



Who says all the fun has to happen at The Tech Interactive?
This DIY activity uses the Science Journal app to build data literacy!



Introduction

Can you move as smoothly and silently as a ninja? In this experiment, you will use your stealthy ninja skills to move through a noisy obstacle course while holding a smartphone that is recording data on your performance. The challenge is to navigate this noisy course with a steady, quiet pace that doesn't cause your phone's sound sensor or accelerometer to spike. This fun activity can get your whole family up and moving while analyzing data!

Design Challenge and Science Journal Experiment

Design a noisy obstacle course and then test your ability to move smoothly and silently through it using the sound sensor and accelerometers on the Arduino Science Journal app.



This activity uses the [Arduino Science Journal app](#), which lets you use your phone's sensors to create experiments and record data on the world around you. If you haven't used it before, download the app and play with it first.

Subject:

Data Science, Physical Education

Ages:

7+

Time:

15 minutes for set-up, experiment time varies

Key concepts:

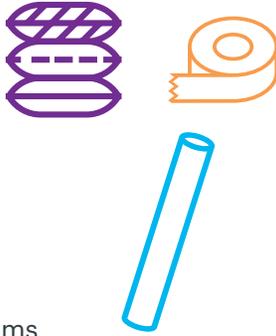
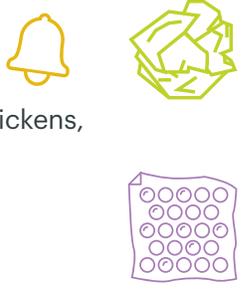
Data literacy, experimental design, experimentation, graphical representation, interpreting data

Materials

The first part of this activity will be to build the obstacle course, which can be made out of a variety of fun materials. Look for materials that are noisy when touched or stepped on. Try to find a wide variety of items that make different noises to surprise you and your fellow ninjas, such as squeaking, crunching and popping. You will also need some large items to define your obstacle course, such as furniture, couch cushions and blankets.

Things you can use

Find a few items from each category, but don't limit yourself to the items on this list. Use whatever you have on hand — be creative!

Obstacle Course Materials	Noisy Items
<ul style="list-style-type: none">• Couch cushions• Pillows• Large soft blocks• Chairs/benches• Blankets/sheets• Jump ropes/ribbon/string• Foam rollers/pool noodles• Inflatables/pool toys• <i>Optional:</i> Tape to secure items 	<ul style="list-style-type: none">• Soft squeaky dog/baby toys• Bubble wrap• Bells• Present bows• Fun noisy toys (ex: Rubber chickens, Whoopie cushions)• Crinkly paper/paper bags/balls of paper• Things that rattle 
Science Journal	 <p>Tip: Don't have a smartphone? Conduct the experiment by having someone listen and count each time they hear you make a noise as you go through the course.</p>

Instructions

Part 1: Build a Ninja Walk Obstacle Course

Have fun creating an obstacle course! It can be as simple as a “lava” path across your couch or a more elaborate course through a room or outside. Try to choose a space that won't be too disruptive to others (if you have to walk through the obstacle course to get to the bathroom, it might not be the best spot!)

If using a larger space, define the boundaries of the course with either large objects or tape.



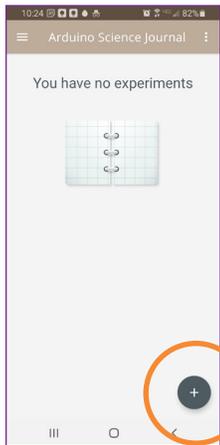
Safety Tip: Avoid having participants traverse potentially dangerous obstacles, such as making them climb over/under unsteady furniture. Secure items to prevent tripping or slipping. Taping items down will also create a more consistent course as items won't shift each time someone goes through.



Level up your obstacle course by attaching materials at different angles. Look for ways you can create “traps” from above, below and on the sides of the course. For example: a blanket tunnel to climb through, crinkly bows on a wall, or pool noodles that stick out from a table. See if you can find some spots for surprise sound traps that you mix in with other materials.

