LED or Other Energy-Efficient Street Lighting

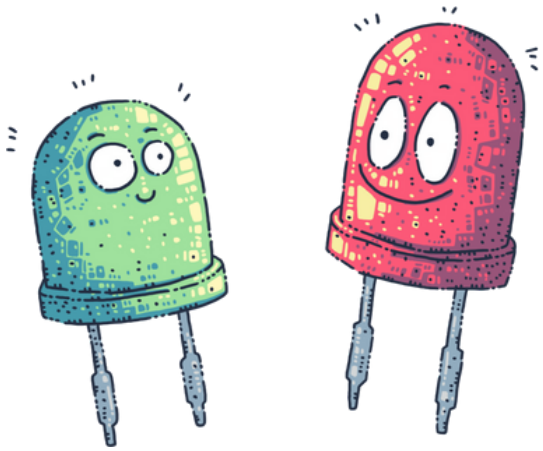
Smart Lighting System for Safer Cities

Keywords:

LED, smart lighting, energy efficiency, circuits, public space, sustainability

Target group:

primary school pupils (ages 6-11)



Objectives:

This activity introduces pupils to the role of energy-efficient street lighting in creating sustainable cities. Through exploration of LED technology and the construction of working streetlight models, pupils will learn how lighting impacts energy use, public safety, and environmental health.

General Guideline on Time Allocation:

The duration needed to carry out this activity may vary depending on the specific group of children. Teachers are encouraged to adapt the implementation according to the needs, interests, and dynamics of the group.

In the preparatory phase, teachers may use a variety of activities to introduce and contextualize the chosen topic. These can include discussions, videos, drawings, storytelling, or even a field trip, depending on the age and background knowledge of the children.

The main construction phase, during which children plan and build their urban element using LEGO bricks, should typically not exceed 45 to 60 minutes. However, this phase often stimulates further curiosity and questions among the children, potentially leading to extended engagement or follow-up activities. For more detailed instructions and pedagogical support on how to implement activities of INNO–kids project, please download the Teacher's Methodological Guide.

Materials and Resources Needed:

- LEGO bricks and baseplates
- Simple electrical components: LED lights (low voltage, child-safe), button batteries or battery holders, copper tape or basic wires (optional: preassembled circuits), switches (e.g. paperclip or foil-based) for turning the lights on/off
- Clear plastic or transparent LEGO for lamp covers
- Paper, pencils, rulers for planning sketches
- Optional: recycled materials for realistic lamp post structures
- Optional: solar-powered garden lights for demonstration
- Visual materials: photos of real-world LED streetlights or smart systems
- Safety scissors, tape, glue

Note: Ensure all electrical parts are safe and age-appropriate. If real circuits are too complex, use simulated "light" with coloured transparent bricks or mock wiring.

Introduction:

Begin with a simple question: "What would your town look like at night without any streetlights?" Show images of different lighting types: traditional lamps, LED lights, and solar-powered systems. Then introduce the benefits of LED lighting:

- Uses less electricity than older bulbs
- Lasts longer and saves money
- Can be powered by solar energy
- Can be part of a "smart" system that turns on only when needed (motion sensors, timers)

Discuss real-world issues with street lighting:

- Too much lighting wastes energy and contributes to light pollution
- Too little lighting makes streets unsafe for walking or cycling
- Some places now use motion sensors or solar lights to balance both

Procedure:

Preparation

Ask pupils to reflect: "What do we need from a good streetlight?" "How can we make it use less energy but still keep people safe?"

Next, pupils sketch their streetlight design. Their plan should include:

- A lamp post with height and placement
- A light source (LEGO brick or real LED)
- Power source – battery or imagined solar panel
- Features like a switch, motion sensor, timer, or dimmer
- Optional: a base with sidewalk, crosswalk, or bike path

Construction

Pupils now bring their streetlight design to life. Steps may include:

1. Build the base – representing a street, park, or public space
2. Construct the lamp post – with appropriate height and stability
3. Add a light source – either a real LED with battery and switch, or a symbolic light
4. Integrate the power system – simulate solar panels or connect wires and batteries
5. Include smart features – such as a pretend motion sensor, a timer, a "dark-sky friendly" design that shines light down, not up

Details

Pupils now refine their streetlight models by adding thoughtful, innovative, and sustainable features. Prompts to guide their thinking:

- "What makes your light different from old-fashioned lamps?"
- "How does your design save energy?"
- "Would people feel safe and comfortable here at night?"

Stories

Pupils now imagine a short story set beneath their streetlight — exploring how this small invention changes lives, solves problems, or connects people. Encourage pupils to include environmental themes, like:

- Reduced energy use
- Less light pollution = more stars
- Safer spaces for both people and animals

Presentation

Each group presents their energy-efficient streetlight. Presentations can include:

- A guided tour of the model: how it works, how it's powered, and where it fits in the city
- An explanation of how their design saves energy or reduces light pollution
- Description of any special features: solar panels, motion sensors, safety zones

Tips:

- Let pupils test light angles and shielding to simulate real lighting needs.
- Remind pupils that energy-efficient design is not just about saving power, but about making life better for people and the planet.

Additional Considerations:

Differentiation:

Provide additional support or simplified instructions for pupils who may require extra assistance. For advanced pupils, offer extension tasks such as researching further sustainable practices or designing more complex models.

Assessment:

Assess pupils based on their participation and engagement during discussions and hands-on activities. Evaluate the creativity, effort, collaboration, depth of understanding demonstrated in their models, critical thinking, ability to provide constructive feedback and presentation skills.

Extension Activities:

- Use light meters or phone sensors to measure brightness levels in real outdoor areas.
- Conduct a local survey: explore your town or village to observe what types of streetlights are used, how many use LED or solar technology, and whether any are part of a smart system.

Curriculum Connections:

This activity integrates:

Social Studies *(public safety, understanding community needs)*
Engineering *(circuits, light, energy types, renewable sources)*
Mathematics *(counting, measuring brightness or distances, mapping streetlights)*
Art *(model-making, design aesthetics)*
Language *(storytelling, oral presentation)*
Environmental Studies *(sustainable infrastructure, light pollution)*

SDG Connections:

- **SDG 4:** Quality Education – Promoting inquiry-based and interdisciplinary learning
- **SDG 7:** Affordable and Clean Energy – Exploring efficient lighting and renewable power sources
- **SDG 9:** Industry, Innovation and Infrastructure – Engaging pupils in building smarter cities through simple technologies
- **SDG 11:** Sustainable Cities and Communities – Designing inclusive, safe, and environmentally friendly urban areas
- **SDG 13:** Climate Action – Reducing carbon footprints through energy-smart solutions

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