Thunder Rolling Down the Plains

Get loud by making your own noisemaker and experimenting with the dynamics of sound!

As a Thunder fan, you know how important it is to have your voice ready for shouting and hands ready for clapping. But what happens when you can't physically be loud enough to show your support? Experiment with these noise-based challenges and discover how to amplify your Thunder enthusiasm to superhuman levels.

HERE'S WHAT YOU'LL NEED

- **Diaper pail bags**
- **Rubber bands**
- **Decibel meter or decibel meter app on a phone** *(See Coach's Corner for suggestions)*
- **Journal or paper**
- **Pencil**

WARMUPS

If you've been to a Thunder game you may have seen some fans using special noisemakers that look like giant french fries. These noisemakers are called "Thunder Sticks" and are vinyl tubes that you inflate just like a balloon. By banging the Thunder Sticks together fans create a noise that is far louder than they can make by just clapping their hands. Any time they want to cheer on their favorite player or distract an opposing team during a free throw, fans bang together their Thunder Sticks and the sound of thunder can be heard throughout the arena. It's one of the reasons the Chesapeake Arena is considered among the loudest in the NBA!

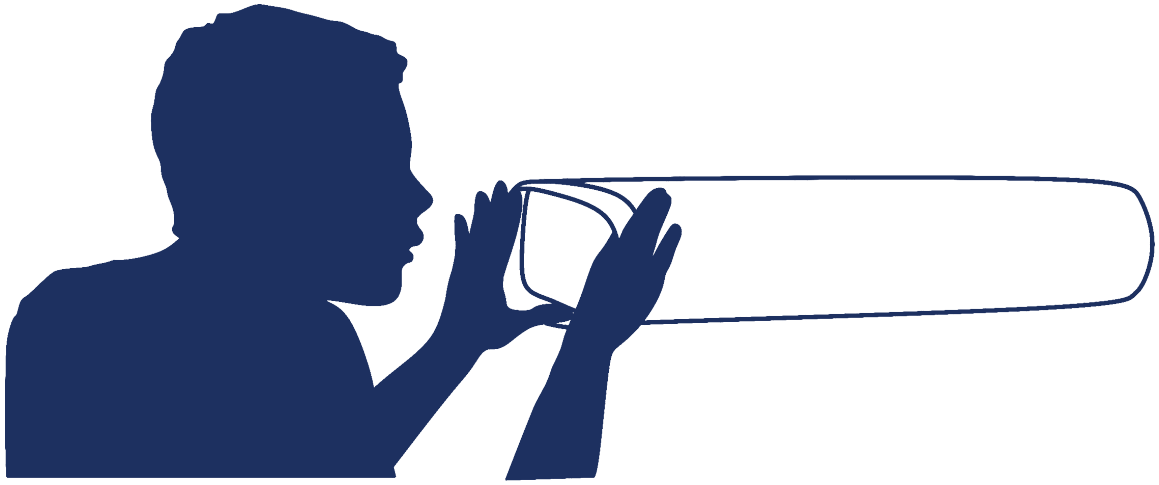
You're going to make your own version of a thunder stick! First, cut a section of a diaper pail bag that is about 4 feet long and tie a knot in one end.

PRO TIP: If you can't get diaper pail bags there are several different substitutes you could use: dry cleaner bags; newspaper bags; or the long plastic bags that hold submarine sandwiches.

Now, you need to inflate your bag! Want to try an experiment? Scrunch up the open end of the bag and blow six great big breaths into it, similar to blowing up a balloon. How full is your bag? How many breaths do you think it will take to fill it completely?

Instead of wasting the time to fill your bag up breath by breath (and possibly get light headed in the process), why don't you use the awesome power of science to help you inflate it!

To do this, you'll start by holding the opening of the bag about 10 inches away from your mouth. Next, you'll need to hold the opening of the bag as wide as you possibly can with the index fingers and thumbs of both hands. Here comes the really fun science-based magic trick: if you do it just right, you'll be able to fill your bag with just one big breath.



Take a deep breath and blow a long, steady stream of air into the bag (imagine you're blowing out the candles on your birthday cake). Here are three important tips to make this work:

- **Keep the bag 10" away from your face**
- **Don't let your mouth touch the bag**
- **Keep the opening of the bag as wide as possible**

It may take a couple of tries to get this technique down properly, but you'll definitely get the hang of it.

Once you've inflated the bag, twist the open end and secure with a rubber band. Repeat the process with the other diaper pail bag.

Congratulations, you've just made a pair of noisemakers! Now let's make some noise! What happens when you use something (like a pencil or ruler) to play one of the bags like a drum? What happens when you clap the two bags together? What if you only filled the bags halfway full of air; does that change the type of noise or amount of noise that they make? What other ways can you discover to make noise with these noisemakers?

GAME TIME

After you've finished experimenting, re-inflate both of your noisemakers to their fullest capacity. The next challenge is going to require the teamwork of your entire class. To make your results as accurate as possible everyone should make their noisemakers out of the same materials, use their noisemakers the same way and have the same amount of air in them. This process is what's referred to as a **control** in a scientific experiment.

