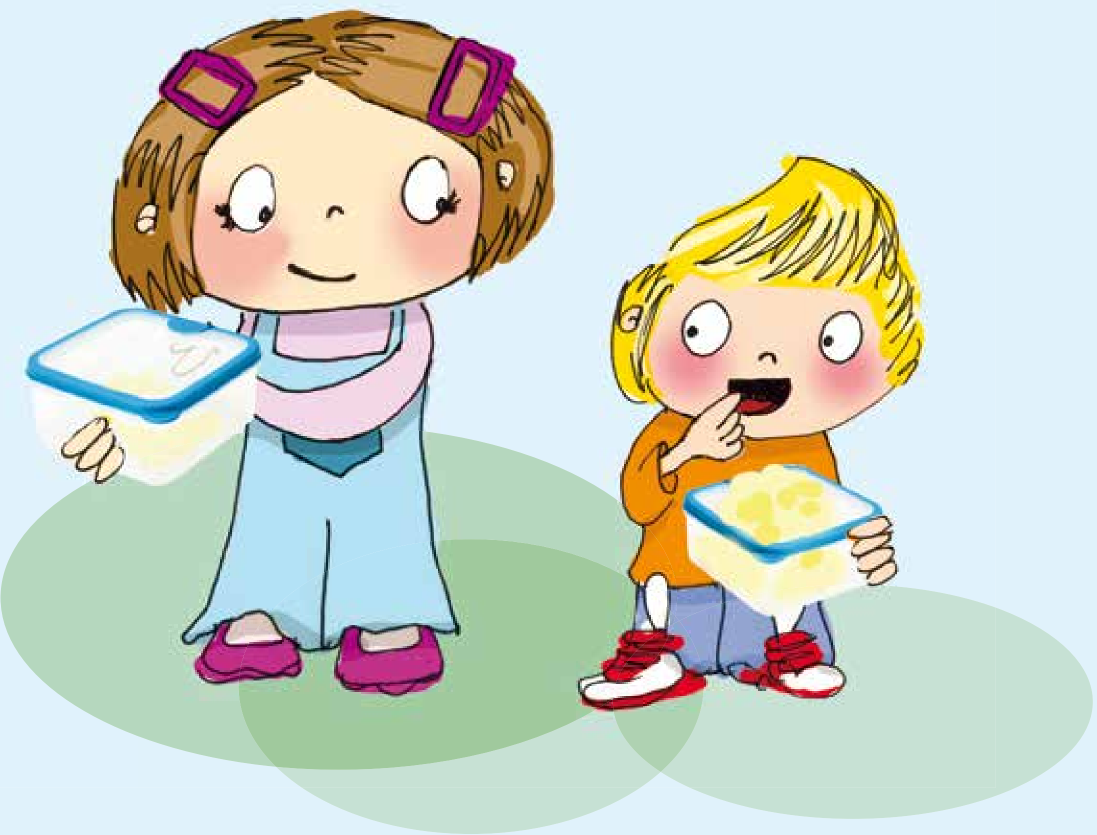
TIME REQUIRED:
30 min once the equipment is obtained.

EQUIPMENT:
Cream
Bowl
Whisk / Hand beaters
Electric mixer

INSTRUCTIONS:
Pour the cream into the bowl (put the bowl on a damp cloth so it does not slip). Divide the children in several groups, and allow them to take turns to whip the cream with the whisk until they notice they’re getting a little tired from the effort. Try making whipped cream with an electric mixer instead. Does it take a long time?

IDEAS TO DISCUSS:
What does the cream look like when you start? Do you see any changes in the cream when everyone has whipped? What is the first thing that happens? Is it harder to whisk at first, or when the cream begins to thicken? This activity can also be connected to saving electricity by comparing how long it takes to produce the cream by hand in relation to using an electric mixer.

