Science

SOUND

In this unit, you will

- identify characteristics of question-and-answer text pattern
- monitor your comprehension
- make your meaning clear while speaking
- identify point of view in web articles
- use strong verbs in your writing
- learn about sound

LET'S TALK

Sound Check

Can you find at least 30 sources of sound in this picture?

Understanding reading strategies

Monitoring Comprehension

Monitoring comprehension means checking to make sure you understand what you are reading. When you get stuck, you can use fix-it strategies to help you make sense of what you're reading.

A World Full of

by David Louis Dreier

Everywhere we go, there are sounds. We might hear people talking, dogs barking, or cars passing by in the street. Even the leaves on a tree make a sound as they rustle in the breeze.

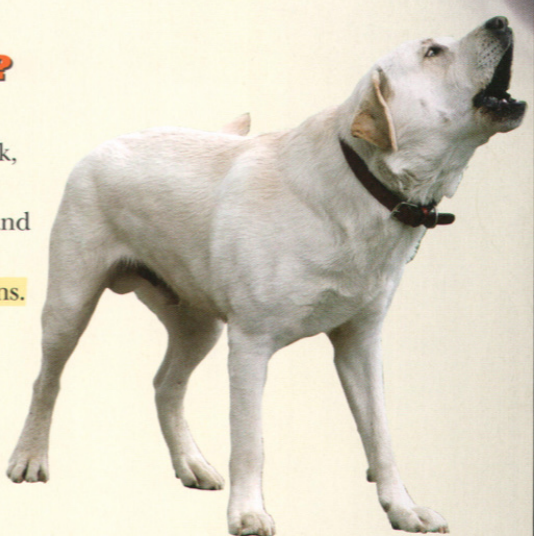
It would be a much different world without sound. Imagine a world of complete silence. There would be no loud conversations among friends, no music, no alarm clocks.

But what is sound? What happens when a glass bottle breaks or a bird chirps that allows us to hear it?

What Is Sound?

→ Important words are often repeated. Make sure you understand important words. What do you know about vibrations?

Sound is produced by vibrations. When you talk, your vocal cords vibrate. A violin string, a radio, and a cricket all make their sounds through vibrations. These vibrations release energy. The energy moves away from the sound source (such as the radio) in the form of invisible waves.

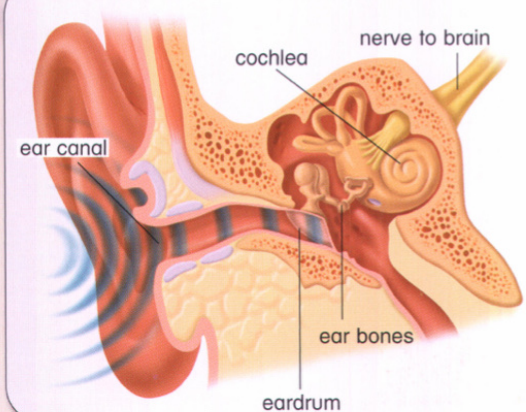


Sound

You can see some kinds of waves. When you drop a stone into still water, the stone creates waves that move away from the centre of the splash. Sound waves also spread outward from a source of vibration.

When the waves reach us, they cause vibrations inside our ears. The vibrations cause signals that go to our brains.

To figure out new concepts, use information in photographs. How does the photograph help you understand waves?



How It Works

Sound waves enter the ear and hit the eardrum. This passes vibrations along three tiny bones to the curly shaped cochlea. The vibrations shake thousands of microscopic hairs inside the cochlea. These send nerve signals to the brain, which then identifies the sound.

Look closely at word parts to help you figure out unfamiliar words. What smaller words do you recognize in the highlighted words?

To understand a new concept, read ahead to find examples. How do the examples help you understand the concept of loudness?

