

wonderful idea co.

Ch **IN** **A** **E**

A chain reaction machine accomplishes a simple task in a ridiculously complicated way. This activity is designed to support learners as they come up with their own ideas, reward intellectual risk-taking through experimentation and iteration, and emphasize the joy of collaboration, by creating opportunities for learners to be part of something larger than themselves.

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facilitation guide

# Chain Reaction

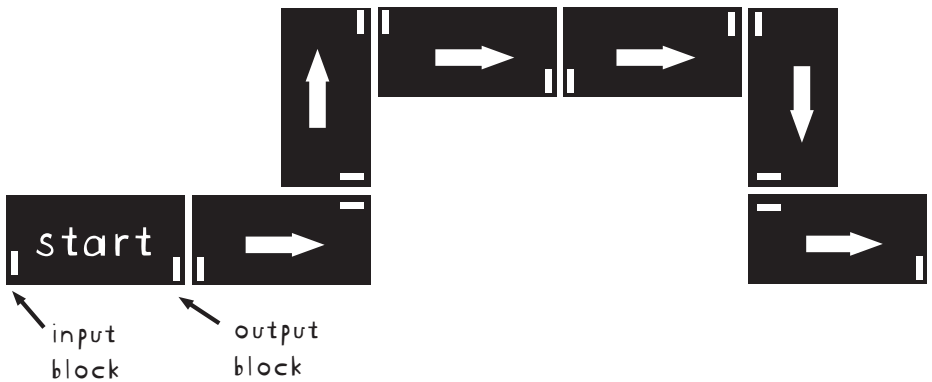
## Step-by-step

### SETTING UP THE ENVIRONMENT

(before the class arrives)

(1) Arrange the tables in a snaky shape that also allows people to move around the room to get more materials, observe each others machines and stretch.

(2) Place input and output blocks on each table (one block at the beginning of each building area, and one at the end) and tape out a square around each block to mark its spot



(3) Place an intriguing object or two on each table, to provide a little inspiration and a starting point ( a blank table can be intimidating! Even if the group ends up using different objects in their final machine, this can help them to get started)

(4) Set up a couple of tables on the side of the room, for building materials and tools

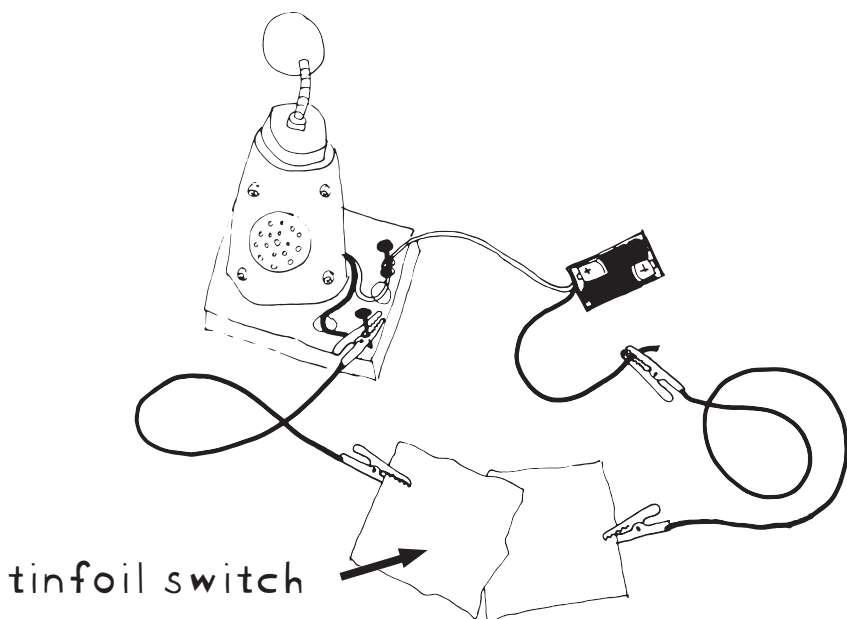
(5) Set up a simple example on one of the tables that demonstrates a few different chain reaction elements.

