

# Exploring Systems with Human Machines

Use this tool when you want to deepen children's understanding of complex systems.

## Step 1

As a warm-up, ask children to explore different ways they can move their bodies or body parts. Provide ground rules such as, "Each person has an imaginary force field around them. Don't get closer than an arm's length."

Ask children to explore moving their bodies or a body part slowly or rapidly, or to appear powerful or weak, tiny or gigantic, etc.

## Step 2

Invite children to choose a motion, perhaps based on criteria you set in Step 1, and use their body or a body part in a repetitive "loop."

## Step 3

Ask children to get into groups of five to seven students and to create a machine they are familiar with (e.g., a toaster, washing machine, or bicycle). Invite each child to perform a different repetitive motion which, when combined with other children's motions, will create the machine. Allow time for each group to share its machines with at least one other group, explaining how each part works and contributes to the whole.

## Step 4

Show children examples (gather them before you begin) of a patent or another diagram of the familiar machines they created earlier (e.g., [a toaster](#)). Ask individuals or pairs of children to draw a diagram showing how the machines they created in Step 3 work and to label the parts.

## Step 5

Facilitate children's reflections about the machines they created by posing one or more of the following questions:

- How does each part work with the others?
- What goes in and what comes out?
- What new ideas came up when you drew the diagram?
- What did you become aware of when you made the human machine that you weren't aware of before?

© 2019 President and Fellows of Harvard College and Opal School. This work is licensed under the [Creative Commons Attribution-NonCommercial-Share Alike 4.0 International](#) license (CC BY-NC-SA). This license allows users to share this work with others, but it cannot be used commercially. To reference this work, please use the following: The Inspiring Inventiveness products were co-developed by Project Zero, a research center at the Harvard Graduate School of Education, and Opal School.



## Children need to understand how systems function.

Inventors use a range of materials to explore and understand complex systems as they identify problems and solutions. Translating ideas from one mode of expression to another deepens understanding of the relationship of parts to whole and provokes new ideas. Asking children to use their bodies to represent an abstract system, and then to diagram their creations, gives children a playful opportunity to imagine and recreate an abstract system.



### Suggested Time Frame

45 minutes

### When and How

Use this tool when you want to give children a playful opportunity to imagine and create a system. Asking children to diagram their creation afterwards helps to deepen their thinking.

### Tips and Variations

- Do not expect children to be able to describe how the system works before they begin playing with each other.
- Consider asking children to draw the machine using large blueprint paper, grid/dot paper, or choosing from a range of paper, pencils, and pens.
- You can search for patent images at [google.com/patents](https://www.google.com/patents).
- Post photographs of the children's human machines and/or diagrams in the classroom as a memory for the group.
- Help children learn the differences between open and closed systems. Ask them to think about the differences, for instance, between an ecosystem and a car engine.

For video examples and reflections on practices that inspire inventiveness, become an Opal School Online Sustaining Member at [learning.opalschool.org](https://learning.opalschool.org).