WHAT WE CAN LEARN:
In the cream there are small “particles” that clump together when it is whipped. The longer you whisk, the more the particles clump together, and the thicker the cream becomes.
Muscular energy makes the cream thicker. Electrical energy is more powerful than muscular energy.



ACTIVITY 3)

MAKING BUTTER

AIM:
The purpose of the experiment is to try to make butter from cream using muscular energy. Our body is supplied with energy from food. With this energy we can do work, e.g. make butter.

TIME REQUIRED:
1 hour

EQUIPMENT:
Cream
Box (es) with lid
Marbles

INSTRUCTIONS:
Pour the cream into the box and then add the marbles. Put the lid on tightly and let the kids take turns shaking the box. Record how long you have to shake before it becomes butter. You can add a little salt to the box. When you see that the cream has turned into butter, pour out the buttermilk. Add a little cold water to the box and shake some more. Pour out the water and the butter is ready. Try the butter on bread.

IDEAS TO DISCUSS:
How long does it take before the cream turns to butter?
How does the butter taste?
Can you make butter using electric energy?
Does the butter taste better with a little salt?
What can we use butter for?

WHAT WE CAN LEARN:
Muscular energy is transferred to the cream, until it is converted into butter.
We get tired muscles when we make butter by hand. Butter is made from cream.

ACTIVITY 4)

RUB YOUR HANDS AND FEEL THE HEAT

AIM:
The purpose of this activity is to show that heat is a form of energy. Our bodies produce heat, and the warm feeling can be amplified by rubbing our hands together.

TIME REQUIRED:
15 min, including discussions

EQUIPMENT:
Eager kids with lots of energy

INSTRUCTIONS:
The kids sit on the floor and rub their hands together. They can also work in pairs and rub each other on the back Or they can sit in pairs, cheek-to-cheek. Another variation is for the children to sit so that their hands are almost touching, or with one hand almost touching their partner's cheek, and see what happens. They can also try breathing on their hands and see what happens then.

IDEAS TO DISCUSS:
Do you feel heat when you hold your hands almost against each other (without quite touching)? Is it easier to feel the heat between your hands or between your hand and cheek? Will it feel hot if we rub our hands together? What happens if we stop rubbing our hands together? How does it feel if you breathe on your hands?

WHAT WE CAN LEARN:
When our body is supplied with energy in the form of food it produces energy in the form of heat. We feel this heat when we touch the skin, give each other a hug, and when we hold our hands (almost) together. In this case, the heat radiation from the body helps to warm the air between our hands. We feel the body heat better if we breathe onto the skin. When we rub the skin we feel extra heat due to a "force" called "friction", which helps to provide extra warmth.

ACTIVITY 5)
FOOD THAT ROTS

AIM:
The purpose of this activity is to show that the energy is needed both for food to rot, and to prevent food from rotting. We also see that rotting food leads to energy in the form of heat.

TIME REQUIRED:
One hour to prepare the bread, place equipment and discuss. The experiment should be left for a week or two.

EQUIPMENT:
3 equal slices of bread with pate (or similar)
3 thermometers
3 plastic bags

INSTRUCTIONS:
Spread three slices of bread with pate. It is important to use the same bread and same type of pate. Place the bread slices in separate plastic bags with a thermometer, and close the bags. Place one bag at room temperature in the light, one bag at room temperature but in a dark box, and one bag in the refrigerator. NB! Read the temperature without opening the plastic bags.

IDEAS TO DISCUSS:
What happens to the colour of the food? The food in which bag is changing the most? Which starts to go mouldy first? Is there a difference between the temperatures in the different bags? The bread in which bag kept the longest without going bad? Which bag developed most heat, was it the one that grew mould first / most? What do we need to keep food fresh?

WHAT WE CAN LEARN:
Food stays fresh longer if it is not receiving energy in the form of heat and light. The refrigerator is dark and cold inside. It uses the electrical energy to stay cold. The bag which went mouldy first / most was exposed to both light and heat. When food rots, it produces energy in the form of heat. When you take away the light, the rotting process slows down. By taking the energy and heat from large piles of rotting garbage, you can heat up your house.

