英語授課用語

國小自然科學領域

雙語教學資源手冊

Natural Sciences

5th Grade

教育部師資培育及藝術教育司
國立臺北教育大學雙語教學研究中心

Table of Contents

5th Grade 1st Semester

5th Grade 2nd Semester

Unit 1

Sun and Light
太陽與光

Lesson Overview
課程簡介

The Sun moves in the sky during the day. We can tell where the Sun is by looking at shadows. The Sun's position also changes throughout the different seasons of the year.

If you live near the Tropic of Cancer (23.5°N latitude), the Sun rises due east and sets due west on the spring and autumn equinoxes. At noon, the Sun is in the south. On the summer solstice, the Sun rises in the northeast and sets in the northwest. At noon, the Sun is right above the head. On the winter solstice, the Sun rises in the southeast and sets in the southwest. At noon, the Sun is in the south.

Sunlight usually travels in a straight line, but when it moves from air to water at an angle, it bends a bit. This bending of light is called "refraction." When sunlight goes from air into water and then comes back out again, it makes a rainbow. If we want to focus light onto one point, we can use a special tool called a "magnifying glass." It also makes things look bigger when we look through it.

The Sun is very important to us because it gives us light and warmth. It also helps us know what time it is!

一天中，太陽的位置隨著時間而改變，我們平時可以利用影子來觀測太陽的位置。太陽的位置在四季中也會產生改變。如果你住在北回歸線附近（23.5°N緯度），在春、秋分時太陽會由正東方升起、正西方落下，中午時，太陽則會在正南方；夏至時，太陽會由東偏北方升起，西偏北方落下，中午時，太陽會在正頭頂；冬至時，太陽會由東偏南方升起，西偏南方落下，中午時太陽則會在正南方。

陽光一般會直線前進，但當它斜斜地從空氣進入水中時，則會產生偏折。這種光的偏折稱為「折射」。當陽光從空氣進入水中，然後再回到空氣中時，會產生彩虹。如果我們想將光線匯聚在一個點上，可以使用一個神奇的工具稱為「放大鏡」。當我們透過放大鏡看東西時，它還能放大物體的影像。

太陽對我們來說十分重要，它能為我們帶來光和熱。同時，太陽也能幫助我們判斷現在是什麼時間！

Sun and Light
太陽與光

The Sun's position changes throughout the day.
太陽的位置隨著一天變化有所改變

Sun and shadows
太陽和影子

We can use shadows to find the Sun's direction and its elevation angle.
我們可以用影子測量太陽的方位和高度角。

Changes of the Sun's position in the four seasons (along the Tropic of Cancer)
太陽在四季中的位置變化(北迴歸線地區)

The Sun rises right in the east and sets right in the west on the spring and autumn equinoxes.
春、秋分時,太陽由正東方升起、正西方落下。

The Sun rises in the northeast and sets in the northwest on the summer solstice.
夏至時,太陽由東偏北方升起、西偏北方落下。

The Sun rises in the southeast and sets in the southwest on the winter solstice.
冬至時,太陽由東偏南方升起、西偏南方落下。

Light properties
認識光的現象

Refraction
光的折射

Light refracts when it passes from air to water at a slanted angle.
光由空氣斜斜地進入水中時,會產生折射。

Rainbow
彩虹

When sunlight goes from air into water and then comes back out again, it makes a rainbow.
陽光從空氣經過水再進入空氣,會形成彩虹。

Magnifying lens
放大鏡

A magnifying lens focuses light onto one point.
放大鏡會匯聚光線。

A magnifying lens makes things look bigger.
放大鏡可以放大物體影像。

Energy in our daily life
能源對生活的影響

Solar energy
太陽能

Solar energy is a renewable energy source.
太陽能是可再生的能源。

Energy conversion
能量的轉換

We use solar energy to generate electricity.
太陽能可以轉換成電能。

WORDS AND PHRASES
單字與片語

1-1 Changes of the Sun's position in the sky
太陽在天空中的位置變化

east	東	west	西
south	南	north	北
northeast	東北	northwest	西北
southeast	東南	southwest	西南
observe	觀察(v)	observation	觀察(n)
measure	測量	shadow	影子
length	長度	position	位置
direction	方位	elevation angle	高度角
sunrise	日升	sunset	日落
spring equinox	春分	summer solstice	夏至
autumn equinox	秋分	winter solstice	冬至

1-2 Light
四季日升日落的變化

refraction	折射	parallel	平行
vertical	垂直	laser	雷射光
rainbow	彩虹	angle	角度
magnifying lens	放大透鏡	focus light	聚光(v.)
form image	成像(v.)		

