

# Module 9: Dynamic Message Signs

## Makey Makey Activity Worksheets

### Grade Level: 6 - 12

#### Task 1: Makey Makey Sensor

##### **Objective:**

In this task, you will learn to create a simple sensor using the Makey Makey circuit board. This sensor will be used to simulate a Dynamic Message Sign that can relay information to drivers that are approaching a hazardous intersection.

##### **Interactive Sensors**

##### **STEP 1**

You will need two pieces of cardboard cut to 2" x 3" and two pieces of aluminum foil tape cut to the same length. Attach the aluminum foil tape to one side of the cardboard pieces.



##### **STEP 2**

Cut two small pieces of foam that will fit between the two pieces of cardboard to create the sensor.

**Note:** *The thickness of the foam will determine how much force is needed to trigger the sensor. To create a sensitive sensor – use a thinner piece of foam.*



##### **STEP 3**

Place the other piece of cardboard (aluminum side down) on top of the foam. Using a rubber band or tape, secure the two pieces of cardboard together with the aluminum sides facing each other and the foam between them. This will create the interactive sensor.

## Task 2: Makey Makey: Interactive Sensor

### Objective:

In this task, you will learn how to connect and program the Makey Makey circuit board to allow the sensor to interact with oncoming traffic.

### Makey Makey & Sensor

#### STEP 1

Gather the materials from the Makey Makey kit and the sensor from Task 1.



#### Materials

Sensor

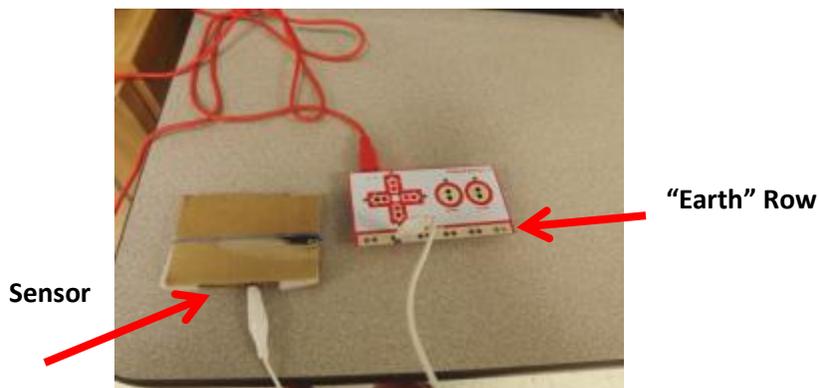
Makey Makey Board

USB Cable

2 Alligator Clips

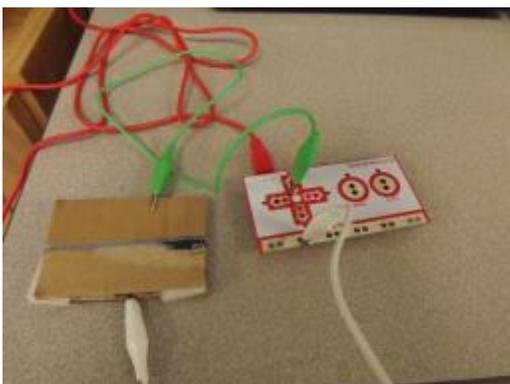
#### STEP 2

Use the red USB cable to connect the Makey Makey to the computer for power. Use one of the alligator clips and connect one end to the “Earth” row on the Makey Makey. The other end should connect to the bottom of the sensor.



#### STEP 3

Finally, connect one end of the second alligator clip to the up arrow of the Makey Makey board. Then connect the other end to the top of the sensor.