ACTIVITY 6)
WHAT IS ELECTRICITY?

AIM:
Electricity can seem like quite an abstract phenomenon. The purpose of this activity is to try to visualize electricity and to give the kids an idea of what this abstract phenomenon actual is.

TIME REQUIRED:
30 min

EQUIPMENT:
Domino pieces

INSTRUCTIONS:
Set up many dominoes vertically in a row with a little less than one domino distance between each domino. When you have a large number, nudge the domino at the end of the row gently so they begin to fall against each other, knocking the line of dominos down in a row. To increase understanding, this activity is done often with activity number 11, "We connect a power circuit with battery".

IDEAS TO DISCUSS:
What happened to the other pieces when you knocked over the one at the end of the row?

WHAT WE CAN LEARN:
When we knock over the first domino it knocks over all the others in turn. This is a picture of what happens in an electric cable or lead. Electricity is actually made up of tiny particles that nudge into each other very quickly. Electric current and electricity are the same thing.

You cannot see electricity, but you can see what it does. The tiny particles that make up electricity are called electrons. These electrons flow through wires and into our houses and together are often known as 'current'. Each electron nudges into the electron in front, which pushes into the next electron and so on. In this way the current moves in the same direction.

ACTIVITY 7)
COUNTING DEVICES THAT USE ELECTRICITY

AIM:
The purpose is to make children aware of our use of energy and the devices and tools that surround us that use electricity.

TIME REQUIRED:
One hour of counting, discussion and visualization of the number counted

EQUIPMENT:
Kids who want to count
"Counting equipment" such as Duplo or Lego blocks

INSTRUCTIONS:
Divide the kids into groups so that each group can count electrical devices in a different room, by placing a coloured duplo block next to each device. Each group should use different coloured blocks. If there are young children, the adults can help to place the blocks. The kids then collect the blocks. When the blocks are collected, you can build towers of each colour. This will allow you to see the room that had the most electrical devices. A drawing of the towers can be used as a simple bar graph, with each tower as a column.

IDEAS TO DISCUSS:
Which room had the most electrical devices? Do all electrical devices use the same amount of power? What happens if we turn off the electrical devices?

WHAT WE CAN LEARN:
Electricity comes into our homes through wires. To get an electrical device to work we need to put a plug into an electrical socket and turn on a switch.
In the lounge there are often many electrical devices in the form of lamps, heaters and air-conditioners, for example. They are often on all the time. In offices there are computers that are on all the time. In the kitchen and bathroom, there are devices such as washing machines and dishwashers that use a lot of power. We have to pay money according to how much electricity we use.
If we do not have electricity, we need to do more physical work using our body. Then we have to wash dishes and clothes by hand. If we do not have electricity, we need to make a fire to get warm, and perhaps read by candlelight. Many places in the world have no electricity.

ACTIVITY 8)
MAKING A WATER WHEEL

AIM:
The aim here is to make a water wheel in order to illustrate that there is a lot of energy in flowing water. Water makes the water wheel spin. By connecting special equipment to such a wheel, we can also use water power to generate electricity.

