THAT'S A SOUND IDEA!

TEACHER GUIDE

WONDER

PLANNING

Here's a suggested schedule for this kit! The activities should be completed in order, but you can choose when the lessons take place over time. The time required for each lesson may vary.

ACTIVITY INFORMATION	SECTION (S)	TIME REQUIRED	DAY/ LESSON
ACTIVITY 1: ON THE BALL It's the battle of the tuning fork vs. the ping-pong ball. What will happen...and why? Time required: 45 min	· Use the Fork	45 minutes	Day 1
ACTIVITY 2: PEPPER PARTY It's the battle of the tuning fork vs. pepper. What will happen? Time required: 1 h 45 min	· Jump Around	30 minutes	Day 2
	· Back and Forth	30 minutes	Day 3
	· Louder, Please · Show What You Know	45 minutes	Day 4
ACTIVITY 3: MUSIC IN THE AIR Make your own musical instrument and learn about frequency and pitch. Time required: 1 h 30 min	· Feeling Plucky · Different Sounds	45 minutes	Day 5
	· Interesting Instruments · Show What You Know	45 minutes	Day 6
ACTIVITY 4: SEND A MESSAGE WITH SOUND See the waves made by sound, then use sound waves to send a message across a distance. Time required: 1 h 45 min	· Making Waves · How Sound Moves	45 minutes	Day 7
	· Words on a Wire · String Phones · Show What You Know	60 minutes	Day 8
ACTIVITY 5: SOUNDS LIKE A PLAN You can do these optional extensions to learn even more about sound. Time required: 30+ min	· Make More Music	30 minutes	Day 9
	· Dancing Oobleck	30 minutes	Day 10
	· Sound and Technology	30 minutes	Day 11
	· Seeing Sound	30 minutes	Day 12

Total time: 6+ hours

Question 3: Circle the picture below that shows the loudest sound waves moving through the air.
Answer: The picture in the middle has the most "squeezed" air (the most compression), so it has the most energy and is the loudest.
How to Help: *If your student is confused because that one has the thinnest bands of squeezed or compressed air, remind them that this means there's more air in each band.*

activity 3

MUSIC IN THE AIR

In the last activity, your student learned what loudness means. Now, they will explore another property of sound: pitch. To do this, they will learn about frequency and types of musical instruments.

LEARNING GOALS:

I can provide evidence that vibrations cause sound, and that sound causes vibrations.

FEELING PLUCKY

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PREPARATION AND SUPERVISION

- They will probably be able to get three bands across before they start slipping. This should be enough for them to see that the tighter rubber bands make a higher-pitch sound when plucked, while the looser rubber bands make a lower-pitch sound.
- They might even be able to see a difference in how fast the rubber bands vibrate if they watch very closely, especially towards the end of the rubber bands' movement as they're about to stop moving.

THINK ABOUT IT!

Question 1: How were the sounds made by the rubber bands different?
Answer: The student should recognize that some sounds were lower and some were higher.
How to Help: *It's possible some sounded the same, but if they all sounded the same, help them adjust the bands so they sound different.*

Question 2: What were the rubber bands doing when they made sound?
Answer: Encourage your student to use the word "vibrate" here to describe the way the rubber bands quickly moved back and forth when plucked.

Question 3: How did the rubber bands that made a high sound vibrate compared to the ones that made a low sound?
Answer: It might be a little tricky to observe, but the high-pitch rubber bands move faster.
How to Help: *They will likely only be able to see this at the end of the movement, when it's slowing down, if they pluck two rubber bands at once.*

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DIFFERENT SOUNDS

CONTENT

- Your student will be introduced to some new vocabulary: frequency and pitch.
- If they have trouble with these concepts, try having them practice that the lows and highs of each term go together: high sound means high pitch, which means high frequency, and low sound means low pitch, which means low frequency.

THINK ABOUT IT!

Question 1: Name a sound you have heard that has a very low pitch.
Answer: A very low pitch sound might include a bass drum, thunder, a heartbeat, a cat purring, a dog growling, or a man's voice.
How to Help: *If your student is having trouble remembering what low and high pitch are, try acting it out by having them make low- and high- pitch sounds with their voice.*

Question 2: Name a sound you have heard that has a very high pitch.
Answer: You can remind your student of sounds like a whistle, birds chirping, a violin, a wind chime, or a child's voice.