1-3 Energy in our daily life
能源對生活的影響

energy	能量	solar energy	太陽能

KEY CONCEPTS
課程焦點

1-1 Changes of the Sun's position in the sky
太陽一天中的位置變化

1. We can use shadows to determine the Sun's elevation angle and direction.
   我們可以利用影子來觀測太陽的方位和高度角。
2. During the spring and autumn equinoxes, the Sun rises due east and sets due west.
   春、秋分時，太陽由正東方升起、正西方落下。
3. During the summer solstice, the Sun rises in the northeast and sets in the northwest.
   夏至時，太陽由東偏北升起、西偏北落下。
4. During the winter solstice, the Sun rises in the southeast and sets in the southwest.
   冬至時，太陽由東偏南升起、西偏南落下。

1-2 Light properties
認識光的現象

1. Light refracts when it passes from air to water at a slanted angle.
   光由空氣斜斜地進入水中時，會產生折射。
2. When sunlight goes from the air into water and then comes back out again, it makes a rainbow.
   陽光從空氣經過水再進入空氣，會形成彩虹。
3. A magnifying lens focuses light onto one point.
   放大鏡會匯聚光線。
4. A magnifying lens makes things look bigger.
   放大鏡可以放大物體影像。

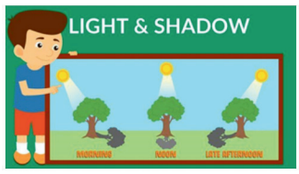
1-3 Energy in our daily life
能源對生活的影響

1. Solar energy is a renewable energy source.
   太陽能是可再生的能源。
2. We use solar energy to generate electricity.
   太陽能可以轉換成電能。

SCIENCE VIDEOS
教學參考資源

1-1

Light and Shadows

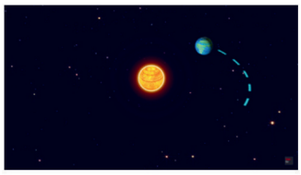


1-1

The Sun

1-1

The Sun's Surprising Movement across the Sky

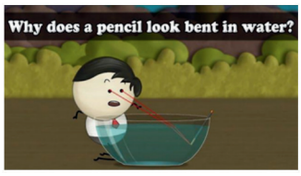


1-1

Reasons for the Seasons

1-2

Refraction of Light



1-2

How Is a Rainbow Formed

1-2

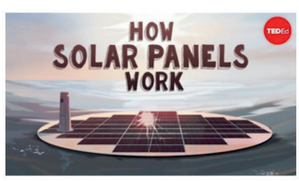
Convex Lens

1-3

How the Sun Affects the Earth

1-3

How Do Solar Panels Work?



1-3

How Solar Power Works

Unit 2

Plants
植物世界

Lesson Overview
課程簡介

The plant body has three main parts: the roots, the stems, and the leaves. Each part has a special job. The roots hold the plant in the soil. The roots also take in water and food from the soil. The stems hold up the plant. They also carry water and food though the plant. Water leaves the plant through the leaves. What's more, the leaves take in sunlight to make food.

Flowering plants also have flowers, fruits, and seeds. Flowers make seeds and fruits after pollination. The seeds then develop into new plants as they grow. Plants can also create new life through other ways. For example, some plants use roots, stems or leaves to reproduce.

There are many different kinds of plants in nature. They give us cool ideas, and we use them to create new inventions. We copy the amazing plant features and use them to solve problems in our daily life. We call this technology "biomimicry."

植物主要由根、莖和葉等三種構造所組成，每個構造都有其特定的功能。植物的根可以固定植物體，並且具有吸收養分和水分的功能。莖可以支撐植物，同時負責運輸水分和養分。植物體的水分會由葉蒸散，葉子也可以行光合作用製造養分，提供植物生長。

開花植物還具有花、果實和種子等構造。植物的花授粉後，會發育成種子和果實。接著，種子會發育成植物。植物也可以透過其他不同方式繁殖，例如有些植物可以利用根、莖或葉來繁殖下一代。

自然界中有形形色色的植物，我們從植物身上獲取靈感，發展出新奇的創意點子。透過模仿植物的特點並應用於解決生活中的問題，這種技術稱為「仿生學」。

Plants
植物世界

Functions of roots, stems, and leaves 植物根莖葉的功能

Roots 根
- The roots hold the plant in the soil. 根可以固定植物體。
- The roots take in water and food from the soil. 根負責吸收水分和養分。

