

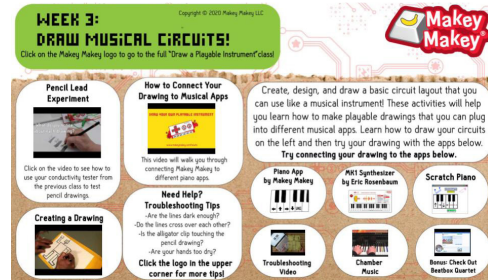
# WEEK THREE: DRAW MUSICAL CIRCUITS

## Lesson Four: Draw a Playable Instrument

### Purposes/Objectives

Students will do the following:

- Test a drawing on their conductivity tester
- Draw and erase circuits
- Test different pencil lead types for conductivity
- Make observations about pencil lead types
- Test out different musical apps with Makey Makey and their own drawings



Use this interactive Google slide in your classroom:  
<https://bit.ly/MakeyClassroomSlides>.

## LESSON FOUR: DRAW A PLAYABLE INSTRUMENT (45 MIN.-1 HR.)

### Overview of Activity

In this 45-minute lesson, students will test the conductivity of pencils of different hardness/softness ratings (optional). Students will try out multiple apps for Makey Makey and draw circuits to create their own playable instrument on paper.

### Before You Begin

Virtual students will need a way to share their drawings and how they are hooking up Makey Makey. They could make a Flipgrid video or, if you want them to share live, you could 3D print a “video call mirror tool” to help students share their hands-on work when working from home.

### Required Materials

- Makey Makey
- Graphite pencil (A 6B artist pencil works the best!)
- Pencils of varying degrees for pencil lead testing
- Paper

### Video Options

- Sketch It! Play It! Inspiration: Student Build Guide
- Pencil Lead Experiment: Student Build Guide
- Connecting Drawings to Makey Makey Apps: <http://makeymakey.com/ConnectMakeyApps>
- Sketch It! Play It! Robot
- Video for troubleshooting: Student Build Guide

### Student Build Guide:

[www.MakeyMakey.com/LessonFour](http://www.MakeyMakey.com/LessonFour)

Print this QR code for students to scan:



# TEACHING GUIDE FOR LESSON FOUR

## RUNNING THE ACTIVITY:

### Warm-Up (10 min.)

In the last lesson, students learned that a conductor is any item that allows electrons to flow through it with little effort. They also learned that if an item has any conductivity, Makey Makey will detect it, and that an insulator is any item that does not allow electrons to flow through it. Now that they know graphite is conductive and paper is an insulator, they can experiment with making pencil drawings that can control their computer!

Ask students to test a pencil drawing on their conductivity tester from the last class. Tell students the following: Graphite is the conductive element in a pencil that makes it a really cool material for inventing!

In this lesson, you will draw your own instrument and alligator clip drawings to Makey Makey so you can play the piano app with a hand-drawn instrument! You will also learn about other pianos you can plug and play with Makey Makey. You will even learn that you can code an instrument in Scratch!

Share this video for inspiration: <http://bit.ly/MakeySketch>.

### Main Activity (45 min.)

Give students paper, pencils, and Makey Makey with the alligator clips.

### Pencil Lead Experiment (Optional) (5 min.)

If you have access to pencils of varying softness (2B, 5B, etc.), have students make a scribble with each pencil type and test their drawings with the piano app. You can share this video or share your own example of a pencil lead experiment.

### Drawing an Instrument (Drawing Circuits) (25 min.)

Tell students the following:

Since we now know that pencil drawings work as long as the drawings are thick and have a lot of graphite, it is time to draw an instrument. The best thing about drawing an instrument is it doesn't have to look like an instrument! What will you create? A robotic piano? A spaceship trombone? Will you maybe draw your name, and each letter can be a different piano key?

Remind students that the drawing will have to be in segments to make different notes play. Share a drawing where lines are connected and show them that they can erase connections! Here is a quick video example of a disconnected robot that functions as a piano: <http://bit.ly/MakeyRobotSketch>.

### More Prompts

- Draw your name where each letter will be a note on the piano.
- Draw a picture of a musical instrument—one you play or would like to play.
- Draw your favorite character from a game, but make sure it is disconnected so different parts of the character can be separate notes!
- Draw the strings of a guitar, the keys of a piano, or organic blobs that will work as different keys.
- Draw a fractured shape where each broken piece is a key note.