Task 2 Completed \_\_\_\_\_

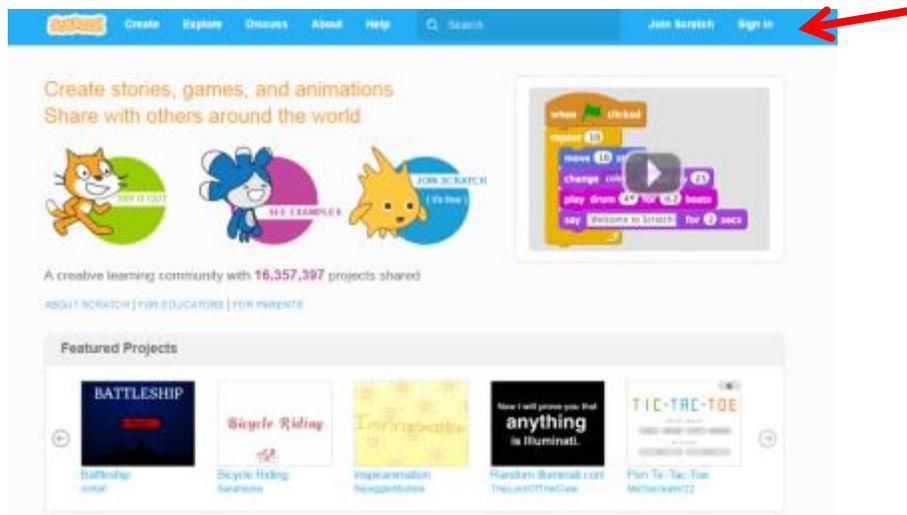
### Task 3: Programming the Interactive Sensor

#### Objective:

In this task, you will program a sensor using a computer programming software called **Scratch**. **Scratch** is a free Internet based programming software that is designed to be used with the Makey Makey board. If you do not already have a *Scratch* account, you may set one up using an e-mail address.

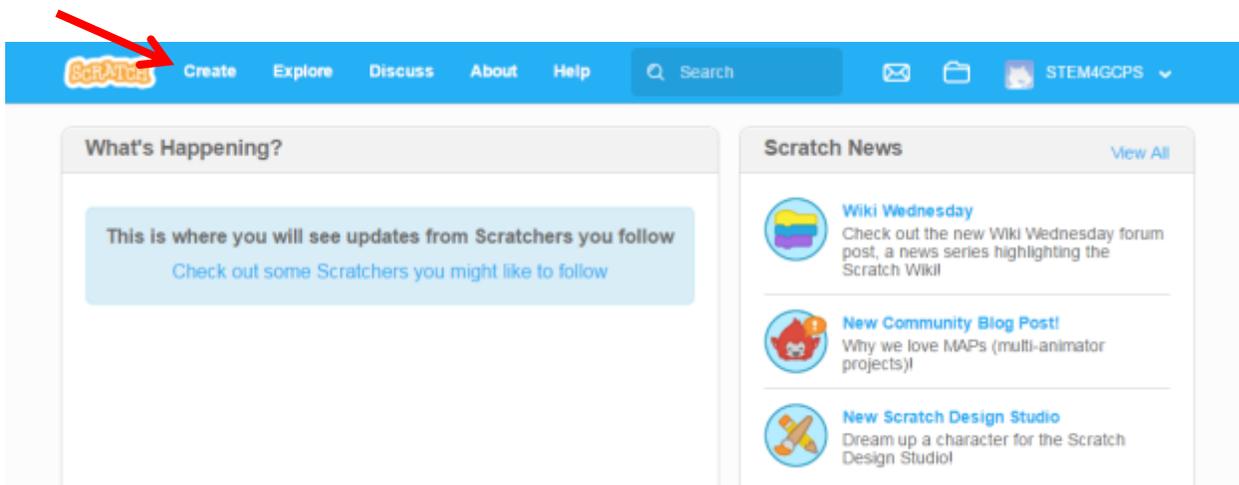
#### STEP 1

- Navigate to the website – [www.scratch.mit.edu](http://www.scratch.mit.edu) and login using the login and password from your teacher.



