SCIENCE NORTH SCIENCE NORD
SUDBURY, ONTARIO, CANADA

Energy Storage Device Part 4 **Grade 5 – Conservation of Energy and Resources**

Lesson Plan

Assessment	Experiments, handout
Cross-curricular	

Big Ideas

- Energy can neither be created nor destroyed, but it can be transformed.
- Conservation (reducing our use of energy and resources) is one way of reducing the impacts of using energy and resources.

Learning Goals

- To demonstrate how the energy storage device works.
- To be able to think through all energy transformations in a variety of experiments.

Specific Expectations:

2.3 use technological problem-solving skills to design, build, and test a device that transforms one form of energy into another and examine ways in which energy is being "lost" in the device
2.4 use appropriate science and technology vocabulary, including energy, heat, light, sound, electrical, mechanical, and chemical, in oral and written communication
2.5 use a variety of forms to communicate with different audiences and for a variety of purposes
3.3 describe how energy is stored and transformed in a given device or system
3.4 recognize that energy cannot be created or destroyed but can only be changed from one form to another
3.5 explain that energy that is apparently "lost" from a system has been transformed into other energy forms that are not useful to the system

Description:

This is the **fourth** out of a five lessons unit. It builds directly on the last one, in which students built an energy storage device. In this lesson they will demonstrate what they built and take a more in depth look at all the devices that were built to understand them better.

Materials/Resources:

-Energy storage devices that students built in lesson 3
-Photocopies of Device worksheets for each student or student group.

Safety Notes

N/A

Introduction

Demonstration

- We start the class with each team demonstrating the energy storage device they built. This should move fairly quickly, as the emphasis really should be on the next part where we go back to each type of experiment (as likely several teams built very similar energy storage devices).

Energy loss from system

Before we go further into depth with each experiment/device let's review **energy conservation and how it relates to energy loss.**

- We have been saying that energy is never lost or created. But for a number of experiments it does appear like energy is lost! What is happening? (Discuss friction, air resistance etc.)
- The upshot is this: **Energy CAN be lost from one isolated system.** Let's say a bouncing ball. The ball loses energy.
- The total energy (in the universe) didn't change as the energy got transferred to something else. For example the ball makes a noise when it hits the ground (air molecules move), it makes the floor vibrate (mechanical energy in the floor), and it may heat up a tiny amount due to being squished.
- What this really means is that **energy isn't conserved very well in the bouncing ball system.**

Energy Conservation

- You have probably heard people about the need to conserve energy. What do they mean? (To use less energy. Related to that is that we need to make better use of the energy we have, i.e. not "waste" or lose energy.
- What we want to do is get the most out of a system (let's say a car) with the least amount of energy use.
- Let's stick with the example of a car:
    - Is energy getting lost overall? NO. We know now that it is always conserved.
    - BUT, if we JUST look at the car, then it is losing energy. To what? (Noise, wind resistance, heat in the engine that heats up air and radiator fluid etc., heat coming out the tailpipe, etc.)
    - What we want to do with a car is get from A to B, fast, and not using much fuel. The losses we just discussed (to other things that are NOT the car's drive train) mean that it is not as efficient as it could be.
    - So when we talk about conserving energy we really mean using less by minimizing losses to things we don't care about
    - Draw examples:
        - **Car with a really upright front.** Maybe even a sail on top of it. Would this car be able to drive fast? No. It has a LOT of drag. It wastes a lot of energy.
        - **Sleek racecar.** This car will be able to go fast because it has low wind resistance.
- Engineers and scientists always try to find ways to make things more energy efficient – to conserve more of the energy for what we really want it for.

Action

Review energy storage devices

- Let's look at your projects again now and see if we figure out how energy is transformed in them and how we might be able to better conserve that energy.
    - Option 1:
        - Pick one device from each type that was built
        - Have the students demonstrate the device again and discuss:
            - What is the INPUT energy (e.g. human movement)?
            - What is the OUTPUT energy for each device that was built (i.e. what type of energy is stored?)
            - What are all the energy transformations in the system?
            - Where is energy lost from the system and how could you make it more efficient (i.e. better conserve energy)?
        - Optionally: have the students fill in the Device Worksheet for each device
    - Option 2:
        - Group similar devices together and get student groups to rotate through, visiting each TYPE of device. Give them a fixed time for each device.
            - Try out the device and discuss what is happening.
            - Fill in the worksheet for that device.

Consolidation/Extension

Summary:

- You can see that every device or process that uses energy has losses in it.
- We always try to find ways to better conserve energy and make our devices and processes more energy efficient.
- This makes things cheaper to run
- Is good for the environment – the less energy we use the less our impact
- Can you think of things that we are working to improve the energy efficiency of?

- One place that everyone would like to make as energy efficient as possible is his or her house.
    - Does your house store energy? (Yes – in winter it stores heat, in summer it may be cooled – which also takes a lot of energy to do).
    - Does a house lose energy?

Homework:

- Find one thing in your house that would make it more energy efficient. Think about what you could do and/or discuss it with your parents. Write down a few sentences describing what you found. Tomorrow we will discuss what you found!
    - Note that this does NOT have to be something that needs to be insulated. It would be perfectly legitimate to find an example of an appliance that is on when it doesn't need to be and draws power, something that is old and energy inefficient (a light bulb for example), etc.