Stems 莖
- The stems hold up the plant. 莖可以支撐植物。
- The stems carry water and food though the plant. 莖負責運輸水分和養分。

Leaves 葉
- The leaves take in sunlight to make food. 葉片行光合作用製造養分。
- Water leaves the plant through their leaves. 植物體內的水分會由葉片蒸散。

Plant reproduction 植物的繁殖

Functions of reproductive organs 繁殖器官的功能
- Flowers make seeds and fruits after pollination. 花朵授粉後,會發育成種子和果實。
- The ovule develops into the seed after fertilization. 胚珠受精後,會發育成種子。
- The ovary develops into the fruit after fertilization. 胚珠受精後,子房會發育成果實。

Ways for seeds and fruits to spread out 果實和種子的傳播方式
- Seeds travel on the wind. 種子隨風飄。
- Seeds pop out from the seeds pods. 種子透過自身彈力傳播。
- Seeds travel with the help of animals. 種子藉由動物傳播。
- Fruits float and travel across water. 果實漂浮在水面,隨水流傳播。

Reproduction through vegetative organs 營養器官的繁殖
- Sweet potatoes grow new plants from their roots. 番薯利用塊根繁殖。
- Potatoes grow new plants from their tubers. 馬鈴薯利用塊莖繁殖。
- Stone lotus plants grow new plants from their leaves. 石蓮花利用葉子繁殖。

Plants in our life 植物與人類生活

Economic plants 具有經濟價值的植物
- Orchids, Tea trees 蘭花、茶樹

Biomimicry 仿生學
- The lotus effect, Velcro 蓮葉效應, 魔鬼氈

WORDS AND PHRASES
單字與片語

2-1 Functions of roots, stems, and leaves
植物根莖葉的功能

root	根	stem	莖
leaf / leaves	葉	structure	構造
function	功能	soil	土壤
absorb	吸收(v.)	nutrient	養分
transport	輸送(v.)	transpire	蒸散(v.)
transpiration	蒸散(n.)		

2-2 Creation of new life
植物的繁殖

flower	花	stamen	雄蕊
anther	花藥	filament	花絲
pistil	雌蕊	style	柱頭
stigma	花柱	ovary	子房
ovule	胚珠	petal	花瓣
sepal	萼片	seed	種子
bloom	開花	pollen	花粉
pollinate	繁殖(v.)	pollination	繁殖(n.)
reproduce	授粉(v.)	reproduction	授粉(n.)

2-3 Plants in our life
植物與人類生活

- biomimicry 仿生學
- velcro 魔鬼氈
- economic plants 經濟植物

KEY CONCEPTS
課程焦點

2-1 Functions of roots, stems, and leaves
植物根莖葉的功能

1. Roots take in water and food from the soil.
   根負責吸收水分和養分。
2. Stems carry water and food though the plant.
   莖負責運輸水分和養分。
3. Leaves take in sunlight to make food.
   葉片行光合作用製造養分。
4. Water leaves the plant through their leaves.
   植物體內的水分會由葉片蒸散。

2-2 Plant reproduction
植物的繁殖

1. Flowers make seeds and fruits after pollination.
   花朵授粉後，會發育成種子和果實。
2. The ovule develops into the seed after fertilization.
   胚珠受精後，會發育成種子。
3. The ovary develops into the fruit after fertilization.
   胚珠受精後，子房會發育成果實。

2-3 Plants in our life
植物與人類生活

1. We use biomimicry to solve problems in our daily life.
   我們利用仿生學來解決生活的問題。

SCIENCE VIDEOS
教學參考資源

2-1

Plant Parts and Functions

2-1

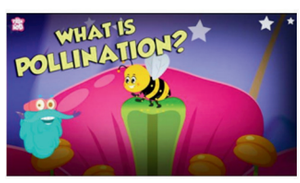
Parts of a Plant

2-2

Parts of Flower

2-2

What Is Pollination?



2-2

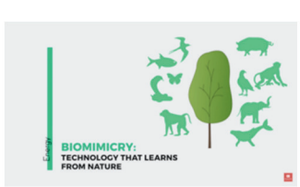
How Do Seeds Travel?

