Tell a story in a miniature world that you create! Tiny Theaters use simple mechanical components and circuitry to create a short narrative when looking through a viewing window of an enclosed cardboard shoebox. This activity was inspired by Artist in Residence Tim Hunkin during a visit to the Tinkering Studio.

**MATERIALS AND TOOLS**

Collect some of these things:

- Shoe box (with a removable lids)
- Yarn, string, and fishing line
- Scotch tape
- Mylar (to create reflections or water-like effects)
- Popsicle sticks, tongue depressors, & skewer sticks
- Paper, cardstock, & cardboard
- Pens, pencils, & markers

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GETTING STARTED

Brainstorm a Narrative:
The first step to create your Tiny Theater is to think of a story you want to tell. It doesn’t have to be long or complex; short, simple stories with small surprises are a delightful way to approach this activity! Think about the setting for your story, who is in it, and two or three actions that take place in it. Here are a few story ideas that might help you get started.

- It was calm in the village, when all of a sudden...
- A little fish was swimming in the pond, then...
- My favorite mystical creature is a ____________

You can draw the characters in your story, or find images (online or in magazines) that you can cut out.

Tools:

- Hot glue gun & glue sticks
- X-acto knife
- Scissors
- Awl (to poke holes for the LEDs)
- Bone folder
- Safety glasses
- Drill & 1” forstner bit (plus scrap wood & clamp for surface to drill into)

Circuit specific materials:

- Coin cell batteries & battery holders
- Electrical wire or copper tape
- Greeting card sound modules
- LEDs (various sizes and colors)
- Multimeter
- Fume extractor
- Soldering iron & solder
- Safety glasses
- Awl (to poke holes for the LEDs)
- Bone folder
- Scissors
Building your Box:

We like to use a shoebox to house our tiny theater, and the arrangement of components in each one will be different based on the story you want to tell. Each mechanical or electrical component will be operated by switches or levers outside of the shoebox and help to animate your theater. Here are some things to think about as you design the layout:

- Consider how the narrative will unfold. Do you want one set of eyeholes or multiple? Will the story progress from the back to the front, left to right, or some other way?
- What elements in your story do you want to move? Pieces can slide on cardboard tracks, be pulled on strings, move up-and-down with levers, or turn on an axle.
- Do you want your audience to interact with the story in some way? Will you operate the switches while someone else looks inside the box, or will the audience be in control themselves?

Drilling holes in cardboard: Make sure you have a piece of scrap wood clamped under the cardboard you want to drill into. Place the cardboard flat on the drilling surface and stabilize it with one hand.

Adding lights, sounds, and incorporating switches:

**Lights:** You can use LEDs to illuminate the interior of your tiny theater and highlight different parts of your story. You may want to have the lights always on, or use switches to selectively turn them on and off.

**Switches:** For building your circuit use copper tape or wire to connect your battery pack to the legs of the LED—soldering or scotch tape are possibilities for joining them together. To add in a switch, make a gap in one side of the copper tape or wire, and then use another conductive material to selectively bridge that gap. You can wire multiple lights and switches in parallel, or have several series circuits with one light on each. For more information on building circuits with LEDs and copper tape, you can check out our Paper Circuits activity guide.

PDF LINK: http://tinkering.exploratorium.edu/sites/default/files/Instructions/paper_circuits.pdf
Recordable greeting card sound modules are a fun way to add custom sound effects or narration to your story. You can experiment with placement of the speaker to see how it affects sound amplification too. Tim Hunkin, who inspired us to develop this activity, used a greeting card module to tell a short but compelling story using multiple tiny theater boxes activated by timed switches!

You can see a video of that tiny theater here: https://vimeo.com/163453311

FACILITATOR TIPS

Getting stuck, and unstuck:

LEDs are not working: There could be a couple things going on: a strong connection is crucial, so try pushing where the LED meets the copper tape or wire to see if you have a strong connection. Polarity is also important for LEDs so the legs could be reversed. If those don’t work, it could be...

Color compatibility: Not all LEDs colors work when they’re in a circuit together. You may discover that if you have multiple LEDs colors in a parallel circuit that some turn on and others don’t. You can test for color compatibility on a coin cell battery before building into your circuit.

Switches: Short circuits and continuity gaps can be challenges when making custom circuits with switches.

○ Short circuits: if closing your switch doesn’t activate your LED, you may have created a short circuit. Short circuits allow the electricity to flow directly from the battery, through the switch, and then back to the battery while bypassing your output. Does your LED turn on when you “open” your switch? If so, that’s a good indicator that there’s a short. Hot batteries are another telltale sign. Try experimenting with rearranging your circuit or tracing the wires to see where they go. Simplification can be a helpful tool in troubleshooting.

○ Continuity: Tiny gaps in conductive materials can stop electricity from flowing - double check to see if there are any breaks in the materials you’re using. The continuity function on a multimeter can also help you test to see if the electricity is flowing or if it is blocked.

These red and yellow LEDs are color compatible so they’re both lit up, but the blue is off. Compatibility varies from color to color and brand to brand, so it’s best to test before you build.

COMPLEXIFICATION

○ Make it a game! Find ways to have your audience interact with your theater in a playful way.

○ Incorporate pinhole viewers. Adding a tiny hole to the top of your box can turn it into a camera obscura. Images from the outside world can become part of your story.

○ Tell a longer tale: use multiple boxes to tell each scene of a more elaborate storyline.
**Paper circuits:**
Using copper tape and surface-mount LEDs allows you to make a fully functional circuit on a flat surface, like a piece of paper. You can make light-up greeting cards, make origami animals come to life, or create three-dimensional pop-up paper sculpture that have working lights in them.
http://tinkering.exploratorium.edu/paper-circuits

**Pop ups:**
Take your paper circuits to the next level by adding a third dimension! Using simple paper folding and cutting techniques you can create pop-up cards with moving elements, then add circuitry and LEDs to create beautiful and interactive works. You can find some inspiration here:
http://tinkering.exploratorium.edu/tinkering/2011/08/06/pop-up

**NOTES**