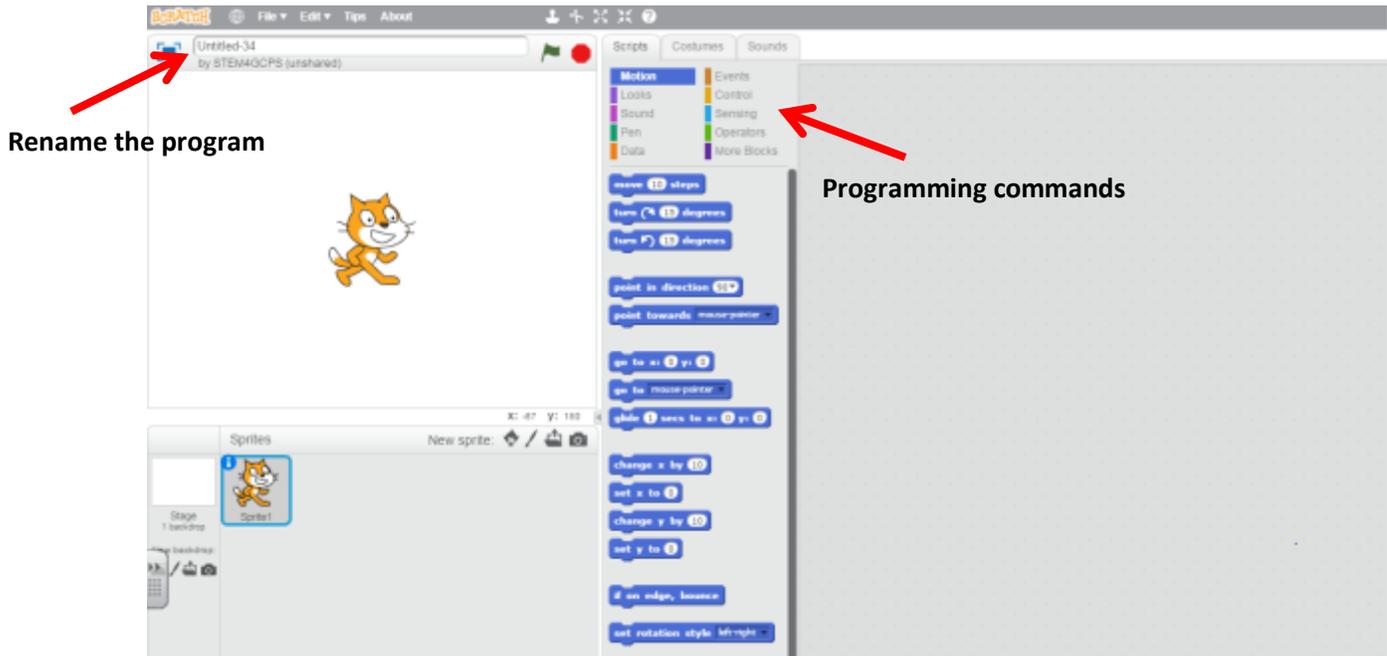
#### STEP 2

- Once you have logged in, click on **Create**. This will take you to the programming area where you can program your sensor.



