LESSON PLAN

Creating Little Magic Lights with Copper and LED

2025

www.makeuin.eu

Co-funded by
the European Union

MAKE U IN Lesson Plan

If you have any questions regarding this document or the project from which it is originated, please contact:

Birgit Kahler

FabLab München e.V.

Gollierstraße 70/Eingang E, Erdgeschoß, 80339 München, Germany

Email: birgit@fablab-muenchen.de

The editing of this document was finished on August 2025

Project website: www.makeuin.eu/

MAKE U IN is an Erasmus+ Small-scale partnerships in school education (KA210-SCH)

Project Number: KA210-BY-24-12-247490

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the National Agency im Pädagogischen Austauschdienst. Neither the European Union nor the granting authority can be held responsible for them.

This document has been created by the collaboration of the whole MAKE U IN partnership: FabLab München e.V. (DE) -project Coordinator, UNIWERSYTET KOMISJI EDUKACJI NARODOWEJ W KRAKOWIE (PL), Mindleap S.L. (ES).

Lesson Plan

Title of the Lesson	Creating Little Magic Lights with Copper and LED
Duration	1 h
Teaching methods and strategies	• Demonstration of LED circuits with copper tape • Hands-on experimentation • Guided group work or pair collaboration • Visual instruction (diagrams, step-by-step guides) • Reflective Discussion
Learning Outcomes	• Understand the basics of electrical circuits (closed loop, power source, conductor, LED) • Learn how to create a working LED paper circuit using copper tape • Develop fine motor skills and spatial planning through crafting • Strengthen problem-solving skills by troubleshooting real-time circuit issues • Collaborate with peers and communicate ideas effectively
Steps to be Followed	**1. Introduction (10 minutes)** • Ask the group: "*What is electricity?*" "*What do you think makes a light turn on?*" • Demonstrate a basic paper circuit with copper tape, LED, and battery • Show finished examples of paper circuits • Explain how copper acts as a conductor and completes the circuit **Adaptation for Inclusivity:**

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the National Agency im Pädagogischen Austauschdienst. Neither the European Union nor the granting authority can be held responsible for them.
Project n. KA210-BY-24-12-247490

	• Use large visuals, live projection, or document cameras • Provide tactile diagrams or embossed circuit patterns • Allow alternative communication (gesture, AAC, drawing) • Simplify language and provide a visual vocabulary chart • Offer repeat demonstrations and slower pacing for processing needs **2. Main Content (40 minutes)** • Illustrate students the steps to create a paper Circuit, as follows: a. Sketch the Layout b. Apply Copper Tape Along the Path c. Place and Connect the LED (match polarity) d. Attach the Battery and Test • Allow time to the activity encouraging creative designs: stars, hearts, animals, initials, etc. • Provide Troubleshooting Support as follows: ○ Ensure copper tape is unbroken and firmly pressed ○ Check LED polarity (long leg = positive) ○ Ensure firm contact between battery and tape **Adaptation for Inclusivity:** <u>Sketching Layout</u> • Use pre-made templates • Provide tactile drawing tools or stencils • Pair students who need motor support with a buddy <u>Applying Copper Tape</u>

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the National Agency im Pädagogischen Austauschdienst. Neither the European Union nor the granting authority can be held responsible for them.
Project n. KA210-BY-24-12-247490

	• Offer pre-cut tape strips • Use tools with large grips • Allow peer or adult support (e.g., guided hand support) <u>Placing the LED</u> • Use enlarged diagrams showing LED orientation • Allow extra time and repeat instructions as needed • Provide alternate methods (e.g., gluing instead of taping) <u>Connecting Battery</u> • Offer Velcro or magnetic holders for easier connection • Assist with tape placement if needed • Praise effort and reinforce experimentation **3. Wrap-Up and Review (10 minutes)** • Invite students to showcase their working or in-progress circuits • Ask questions: *"What worked for you?" "What did you change or learn?"* • Turn off classroom lights to enjoy the "magic lights" display • Celebrate everyone's creativity and persistence **Adaptation for Inclusivity:** • Allow alternative forms of reflection (drawing, buddy speech, photos) • Accept all outcomes, working or not—highlight creative efforts

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the National Agency im Pädagogischen Austauschdienst. Neither the European Union nor the granting authority can be held responsible for them.
Project n. KA210-BY-24-12-247490

	• Give extra time if needed for presenting or finishing

Required material and resources	• Copper tape (conductive)
	• LEDs (assorted colors if possible)
	• Coin cell batteries (e.g., CR2032)
	• Thick paper or cardstock
	• Adhesives: tape, glue dots, or Velcro
	• Scissors (adaptive if needed)
	• Templates (for layout design)
	  ○ Instructables – Paper Circuit Templates
	  ○ TeachEngineering – Intro to Electric Circuits
	
	Extra resources:
	
	3D Paper Circuit & STEM Activity Inspiration
	
	• Chibitronics – Paper Circuits & Tutorials
	
	• Tinkering Studio – Paper Circuit Activities
	• Science Buddies LED Card Guide
	• Makey Makey STEM & Assistive Tech Projects

Assessment or evaluation techniques	**Hands-on Engagement:** Observe students' active participation in building circuits. **Problem-Solving Skills:** Evaluate their approach to troubleshooting and persistence. **Creativity and Design:** Consider how each student personalized their layout. **Collaboration:** Note how students support each other in pairs or groups.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the National Agency im Pädagogischen Austauschdienst. Neither the European Union nor the granting authority can be held responsible for them.
Project n. KA210-BY-24-12-247490

	Reflection Participation: Assess their ability to explain or share their process and outcomes in any form.
Ethical Considerations	**Inclusivity and Accessibility** • Design tasks to be multimodal (visual, tactile, verbal) for diverse learners. • Ensure accessible materials (large print, tactile guides, adaptive tools). • Provide choices in how students engage with each part of the activity. **Respect for Diverse Abilities** • Foster a supportive environment where all contributions are valued. • Encourage peer collaboration with roles that allow everyone to shine (e.g., designer, assembler, tester). **Safety and Supervision** • Closely monitor battery handling and ensure copper tape is safely applied. • Provide age-appropriate, safe materials and tools. **Encouraging Positive Behaviour** • Model and promote kindness, patience, and teamwork. • Intervene in exclusionary behaviour and foster inclusive peer support. **Environmental Impact** • Encourage recycling of paper and batteries post-activity. • Reuse leftover copper tape strips and components where possible.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the National Agency im Pädagogischen Austauschdienst. Neither the European Union nor the granting authority can be held responsible for them.
Project n. KA210-BY-24-12-247490

Co-funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the National Agency im Pädagogischen Austauschdienst. Neither the European Union nor the granting authority can be held responsible for them.
Project n. KA210-BY-24-12-247490