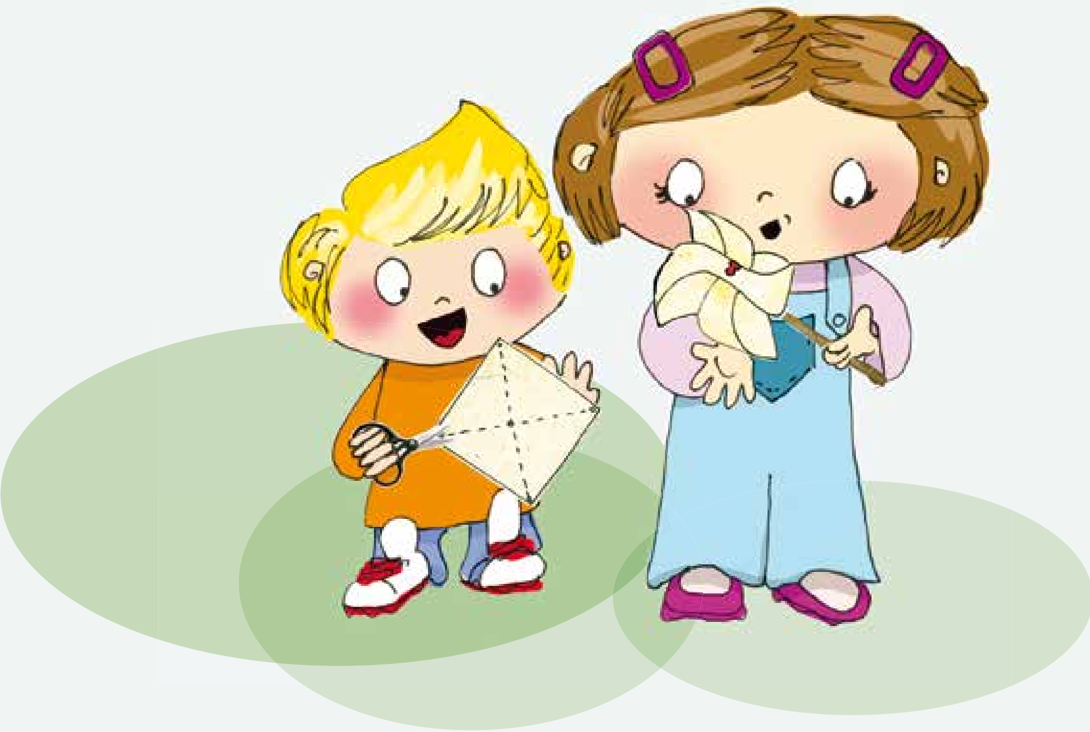
TIME REQUIRED:
One hour to build. One hour of testing. The kids can work together.

EQUIPMENT:
Potato, styrofoam ball or wine cork as the core of the water wheel.
Sticks
Plastic spoons to be the "turbine blades"

INSTRUCTIONS:
You can make a small water wheel that you can try under the tap inside, or a slightly bigger one that you can test in a stream or a water gutter outside.
To make a water wheel, you can use a large potato or a large styrofoam ball. Insert the handles of the plastic spoons into the potato/ball in a line around the object. Make a little hole through the middle of the potato / ball and stick a sharp stick through it.
Test the water wheel under the tap, under a gutter or a stream.
The kids may want to make different types of water wheels and see which spins fastest, steadiest, longest, etc.

IDEAS TO DISCUSS:
What happens when the water jet hits the spoons in the water wheel? When does the wheel spin slowly, and when does it spin fast? If a lot of water comes out the tap, what happens to the wheel then? Can you try to imagine water pouring out of a huge tunnel that hits a water wheel that is as big as a room?

WHAT WE CAN LEARN:
We see that the water wheel spins around when the water jet hits the rotor blades.. When we increase the amount and pressure of the water, then the wheel spins faster. The water wheel with spoons is just like a real type of turbine in a power plant called "Pelton turbine."
For thousands of years, people have realized that they could exploit the power of flowing water to do work. You could pick up the water with bowls and get it to run somewhere else, or connect rods to round stone discs that could spin around and grind grain.
In order to get electrical power, magnets must be connected to a large water wheel that spins past coils of copper wire. This is how electricity is made. In Norway, there are many waterfalls and rivers that can be used to generate electricity.



ACTIVITY 9)
MAKING A WINDMILL

AIM:
The purpose is to make a windmill to show that there is a lot of power in the wind. Wind makes a wind turbine spin round. By connecting different things to a wind turbine, you can take advantage of wind power to generate electricity.