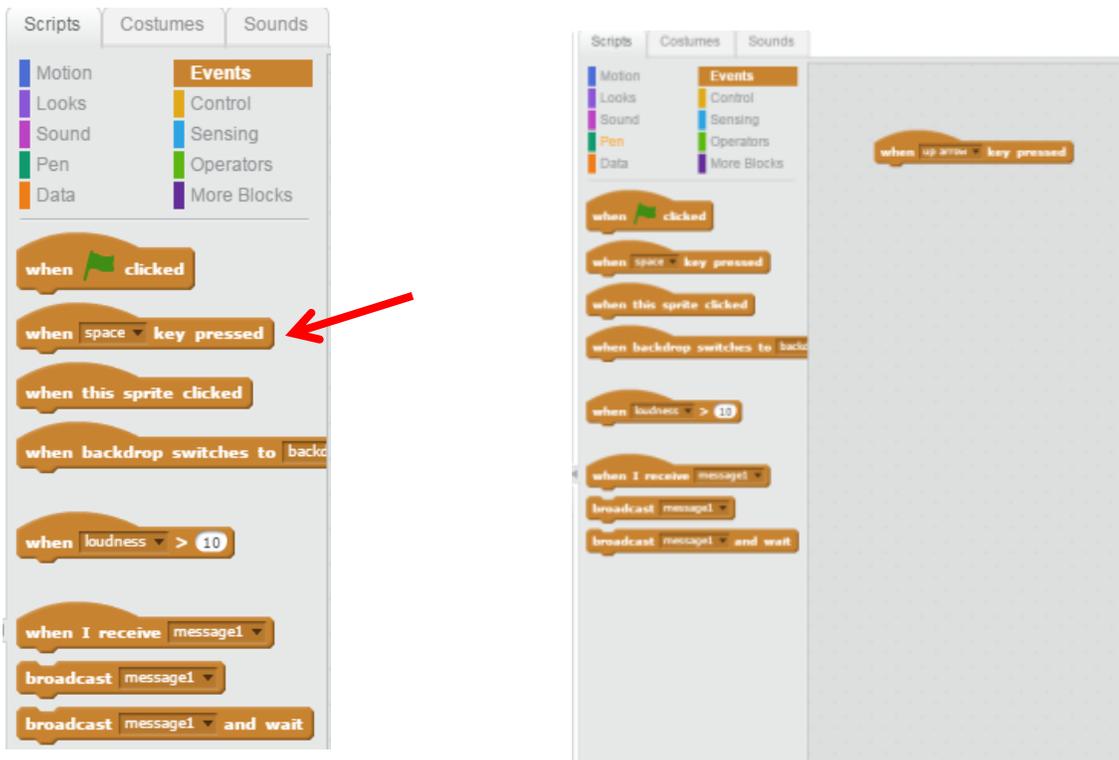
### STEP 3

- First, you will need to rename your program. *Scratch* automatically saves your program as you work. Notice the different colored tabs. Click on these different tabs to find the commands to program your sensor.



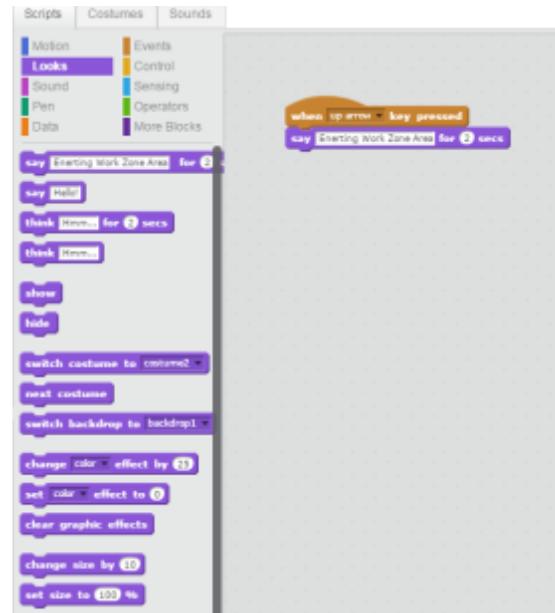
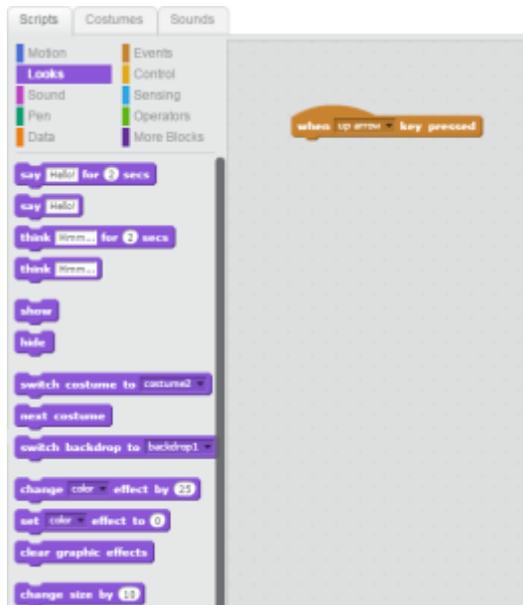
#### STEP 4

- To begin programming your sensor, you will need to tell the computer where your sensor is located on the Makey Makey board.
- To do this, go to the **Events** tab and select **when space key pressed**. Notice that this button has a drop-down menu where you can select different keys on the keyboard. The current sensor is connected to the up arrow on the Makey Makey board – **Select Up Arrow**.
- Drag this button over to the gray programming area. This command tells the computer that when the up arrow is pressed it will need to perform an action. Now we need to tell it what action to perform.



## STEP 5

- Click on the purple **Looks** tab. In this tab, you can program a message to flash when your sensor is activated (to simulate how a Dynamic Message Sign would operate). To do this, click on the **say hello for 2 seconds** tab. Notice that both the message and the time can be changed. Change the message from hello to “Entering Work Zone Area.”
- Once you have changed your message, drag the button over to the gray programming area and connect it under the orange button. The buttons connect like puzzle pieces. If the buttons are not connected, the program will not run properly.



## CONGRATULATIONS!

You have now written a program that tells your sensor to flash “Entering Work Zone Area” on the computer screen when it is activated. Try pressing your sensor and see if your message flashes on the screen.

### Trouble Shooting Programming:

If the message does not appear, click in the gray box to let the computer know that you want it to read the program you created.

If the message still does not appear, check the connections on the Makey Makey to ensure that the alligator clips are making a connection with the aluminum foil tape and that the alligator clips are making good connections on the Makey Makey board.