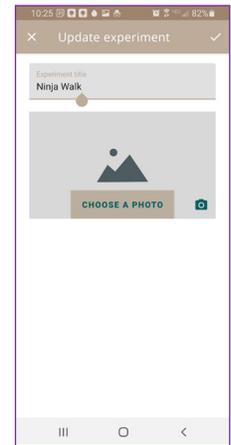
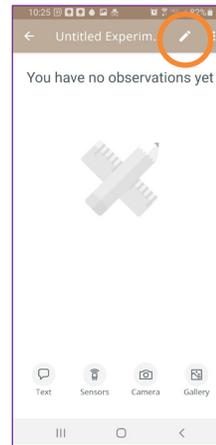
Part 2: Conduct the Experiment with Science Journal

- 1 **Open the Science Journal app** and start a new experiment.

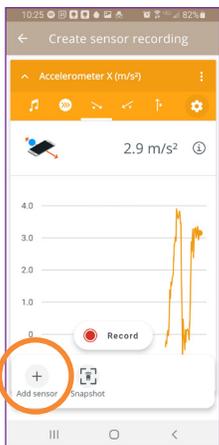


Tap the + icon to start a new experiment.

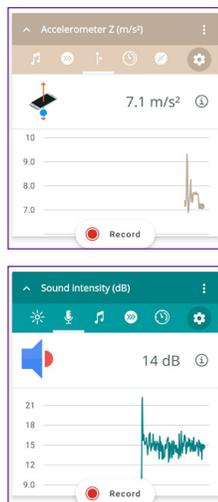
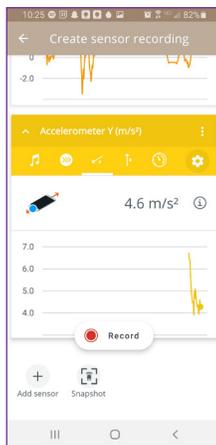
- 2 **Rename it Ninja Walk.** (This will help you organize your data and experiments.)



- 3 **Add Accelerometer (X-axis, Y-axis and Z-axis) and sound sensors to the experiment.**



Tap the + icon to add a sensor.



- 4 **Take turns holding the phone** and moving through the course as smoothly and quietly as possible.

- When you begin, start recording by pressing the red record button. The accelerometers and sound sensor will pick up any sound or motion and track it on the graph. Your goal is to keep the graph lines as flat as possible.
- Make sure your environment is as quiet as possible while you go through the course.
- Stop the recording by pressing the red stop button again.



Tap the red icon to record.

- 5 **Analyze your results:**

- Look at how the graph peaks.
- Where did you make the most noise?
- When do the accelerometers show the most motion? Why?
- Ninjas are stealthy and move very steadily, so they would have the fewest and smallest peaks. How can you change the way you navigate the course to be more ninja-like?



- 6 **Try the course multiple times** with different strategies.

- Can you get better results?
- Invite your family to experiment with you!
- Who was the quietest ninja?
- Who was the most graceful ninja?
- How were they able to achieve those results?

Explore More

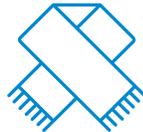
- Complete the course with earplugs, earmuffs or headphones playing music so you can't hear when you trigger sounds. Experience the noise afterwards by interpreting your graph. How did you do?
- Team up with your siblings to create an obstacle course the adults in your house can navigate.
- Time yourself going through the course and see if you can be quick AND ninja-like!



Top Tips

Accelerometer Sensors:

- Try to keep the phone in the same position each time someone runs the course. This will make sure your data is comparable.
- Think about what type of "ninja attire" you could wear that holds the phone for you. For example:
 - A sweatshirt with a big pocket
 - An elastic band or bandana to attach the phone to your arm
 - A scarf to wrap it around your waist



Sound Sensor:

- Did you notice, even when we are not making noise, the sound sensor will pick up on other sounds from the environment? If your results seem higher than you expected, see if you can figure out what might be affecting your tests.
- Try running the sound sensor before doing the course and see what it picks up. Is there a fan going in the background? Are there noises from outside? What happens when you change locations or silence one of the noises?

Share Your Results! Keep us posted about your design challenges on social media with **#TheTechatHome**.



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