TIME REQUIRED:
1-2 hours

EQUIPMENT:
Scissors
A piece of thick paper, about 20 x 20 cm
Pencil or a thin stick/rod
Pin
One or two beads
Tape
A hair dryer

INSTRUCTIONS:
Fold an A4 sheet of paper so you get a square. Cut off the paper which is outside the square. Fold the square diagonally so that you get a cross and a centre point. Fold the paper back and let the paper lie completely flat. Paint the different segments in different colours. Cut along each fold with the scissors.
NB! Do not cut all the way to the middle, but stop 2–3 cm from the centre. Once you have cut along the four folds, bend every second point toward the centre. Let them overlap, and secure with tape in the centre of the paper. Take a pin and poke through the middle. Insert the pin into the end of a pencil or stick. To get the windmill to spin better you can put a bead between the pencil and the windmill and between the windmill and the top of the pin.

IDEAS TO DISCUSS:
What is it that causes the windmill to go round? Is it easier to get it to go round if you blow on the front or the side? Does it spin fastest with a lot of wind or a little wind? What gets the windmill to spin faster – a hairdryer or the wind? (Note: Remember that the hair dryer also uses electricity)

WHAT WE CAN LEARN:
The wind direction makes a difference to how the windmill spins. The windmill we have made spins fastest when we blow from the side. Large wind turbines that generate electricity have different “arms” – or blades – that look more like a propeller. For them to get the best advantage of the wind, the propeller blades can twist.
As with a water wheel, the propellers on these large wind turbines must have coils and magnets attached to them in order for them to create electricity. To help understand how much force the wind can have, you can take a plastic bag attached to string and release into the air on a windy day. This is like flying a kite. NB! Stay away from electrical wires when you do this, and do not do this when it rains.

ACTIVITY 10)
POP BALLS STORING ENERGY

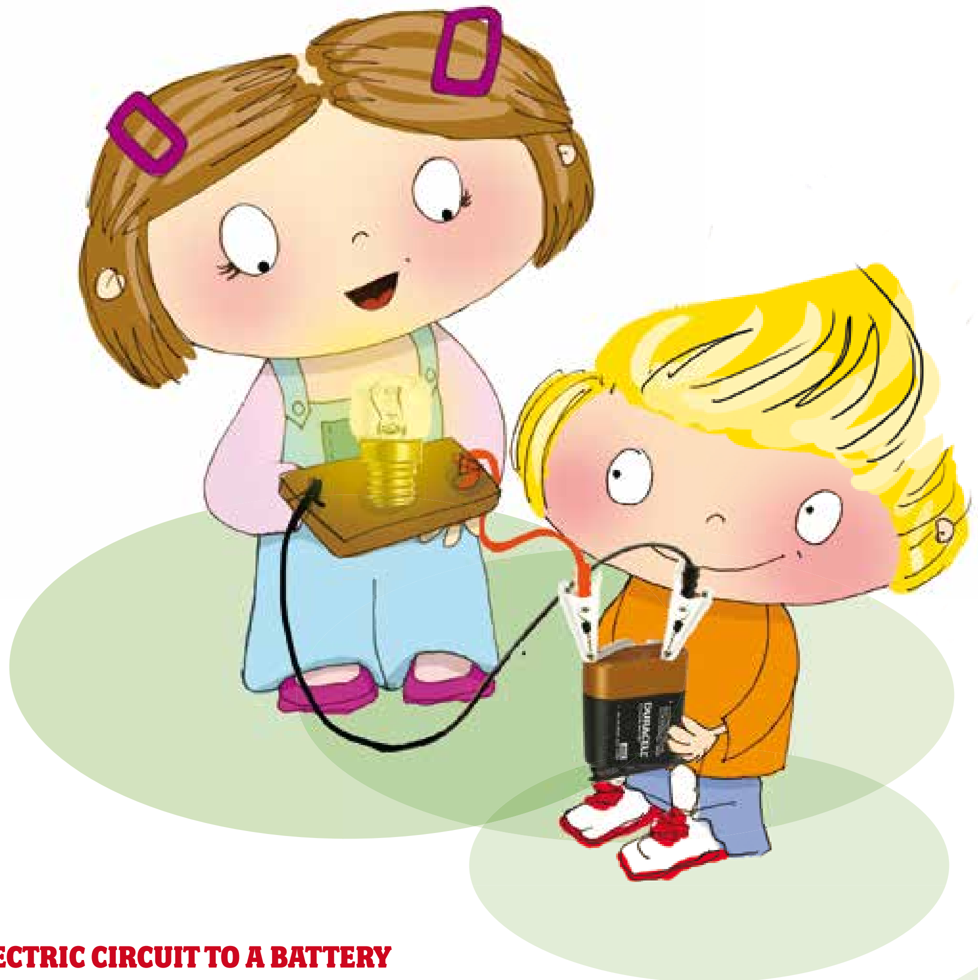
AIM:
The purpose of this activity is to become familiar with the concept of energy storage. The children will use the energy stored in their bodies to turn a pop ball inside out and see how long it keeps the energy before it pops up.

