

SCIENCE & MUSIC**Lesson 13: Sound Movement with a Chladni Plate 3-6**

Watch an experiment with a Chladni plate to learn how sound moves! Then create your own version to try the same experiment.

Standards listed on next page

Supplies:

- Paper & writing utensil
- Glass bowl & salt
- Parchment Paper
- Portable speaker (Bluetooth)
- Tone generator app
- Rubberbands or fastener

Objective

Students will experience how soundwaves colliding, creating standing waves with nodes, can be observed with visual experiments like a Chladni plate.

Outline of Video

1. What do you think music looks like? Discuss with classmates (0:17).
2. Recall that sound travels in waves through solids, liquids and gases.
3. Learn about the history of the Chladni Plate and how when multiple sound waves move through the same medium, they sometimes collide and create a **standing wave**. Standing waves have points along the medium that appear to stand still, or not move, due to the collision, called **nodes**. Areas that clear from standing waves are called antinodes. Chladni Figures are the patterns that have formed from observing this movement.
4. You can complete a basic version of the Chladni Plate experiment at home using a drum with salt spread on the drumhead, and closely vocalizing to match the pitch of the drum. You'll see the salt move and be displaced by the vibration of the drum (2:55).
5. Watch Ms. Liz introduce the Chladni Plate experiment and generator.
 6. Notice what each dial does: the first changes frequency (pitch), the second the amplitude (the intensity) (3:53).
 7. With paper and a writing utensil, observe the experiment beginning at (5:00) and write down the frequency number (seen on the generator) whenever a pattern appears. At the end of the experiment, compare notes with your classmates (10:04).
 8. What did you notice while watching the experiment (10:24)?
9. Here are the changes Ms. Liz noticed:
 10. At 50 hz: movement began, though it didn't quite form a consistent pattern (10:43).

11. At 60hz: the sand began moving into a circle (10:52).
12. At 80hz: the circle hollowed out (empty center) (10:58). Draw a diagram of this pattern (11:10).
13. At 230hz: the sand moved into a very distinct pattern (11:20), draw a diagram of this pattern (11:30).
14. At 240hz: the pattern changes (11:40) to more defined like tic-tac-toe, draw this pattern (11:48).
15. At 400hz: the shape looks like a flower or butterfly (11:57), draw this pattern (12:05).
16. Using the images at (12:25) or your own diagrams, compare the patterns. Notice the patterns get more complex as the frequency increases. **Frequency** is the number of times a sound wave repeats itself, and it is measured in hz.
17. DIY: Create your own Chladni plate by placing a portable speaker at top volume, face-up in a glass bowl with a tight cover (cling wrap). Sprinkle salt over the top of the bowl cover. and use a tone generator app (ex. [Sonic](#)) to change the frequency and watch the salt move (13:26).

Kentucky Standards:

K-PS2-1, K-PS2-2. Simple tests can be designed to gather evidence to support or refute student ideas about causes.

KPS2-1. Scientists use different ways to study the world.

KL1-1. Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations. Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions.

K-LS1-1. Patterns in the natural and human designed world can be observed and used as evidence.

K-ESS3-3. Events have causes that generate observable patterns.

K-PS3-1. Make observations (firsthand or from media) to collect data that can be used to make comparisons.

K-LS1-1. Scientists look for patterns and order when making observations about the world.

1-PS4-1 Science investigations begin with a question. Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.

2-PS1-4. Scientists search for cause and effect relationships to explain natural events.

3-LS1-1. Patterns of change can be used to make predictions.

3-LS2-1. Construct an argument with evidence, data, and/or a model.

3-LS3-2, 3-LS4-2. Cause and effect relationships are routinely identified and used to explain change.

4-PS3-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

4-PS3-4. Science affects everyday life.

Ohio Standards:

K.PS.2: Some objects and materials can be made to vibrate and produce sound

3.PS.3: Heat, electrical energy, light, sound and magnetic energy are forms of energy.

5.PS.2 Light and sound are forms of energy that behave in predictable ways.