

UDL AND SCIENCE

LESSON OVERVIEW

Title: Vibrating Strings

Author: Battle Creek Area: Mathematics & Science Center

Subject: Science

Grade Level – 3rd grade

Duration – 2 class periods - 40 minutes each

Unit Description - Sound can make matter vibrate, and vibrating matter can make sound.

Lesson Goals –

- I can distinguish that when a force is acted upon an instrument that the vibrations can create a high or low pitch sound.
- I know that when the instrument is plucked and strummed that the vibrations will create sound.

NGSS –

- 1-PS4-1. Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.

Science and Energy Practices:

- Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.
- Plan and conduct investigations collaboratively to produce data to serve as the basis for evidence to answer a question. (1-PS4-1)

Crosscutting Concepts

- Simple tests can be designed to gather evidence to support or refute student ideas about causes. (1-PS4-1)

Big Ideas –

- Sound is produced by a movement or vibration created by a force.
- With stringed instruments, we pluck, strum, or move a bow across the string as the force that causes the string to vibrate.

Barriers –

- Building instrument

Checkpoint 7.3

Barrier solution: Can have music being played. Instead of gripping the instruments, use Garageband and show the different types of instruments and the sound it makes. When each instrument is

- Being able to hold the material (challenge for students who have gripping problems)
- Hearing the strumming or plucked string (hearing problems)

UDL Checkpoints

Guideline 6: Provide options for executive functions

- Checkpoint 6.1 – Guide appropriate goal setting

Guideline 3: Provide options for comprehension

- Checkpoint 3.1 – Activate or supply background knowledge

Guideline 7: Provide options for recruiting interest

- Checkpoint 7.3 – Minimize threats and distractions

Guideline 8: Provide options for sustaining effort and persistence

- Checkpoint 8.3 – Foster collaboration and communication

METHOD

Anticipatory Set

1. Students create hypothesis: Can objects make sounds when it is not vibrating?
When objects vibrate, does it create sound?
2. Begin the discussion around the topic of objects vibrating and creating sound.
3. Build on students' background knowledge.
QUESTION #1: How can you describe sound?

Checkpoint 3.1: By asking the students questions about sound and vibration, they can connect it to prior knowledge of how sound is created. Students can give the example of touching your neck and speaking to feel the vibrations and how everything is voiced.

- QUESTION #2: How do all objects make sound/noise?
4. To further embed the idea of sound and production from instruments, instructor should bring in actual instruments for the students to view. Once the student has viewed it, the students will be given the opportunity to mess around with them. From this, the students must explain to me what they're hearing and the ways they're causing the instruments to make that sound.

Introduce and Model New Knowledge

1. Discuss the keywords.

Keywords:

Pitch – Pitch is a property of sound that is produced through vibrations. Vibrations that are fast or close together produce a high pitch. Vibrations that are slow or farther apart produce a low pitch.

Vibration – Vibrations are regular back and forth movements of objects.

Sound – Sound is produced by vibrating objects and vibrating columns of air.

2. Ask students how the rubber bands produce sound.
3. Ask students if they can see or feel vibrations of the rubber band.

Provide Guided Practice

1. Give students examples of stringed instruments such guitars, violins, cellos.
2. Ask students to share their initial ideas of how stringed instruments make a sound.
3. Ask students what needs to be present for sound to be made and heard (vibrations).
4. Students will identify the forces that are caused to create sound for stringed instruments; plucked or strummed.
5. Challenge the students to think about if all instruments are plucked or strummed, do they all make the same sound and have the same pitch?

Checkpoint 6.1: By using the instruments with the students, I would be scaffolding on how they should be used. The students will follow along with what I'm doing but as time goes on, I will give the students more opportunity to explore with them. So they can find out the creation of sound through vibrations.

Provide Independent Practice

1. Playing the three instruments. Students will be set into groups.
2. Three instruments (cardboard bowl, Styrofoam cup, and clear plastic cup) will be provided for the students' investigation.
3. Have certain groups only investigate certain instruments so there can be a variety of data being collected by each group. Two groups can have the same instrument but can possibly hear completely different things.
4. Students have switch between plucking and strumming the string to compare the noises. They must keep control over the pace of the strumming to the same distance length in plucking.
5. Students should take notes of the different pitches that are produced for each instrument and the noise.

Checkpoint 8.3: Students will be working in groups during the activity. They will have to collaborate and communicate their ideas off of each other. Compare and contrast from peers. Less guided activity from instructor.

