# Automata

**Audience**: Ages 4 and up
**Subjects**: Physical sciences; life sciences; engineering and technology; science and society; art, music, and literature
**Time required**: 20 minutes (15 minutes for activity and 5 minutes for discussion)

## Description

In this activity, learners make an automaton, a moving mechanical device that imitates the movement of a human, animal, or other living thing. The activity is designed to prompt conversation and reflection about responsible innovation.

## Learning objectives

The primary objective of this activity is to encourage creativity and reflection about responsible innovation. In addition, learners will explore the following concepts:

- How to be more creative by inventing new things.
- The social and ethical consequences of scientific and technological exploration.
- How robots work and what attributes they have.

## Procedure

By using simple components, such as a plastic container, a piece of straw, skewers and foam circles, learners build their own machine and animate it with handlers.

When they're done with the activity, facilitators ask the following questions:

- Is it alive?
- How can you tell the difference between a machine and a living creature?

## Common Core Standards

This activity is aligned with the following Science and Technical Subjects:

- **Grade 6-8**: CCSS.ELA-LITERACY.RST.6-8.1, CCSS.ELA-LITERACY.RST.6-8.3, CCSS.ELA-LITERACY.RST.6-8.8
- **Grade 9-10**: CCSS.ELA-LITERACY.RST.9-10.1, CCSS.ELA-LITERACY.RST.9-10.3, CCSS.ELA-LITERACY.RST.9-10.8
- **Grade 11-12**: CCSS.ELA-LITERACY.RST.11-12.1, CCSS.ELA-LITERACY.RST.11-12.3, CCSS.ELA-LITERACY.RST.11-12.8

## Next Generation Science Standards

This activity is aligned with the following disciplinary core ideas'

- Life science (LS)
- Physical science (PS)
- Engineering, technology, and the application of science (ETS)
- Appendix J—Science, technology, society, and the environment
- Science and engineering practices

## Battery Stack

**Audience**: Ages 7 and up
**Subjects**: Physical sciences; life sciences; engineering and technology; electricity and magnetism; health and medicine; science and society; art, music, and literature
**Time required**: 25 minutes (15 minutes for activity and 10 minutes for discussion)

### Description

In this activity, learners make a voltaic pile, the first kind of battery. The activity is designed to prompt conversation and reflection about responsible innovation.

### Learning objectives

The primary objective of this activity is to encourage exploration and reflection about responsible innovation. In addition, learners will investigate the following concepts:

- How to be more creative by inventing new things.
- The social and ethical consequences of scientific and technological exploration.
- How Mary Shelley's Frankenstein inspired scientists studying electricity.

### Procedure

By using zinc and copper washers, vinegar and a rod, learners build a voltaic pile. Then, they attach a buzzer or LED to the pile and use a meter so they can observe how much electricity their pile generates. They are also encouraged to add more zinc and copper washers to their pile and see what happens to the buzzer or LED.

When they are done with the activity, facilitators will engage in a discussion with them about the inventor, Allesandro Volta as well as Frankenstein and electricity. Learners will be asked to reflect on the following questions:

- Why do you think Volta may have wanted to investigate electricity?
- How do you think Shelley may have felt about the electrical experiments going on during her lifetime? How would you have felt about them?
- Are inventors responsible for the ways people use their inventions? Is an invention itself good or bad, or does it depend how people use it?

**Common Core Standards**

This activity is aligned with the following Science and Technical Subjects:

- **Grade 6-8**: CCSS.ELA-LITERACY.RST.6-8.1, CCSS.ELA-LITERACY.RST.6-8.3, CCSS.ELA-LITERACY.RST.6-8.8
- **Grade 9-10**: CCSS.ELA-LITERACY.RST.9-10.1, CCSS.ELA-LITERACY.RST.9-10.3, CCSS.ELA-LITERACY.RST.9-10.8
- **Grade 11-12**: CCSS.ELA-LITERACY.RST.11-12.1, CCSS.ELA-LITERACY.RST.11-12.3, CCSS.ELA-LITERACY.RST.11-12.8

**Next Generation Science Standards**

This activity is aligned with the following disciplinary core ideas:

- Life science (LS)
- Physical science (PS)
- Engineering, technology, and the application of science (ETS)
- Appendix J—Science, technology, society, and the environment
- Science and engineering practices

# Dough Creature

**Audience:** Ages 7 and up
**Subjects**: Physical sciences; life sciences; engineering and technology; electricity and magnetism; health and medicine; science and society; art, music and literature
**Time required**: 20 minutes (15 minutes for activity and 5 minutes for discussion)

**Description**

In this activity, learners make a creature out of conductive dough and use it to create an electrical circuit. The activity is designed to prompt conversation and reflection about responsible innovation.

**Learning objectives**

The primary objective of this activity is to encourage creativity and reflection about responsible innovation. In addition, learners will explore the following concepts:

- How to be more creative by inventing new things.
- The social and ethical consequences of scientific and technological exploration.
- How medical technologies can take advantage of the fact that the human body can complete an electrical circuit.
- How technological advancements can help us better understand the world around us.

