



START to STEM

A turn-key solution to STEM!

What is Start to STEM?

Start to STEM is a comprehensive STEM program designed to bring innovative products into the classroom to connect STEM principles to the real world. You have the option to customize your program to create the best solution for your school. We offer:



Engaging STEM Products

- Equipment for a class size of 24
- Centralized around a core STEM topic area
- Reusable for years to come



Day-by-Day Lesson Plans

- Aligned to national education standards
- Scalable across different grade levels
- Includes lessons, vocabulary, equipment instructions, student worksheets, and more



Virtual Professional Development

- Live virtual training with a STEM expert
- Expanded overview of equipment and activities
- Opportunity to learn best practices in using the equipment and teaching real-world applicable STEM lessons

Ready to start your STEM journey?

Whether you're a STEM veteran or new to STEM teaching, we're here to help. The Start to STEM program was designed as a turn-key solution that focuses on real-world applications of STEM fields through hands-on and inquiry-based methods. We're here to provide you the best teaching and learning experience for classrooms, makerspaces, and everything in-between.

Contact Us Today!

stem-supplies.com/start-to-stem | orders@stem-supplies.com | (855) 826-4540

Technology is the fastest growing STEM field. In fact, by the end of 2024, the U.S. Bureau of Labor expects over a million new jobs to be created in computer science fields! To prepare students for a technologically advanced future, teachers will need to expose students to computer science in the K-12 space. The best way to learn computer programming is through hands-on and real-world relevant equipment and curriculum. Through Start to STEM Coding and Robotics Kits, students will explore computer science concepts like algorithms, computer programming, and “debugging” throughout ten days of hands-on and inquiry-based coursework.

The Start to STEM Coding and Robotics Complete Kit includes hands-on equipment for 24 students, a comprehensive curriculum manual aligned to the Next Generation Science Standards and the CSTA K-12 Computer Science Standards, and a three-hour virtual professional development training. You also have the option to purchase the equipment or the manual alone, as well as the equipment and the manual without the training.

Top Subject Areas Covered:



Programming



Hardware



Troubleshooting



Circuits

Lesson Objectives:

Daily Instruction Topics	Example Learning Objective
What is Coding?	Be able to write an algorithm for a real task and understand the level of detail required.
Coding from Scratch	Practice making scripts in a computer language.
Circuits and Coding	Learn how a circuit board can control aspects of a computer.
Introduction to Robots	Understand how sensors impact the output actions of a robot.
Coding with Ozobots	Define what an optical sensor is.
Coding with Dash	Draw connections between one programming language and another.
Culminating Coding Challenge	Complete a challenge using the unique skills of different robotics platforms.



Learning Objectives

- Define conductivity and be able to test if a material is conductive.
- Be exposed to a real-world circuit board that can control elements of a computer.

Equipment List

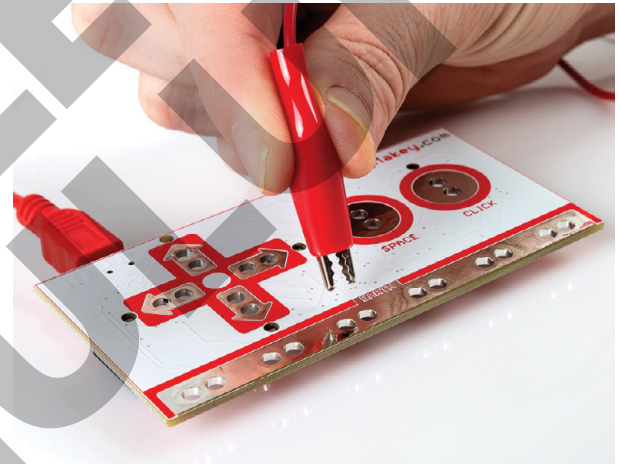
- Makey Makey® Class Pack:
 - 12 Makey Makey® Classics
 - 12 Alligator Clips with 6'L Cord
 - 12 Connector Wires (6'L)
- Computers, 1 per Makey Makey® in use
- Conductive and non-conductive items from the classroom (e.g., aluminum foil, pencils, paper clips, etc.)
- 72 Additional Alligator Clips
- 144 Additional Connector Wires
- 12 Conductive Pencils

Suggested Timing

- 45+ minutes

SET UP

- Split students into partners or small groups.
- Give each grouping an equal number of supplies from the Makey Makey® kit. Split up the supplies using the equipment list of above based on your number of groupings.
- Give each group a number of supplies to check for conductivity. Examples include paper clips, foil, pencils/pens, paper, scissors, toothpicks, etc.
- Give each group a copy of the "Conductivity Checklist" worksheet.



TEACH

- Define conductivity as the ability of an object to transmit electricity. A conductor is anything that is able to conduct electricity, while an insulator is any material that does not.
- Recall what types of materials were conductive in the circuits created in Lesson 6.
- Have students fill out their predictions of which given supplies are conductive using the "Conductivity Checklist" worksheet.
- Introduce Makey Makey®:
 - Makey Makey® is a circuit board. When you connect the Makey Makey® to a computer via a USB, the Makey Makey® receives power (like a battery in a circuit). Connecting different wires to the Makey Makey® allows you to create circuits.
- Create a simple circuit using Makey Makey® following the instructions in the "Makey Makey® Troubleshooting Guide".
- Have students test the conductivity of each supply by integrating it into their Makey Makey® circuit. Record the answers in the "Conductivity Checklist" worksheet. The Makey Makey® circuit board will blink a green light if something is conductive.