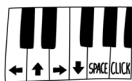
## LESSON FOUR CONTINUED: DRAW A PLAYABLE INSTRUMENT

### Plug and Play

Now that students know about the conductivity of pencil lead, they are ready to experiment with multiple piano apps! The best thing about Makey Makey is that it can control any app, web page, or Scratch project that works with key presses. Ask students to test their drawings on multiple apps. This video will walk students through connecting Makey Makey to our suite of apps (<http://MakeyMakey.com/ConnectMakeyApps>).

#### Apps for Plug and Play

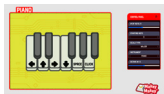
Here are some of our favorite apps ([MakeyMakey.com/Apps](http://MakeyMakey.com/Apps)):



**Makey Makey Piano:** This is a piano designed for Makey Makey. Play a melody with the arrow keys and space bar (and click, too).



**MK-1:** This is a sampling synth made by Eric Rosenbaum for Makey Makey. Record your own sound, use preset scales, and set the keys to play just the notes you want. (Watch the last few minutes of this live webisode to see more about using the MK-1 synthesizer.)



**Adjustable Piano** - Add more keys, change instruments, or octaves in this new plug and play app.



**Makey Makey Sampler:** This app allows you to play music and sounds like a DJ or producer. You can even record your own sounds. Making it an ideal app to start creating with Makey Makey before you start coding your own projects.



**Buzzer** - Run your own gameshow and Buzz in with Makey Makey!



**Counter** - Use your Makey Makey to tally votes, collect data, and more.

## LESSON FOUR CONTINUED: DRAW A PLAYABLE INSTRUMENT

**Wrap-Up (10 min.)** Discuss the science behind this activity.

Tell students the following:

We learned in the last lesson that a conductor is any item that allows electrons to flow through it with little effort. We also learned that if an item has any conductivity, Makey Makey will detect it. We learned an insulator is any item that does not allow electrons to flow through it. Since we tested graphite and it is conductive, and we learned that paper is an insulator, we know now that if we make our drawings thick enough on regular paper, we can use drawings to control our computer keys!

In our next lesson, we will go a step further and learn how to code our key presses with Scratch. As an inventor, you'll want to create your own apps and computer programs, so we will show you how to do just that!

### Teaching Tips

If you are dividing up the STEM pack to send home Makey Makey to individual students, we suggest all students create drawings and check out the virtual Makey Makey Scratch project.

- If students have to wait for Makey Makey, ask all students to create a drawing for testing and playing.
- Regular pencils will work, but they will need to draw very dark drawings with a lot of graphite. If you are working with younger students, you might consider purchasing some art pencils (6B) to decrease frustrations.
- We like to put pencils and erasers at table groups. Drawing a circuit is a cool way to learn, but erasing to find out how to break a circuit is even more exciting!

Oftentimes students get stuck on only using our Piano and Bongo apps, but any app that uses key presses can be controlled with Makey Makey. This is a great video for showing how to use our Makey Makey Sampler App (<http://makeymakey.com/ConnectSampler>)!

### TROUBLESHOOTING TIPS

- Are the lines dark enough?
- Do the lines cross over each other?
- Usually, it is recommended that beginners keep their lines separate so that each line makes one distinct sound.
- Is the alligator clip touching the pencil drawing nicely?
- Are somebody's hands just too dry? Try putting out a damp sponge for people with dry hands.
- Have you clicked on the piano to bring browser focus to the piano?
- Is your sound turned on?
- Try pushing the arrow keys directly on your keyboard and watch the piano on the screen.
- Is the Makey Makey plugged into the USB?
- Are you drawing on a smooth, hard surface (such as a clipboard)?
- Are you grounded? You have to be touching ground AND touching the arrow input both at the same time.