Loud and Soft

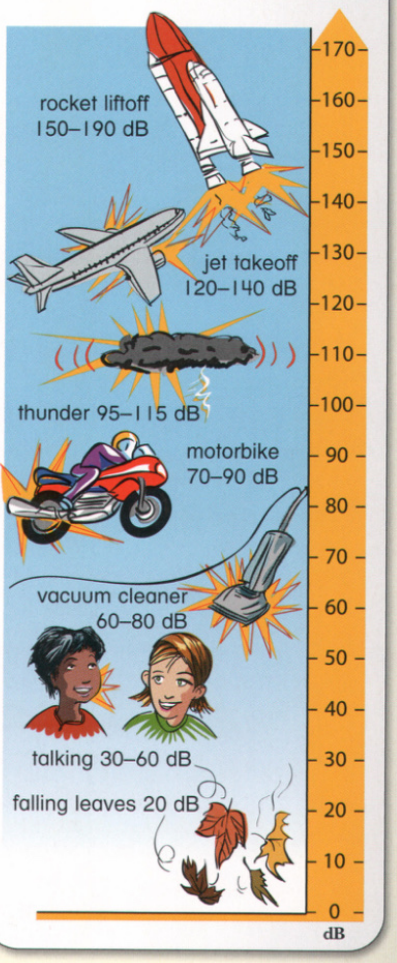
The loudness of a sound is the amount of energy the waves are carrying. A friend's whisper or a cat's purr are soft sounds, with very little energy. An explosion creates a very loud sound because a great amount of energy has been released.

Of course, a loud sound doesn't seem loud if it is far away. That is because as sound waves move away from a source, their energy gets spread over a larger and larger space. The sound of someone humming right next to you might seem quite loud. At that close distance, most of the energy in the sound waves would be reaching your ears. But if you stood a little farther away, you might not even hear the humming.

→ To understand a new concept, read ahead to find more information. Why does a loud sound seem less loud if it's far away?

Measuring Sound

The loudness of sound is measured in decibels (dB). This chart shows the decibel level of some everyday sounds. Loud sounds can damage our ears. Sounds louder than about 130 dB can make our ears hurt.

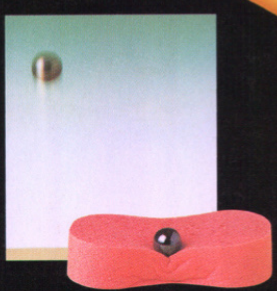


BOUNCING BACK

by Barbara Taylor

Try dropping marbles onto a hard surface and a soft surface. How is the sound different?

When a sound hits a surface, it bounces back, or is reflected. Hard surfaces reflect sound better than soft surfaces. Soft surfaces soak up, or absorb, sounds so they do not bounce back as much. This makes sounds quieter.



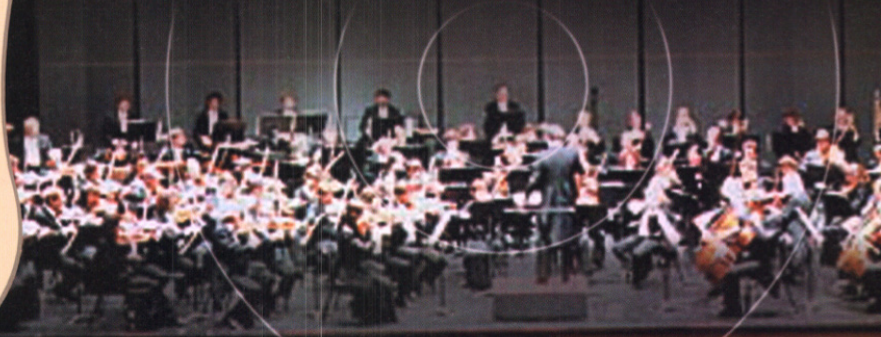
In a concert hall, music bounces off the walls and ceiling. The materials in the walls and ceiling and the shape of the hall control the way the music bounces. Concert halls have to be carefully designed to cut down on unwanted echoes and make it possible for the audience to hear the music properly.

Applying Strategies

Monitoring Comprehension

As you read, check your understanding. Ask yourself if what you're reading is making sense. If you get stuck,

- make sure you understand important words
- use information in photographs
- read ahead to find examples and more information
- figure out unfamiliar words by looking at word parts



In concert halls, materials such as carpet, upholstered seats, and special tiles can help soak up sounds.

Bats make high, squeaking sounds and use their large, sensitive ears to collect the echoes from objects around them. This is called echolocation and helps bats to find their way around in the dark and detect food, such as insects. The echo-squeaks made by bats are usually too high for us to hear.

Try This

You will need

- an alarm clock
- a cookie tin with a lid
- tissue paper
- a towel

1. Place the ringing alarm clock inside the cookie tin and listen.
2. Put the lid on the tin and listen to the alarm again.
3. Wrap the clock in tissue paper inside the tin, put the lid on, and listen again.
4. Wrap the clock in a towel inside the tin, put the lid on, and listen to the alarm.