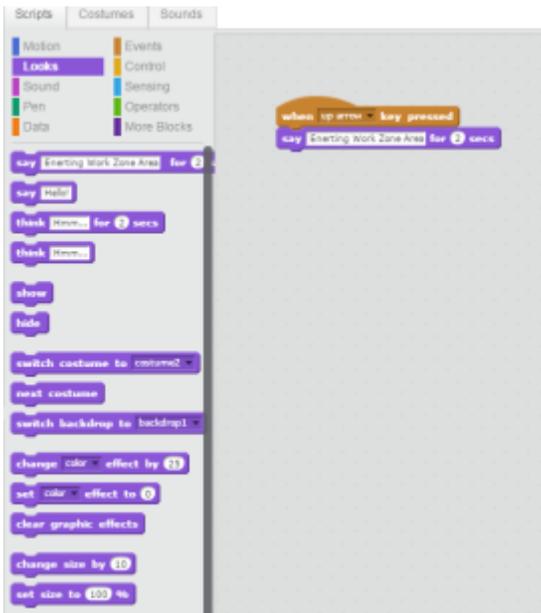
## Task 4: Adding Sound To Your Program

### Objective:

In this lesson, you will expand your knowledge of programming with *Scratch* and learn how to add sound clips to your program for your interactive sensor.

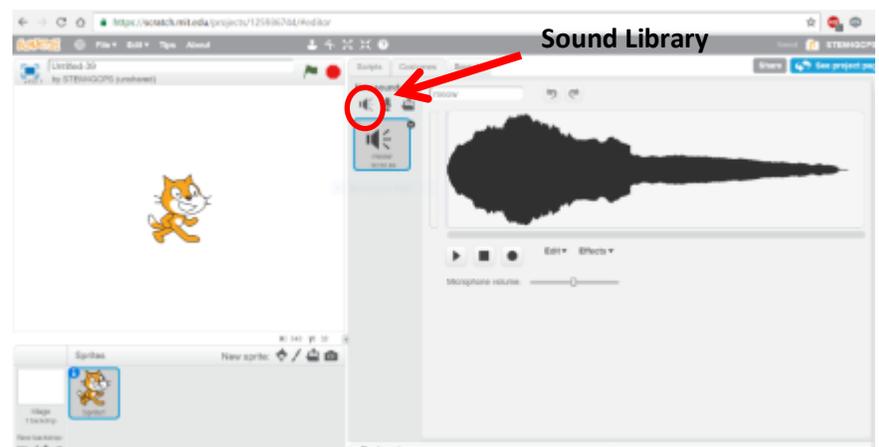
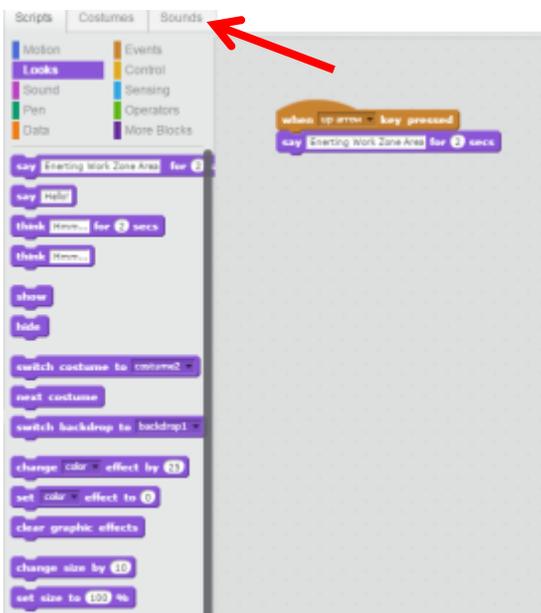
### STEP 1

- Begin with the program that you created in Task 2 for your interactive sensor.



