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**Findley Oaks STEM Challenge**

**4th Grade Design Brief**

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| **Challenge**  Controlling Sound | **Unit**  Sound |

**Before the Activity**

* Gather materials
* Copy Headphone Planning Sheet

**Standard:** Prioritized Standard: S4P2.a Obtain, evaluate, and communicate information about how sound is produced and changed and how sound and/or light can be used to communicate. Plan and carry out an investigation utilizing everyday objects to produce sound and predict the effects of changing the strength or speed of vibrations.

Students should follow the **Engineering Design Process.**

**Background/Problem:**

Have you ever wondered why some materials absorb sound, while others reflect it?

Take a look at your ceiling and floor. What did you notice?

What would happen if the floor was made out of hard tile and the ceiling had the same material?

(Answers: There would be a lot of echoes, sound waves would not be absorbed quickly, it would be noisy.) Acoustical engineers have noticed this phenomenon and design special tiles for the ceiling that absorb sound. And, they know that some materials absorb sound, so they usually put carpet on the floor when they are designing a classroom!

In this lesson you will have the chance to act like an acoustical engineer. Acoustical engineers study sound and design buildings that reflect and absorb sound to create the desired acoustics. In this activity, students are acting as acoustical engineers as they use design headphones using sound-absorbing materials.

Watch the “What is an acoustical engineer video.”

Teacher Notes:

Here is a pair of real headphones, when I put them on they should block sounds/noise. It looks like whoever designed these headphones did (or, possibly, did not do) a good job!

Now you are going to have a chance to design your own headphones using materials available. You will also be constrained with time. Once you are done, we will test them.

Before you can begin building, you will need some time to brainstorm your ideas and come up with a plan. Real engineers always have a plan before they build.

**Design Challenge:**

* Design and test headphones that absorb sound.

**Criteria:**

* Your headphones should block as much sound as possible.

**Constraints:**

* Make sure you have a design plan before you start.
* You may use some or all of the materials listed.

### Materials:

**Teacher –**

**For activity demonstration:**

* one pair of working headphones (the kind that covers the entire ear)
* bells, small buzzer, CD player, or other noise-making items

**Student -**

* various materials such as cloth, sponges, foam, cotton balls, cotton batting, small carpet samples, and any other materials that will absorb sound
* something to hold the earpieces together, such as old headphones without the earpieces or a piece of material that will bend without breaking (vinyl strips from a mini-blind or inexpensive plastic headbands)
* Dixie cups (work well as earpieces and can be stuffed with sound-absorbing materials)
* rubber bands
* duct tape
* masking tape
* 2 copies of [Headphone Planning Sheet](https://www.teachengineering.org/content/cub_/activities/cub_soundandlight/cub_soundandlight_lesson5_activity1_headphone_planning_sheet.pdf)

Tools:

* Scissors
* Paper/pencil for design planning

Brainstorm ideas…. make sure you are brainstorming some ideas before you build.

Complete worksheet.

**Post your creation on** [**Flipgrid here.**](https://flipgrid.com/8d5ae4dd)