



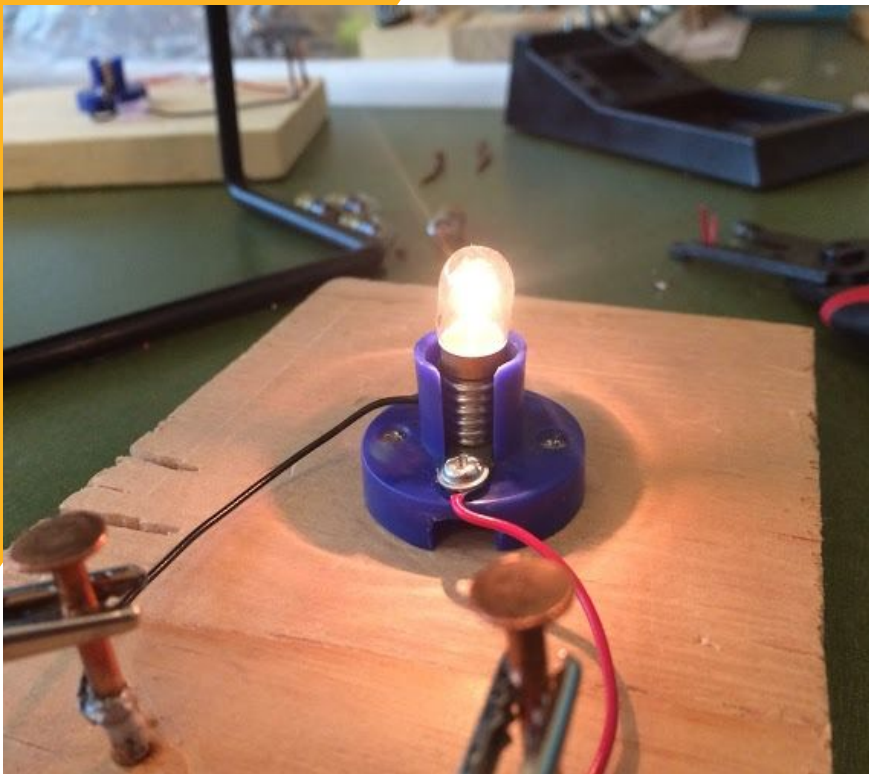
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CIRCUIT BLOCKS

A Guide from the Creativity Lab



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Based on

*An activity from
the Tinkering Studio*



About This Project

This guide offers an overview of circuit block investigations and focuses on an inquiry model for classroom discovery. It lists the basic materials and tools needed to create blocks, and then delves into some background information on where students can find electricity in their everyday lives.

In this project, students make discoveries about electricity and current by creating connections between different types of circuit blocks - batteries, lights, motors, and anything else we can create! Circuit blocks also emphasize the trial and error process while encouraging creativity. The activity can be tailored to classes spanning kindergarten to high school.

For step-by-step instructions on creation and suggested projects with circuit blocks, see the Tinkering Studio's [Circuit Board Activity Guide](#).

Our Story

At Lighthouse and Lodestar, we've used circuit blocks across all grades to solidify understanding of basic circuits. This guide later goes into detailed pictures of practice at both schools.

At Lighthouse, we design projects that give students ownership of their learning. Circuit blocks are a great example of this. We use circuit blocks in elementary, middle, and high school classes, following the same introductory process, but with more technical questions and exploration for the older students.

At Lodestar, students can check out circuit block kits and explore electricity independently or explore during free-making time.

Materials & Tools

MATERIALS

- Wood Blocks
- Wire
- Copper Nails
- Screws
- Alligator Clips
- Hobby Motor
- Motor Holder
- Batteries (AA)
- Battery Packs
- Light Bulbs
- Lamp Bases
- Switches