TIME REQUIRED:
20 min

EQUIPMENT:
Pop balls (can be bought in toy shops)
Stopwatch
Tape measure

INSTRUCTIONS:
Hold the pop ball with both hands and press both thumbs on top of the pop ball until it is inside out. Squeeze hard so the sides touch together for a few seconds. Vary how long the ball is squeezed for. Put the pop ball first on the table, then on the floor, on a book, on a sponge and in a bowl with water. Measure how long it stays inside out before popping for each surface. Measure the height to see if the surface it is placed on determines how high the pop ball jumps.
Ideas to discuss:
How many seconds was the pop ball inside out? Does the surface make a difference to how high the pop ball jumps?

WHAT WE CAN LEARN:
Pop balls are made of rubber. When you flip it inside out, one side is stretched. Energy is required to stretch the rubber, and it is in the stretch of the pop ball that the energy is stored. But, as you can see, the pop ball doesn’t want to store this energy. It uses up the energy to flip back to its original shape at tremendous speed. This causes the pop ball to jump up. The original muscular energy is then converted to kinetic energy.



ACTIVITY 11)
CONNECTING AN ELECTRIC CIRCUIT TO A BATTERY

AIM:
The purpose of this activity is to show that batteries can store electrical energy. We can store electricity in batteries and use it when we need it. We use electricity to get the TV to work, keep the fridge cold and to get many of the other things around us to work.

TIME REQUIRED:
30 min

EQUIPMENT:
Wires with alligator clips
Lamp holder E10
3.5 V light bulb
4.5 V battery

INSTRUCTIONS:
Let the children first screw the bulb into the lamp holder. Connect the cables to the lamp holder and let the kids try to figure out what to do to get the bulb to light up. If you have a small radio that runs on batteries, it is good to compare it with and without a battery.

IDEAS TO DISCUSS:
How did you get the lamp to light?
Is a single wire that is in contact with the battery enough?
Is the light bulb hot?

WHAT WE CAN LEARN:
We have found that both wires from the bulb must be connected to the battery in order to get electricity to go through the light bulb and to get the bulb to light up. We need one wire for each point on the battery. Are there other things we can use batteries for? When the bulb is lit up, it is also creating heat energy.

ACTIVITY 12)
STORING HEAT IN A THERMOS

AIM:
The purpose of this activity is to store heat (energy) in hot water or other hot liquids using a thermos.