What did you notice about how the sound of the alarm changed? Which material worked best as soundproofing?

Reflect on

Strategies: Were there places you got stuck when you were reading this article? What strategies did you use to help you?

Your Learning: How does your school gym sound when you have an assembly? What did you learn in this article that you could use to change the sound in your gym?

Understanding writing strategies

Choosing Strong Verbs

Strong verbs help your readers visualize what you are writing about.

A weak verb gives a fuzzy picture. A strong verb lets your reader see, hear, smell, feel, and taste the action you are describing.

This student is writing about a sound he hears when he wakes up in the morning. What verbs does he choose? How does changing the verb help to make the picture in your mind clearer?

sounded
When the alarm ~~went off~~,
I woke up.

rang
When the alarm ~~sounded~~,
I woke up.

clanged
When the alarm ~~rang~~,
I woke up.

When the alarm clanged,
I woke up.

How to choose strong verbs:

- ☑ Picture in your mind what you want to write about.
- ☑ Brainstorm strong verbs.
- ☑ Ask yourself if the verbs match the picture in your mind.
- ☑ Try out other verbs to see if they are better.

SOUND THE ALARM!

People and animals use sound as an alarm. Sound can warn people of danger or remind them to do something important. An alarming sound is often very loud.

An alarm clock rings to let us know it is time to get up. We might miss something important if we don't wake up.

Sirens wail to tell us that someone is hurt or in trouble and needs help. Drivers of emergency vehicles turn on their sirens to let people know they are in a hurry.

Lions roar to scare other animals away from their territory and food. The roar lets other animals know they might become the lion's next meal if they come any closer.

Applying Strategies

Reading Like a Writer

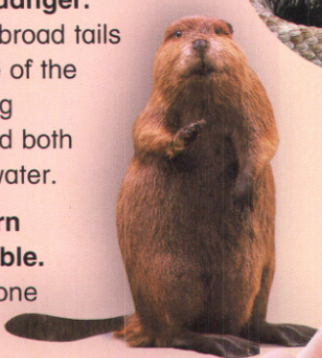
As you read, look for strong verbs that help you hear the sounds in your mind.

Cats hiss, growl, and yowl when they feel angry or afraid. Their sounds warn people and other animals to stay back. A hissing cat may attack.

Smoke alarms beep loudly to warn people that something may be burning nearby. The alarm tells people to leave the building. They are in danger from smoke and heat.

Rattlesnakes rattle their tails to let other animals know they have come too close. The snake's tail rattle warns others to go away or be bitten.

Slapping beaver tails alert other beavers to danger. Beavers slap their broad tails against the surface of the water. This slapping sound can be heard both above and under water.



People yell to warn others about trouble. Shouting for someone to "watch out" is a sound warning.

Reflect on

Writer's Craft: Find three verbs in the article that helped you hear the sound the writer was describing.

Connections: Think of a time when you heard an alarm. How did you feel? What did you do?