You're going to measure the **decibels** that your noisemakers can make in a number of different experiments. Decibels are units used to express the intensity of a sound wave and is how we measure sound. To gather this measurement, scientists use a tool called a **decibel meter.** You'll need a decibel meter for the next experiment.

PRO TIP: You can download free and relatively reliable decibel meter apps on a phone or tablet!

If you've ever been to a Thunder game you've heard the deafening roar of Thunder fans when they clap together their Thunder Sticks. Time to "bring the thunder" to your classroom!

Begin by placing the decibel meter (or device with a decibel meter app) in the middle of the classroom. Everyone needs to stay as quiet as possible to get accurate readings. Have one student clap a pair of noisemakers together for five seconds while another student records the readings of the decibel meter. Write the decibel readings on a chart or the chalkboard.

Repeat the experiment with two people clapping noisemakers.

How did the results compare? What about if you repeat it with four students, or eight students? What are the results when only half of the class uses their noisemakers? How about when the entire class uses them at the same time? Were the results what you expected?

Does location matter? At a Thunder game fans sitting by the goals at both ends of the arena are given Thunder Sticks. How do you think having a lot of fans concentrated in one area impacts the volume of the noisemakers? Let's do an experiment and give it a try! Gather everyone in one specific area of the classroom and have them use their noisemakers. Check the reading on the decibel meter and add the data to your chart. Was there a difference in having everyone make noise in the same spot as opposed to spread throughout the room?

Last experiment. **Does rhythm matter?** Have everyone use their noisemakers in any way they want. The more chaotic, the better! Measure the noise level and record it on the chart. Now, have everyone clap their noisemakers to a set rhythm and measure the result. Was there a difference?

ANALYZE THE REPLAY
What happened?

What did you think about the results of the decibel meter challenges? Besides concentrating people in one area of the classroom before testing, what other changes could you make to the experiment that might yield different results?

After conducting the experiment on location, do you think people behind the goal are a factor when basketball players are attempting a free throw? Why or why not?

After conducting the experiment on rhythm, was there a significant difference in decibel readings between chaotic and coordinated noisemaking? Which do you think is more distracting to an NBA player? Why?

At Thunder games Thunder Sticks are usually bright yellow. Why do you think that is?

Which do you think is more distracting the movement of a thunder stick or the noise it makes?

OVERTIME
Let's take it further

Now that you've experimented with making your noisemaker the loudest it can be, what changes could you make that might make it even louder? Could you add craft or recyclable items to it that would increase its noise potential? Could you change the shape of it in any way to make it louder? Experiment with altering your noisemaker to see just how loud you can make it to "bring on the thunder" at home!

COACH'S CORNER
Additional information and explanations for parents and educators

Several different scientific principles were examined in this month's activity. First, students used Bernoulli's principle to their benefit in inflating their airbags. The bag quickly inflates because air from the atmosphere is drawn into the bag with the stream of air the students blew into the bags. When the students tried to blow up the bags like balloons, the air available to inflate them was limited to the student's lungs. Therefore, six breaths only partially filled the bags.

However, when students held the bags open and away from their mouths, they were able to draw on all of the airspace around them. As they blew out a breath, the increased movement of the air molecules directed towards the bag's opening created an area of low pressure into the bag. This low pressure essentially created an air pathway. Higher pressure air in the atmosphere followed that pathway into the bag to equalize the pressure, drawing in enough molecules to inflate the bag completely.

Students also experimented with measuring the amount of decibels their noisemakers made in various situations. In Game Time, students identified how much the power of sound is multiplied. They also discovered how the concentration of sound in one specific area can affect the impact. Some sporting events allow the use of Thunder Sticks or other noisemakers throughout the entire arena while others limit their use or ban them entirely, citing growing concerns about possible hearing damage from noise. The great vuvuzela debate during the 2010 FIFA World Cup might spring to mind as an example.

The physical and psychological impact of noise on players and fans in sports arenas is the subject of significant research. Students were asked to write their own opinions as to whether they thought the way noisemakers were used impacted player performance.

The results are not clear. Some researchers suggest that the chaotic and disjointed waving of noisemakers such as Thunder Sticks might not be a distraction to players at all. Highly trained professional players can block out both the noise and motion. Statistics of teams having similar free throw success rates on the road versus at home are used to back up this position.

Other researchers believe that, due to how the brain senses motion, this movement of Thunder Sticks waving in unison may be disorienting. This could give players a false sense of motion and prove disorienting enough to negatively impact their performance.

There is one thing on which everyone can agree…there's nothing that can measure the full impact of an arena of fans cheering on the Thunder!

APP SUGGESTIONS:

Decibel: dB, dBA Sound Meter (iOS), NIOSH Sound Level Meter (iOS), deciBel (Android)

DO YOU WANT TO LEARN MORE?

Research: Bernoulli's principle, sound, decibels, sports psychology

OKLAHOMA ACADEMIC STANDARDS: SCIENCE

STANDARD	4TH GRADE	6th Grade
PS3-2 - Energy	●	
PS3-4 - Energy	●	●
PS4-1 - Energy	●	