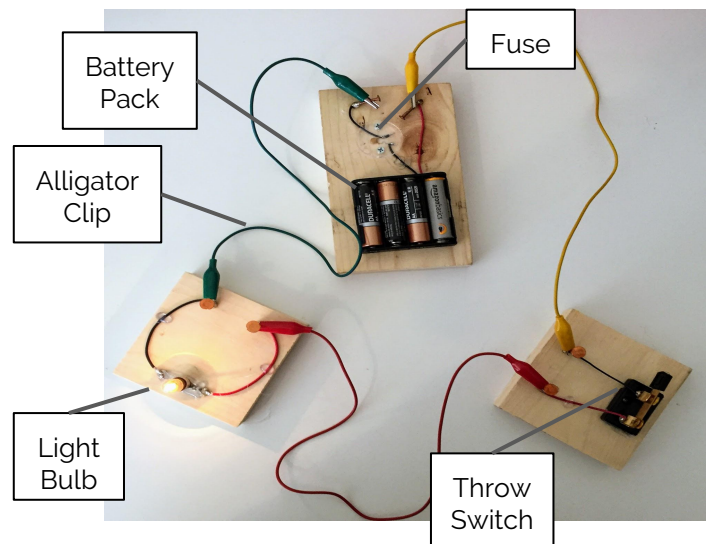
For detailed parts: LCL.how/CircuitParts

TOOLS

- Soldering Kit
- Wire Stripper
- Wire Cutters
- Pliers
- Hammer
- Hot Glue Gun
- Screwdriver / Drill

Learning Targets

- I can explore playfully without a preconceived plan.
- I can learn from mistakes and follow unintended paths.
- I can construct a working circuit.
- I can describe the flow of electricity.
- I can record observations.
- I can draw a circuit schematic.
- I can explore complexity.
- I can think or talk with others about an aspect of my work or process.



Context: Before We Make...

Circuit blocks are great for introducing the broader topic of electricity with simple parts and familiar objects. Even at the youngest level, students know there is a connection between batteries and power - batteries are what make lights turn on and toys work. In this activity, they can see this abstract concept come to life. The learnings that students gain can be transferred to more making activities, such as paper circuits, or even to everyday objects in their own homes.



Photo: bobvila.com

Material Management

- Consider organizing a variety of blocks into small kits that students can check out themselves
 - Include suggested projects and challenges
 - Store books with background information or related activities nearby
- Blocks often need to be resoldered or repaired. Have a bin for broken blocks nearby.
- Monitor student circuits to ensure short circuits are not created (check battery packs to see if warm)

How to Introduce New Tools & Tech SAFELY

When creating or repairing circuit blocks, here are a few safety tips to decrease the risk of burns.

For hot gluing:

- Use low heat guns
- Use popsicle sticks instead of fingers to push pieces together

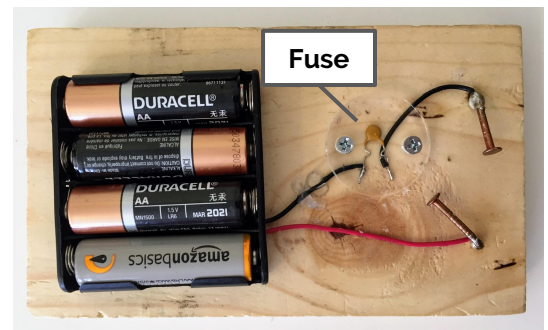
For soldering:

- NEVER touch the soldering iron
- ALWAYS return the soldering iron to its stand when not in use
- Use clamps to hold the materials to be soldered

Notes

Circuit blocks can be created with various materials, such as moving parts from [toy take aparts](#), and blocks can be used as components of different activities, such as [light play](#) and [chain reactions](#).

Additionally, consider adding a fuse to the negative (black) wire of a battery pack to keep the batteries from overheating when there is a short circuit. Cover the fuse with clear plexiglass to protect students and keep the parts visible.