2-2

Seed Dispersal

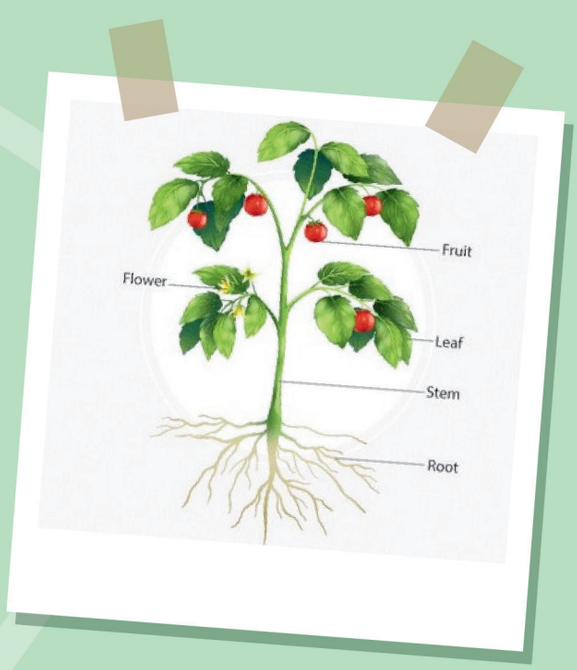
2-3

Biomimicry



2-3

Lotus Effect



Unit 3

Solutions
水溶液

Lesson Overview
課程簡介

When a substance dissolves in water, it creates a solution. Solutions can look and smell different from each other. Also, they can be either acidic, basic, or neutral. If we want to check if a solution is acidic or basic, we can use litmus paper. The cool thing about litmus paper is that it changes color. If a solution is acidic, the blue paper turns red! But if it is basic, the red paper turns blue! So, the color change helps us know if a solution is acidic or basic.

Solutions also have different levels of conductivity. We can create a simple conductivity tester with batteries, wires, and an LED bulb. If electricity is flowing through the circuit and the solution is a good conductor of electricity, it can light up the LED bulb.

物質溶解於水中會形成溶液。不同溶液具有不同的顏色和氣味。此外，溶液可能是酸性、鹼性或中性的。我們可以用石蕊試紙檢測水溶液的酸鹼性，石蕊試紙會產生顏色變化，十分有趣！當藍色石蕊試紙遇到酸性水溶液，會變成紅色；如果水溶液是鹼性的，則紅色石蕊試紙會變成藍色。因此，我們可以透過顏色變化來判斷水溶液的酸鹼性。

不同的水溶液，導電性也不同。我們可以用電池、電線和燈泡製作簡單的導電性測試裝置。電路接通後，如果水溶液容易導電，LED燈泡會亮起來。

Solutions
水溶液

Dissolution
溶解現象

- When a substance dissolves in water, it creates a solution.
  物質溶解於水中會形成溶液。
- A solution is made up of solvents and solutes.
  溶液由溶劑和溶質組成。
- Solutions differ in color and smell.
  不同溶液具有不同的顏色和氣味。

Acids and bases
水溶液的酸鹼性

- Solutions are either acidic, basic, or neutral.
  溶液可能是酸性、鹼性或中性的。
- We use litmus paper to test if a solution is acidic or basic.
  我們可以用石蕊試紙檢測水溶液的酸鹼性。
- We can create a neutral solution by mixing an acidic solution with a basic one.
  將酸性和鹼性水溶液混合可以形成中性水溶液。

Eletrical conductivity
水溶液的導電性

- Some solutions are good conductors of electricity.
  有些水溶液容易導電。
- We can create a simple conductivity tester with batteries, wires, and an LED bulb.
  我們可以用電池、電線和燈泡製作簡單的導電性測試裝置。

WORDS AND PHRASES
單字與片語

3-1 Dissolution 溶解現象

solution	水溶液	solute	溶質
solvent	溶劑	property / properties	特性
coffee	咖啡	tea	茶
juice	果汁；蔬菜汁	pure water	純水
sugar water	糖水	salt water	食鹽水
soda water	小蘇打水	limewater	石灰水
citric acid	檸檬酸	vinegar	醋
substance	物質		

3-2 Acids and bases 水溶液的酸鹼性

litmus paper	石蕊試紙	purple cabbage；red cabbage	紫高麗菜
tweezers	鑷子	acid	酸性
acidic	酸性的	base	鹼性
basic	鹼性的	neutral	中性的

3-3 Electrical conductivity 水溶液的導電性

conductivity	導電性	conductive	可導電的
battery	電池	circuit	電路
closed circuit	通路	open circuit	未通的電路