REFLECTION QUESTIONS

- What is the source of power for the Makey Makey® circuit board?
- What types of materials are conductors? Which materials are insulators?
- Are humans conductive? How can we test that using the Makey Makey®?
- Is water conductive? How can test that using the Makey Makey®?

Next Generation Science Standards

PS3.A: Definitions of Energy

- Energy can be moved from place to place by moving objects or through sound, light, or electric currents.

PS3.B: Conservation of Energy and Energy Transfer:

- Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy.

Vocabulary

- **Conductor** - a material that allows electric current to flow (e.g., steel).
- **Insulator** - a material that electric current cannot flow through (e.g., plastic).

Worksheets

- Conductivity Checklist, p 51
- Makey Makey® Troubleshooting Guide, p 59

TEACHING SUGGESTIONS

- Give each group a good mix of insulators and conductors to test. Encourage students to also look around the classroom for even more examples.
- Follow the "Makey Makey® Troubleshooting Guide" to set up Makey Makey® for the first time.

ADDITIONAL LESSON OPTIONS

- Have students do a conductivity scavenger hunt where they identify conductors and insulators found throughout the classroom.
- Have students test materials in a paper circuit using the materials from the Paper Circuits Class Kit.

TEACHER REFLECTION

CONDUCTIVITY CHECKLIST

Name(s): _____

In the table below, list the name of the object you will be testing (e.g., a toothpick). In the second column, make a prediction if that item is a conductor (allows electricity to flow) or an insulator (does not allow electricity to flow). Test the item in your circuit and record if it was conductive or was not. Then determine if this item behaved as you predicted. See example in row 1 of the table below.

Object Name	Prediction: Conductor or Insulator	Test Results: Conductor or Insulator	Did This Item Behave as You Predicted?
Toothpick	Conductor	Insulator	No

What types of materials make good conductors?

What types of materials make good insulators?

Overview

- Makey Makey® is a circuit board that plugs into a computer and acts like a keyboard.
- Each metal pad on the Makey Makey® is a conductive touch pad.
- Makey Makey® can be programmed using Scratch.

Compatibility

- Devices that support a USB keyboard or mouse:
 - Windows
 - Mac
 - Chromebook
 - Linux

Website

makeymakey.com

CONNECTING MAKEY MAKEY® TO A DEVICE

- Plug the small side of the USB cable into Makey Makey®.
- Plug the big side of the same USB cable into a computer.
- If your computer asks you to install drivers or do other setup, click cancel or close those windows. You don't need to install anything to use Makey Makey®.



CONNECT TO EARTH

- Connect one end of an alligator clip to EARTH on the bottom front side of your Makey Makey®.
- Hold the metal part located at the other end of the alligator clip between your fingers. You are now "grounded".

CONNECT TO SPACE

- Connect a second alligator clip to the pad labeled SPACE.
- While grounded, touch the other end of the SPACE alligator clip between your two fingers.
- Touching this clip will make your computer perform the same action that it would if you hit the space button on your keyboard. Test this function by opening a program like Microsoft Word.
- Repeat these steps by connecting to other pads like the arrow keys or CLICK.

CONNECTING MAKEY MAKEY® TO EVERYDAY ITEMS

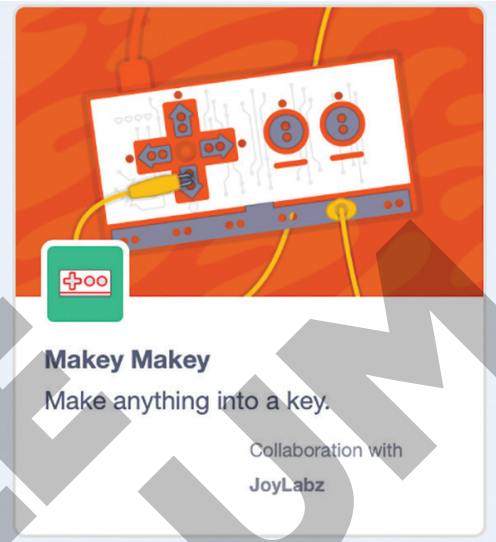
- Anything conductive can be connected to Makey Makey®.
- Connect the alligator clips to the pads as described above.
- Instead of holding the other end of the clips with your fingers, attach something conductive. These are some conductive items that you can try:
 - Fruits and vegetables (Makey Makey® famously uses a banana in many set ups!)
 - Graphite from a pencil
 - Play-Doh®
 - Metal objects like coins
- Touch the conductive item instead of the clip's end to make the Makey Makey® work.

Technology Tips

- Makey Makey® has excellent tutorials that students can follow. Go to the Makey Makey® website and select "Resources" from the top toolbar. Within this menu, select "How to Guides" for a list of projects that can be done with your Makey Makey®.
- Technology changes all the time! We'll do our best to provide you the most current information in this manual, but if need more help, visit Makey Makey's website directly at www.makeymakey.com.

MAKEY MAKEY® AND SCRATCH

- Set up your Makey Makey® as usual.
- Open Scratch. For more information, see the "Scratch Troubleshooting Guide" in this manual.
- Create a program that will work with Makey Makey®. Include an event block that corresponds to the pads on Makey Makey® (e.g., "when key pressed").
- Additionally, you can use the Makey Makey® extension blocks by clicking the block adding icon in the bottom left corner of Scratch and choosing the Makey Makey® extension.



TROUBLESHOOTING TIPS

- If one of the keys won't stop pressing, try unplugging the device from the computer. Then plug it back in again.
- You can also try disconnecting all alligator clips and then reattaching them one by one.
- If your Makey Makey® isn't working, your materials may not be conductive enough.
- Make sure to check your connections. If connections are accidentally touching, you may get unexpected results.

TEACHER REFLECTION