Applying Strategies

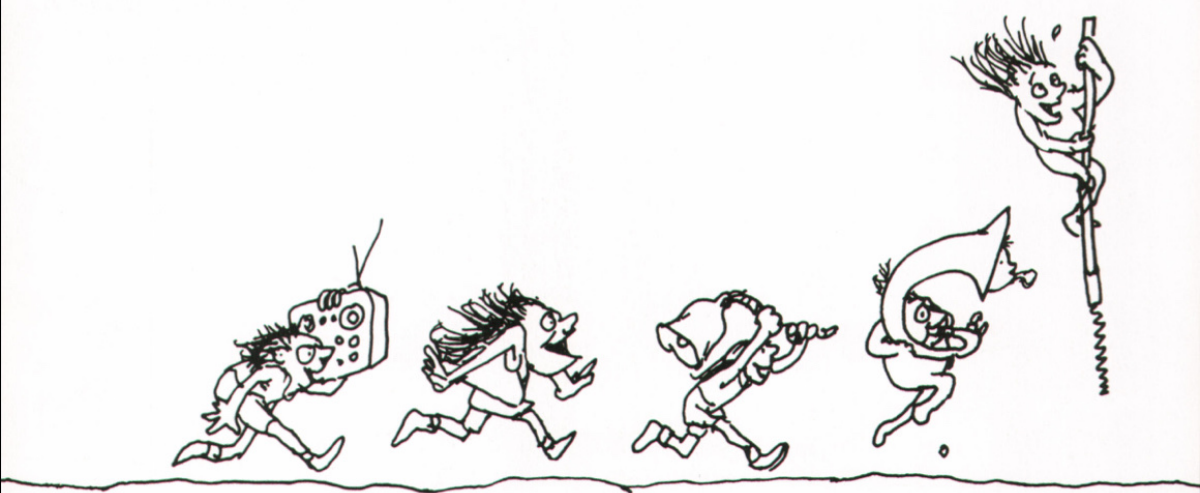
Reading Like a Writer

As you read, notice how the poet uses verbs to create pictures in your mind.

NOISE DAY

by Shel Silverstein

Let's have one day for girls and boyses
When you can make the grandest noises.
Screech, scream, holler, and yell—
Buzz a buzzer, clang a bell,
Sneeze—hiccup—whistle—shout
Laugh until your lungs wear out,
Toot a whistle, kick a can,
Bang a spoon against a pan,
Sing, yodel, bellow, hum,
Blow a horn, beat a drum,
Rattle a window, slam a door,
Scrape a rake across the floor,



Use a drill, drive a nail,
Turn the hose on the garbage pail,
Shout Yahoo—Hurrah—Hooray,
Turn up the music all the way,
Try and bounce your bowling ball,
Ride a skateboard up the wall,
Chomp your food with a smack and a slurp,
Chew—chomp—hiccup—burp.
One day a year do *all* of these,
The rest of the days—be *quiet* please.

Reflect on

Writer's Craft: If you were one of the "girls and boyses," what "grandest noises" would you like to make?

Critical Literacy: Do you think all boys and girls would enjoy a Noise Day? Who might not have fun on a Noise Day?

Understanding text patterns

Identifying Characteristics of Question-and-Answer Text Pattern

Question and answer is a way of organizing information. Each question introduces a topic and answers give information about the topic. Answers may include facts or explanations, or both.

FAQ: SOUND

by Etta Kaner

How do snakes hear without ears?

Snakes use the fact that sound travels better through solids than through air to "hear." Snakes have no ears, but if a snake lays its head on the ground, a bone inside its head picks up the sound vibrations coming from an approaching animal's movements. The vibrations travel to the snake's brain via a cochlea similar to the one inside the human ear.

Each question introduces a topic. What is the topic of this first question?

What's the quietest place in the universe?

Outer space. Sound must travel through air, liquid, or solids in order to be heard. In outer space, there is nothing to carry the sound waves. That's why astronauts must use radios to communicate. Radio waves can travel where sound waves cannot.

Answers give information about the topic. What information does this answer give you?

Does sound travel through water?

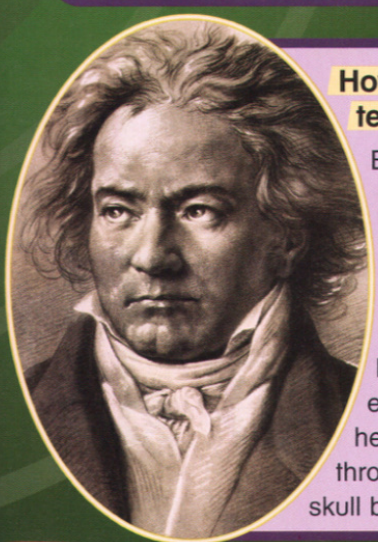
The next time you go swimming, ask a friend to tap two spoons or rocks under the water while your head is above the water. Can you hear anything? Now put your head under the water and try it again. Does sound travel through water? It sure does. In fact, it travels about four times faster through water than through air.

←

Answers may include facts. What do you learn about the speed of sound in water?

What's the noisiest animal in the world?

The male howler monkey of South America has two bony "sound boxes" in its throat. When it howls, air blows across the boxes, just like air blowing across empty pop bottles. The resulting roar can be heard over a distance of 5 kilometres.



How did Beethoven use his teeth to compose music?