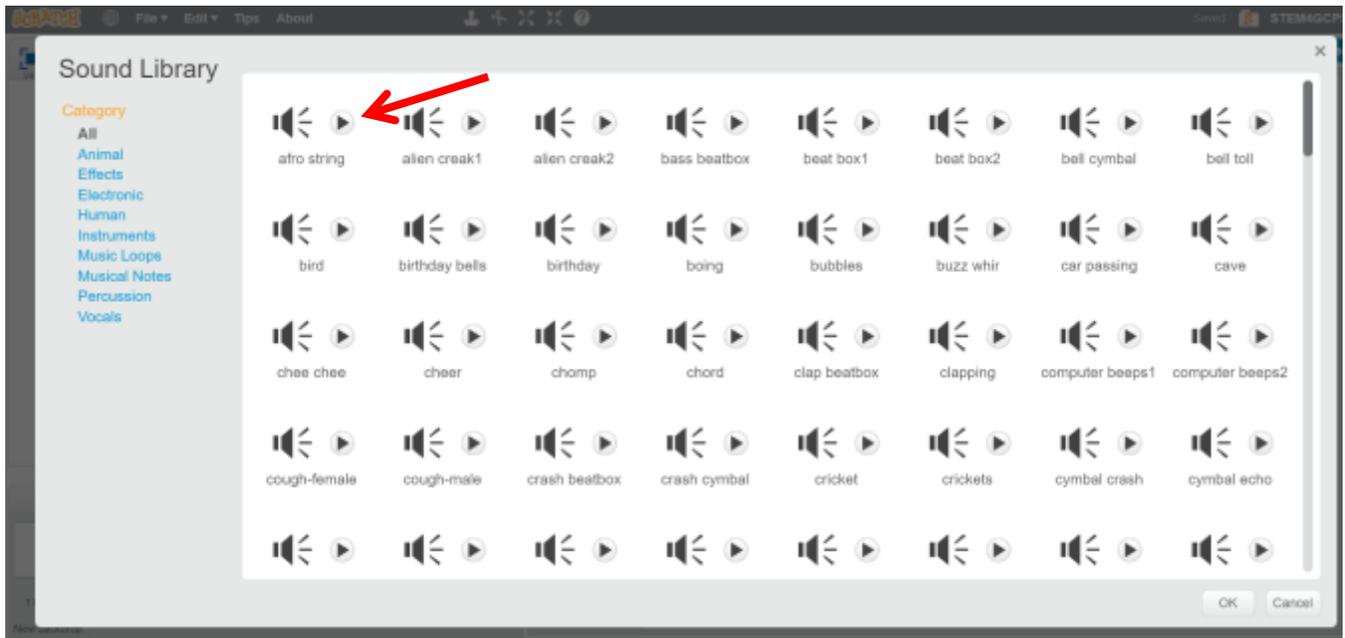
### STEP 2

- Click on the grey **Sounds** tab at the top. This tab allows you to choose a sound from the sound library, download a sound, or record your own sound. First, we will learn how to add a sound from the sound library to our program.
- Click on the **speaker button** to see the sound library.



## STEP 2 (continued)

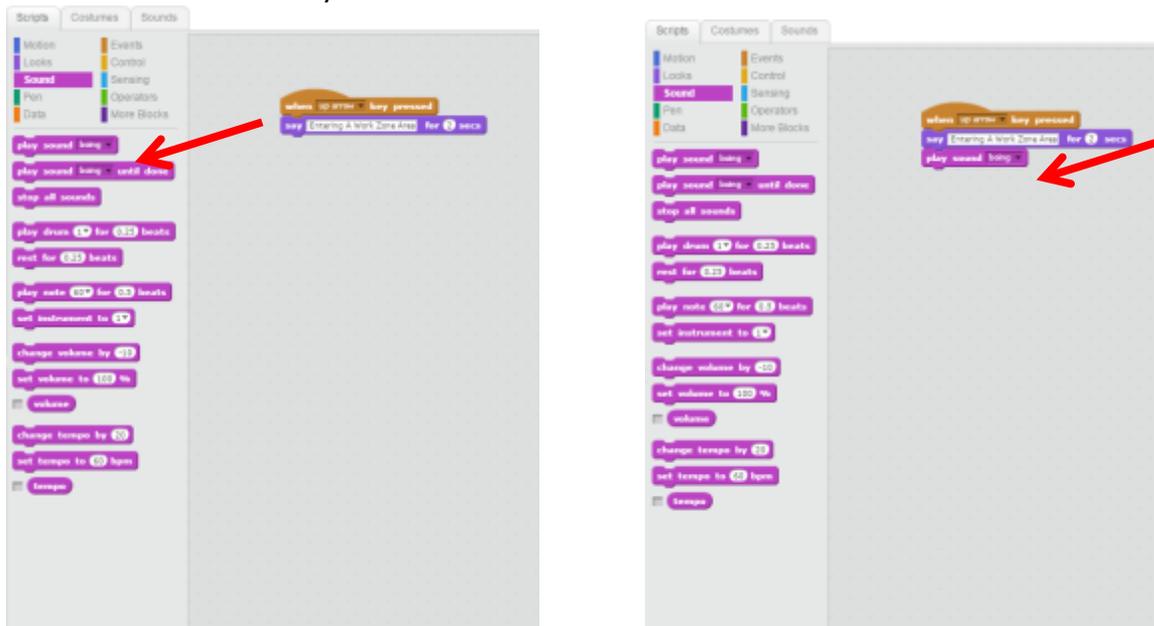
- Once you have opened the sound library, you can click play to listen to any of the sounds.



