

5 E Lesson Plan Template:

Frequency and Pitch

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Topic: Force, Motion, and Energy

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NSES: 8AS11.3: Use appropriate tools and techniques to gather, analyze, and interpret data

8AS11.4: Develop descriptions, explanations, predictions, and models using evidence

Grade level: 5th

SOL: 5.2b. The student will investigate and understand how sound is created and transmitted, and how it is used. Key concepts include:

b) vibration, compression, wavelength, frequency, amplitude

Daily Question: What are four different ways that you can change sound?

Subject: Frequency and Pitch

Procedures for Learning Experience	Guiding Questions	Materials Needed	Evaluation (Assessment)	Approximate Time Needed
Engagement: *Place a different stringed instrument on each of the four desk groups in the classroom, preferably ones that sound very different from one another. In my case, a violin, a lute, a ukulele, and a banjo). Break students up into 4 groups and have them	Why do strings produce different sounds on different instruments? What causes the production of high sounds versus low sounds?	*Violin *Lute *Ukulele *Banjo	*Observe student reactions and observations *Record student guesses to questions on the board	10 minutes

<p>spend two minutes at each table examining each instrument and listening to the sounds that its strings make. Have students bring their journals and record the similarities and differences that they see in the strings, and record what kinds of sounds that they hear.</p> <p>*Remind students about their lesson the previous day on sound vibrations, compressions, and resonance. Have students make the connection that these strings have these same sound properties that make them produce a specific kind of sound.</p> <p>*Have a student who knows how to play the violin play thirty-seconds of “Fur Elise” by Beethoven to show students how playing and manipulating different strings produces high and low frequencies.</p>	<p>Why do strings of the same length produce different sounds?</p> <p>Why do thicker strings produce lower sounds and thinner strings produce higher sounds?</p>	<p>*Student journals and pencils</p>	<p>*Journal Responses (Formative)</p>	
<p>Exploration: Explain that each group will be create their own stringed instrument that will have all properties of sound. Give each student a pegboard, eight eyebolts, and four different types of strings (balloon string, tennis string, thin wire rope, brass string), shears. Have students cut 10 inches of each type of string/wire, and then cut 5 inches of each type of string and wire. Screw the eyebolts into the holes in the pegboard, and have students work together to tie strings tightly to the eyebolts. Once all strings are attached, have students pluck the strings and observe the different in sound. Give them a</p>	<p>Questions on the handout:</p> <p>*Which of the four types of strings produces the highest sound when you pluck it? The lowest sound?</p> <p>*Does the 10 inch string and the 5 inch string of the brass wire produce the same sound?</p> <p>*Do the strings produce a</p>	<p>*pegboard, *16 eyebolts</p> <p>*4 different types of strings (balloon string, tennis string, thin wire rope, brass string), *shears</p>	<p>*Answers on the handout will be submitted</p> <p>*Observe student participation in the activity</p>	<p>15 minutes</p>

<p>handout and have them record their observations and answers to the questions posed in bullet point form.</p>	<p>different sound when you press your finger them?</p> <p>*Do the thicker and heavy strings produce a higher or lower sound than the thinner strings?</p> <p>*What happens when you turn the eyebolt to the right and increase the tension of the string? Does it produce the same sound?</p>			
<p>Explanation: Gather the students in a circle after the completion of the activity. Ask them how the sounds of the strings on their ‘instrument’ differed based on the type of string and how they manipulated it. Bring up the previous lesson on sound vibrations and compressions. Explain that strings vibrate at a specific “frequency” or “pitch,” which is the number of these compressions that passes a fixed point per unit of time. Higher numbers of compressions produce high frequencies, while lower numbers of compressions produce low frequencies. Explain that there are four ways to change a string’s frequency: changing the length, thickness, tension, or density. Shorter and strings will high tension will produce a higher frequency, while thicker and denser strings will vibrate more slowly and have low frequencies.</p>	<p>*What is frequency, and what is another name for it?</p> <p>*How does frequency relate to sound vibrations and compressions learned in the previous lesson?</p> <p>*What are the four variables that change a string’s frequency?</p> <p>*Do strings vibrate at faster speeds when they produce high or low frequency sounds?</p>	<p>*Notebooks for students to write down the definition of “frequency” or “pitch,” and how it relates to vibration and compression.</p>	<p>*Observation of student responses to activity and questions posed.</p>	<p>10 minutes</p>

<p>Extension: Ask students about other instances in their daily life where they will encounter high and low frequency? Ask why a balloon will produce sounds at different frequency levels based on how far its opening is stretched when letting the air out? How does this relate to the high and low frequencies of the different strings in this lesson? Assign students homework where they record three different objects that produce a high frequency sound and three different objects that produce a low frequency sound. Have them observe the characteristics of each object (density, tension, length, thickness), and have them hypothesize how these characteristics affect the sound produced. Also, have them create hypotheses for why the four different instruments that they observed at the beginning of class produced the sounds that they did. (Ex. The banjo has very thin strings, therefore...)</p>	<p>*What other objects besides strings produce sounds of high or low frequency? Can these objects be manipulated so that their sound will change?</p>	<p>*Balloon *Journals (to be taken home for homework)</p>	<p>*Observation of participation. Take note of which students are participating and making correct connections to frequency in their daily lives.</p>	<p>10 minutes</p>
<p>Evaluation: Students will record all observations throughout the lesson in their journals, will complete a worksheet with questions about their activity. They will also complete the questions in extension part of the lesson for homework in their journals.</p>	<p>*Did the students actively participate in the activity? *Did students define all vocabulary terms? *Did students complete all written requirements for the lesson? *Were students engaged</p>	<p>*All of students' written assignments</p>	<p>*Formative assessment will include observing them complete tasks, seeing their progress in their journals, and correcting answers on the activity response handout. *A summative</p>	<p>(Outside of Lesson)</p>

	and did they connect content to the outside world?		evaluation will be an end of semester test that will have a certain amount of questions on this frequency lesson.	
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Notes: Because there are very fragile instruments being introduced to the class, I will ensure that students are warned in advance that they need to handle instruments extremely carefully. I will choose a student to play 30 seconds of his or her instrument so that the class can see how frequency is tangible and applicable to every day life and they can be engaged and inspired by one of their classmates. For differentiation, students will be strategically placed into groups with a balance of different skills and dispositions. For students with special needs, if a student was hearing impaired, he or she could focus on the feel of the different vibrations of the strings opposed to the sound.