# GETTING STARTED

(with the class)

## Step one

Talk through the example (and as a demonstration, show a switch made with tinfoil). Try the example out, while emphasizing it's okay if everything doesn't work perfectly.



## Step two

Explain the prompt to build a machine that starts when an input block gets knocked over, which starts a group's machine, which knocks over their output block, which knocks over the next group's input block, which triggers their machine . . . . and so on!

## Step three

Divide groups in pairs and assign each group to a table. Announce how much time they have until you set off the chain reaction machine.

# BUILDING FACILITATION TIPS

Think of your role as a facilitator as helping learners to develop their own ideas. You're there to introduce the prompt, offer hints and tips, and support their process in moments of failure and frustration. Here are a few general techniques to keep in mind.

Observe and listen to learners before jumping in. Your first interaction might be an open ended question about their process

Get down to their eye level when explaining or modeling

Offer suggestions instead of giving directions

Show enthusiasm about their ideas, celebrate moments of wonder, joy, and surprise.

Value tentative ideas, "mistakes" and wrong directions

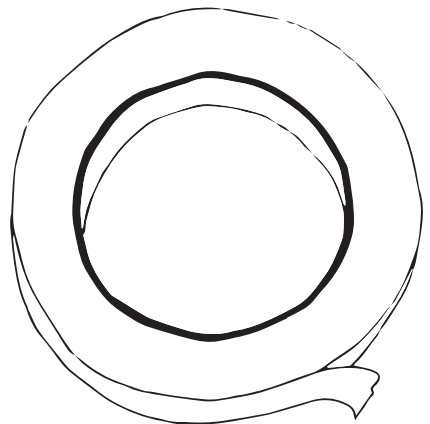
# HELPFUL BUILDING TECHNIQUES TO OFFER WHEN PEOPLE GET STUCK

## Tape helps!

You can use tape to keep objects in exactly the right spot, as you build and test your machine.

Tape hinges are very useful for resetting dominoes or blocks that get knocked over.

To keep a ball at the top of a ramp until you are ready for it to roll down, use a tape tab. It provides just enough resistance to hold the ball in place until something gives it a push

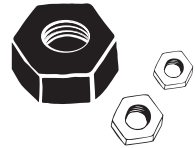


## Try it out!

it's easy to get so caught up in building that you forget to test your machine to make sure it works . . . encourage learners to test their machine as they build it, so they can get feedback from the materials that will help them refine their ideas

## Weight

Adding a little weight to one side of an object helps you tip it over with a small amount of force. Adding small weights (like washers or nuts) one at a time, lets you fine-tune the amount of weight until it is balanced just right (ready to tip, without falling over on its own)



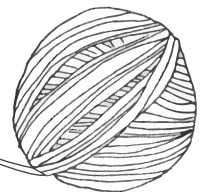
## Shims

If you tilt an object up on edge, even just a bit, with a cardboard shim, it makes it much easier to knock the object over, and requires less force



## Gravity

Really need some power? Tie a string to an object, and knock it off the table. The heavier the object, the more force it will generate as it falls, and you can use that force to activate the next bit of your machine