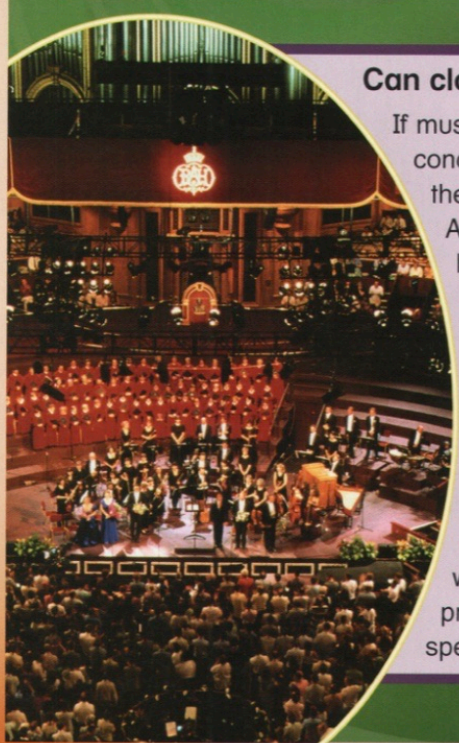
Beethoven, a famous composer of the late 1700s and early 1800s, continued to compose great music even after he became deaf. To help him hear the music he was writing, Beethoven would hold one end of a wooden stick between his teeth and put the other end against the piano strings. When he played a note, the sound travelled through the stick, through his teeth and skull bones, directly to his inner ears.

←

Answers may give an explanation. What will be explained in the answer to this question?

Why is it so quiet just after a snowfall?

There are millions of tiny spaces inside and surrounding the flakes that make up the freshly fallen snow. These spaces absorb sound. This may be an advantage in a large city since it temporarily cuts down on noise pollution. But on Antarctic expeditions, people who are more than 5 metres apart in freshly dug snow tunnels must shout to be heard.



Can clothes change sound?

If music doesn't sound right in a concert hall, don't always blame the building's designer. The Royal Albert Hall in London, England, has been a popular place for concerts since 1871. But in the 1930s, people complained about the sound of the music there. Someone discovered that, since women were no longer wearing long dresses made of several layers of material, not as much sound was being absorbed. This problem was solved by adding special fibre tiles to the walls.

School of Sound

Interview by Laura Edlund

Bill Morgan is a judo competitor, a graduate of W. Ross Macdonald School in Brantford, Ontario, and now an educational assistant there. Bill has low vision, so he has learned to use sound to get around. He talked to us about sound and his school.

Applying Strategies

Identifying Characteristics of Question-and-Answer Text Pattern

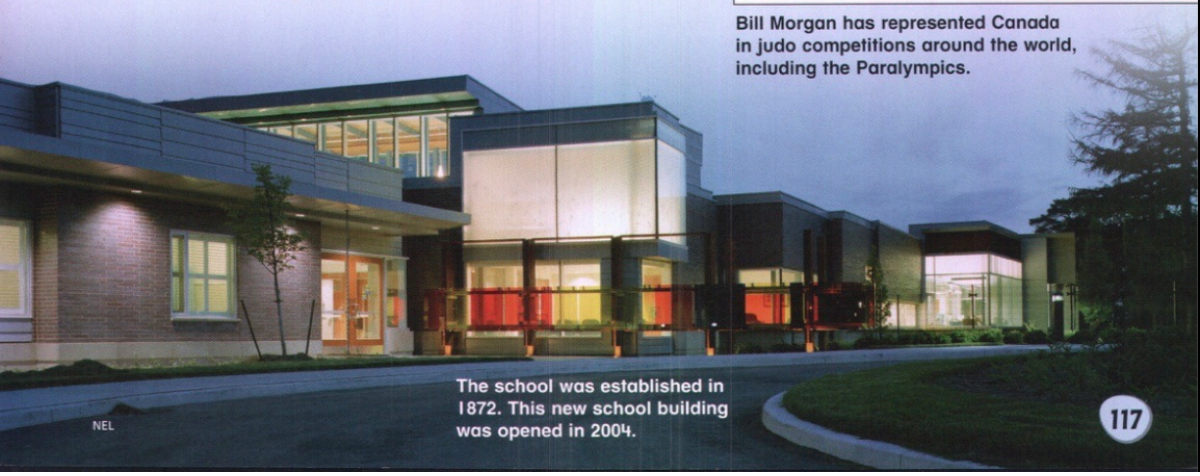
As you read this interview, look for characteristics of question-and-answer text pattern:

- Each question introduces a topic.
- Answers give information about the topic.
- Answers may include facts or explanations, or both.