Question 3: Which of the two sounds you wrote has a higher frequency?
Answer: The high pitch sound has a higher frequency.
How to Help: *Remind your student as needed that higher-pitch sounds have a higher frequency because their sound wave moves faster.*

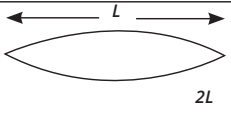
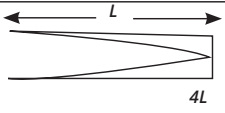
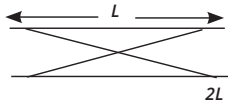
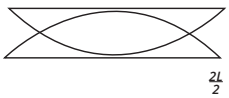
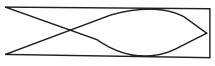
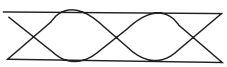
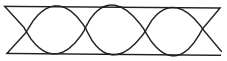
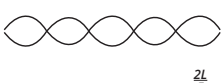
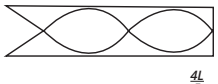
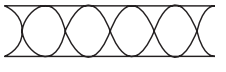
INTERESTING INSTRUMENTS 8

CONTENT

• This explanation is probably the most difficult content of the kit. We've simplified it immensely for this age group, and if they seem to have a good grasp on shorter and longer air columns, you can add some information.
• For instance, while what we have told them is true (the sound waves bounce around in the air inside the tube), a big part of why instruments have different tones is because of the harmonics, or standing wave properties.

• Air doesn't just bounce around an instrument once; it does so many times per second, and makes a pattern of interfering waves.
• This makes a standing wave with specific properties that produce the instrument's signature tone and timbre.
• Here are some standing wave harmonics that could be produced by tube and string instruments. For a tube-shaped instrument, variations on its harmonics depend on how many finger holes are covered. For string instruments, the harmonics depend on where the string is pressed and the resulting vibration pattern when it's plucked.

MODES OF VIBRATION OF STANDING WAVES

MODE	STRING	CLOSED PIPE	OPEN PIPE
1st harmonic or fundamental			
2nd harmonic or 1st overtone			
3rd harmonic or 2nd overtone			
4th harmonic or 3rd overtone			
5th harmonic or 4th overtone			

Question 2: Explain how vibration helps a friend hear your message in the other cup.
Answer:
• Vocal cords of Person 1 vibrate (this wasn't mentioned in the student text, but they might make the connection.)
• Person 1 makes a sound (a whisper or talking)
• The sound makes the cup vibrate (a sound wave)
• The cup makes the string vibrate
• The vibrations in the string reach the other cup and make it vibrate
• The vibrations of the cup cause sound that reaches the ear of Person 2

5 SOUNDS LIKE A PLAN

Here are some optional extensions for your student to learn more about sound. You can help your student pick one, none, some, or all of them to do.

MAKE MORE MUSIC

DIY PROJECT 15

• Help your student use the leftover kit materials and other household materials to make other homemade musical instruments.
• A wide variety can be made, including string instruments, percussion instruments, and wind instruments.
• There are some suggestions for where to start in the Student Workbook.
• You might be surprised at how well DIY instruments can work, and this is a great way for students interested in music to show their creativity.

DANCING OOBLECK

HANDS-ON 16

• One note about materials: To protect your speaker, be sure to cover it with something like plastic wrap. If you don't, it will be ruined by the oobleck mixture.

SOUND AND TECHNOLOGY

RESEARCH 17

• Encourage them to write about what they learn and to use their new vocabulary about sound waves, frequency, and vibration.

SEEING SOUND

TECHNOLOGY CONNECTION 18

• Help your student search for online tools using keywords like "audio visualizer" or "see sounds waves" app.

GLOSSARY

Energy – ability to make something move or change.
Frequency – how fast waves are moving.
Loudness – the power or energy carried in a sound wave.
Pitch – how high or low a sound is.
Sound – energy that moves using vibration.
Vibration – quick back and forth movement.
Wave – a pattern of moving energy.

WONDER

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Kit	SU-SDIDEA
Instructions	IN-SDIDEAT
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