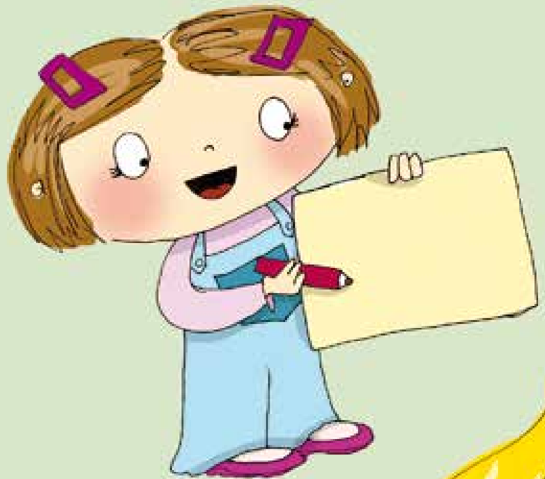
TIME REQUIRED:
From 1 hour

EQUIPMENT:
Thermos (minimum 1 litre)
Soda bottle (minimum 1 litre)
Hot water from the tap
2 glasses or cups
2 thermometers

INSTRUCTIONS:
Fill the thermos and soda bottle with hot tap water. Measure the temperature of the water. Draw the result on a bar graph. After 10 minutes, put a thermometer in each of the two glasses. Label each glass, respectively as 'thermos' and 'soda bottle'. Then pour the water from each container into the corresponding glass so that it covers half of the thermometer. Measure the temperature of the water. Draw the result on a bar graph. Empty the glasses. Repeat the same thing every five minutes until the thermos and soda bottle are empty of water.

IDEAS TO DISCUSS:
Why do you think the water stays warm in a thermos?
When do you use a thermos?
When is it sensible to use a thermos?
What can we do to soda bottles to make them keep warm?

WHAT WE CAN LEARN:
The thermos stores the heat and energy. Most thermoses are made up of two cylinders, an inner and an outer cylinder. The inner cylinder is smaller and located inside the other. The air between the cylinders is taken away, this is called a vacuum. This vacuum prevents the heat from spreading to the surroundings. Do you think it is possible to use a thermos to keep things icy cold?



ACTIVITY 13)
KEEPING WARM WITH INSULATION

AIM:
The purpose of this activity is to get kids to learn that good clothing retains heat. Our bodies continually lose a lot of heat, and therefore it is important that this energy is conserved.

TIME REQUIRED:
30 min

EQUIPMENT:
Different types of material. For example, woollen blankets, plastic garbage bag, fur, cotton blankets / sheets, towels, aluminium foil, thermal underwear, workout clothes (shorts and t-shirts), woollen socks

INSTRUCTIONS:
Start by asking the children questions about what they think is the warmest to wear. Then let the kids try the various blankets and clothes to see what retains most heat. Finally, children can draw the type of material that they thought was the best retainer of heat, and which they thought was the worst.

IDEAS TO DISCUSS:
What have you found out? Which blankets and / or material do you think keeps heat in the best?
Why do you think the warmest blanket is the best at retaining the heat? Is it thicker or more breathable?

WHAT WE CAN LEARN:
Woollen clothing has many tiny air pockets. It is in these pockets that wool is able to capture and store heat from our body. Therefore it is important that we have wool as the inner garment to keep us warm in very cold weather.

ACTIVITY 14)
WATER-SAVING SHOWER HEADS AND TAPS

AIM:
The purpose of this activity is to see the difference between a water-saving and a regular shower head and tap. The point of using water-saving shower head is to use less hot water when showering.

TIME REQUIRED:
30 minutes–1 hour

EQUIPMENT:
Regular shower head or regular tap
Water saving shower head or tap
10 litre bucket
Stopwatch

INSTRUCTIONS:
Prepare the stopwatch. Place an empty bucket under the water-saving shower. Turn on the water and start the stopwatch. Stop the stopwatch when the water reaches the top of the bucket.
Repeat the same with a regular shower head or with water straight from the tap.
Set up the results in a bar graph. Feel the water jets from both shower heads. Discuss what you feel.
If you can fill up a bucket in less than 45 seconds, then the shower head is not a water-saving shower head.

IDEAS TO DISCUSS:
Which bucket was filled up first? Set up the result in a bar graph.
Did you notice any difference between the jets from the water-saving shower and the regular shower?
Are we as clean after showering with a water-saving shower head? In what situations should we save on the hot water?
How quickly can we manage to take a shower?