Laura: *What are some things that make your school great?*

Bill: The people who made the new school building had to figure out how it could work for the students. All the students at the school are blind or deafblind, or have low vision. Certain things at the school can help students get around independently. For example, the new school building has no carpets and has many wide hallways. These things help make the school great.

Bill Morgan has represented Canada in judo competitions around the world, including the Paralympics.



The school was established in 1872. This new school building was opened in 2004.

Laura: *Why aren't there any carpets?*

Bill: Well, for many students at the school, sound is information that can help them get around. Carpets muffle sound. But wood or tile floors reflect sound well and give information. Wide hallways with high ceilings reflect sound well, too. They don't create too many echoes, which can distort the information.

Laura: *What are other ways that some students use sound?*

Bill: Some students use certain sounds to figure out where they are in the school. For example, the hum of the vending machines or the sound of the water fountains can be a landmark for a student. Me? I can hear the doorways.

When Bill walks along hallways in the school, he hears the change in the sound reflected back to him. The sound reflected from a wall is different from the sound reflected through an open doorway.

Laura: *But how well can a student use sounds in a* busy *hallway?*

Bill: Sounds sure do get distorted when 100 students are walking in the halls. That's why we use the rule "Stay to the right!" And we use other sorts of information—for example, the rooms and hallways are in exactly the same place on each floor. That makes it easier for students to know where they are and to get where they are going. They can create a mental map of the school.

Bill helps a student to walk, using a gait trainer.

The school's motto is "The impossible is only the untried."

Laura: *Thanks very much for telling us about your school, Bill. Do you have anything else you'd like to tell us about sound?*

Bill: Here's something neat. If someone drops a coin on a table, I can tell from the sound what coin it is—quarter, nickel, dime—and even if it's Canadian or American. I know one of my students can do this, too, but I don't know if other people can.

Reflect on

Strategies: How did thinking about question-and-answer text pattern help you to understand the information in this interview?

Your Learning: How can you use what you learned in this article to be more aware of the sound messages around you?

Understanding media

Identifying Point of View in Web Articles

Sounding Off

Everyone has a personal point of view. Your point of view is the way you look at the world around you. You and your friends may have the same point of view about what makes a great movie. You and your parents may have different points of view about certain TV shows.

On these two pages, you'll read web articles about an invention called the Mosquito. As you read, notice the different points of view.

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Favorites Search Print Mail

Address Go

eNews

Fed Up with Noisy Teenagers Hanging Around Your Store?

The Mosquito is the invention of Howard Stapleton. It gives off a high-frequency sound that sounds like a buzzing insect. Apparently, only people under 20 can hear the sound. The device is the perfect solution to the problem of young troublemakers. These noisy teens hang around outside stores and drive away paying customers.

Add your comment

Why spend hundreds of dollars on the Mosquito? I thought the easy (and cheap) way to keep teens from hanging around was to play classical or opera music on your store's sound system.

True Blue, Oak Ridges, ON

Think about what ideas are missing. What does this text *not* say about teenagers?

Look at the writer's word choice to help you figure out point of view. How are teenagers described in this web article?

Make inferences to discover point of view. What does this writer think about teenagers' tastes in music?

Read this web article about how some students used the Mosquito sound in an unexpected way. Look at the writer's word choice and make inferences to help you figure out the different points of view.

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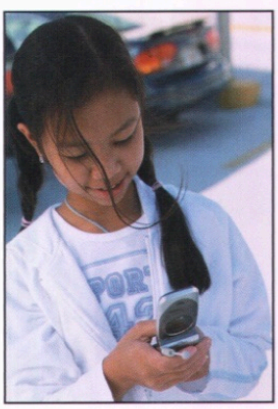
Sounds GOOD!



School children have hijacked a high–pitched alarm that cannot be heard by adults. They have created ringtones using this sound so they can get away with using cell phones in class.

Techno-savvy students have adapted the Mosquito alarm, used to drive teenage gangs away from shopping centres.

The alarm works because its ultra-high sound can be heard only by youths but not by most people over 20.

School children recorded the sound, which they named Teen Buzz, and spread it from phone to phone via text messages. Now they can receive calls and texts during class, and teachers have no idea what's going on.