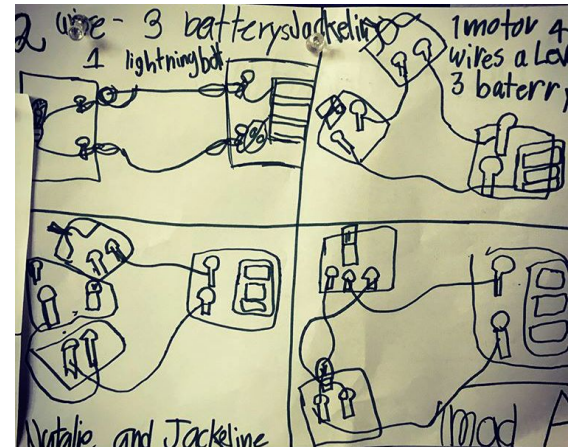
Inquiry Model

When starting circuit blocks, students first receive simple circuit materials (e.g. battery packs and light bulbs) so they can focus on making the connections work. This limitation encourages students to focus on the task at hand, as well as introduce a concept that may be more challenging than past experiences. This inquiry cycle can be replicated with numerous materials, where students experience the different effects of electricity, such as movement from motors and toy parts, or the directionality of electricity in some blocks.

During this activity, it is helpful to create a class-wide conceptual model about electricity and circuits, collaborating to synthesize our discoveries. After tinkering and thinking individually, students post their most important findings in this model. If students post misconceptions, we leave them visible and plan the next day's activity so it provides evidence to confront the misconception. Once students discover this new evidence, we ask them to re-evaluate the model and decide if all the statements should remain. In short, we want students to own the discovery of key circuit and electricity ideas.

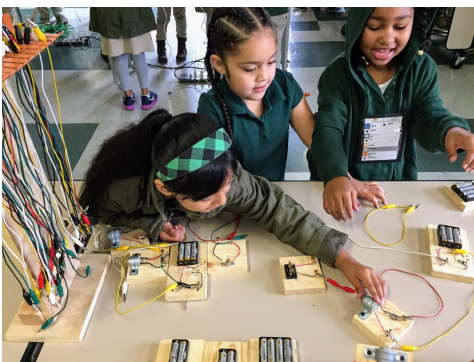
The inquiry model described above follows these steps:

1. **NOTICE** - Students tinker with a battery pack and a light-bulb or motor block to create a circuit.
2. **RECORD** - Students individually record noticings in notebooks or worksheets. Encourage students to diagram their circuit block connections.
3. **COLLABORATE** - At table groups, students discuss what they noticed, comparing and contrasting findings. Students write the 1-2 most important discoveries on sentence strips and post them on the wall in the whole-group model.
4. **QUESTION** - What questions do students now have about electricity and connections?
5. **REPEAT** - On another day, have students explore a different type of block, or create more complex connections.



Pictures of Practice

LODESTAR LAB



At Lodestar, we cultivate an atmosphere of independent learning, which is most prominent in the learning lab spaces. In our first year of operation, the Lodestar Lab rolled out circuit blocks and encouraged students to explore. Later, we added a bit more structure and created interactive kits that students can take out themselves, emphasizing more discovery than instruction. Each kit has a list of all the included materials, such as battery packs, light bulbs, and switches, along with simple instructions and project suggestions.

After we had a chance to pilot circuit blocks in the Lab, we reintroduced them in the elementary Making, Art, & Design class to refresh students' knowledge of circuitry before creating sewn circuits.

Pictures of Practice (cont.)

LIGHTHOUSE ELEMENTARY

Lighthouse structures the introduction of circuit blocks, starting with very simple circuits of battery packs and either motors or light bulbs. Teachers ask students to create a simple circuit, beginning with a prompt such as, "Can you make a light bulb turn on?" While students complete this task, they record their noticings, and later move on to creating collaborative circuits.

After students have explored the different blocks, they transition to tracing the path that electricity travels. Teachers facilitate the discussion by asking questions like "What part does the electricity come from?" and "How does electricity get from one part to another?"

This activity is closed out by a reflection period, where students share their observations and any additional questions they might have. It is helpful to use the thinking exercise "I used to think... But now I think...", where students share how their understanding of circuits and electricity has changed.



LIGHTHOUSE HIGH SCHOOL

At Lighthouse, the high school version of circuit blocks mimics the general structure of the elementary school's, but it is paired with a unit on electricity. Circuit blocks are used as an introductory tool for the unit, where students create different circuits using the available materials, and then they go back and draw the circuit out. Students note and discuss how electricity travels through motors, bulbs, switches, and anything else that students care to add to their circuits.

Related Extension Projects



[Light Play](#)



[Soldering](#)



[Paper Circuits](#)