## LESSON FOUR EXTENSIONS: DRAW A PLAYABLE INSTRUMENT

### Extension Lesson: Makey Makey Sampler

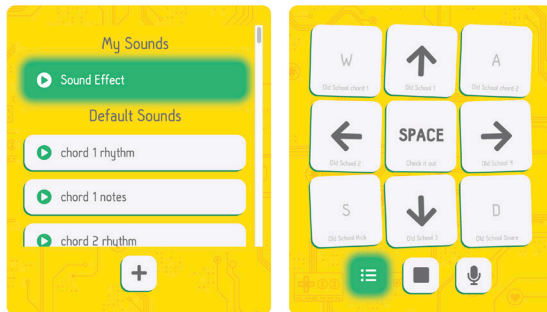
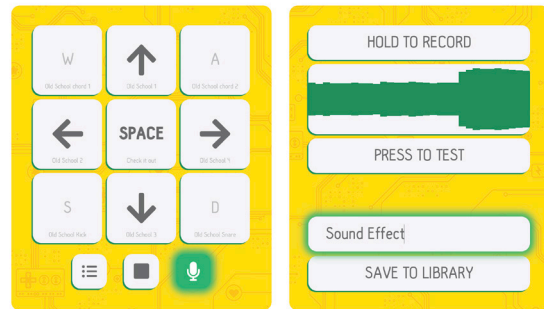
With our new Sampler, you can record voice samples and sound effects directly into our Sampler app and connect straight to Makey Makey for a plug-and-play experience! A music sampler is composed of pads that let you sample music on each pad. Think of it like a food sampler, but with music!



The Sampler is a plug-and-play experience without any coding! Ask students to click on the microphone to record their own sounds. Press and hold the microphone to record. (Five second limit for recording.)

To test the sample, click on “Press to Test,” then click on the sound wave to trim.

Once a sound sample is made, ask students to name it and press “Save to Library” to save it to the library. “My Sounds” appear at the top of the library of sounds and are highlighted green.

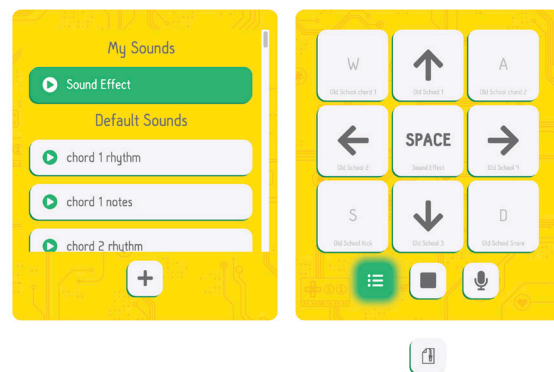


To place a sound, click on the library icon, then click on the sound to be moved. All of the Sampler buttons will jiggle, ask students to click on the sample pad where they want to save the sound.

Sounds will only be stored for this session, so if students like all recordings and want to use them again, they will need to export the sample pack (all of the sounds visible on the Sample pads) once all samples are recorded and placed accordingly.

Once new sounds are placed on the sample pad, an “Export” icon will appear. This will export a ZIP file that students can save to a Google Drive and reupload to the Sampler as needed.

(Full video tutorial: <http://makeymakey.com//SamplerTutorial>)



# CONNECT WITH EDUCATORS AND PROJECT IDEAS

Connect with other educators and share your student projects on social media! Our team is constantly updating and sharing new ideas on our how-to page ([makeymakey.com/howto](https://makeymakey.com/howto)) and hosting webinars with educators just like you! Sign up for our newsletter to learn more ways to go beyond the banana!

- **How-To Page:** <https://makeymakey.com/pages/how-to>
- **Resources for Beginner and Intermediate Inventors:** <https://bit.ly/MakeyAtHomeProjects>
- **Information about Webinars and Teacher Projects:** <https://makeymakey.com/blogs/blog>
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Placing an order for your school or classroom?  
Education orders: [education@joylabz.com](mailto:education@joylabz.com)



Interested in carrying Makey Makey in your store?  
Retail orders: [sales@joylabz.com](mailto:sales@joylabz.com)



Have a question about an event? A project you want to bring to life?  
General inquiries: [info@joylabz.com](mailto:info@joylabz.com)



Having issues with your board? Have a tricky technical question?  
Tech support: [support@joylabz.com](mailto:support@joylabz.com)



Have a question about ordering, or about an existing order?  
Orders and shipping: [support@joylabz.com](mailto:support@joylabz.com)

## PHONE

You can reach us Monday - Friday, 9:00 - 5:00 (US Pacific Time) at: +1-831-460-6242  
If you don't get an answer right away, shoot us an email.

## THE INTERNET

We're on social media! We love to see you there and the things you invent. Tag us and send us your students' creations on:



[Facebook.com/makeymakeykit](https://Facebook.com/makeymakeykit)



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