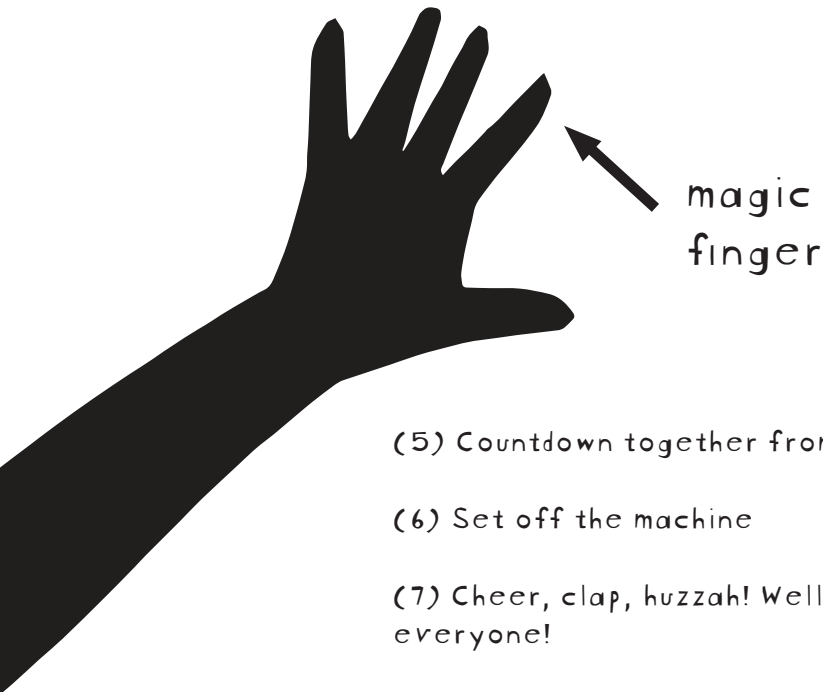
# Setting off the Machine

(1) Let everyone know when they have 10 minutes left to build, 5 minutes, and one minute

(2) Have everyone set up their machines so that they are ready to be triggered

(3) Walk through the whole chain reaction machine as a group, and look at each part together. This is a good time to ask about the process (what went well, what was challenging, what are you proud of) that each group went through.

(4) Introduce the magic finger. We often say that often everything doesn't go exactly according to plan and that each group can use their "magic finger" to help their own contraption along.



(5) Countdown together from ten

(6) Set off the machine

(7) Cheer, clap, huzzah! Well done everyone!

(8) If you can, add in a few minutes for everyone to clean up together.

# Reflection Questions for Facilitators

(after the class leaves)

Facilitation is a practice that takes time to develop. It's helpful to reflect on your process after each experience working with learners. If you can, spend five minutes answering these questions after each chain reaction session.

What went well (what positive interactions did you have)?

What questions do you have?

What are you unsure of? What could be improved?

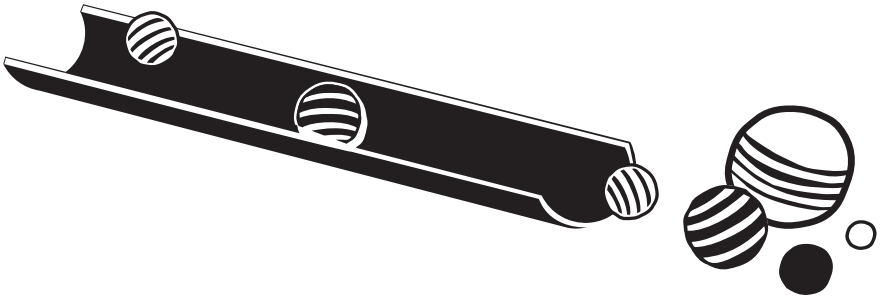
Were there any challenging interactions?

# Scale it up, scale it down

You can scale this activity up or down, to accommodate deeper investigation, younger builders, and different environments. Here are some of the parameters you can play with to make a chain reaction that fits your needs.

## Size

You can make your chain reaction as big, or as small, as you like. Add more tables to make a longer chain reaction, or take tables away for a small one. Just make sure you scale quantities of building materials to fit, as well.



## Complexity

For younger builders, limit the palette of materials to simple parts, like ramps, balls, blocks, and dominoes, and make the activity more exploratory, rather than a collaborative chain reaction with a time limit, or scaffold this activity by providing pre-built, resettable elements. You might also experiment with more imaginative chain reaction machines, through drawing and storytelling.

To go deeper, incorporate electro-mechanical elements, like motors, tinfoil switches, and mechanical toy parts. Provide materials that can be altered, like cardboard and wood, along with tools, like saws, drills, and hot-glue. You could also come up with an over-all theme, either metaphorical or practical (a love machine vs. breakfast machine, for example) and provide thematic objects that can be built into the machine.