One high-school teacher said, "All the kids were laughing about something, but I didn't know what. They know phones must be turned off during school. They could all hear somebody's phone ringing, but I couldn't hear a thing. One of the other children told me all about it later. I couldn't be too upset because it shows resourcefulness."

Inventor Howard Stapleton said, "I think it is a giggle."

Understanding speaking strategies

Making Meaning Clear

Words often have more than one meaning. When you are speaking, you want to make sure that your listener is thinking about the same meaning that you are. Sometimes, you need to add details to make the meaning of your words clear.

How to make sure your listener understands what you mean:

- ☑ Use the correct word.
- ☑ Think about whether the word could mean something else.
- ☑ Make sure you add enough details to make the meaning clear to your listener.

MUSICAL SOUNDS

by Julian Rowe and Molly Perham

A musical instrument produces a sound by making the air around it vibrate.

TYPES OF INSTRUMENTS

- The strings of stringed instruments make the air vibrate when they are plucked or played with a bow.
- Wind instruments work when you blow on the column of air inside them.
- Percussion instruments have a tight piece of skin or plastic, or a piece of metal or wood. These make the air vibrate when you bang, scrape, or shake them.

How do these instruments make the air vibrate to make a sound?

Putting It All Together

As you read this article, remember to use the strategies you've learned in this unit:

- Monitor comprehension.
- Recognize strong verbs.
- Identify characteristics of question-and-answer text pattern.

How do Stringed Instruments Work?

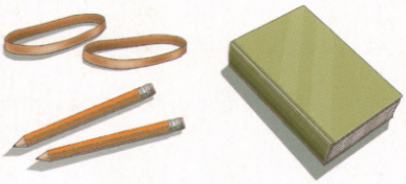
This guitar player plucks the strings with the fingers of her right hand to make music. When a string is plucked, its vibrations cause sound waves in the air. As these waves reach our ears, we hear a note.

By pressing strings with the fingers of her left hand, the player makes the notes high or low.

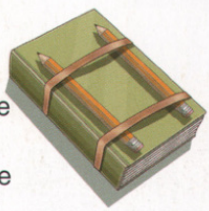
Make a Guitar

What you need

- two large rubber bands
- two pencils
- a book

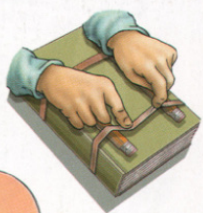


Stretch the rubber bands around the book. These will be the "strings." Push the pencils under the rubber bands. Press down one of the strings with your finger to change the length of the string that you pluck.

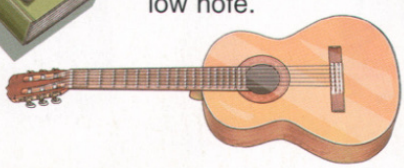


Plucking the short part of the string makes a high note.

Plucking the long part of the string makes a low note.



The rubber bands work much like the strings of a guitar.



How do Wind Instruments Work?

The recorder player blows the air inside the pipe to make music. He moves his fingers on and off the holes to produce different notes. When a hole is open near the top of the recorder, some of the air in the pipe escapes. When there is less air, the column of air inside vibrates quickly and produces a high note.

The flute is another wind instrument.

Make a Bottle Organ

What you need

- six plastic bottles that are the same size and shape

Stand the bottles in a line and pour different amounts of water into each one. Blow across the tops of the bottles. Each one makes a different note.

Which one makes the highest note?

Which one makes the lowest note?

How Do Percussion Instruments Work?

hand drum

bongos

A drum has a piece of thin material called a drumhead stretched across the top. When you bang the drumhead, it vibrates and makes sound waves in the air. Before he plays, this drummer will turn a screw to make the drumhead tighter.

A tight drumhead vibrates faster and produces a high note. When it is looser, it vibrates more slowly and produces a low note.

Make a Drum

What you need

- a hollow container—such as a bowl, saucepan, ice-cream container, or wastebasket
- plastic wrap
- tape or a strong rubber band
- wooden spoon

Stretch the plastic wrap tightly over the container to make the drumhead. Tape down the edges firmly, or use the rubber band.

Use the spoon for a drumstick.

Reflect on

Strategies: What strategies helped you understand the article? Was there a place you got stuck? What strategy did you use to help you?

Your Learning: You've just read an article about musical sounds. How could you use PowerPoint to present the information in a different way?

Credits

Text

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