WRAP UP

Once the students are winding down and completing the investigation, call them back for a whole class discussion. In the discussion, each group will report out what they've heard. Instructor should have the three instruments in their own personal categories. Under each category, the instructor should take notes from each groups' data. As a group, students will be given an assessment on the lesson.

ASSESSMENT

Summative Assessment

- Use the team presentations of their instruments to assess the student's ability to communicate and present findings of observations and investigations.

- Meet back together and report out the findings. Discuss if the hypothesis was accurate or not. If not, give possible ways of why they came to that conclusion.
- Ask the students' difference they are hearing in the vibrations of the rubber bands is called pitch. Students should give definition after the whole activity is finished.
- Students should identify that sound and pitch differences can be because of the size of the instrument, the material it's made out of, the thickness of the rubber band, the stretch of the rubber band.
- Students should describe that if they pluck or strum the rubber band, it is the forces that causes sound.

MATERIALS

3 different types of strings/ rubber bands (thin, thick, medium) [*rubber bands can be used if string is not available. Rubber bands might be more reliable.*]

1 cardboard bowl

1 Styrofoam cup

1 plastic clear cup

Worksheet

Handout

Group: _____

Date: _____

Vibrating To Make Sounds

Record your finding about each vibrating object and the pitch (sound) created.

1. The cardboard bowl had a _____ pitch when it was strummed.
2. The cardboard bowl had a _____ pitch when it was plucked.
3. The Styrofoam cup had a _____ pitch when it was strummed.
4. The Styrofoam cup had a _____ pitch when it was plucked.
5. The clear plastic cup had a _____ pitch when it was strummed.
6. The clear plastic cup had a _____ pitch when it was plucked.

WORD BOX

high

low

medium

dum

thud

bling

ting

thing

boing

Describe the sound the objects made. Can use the words in the word box or create own.

Cardboard Bowl: _____

Styrofoam: _____

Clear Plastic Cup: _____

Section 2: The UDL Elements

Engagement	
Which checkpoint did you incorporate?	How and why?
Checkpoint 8.3 – Foster collaboration and communication	The students will be put into groups to collaborate ideas from each other. Group work. Reason it's used is to hear out others point of views and see if they are related or not.
Checkpoint 7.3 – Minimize threats and distractions	I would create other alternatives for students who are low functioning. Make the work easier for the students to comprehend but not too easy that they have a higher advantage than the others.

Representation	
Which checkpoint did you incorporate?	How and why?
Checkpoint 3.1 – Activate or supply background knowledge	Asking students questions on if they know the topic. Possibly could help other students bring out information they already know but forgot to share or shy to say. To gage the comprehension and background the student brings to the activity.

Action and Expression	
Which checkpoint did you incorporate?	How and why?
Checkpoint 6.1 – Guide appropriate goal setting	To exhibit the way I want my students to learn and do the activity in the beginning. But as time progresses, they will do it more on their own and to their own interpretation. Students can learn more on their own once their guided in a particular way.

Section 3: Other UDL Ideas

Engagement	
Activity	How would this help students meet the goal?
Writing ideas on a poster board for the whole class	Students will be able to move around the room to reach the board. On the poster board, students can write down their ideas in front of the whole classroom. Students can learn from their peers' ideas than only learning from the instructor.
Creative writing	Students can make a prediction on how the sounds will be. The writing is up to the students' interpretation. Instruments that make sounds.
Drawing	Students draw instruments that they know.

Representation	
Activity	How would this help students meet the goal?
Having students listen to music	The students can listen to the music than playing it themselves. Instead of physically seeing the instruments they can auditory hear the instruments and the sounds.
Compare and contrast instrument sounds	Play the instrument and compare it to another to find differences and similarities.
Hand clapping	Do a hand clapping or banging on the table to create sound.

Action and Expression	
Activity	How would this help students meet the goal?
Recording the students voices	Instead of using instruments, can use students' own voice and looking at the vibrations. The lesson is about vibrations and how sound is created. If the student sees the vibration of their voice in the digital recording, it will show the main goal of the activity.
Write a reflection	Students write what they saw and heard during the activity. A wrap up.
Building own instruments	Students can build completely different instruments than the ones the instructor provided. The students are given the opportunity to investigate and create their own instrument to their liking. With each student having their own type of instrument, there will a wide range of sound and pitch it would make. The instruments would have to be stringed.