- Decide which sound you would like to include in your program and double click on the speaker.
- Scratch will automatically upload the sound into the sound list allowing you to choose this sound for your program.

## STEP 3

- To include sound in your program, click on the grey **Scripts** tab.
- Click on the pink **Sound** button.
- Drag the **play sound** button over to the programming area and connect it to your program. To change which sound will play, click the down arrow on the **play sound** button. You should see the new sound that you added.



Task 4 Completed

## Task 5: Downloading A New Sound

### Objective:

In this task, you will learn how to download an outside sound into *Scratch* that you can use for your interactive sensor.

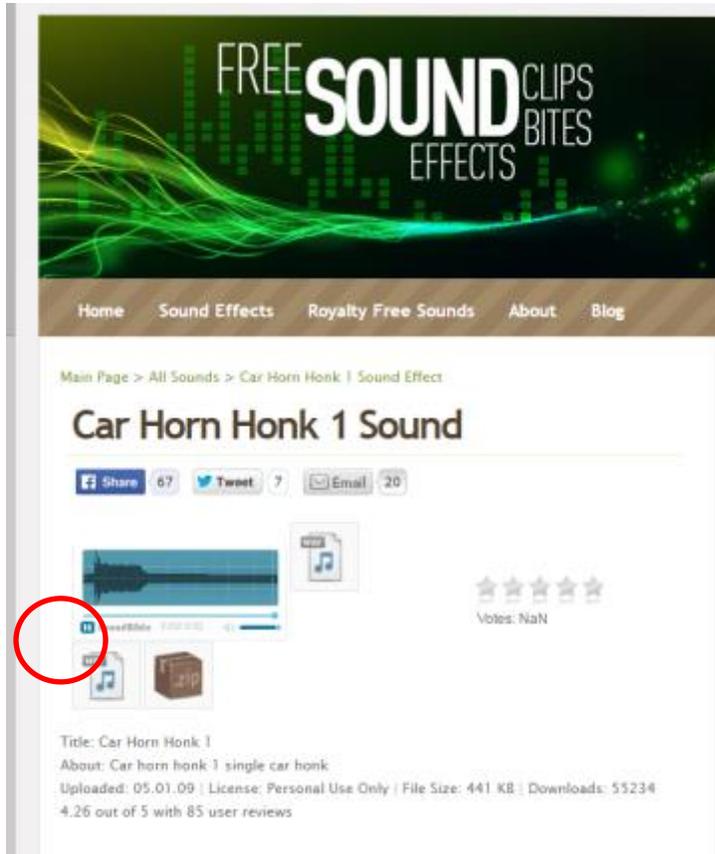
### STEP 1

- Begin with the program that you created in Task 3. Since you will be adding a downloaded sound to your program, remove the sound clip that you added in Task 3.
- To do this, click on the sound block and move it back to the sound list.

*In order to download a sound into Scratch, you will need to find a free MP3 sound file or a WAV sound file to download from the Internet. One website that is easy to use is [www.soundbible.com](http://www.soundbible.com). You can also use a search engine to search for other appropriate sounds.*

### STEP 2

- Open an internet browser and navigate to this website. You will notice that this website allows you to search for various sounds.
- Search for a **Car Honk** sound. When you search, only 1 entry will appear. Click on the play button to hear the sound.
- To download this sound, click on **Car Horn Honk 1**.