WHAT WE CAN LEARN:
A water-saving shower has small, narrow holes. Because the holes in the water-saving shower head are smaller than in regular shower heads, it gives out less water than a regular shower, but has greater pressure. A regular shower head uses more hot water and more energy than a water-saving shower head.

ACTIVITY 15)
ELECTRICITY POLICE

AIM:
The purpose of this activity is to learn to turn off lights in rooms not in use. Children are engaged and involved through the responsibility to help everyone to keep the rules.

TIME REQUIRED:
1 hour to make signs and rules - then an ongoing activity.

EQUIPMENT:
Police Badges, which can be made by children themselves.

INSTRUCTIONS:
Two children will be appointed to the Electricity Police. This is changed every week. Create a set of rules that the Electricity Police should be helping everyone to keep. See suggestions on the activity sheet in the portfolio.
Some adults can use role play to break the rules. Then the children get to try to be the Electricity Police.

IDEAS TO DISCUSS:
Where does electricity come from?
Why is it important to save energy?

WHAT WE CAN LEARN:
Electricity is a resource that we shouldn't waste. Being in the Electrcity Police helps children to learn about the ethics and attitudes relevant to energy efficiency and conservation. Environmentally friendly actions become a habit.

ACTIVITY 16)
DARK DAY

AIM:
The purpose of this activity is to try to have a full day of kindergarten without the use of electric light. We see the contrast in comparison to a normal day. This is how many people in the world live today, and how it used to be in your country in the old days.

TIME REQUIRED:
1 hour to prepare
1 day to complete

EQUIPMENT:
Torches/flashlights (preferably "shake flashlights", for example, or LED lights, as they are the most environmentally friendly)
Headlamps
Children can bring a torch from home.

INSTRUCTIONS:
Try to have a day in kindergarten without electric light. Try not to use appliances that require electricity either. Maybe you can cook on the stove or over a fire?

IDEAS TO DISCUSS:
A there places in the world where people don't have electric lighting? How do they live? What was it like here in this country in the old days? What kind of tools did they have in the past?

WHAT WE CAN LEARN:
We realize that we are very dependent on electricity when we don't have it. We also learn which appliances use electricity.

ACTIVITY 17)
STUDYING DIFFERENT TYPES OF LIGHT BULBS

AIM:
The purpose of this activity is to show the difference between energy-saving light bulbs and other types of bulbs.

TIME REQUIRED:
30-60 min

EQUIPMENT:
A regular light bulb (40W)
An energy-saving bulb (about 9 W) with the same brightness as the regular bulb
Lamp with switch
Thermometer

INSTRUCTIONS:
Let the children hold and look at the two different light bulbs without revealing which one is the energy-saving light bulb. Have an adult put a regular light bulb in the lamp. Turn on the lamp and observe. Hold the thermometer about 20 cm above the lamp for one minute. Measure the temperature. Turn off the lamp and let the light bulb cool. When the bulb is cold enough, let an adult replace it with an energy saving light bulb. Turn on the lamp and observe. Hold the thermometer around 20 cm above the lamp for one minute. Measure the temperature. Turn off the lamp. Walk around the kindergarten with the children and count how many lights you have. Can some regular bulbs be replaced with energy saving light bulbs?

IDEAS TO DISCUSS:
Create a bar graph showing the temperature difference between the two light bulbs. Which light bulb emits more heat? Why?

WHAT WE CAN LEARN:
We learn that heat from a light bulb is lost energy. When we use light bulbs that create less heat, yet provide just as much light, we are saving energy.

TRONDHEIM KOMMUNE

www.trondheim.kommune.no/idaandmarkus

Mailing address
Trondheim Kommune
Grønn Barneby
Environmental Unit
Postboks 2300, Sluppen
7004 Trondheim

Office Address
Bytorget
Erling Skakkes gate 14