

Title	Living in Balance	Time	2-3 days
Subject:		Biology, Physics, Geography	
Aims		<p>General competence¹: 4. Developing a healthy lifestyle in a natural living environment</p> <p>General competence²: 3. Analysing data and information collected experimentally or from other sources on simple physical phenomena and their technical applications.</p> <p>General Competence³: 4. Developing an investigative approach from a lifelong learning perspective and for everyday life.</p> <p>Specific competence⁴: 4.2. Evaluating the consequences of one's own behaviour on own health and the state of the environment</p> <p>Specific competence⁵: 3.4. Identifying risks to the environment and to oneself due to inappropriate use of technological appliances and devices.</p> <p>Specific competence⁶: 4.4. Identifying solutions to protect the geographical environment</p> <p>Aim of the activity: Develop a personal plan for sustainable energy consumption.</p>	
Key CS elements:		Decomposition; Pattern recognition; Algorithm design; Debugging	
Age group :		13-14 year old	
Learning situations:	investigation	Activity type :	extracurricular
Resources:		Notebooks and pencils	
Duration:		2-3 days	
Learning development:			

¹ According to the school curriculum for Biology, grade VIII, approved by order of the Minister of Education no 3393 / 28.02.2017.

² According to the school curriculum for Physics, grade VII, approved by order of the Minister of Education no 3393 / 28.02.2017.

³ According to the school curriculum for Geography, grade VII, approved by order of the Minister of Education no 3393 / 28.02.2017.

⁴ Idem ¹

⁵ Idem ²

⁶ Idem ³

Objective:

- To develop students' understanding of energy consumption.
- To teach students how to measure energy usage and identify ways to reduce it.

Lesson Outline

1. Introduction (5 minutes)
 - Briefly discuss the importance of energy conservation.
 - Explain the goal of the lesson: to measure energy consumption and find ways to reduce it.
2. Decomposition (10 minutes)
 - Break down the problem of high energy consumption into smaller, manageable parts.
 - Discuss different sources of energy consumption in a typical household (e.g., lighting, appliances, heating, and cooling).
 - Identify which appliances consume the most energy.
3. Pattern Recognition (10 minutes)
 - Guide students to identify patterns in energy usage.
 - Compare energy consumption of different appliances.
 - Recognize peak usage times and factors that contribute to higher energy use (e.g., leaving lights on, standby power consumption).
 - Identify common behaviors that lead to increased energy consumption.
4. Abstraction (10 minutes)
 - Abstract key concepts from the data collected.
 - Focus on understanding the main causes of high energy consumption.
 - Highlight effective solutions to reduce energy usage, such as using energy-efficient appliances and changing habits (e.g., turning off lights when not in use, unplugging devices).
5. Algorithm to Measure Energy Consumption and Reduce It
 - Step 1: Measure Current Energy Consumption
 1. Identify Major Energy Consumers:
 - List all electrical appliances and devices in your home.
 - Note the power rating (in watts) of each device (usually found on a label or in the user manual).
 2. Calculate Daily Energy Consumption for Each Device:
 - Use the formula:
$$\text{Energy (kWh)} = \frac{\text{Power (W)} \times \text{Usage Time (hours)}}{1000}$$

Record the daily usage time of each device.

3. Sum Up Total Daily Energy Consumption:
 - Add the energy consumption of all devices to get the total daily consumption.
4. Use an Energy Monitor (Optional):
 - Install a smart energy meter to track real-time energy usage.
 - Collect data over a period (e.g., one month) to understand consumption patterns.

Step 2: Analyze and Identify Areas for Reduction

1. Identify High Energy Consumers:
 - Highlight devices that consume the most energy.
 - Look for patterns (e.g., certain times of the day when consumption spikes).
2. Assess Energy Efficiency:
 - Check if appliances are energy-efficient (look for Energy Star ratings or equivalent).

Step 3: Implement Measures to Reduce Energy Consumption

1. Optimize Usage:
 - Turn off devices when not in use.
 - Use power strips to easily switch off multiple devices.
 - Unplug chargers and devices that are not in use.
2. Upgrade to Energy-Efficient Appliances:
 - Replace old appliances with newer, energy-efficient models.
 - Look for appliances with high energy efficiency ratings.
3. Implement Smart Home Solutions:
 - Use smart thermostats to optimize heating and cooling.
 - Install smart lighting systems to automatically turn off lights when not needed.
4. Behavioral Changes:
 - Encourage household members to be mindful of energy usage.
 - Schedule high-energy activities (like washing and drying clothes) during off-peak hours if your utility offers time-of-use rates.
5. Improve Home Insulation:
 - Insulate walls, roofs, and floors to reduce heating and cooling needs.
 - Seal windows and doors to prevent drafts.

Step 4: Monitor and Review

1. Track Progress:
 - Continue using the energy monitor to track changes in energy consumption.
 - Compare monthly energy bills to see if consumption has decreased.

2. Adjust Measures as Needed:
 - Review the effectiveness of the measures implemented.
 - Make adjustments based on real-time data and ongoing analysis.
3. Repeat the Process:
 - Regularly reassess energy consumption and look for new ways to save energy.

6. General Approach (10 minutes)

- Summarize the steps students can take to measure and reduce energy consumption.
- Discuss how to apply these steps to real-life scenarios.

Assessment

- Evaluate students based on their participation and understanding of energy consumption measurement and reduction techniques.
- Have students create a short plan on how they will implement energy-saving strategies at home.

Expected Outcomes

- Students will be able to measure energy consumption.
- Students will identify patterns in energy usage.
- Students will abstract key energy-saving concepts.
- Students will develop a plan to reduce energy consumption in their daily lives.

Assessment/Extension:

Students can create their own plan.

Notes:

By following these steps, you can effectively measure and reduce energy consumption at home. Start by identifying and measuring the energy usage of your devices, analyze the data to find high-energy consumers, implement practical measures to reduce usage, and continually monitor progress to ensure ongoing efficiency.