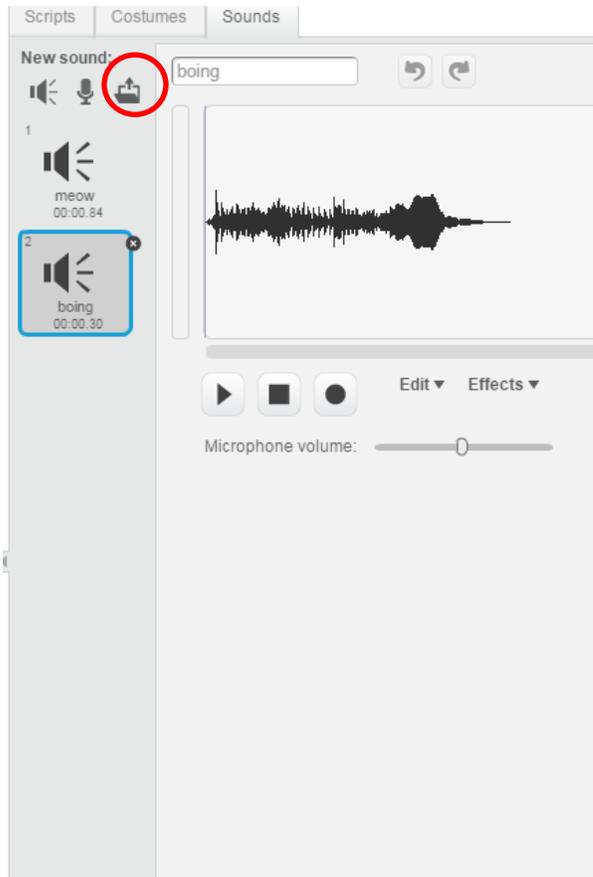
## STEP 2 (continued)

- Now, you will be able to choose either to download as an MP3 file or a WAV file.
- Click on the MP3 and the file will automatically download. Sometimes, the computer will ask you where you want to save the file. If so, you can choose where to save it. If not, the computer will automatically save to the “Downloads” folder.

## STEP 3

***Once your sound has been downloaded, you will need to upload the file into Scratch.***

- Go back to the *Scratch* programming screen and click on the grey **Sounds** tab.
- Click on the file folder. The computer will ask where the file is saved.
- To find the MP3 sound file, look in the computer’s “Downloads” folder or in another place that you have saved the sound clip.
- Once you have located the sound clip, double click on the clip, and the computer will automatically upload it into the *Scratch* sound list.
- Once the new sound is in the *Scratch* sound list, you can navigate back to the grey **Scripts** tab and you will be able to add your new sound the same way as in Task 3.



## Task 6: Designing a Roadway with a Dynamic Message System

### Objective:

In this task, you will use both the interactive sensors as well as the MOSS Connected Vehicle you designed in previous activities and incorporate them into a roadway that will be able to alert drivers to potentially hazardous roadway conditions.

### Highway Design

Brainstorm a transportation situation where drivers would need to be alerted to potentially hazardous roadway conditions. This would be a situation that may lead to vehicle crashes or a situation where drivers would need to be aware of changing roadway conditions.

### Possible Transportation Situations

Using one of the transportation situations listed above, **design a highway intersection *that uses at least two interactive sensors to alert drivers to the hazardous roadway conditions or gives drivers information on roadway conditions ahead.*** Once you have sketched your highway design with the interactive sensors, you will need to get your teacher to approve your highway intersection sketch.

### Highway Design With Dynamic Message Systems

## **Task 7: Building a Roadway with a Dynamic Message System**

### **Objective:**

In this task, you will use both the interactive sensors and the Connected Vehicle designed in previous activities and build a model of an Intelligent Transportation System Highway that includes a Connected Vehicle and a Dynamic Message System.

### **Building An ITS System**

After your highway intersection design has received approval from your teacher, use your interactive sensors from Task 1 and the Connected Vehicle you created to simulate how an ITS system with a Dynamic Message System would function. Suggestions of classroom materials to be used to create this simulated system are listed below.

Once you finish your highway design, test the ITS system to see if your Connected Vehicle and the interactive sensors can work together to alert drivers to your hazardous intersection.

### **Highway Intersection Design Materials**

- White poster board
- Cardboard
- Colored Paper or Construction Paper
- Scissors
- Glue
- Markers, Crayons, Colored Pencils

### **Conclusion**

Once your group has finished building and testing your ITS system simulation, be prepared to share your project with your classmates.

## Dynamic Message Signs & Connected Vehicles

Below are examples of student created intersections with the interactive sensors and simulated Connected Vehicles.