**Procedure**

By forming conductive and insulating playdough balls, learners create simple circuits. Then, they put a wire from a battery pack into each ball and attach LED bulbs to the dough. Learners are encouraged to experiment with different solutions, such as creating their dough creatures and attaching multiple bulbs, a buzzer, or a motor.

When they are done with the activity, learners will be asked to reflect on the following questions:

- What kind of creature do you want to make?
- What is your creature like? Is it kind, silly, or naughty?
- Does it get along with others?
- What does your creature do? Where does it live? Who takes care of it?

**Common Core Standards**

This activity is aligned with the following Science and Technical Subjects:

- **Grade 6-8**: CCSS.ELA-LITERACY.RST.6-8.1, CCSS.ELA-LITERACY.RST.6-8.3, CCSS.ELA-LITERACY.RST.6-8.8
- **Grade 9-10**: CCSS.ELA-LITERACY.RST.9-10.1, CCSS.ELA-LITERACY.RST.9-10.3, CCSS.ELA-LITERACY.RST.9-10.8
- **Grade 11-12**: CCSS.ELA-LITERACY.RST.11-12.1, CCSS.ELA-LITERACY.RST.11-12.3, CCSS.ELA-LITERACY.RST.11-12.8

**Next Generation Science Standards**

This activity is aligned with the following disciplinary core ideas:

- Life science (LS)
- Physical science (PS)
- Engineering, technology, and the application of science (ETS)
- Appendix J—Science, technology, society, and the environment
- Science and engineering practices

## Frankentoy

**Audience:** Ages 7 and up
**Subjects**: Life science; science and technology; science and society; art, music and literature
**Time required:** 15 minutes (5 minutes for activity, 10 minutes for discussion)

**Description**

In this activity, learners make a “creature” by mixing and matching different parts of toys. The activity is designed to prompt conversation and reflection about responsible innovation.

**Learning objectives**

The primary objective of this activity is to encourage creativity and reflection about responsible innovation. In addition, learners will explore the following concepts:

- How to be more creative by inventing new things.
- The social and ethical consequences of scientific and technological exploration.
- How researchers can create modified and entirely new organisms.

**Procedure**

By mixing and matching parts of plush animals and dolls, learners create their own creatures. Then, they are asked to act out a story of their creation and take photos of it.

When they are done with the activity, learners will be asked to reflect on the following questions:

- What kind of creature is it? Is it a pet or a wild animal?
- What does your creature say and do?
- Where does it live?
- Can it make friends with another creature?

**Common Core Standards**

This activity is aligned with the following Science and Technical Subjects:

- **Grade 6-8**: CCSS.ELA-LITERACY.RST.6-8.1, CCSS.ELA-LITERACY.RST.6-8.3, CCSS.ELA-LITERACY.RST.6-8.8
- **Grade 9-10**: CCSS.ELA-LITERACY.RST.9-10.1, CCSS.ELA-LITERACY.RST.9-10.3, CCSS.ELA-LITERACY.RST.9-10.8
- **Grade 11-12**: CCSS.ELA-LITERACY.RST.11-12.1, CCSS.ELA-LITERACY.RST.11-12.3, CCSS.ELA-LITERACY.RST.11-12.8

**Next Generation Science Standards**

This activity is aligned with the following disciplinary core ideas’

- Life science (LS)
- Physical science (PS)
- Engineering, technology, and the application of science (ETS)
- Appendix J—Science, technology, society, and the environment
- Science and engineering practices

**Monster Mask**

**Audience:** Ages 4 and up
**Subjects**: Physical sciences; life sciences; engineering and technology; technology; electricity and magnetism; science and society; art, music and literature
**Time required**: 20 minutes (15 minutes for activity; 5 minutes for discussion)

**Description**

In this activity, learners make a mask with a special feature: an LED bulb that lights up. The activity is designed to prompt conversation and reflection about responsible innovation.

**Learning objectives**

The primary objective of this activity is to encourage creativity and reflection about responsible innovation. In addition, learners will explore the following concepts:

- How to be more creative by inventing new things.
- The social and ethical consequences of scientific and technological exploration.
- How technologies can be used to modify living organisms.

**Procedure**

Learners create their paper mask by drawing its shape on a sheet of paper. Then, they cut it out and attach LED bulbs to the mask.

During this activity, learners will be asked to reflect on the following questions:

- What can you add to give the mask character?
- How will we know whether your mask is friendly or scary?
- Did you design your mask to give it a certain personality or character?
- What makes a face seem funny, scary, or just plain weird?

**Common Core Standards**

This activity is aligned with the following Science and Technical Subjects:

- **Grade 6-8**: CCSS.ELA-LITERACY.RST.6-8.1, CCSS.ELA-LITERACY.RST.6-8.3, CCSS.ELA-LITERACY.RST.6-8.8
- **Grade 9-10**: CCSS.ELA-LITERACY.RST.9-10.1, CCSS.ELA-LITERACY.RST.9-10.3, CCSS.ELA-LITERACY.RST.9-10.8
- **Grade 11-12**: CCSS.ELA-LITERACY.RST.11-12.1, CCSS.ELA-LITERACY.RST.11-12.3, CCSS.ELA-LITERACY.RST.11-12.8

**Next Generation Science Standards**

This activity is aligned with the following disciplinary core ideas'

- Life science (LS)
- Physical science (PS)
- Engineering, technology, and the application of science (ETS)
- Appendix J—Science, technology, society, and the environment
- Science and engineering practices

## Scribbler

**Audience**: Ages 4 and up
**Subjects**: Life sciences; physical sciences; science and technology; electricity and magnetism; science and society; art, music and literature
**Time requirement**: 20 minutes (15 minutes for activity; 5 minutes for discussion)

### Description

In this activity, learners make a toy bot that is capable of scribbling on a sheet of paper. The activity is designed to prompt conversation and reflection about responsible innovation,

### Learning objectives

The primary objective of this activity is to encourage creativity and reflection about responsible innovation. In addition, learners will explore the following concepts:

- How to be more creative by inventing new things.
- The social and ethical consequences of scientific and technological exploration.
- How robots and artificial intelligence work.

### Procedure

Learners will create scribble bots by using simple materials, such as pool noodles, markers and rubber bands. They will animate their scribblers with an electric toothbrush so it can move and drawn on a sheet of paper.

When they're done with the activity, facilitators will ask the following questions:

- How can you give your creature its own personality and abilities?
- Is your creature alive, or does it just seem to be? Are its scribbles art?
- If so, who is the artist—you or the scribbler?

### Common Core Standards

This activity is aligned with the following Science and Technical Subjects:

- **Grade 6-8**: CCSS.ELA-LITERACY.RST.6-8.1, CCSS.ELA-LITERACY.RST.6-8.3, CCSS.ELA-LITERACY.RST.6-8.8
- **Grade 9-10**: CCSS.ELA-LITERACY.RST.9-10.1, CCSS.ELA-LITERACY.RST.9-10.3, CCSS.ELA-LITERACY.RST.9-10.8
- **Grade 11-12**: CCSS.ELA-LITERACY.RST.11-12.1, CCSS.ELA-LITERACY.RST.11-12.3, CCSS.ELA-LITERACY.RST.11-12.8

**Next Generation Science Standards**

This activity is aligned with the following disciplinary core ideas'

- Life science (LS)
- Physical science (PS)
- Engineering, technology, and the application of science (ETS)
- Appendix J—Science, technology, society, and the environment
- Science and engineering practices

## Spark of Life

**Audience**: Ages 4 and up
**Subjects**: Life sciences; physical sciences; science and technology; electricity and magnetism; health and medicine; science and society; art, music and literature
**Time requirement**: 20 minutes (5 minutes for activity; 15 minutes for discussion)

**Description**

In this activity, learners will create a battery from two kinds of metal and their own body. This activity is designed to prompt conversation and reflection about responsible innovation.

**Learning objectives**

The primary objective of this activity is to encourage exploration and reflection about responsible innovation. In addition, learners will investigate the following concepts:

- How to be more creative by inventing new things.
- The social and ethical consequences of scientific and technological exploration.
- How medical technologies can take advantage of the fact that the human body can complete an electrical circuit.

**Procedure**

Learners will create an electric circuit by placing their hands on a steel and copper sheet, and using their own body. They can measure how much electricity they produce by a meter.

When learners are done with the activity, facilitators start a conversation about how medical technologies, like a TENS unit, use electricity to help people, and how electricity and magnetism inspired Mary Shelley to write *Frankenstein*. Then, they ask the following questions:

- Would you try a TENS unit to help heal an injury? Would you be nervous or excited to see if it worked?
- How do you think Shelley may have felt about the electrical experiments going on during her lifetime? How would you have felt about them?
- Would you get a chip in your brain to help you move a paralyzed arm? Would you get a brain chip to become better at sports?

**Common Core Standards**

This activity is aligned with the following Science and Technical Subjects:

- **Grade 6-8**: CCSS.ELA-LITERACY.RST.6-8.1, CCSS.ELA-LITERACY.RST.6-8.3, CCSS.ELA-LITERACY.RST.6-8.8
- **Grade 9-10**: CCSS.ELA-LITERACY.RST.9-10.1, CCSS.ELA-LITERACY.RST.9-10.3, CCSS.ELA-LITERACY.RST.9-10.8
- **Grade 11-12**: CCSS.ELA-LITERACY.RST.11-12.1, CCSS.ELA-LITERACY.RST.11-12.3, CCSS.ELA-LITERACY.RST.11-12.8

**Next Generation Science Standards**

This activity is aligned with the following disciplinary core ideas'

- Life science (LS)
- Physical science (PS)
- Engineering, technology, and the application of science (ETS)
- Appendix J—Science, technology, society, and the environment
- Science and engineering practices