KEY CONCEPTS
課程焦點

3-1 Dissolution 溶解現象

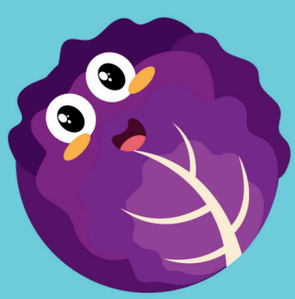
1. When a solute dissolves in a solvent, it forms a solution.
   溶質溶解於溶劑中會形成水溶液。
2. Solutions differ in color and smell.
   不同溶液具有不同的顏色和氣味

3-2 Acids and bases 水溶液的酸鹼性

1.Solutions are either acidic, basic, or neutral.
  溶液可能是酸性、鹼性或中性的。
2. We use litmus paper to test if a solution is acidic or basic.
   我們可以用石蕊試紙檢測水溶液的酸鹼性。

3-3 Electrical conductivity 水溶液的導電性

1. Some solutions are good conductors of electricity.
   有些水溶液容易導電。
2. We can create a simple conductivity tester with batteries, wires, and an LED bulb.
   我們可以用電池、電線和燈泡製作簡單的導電性測試裝置。



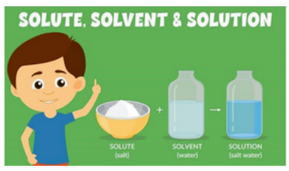
SCIENCE VIDEOS
教學參考資源

3-1

Dissolving

3-1

Solute, Solvent, and Solution



3-1

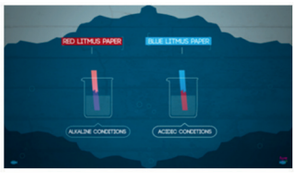
Dissolving Experiment

3-2

Acid and Base

3-2

What Is the pH Scale?



3-2

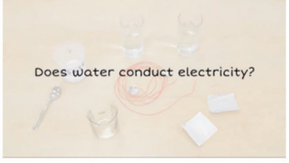
What Are Indicators & How Do We Use Them?

3-2

Make Litmus Paper from A4 Paper at Home by Yourself

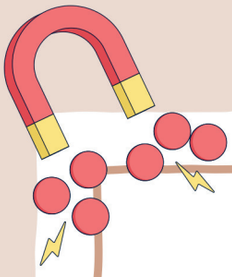
3-3

Does Water Conduct Electricity?



Unit 4

Force and Motion
力與運動



Lesson Overview
課程簡介

There are two types of forces: contact and non-contact forces. Contact forces happen when things touch each other. When you push or pull something, that's a contact force! Non-contact forces are a bit different. They can act on things without actually touching them. For example, gravity pulls things toward the ground, and magnetic force can move things without touching them.

We can measure how strong a force is using a special tool called a "spring scale." When a force is bigger, like when you push harder, the spring stretches more.

Now, let's talk about friction. Friction is what makes things slow down when they move. Rough surfaces, like sandpaper, have more friction, so things move slower on them. Smooth surfaces, like ice, have less friction, so things slide more easily.

When things move, they have speed. If you travel the same distance in a shorter time, you're moving faster! If you travel a longer distance in the same amount of time, that also means you're moving faster. It's all about how quickly or slowly things move around!

力可以分成兩種：接觸力和非接觸力。當物體彼此接觸時，就會產生接觸力。例如，當你推或拉某物體時產生的力，就是接觸力。非接觸力則有些不同，它可以在沒有實際接觸的情況下產生作用。例如，地心引力會將物體拉向地面，而磁力可以在沒有接觸物體的情況下移動它。

如果我們要測量力的大小，可以使用一種特殊工具：彈簧秤。當力愈大時，例如你用更大力氣推時，彈簧會拉得更長。

現在，讓我們來談談摩擦力。摩擦力是物體移動時減慢速度的原因。粗糙的表面，像砂紙，有較大的摩擦力，因此物體在上面移動得比較慢。而光滑的表面，像冰，摩擦力較小，因此物體更容易滑動。

當物體移動時，它們會有速度。如果你在較短的時間內走完相同的距離，你就是在快速移動！如果你在相同時間內走更遠的距離，也表示你在快速移動。這一切都關乎物體如何快速或緩慢地移動！

Force and Motion
力與運動

- Measure forces 力的測量
  - Types 力的種類
    - Contact forces: push and pull. 接觸力：推力和拉力。
    - Non-contact forces: gravity and magnetism. 非接觸力：重力和磁力。
  - Size 力的大小
    - We use a spring scale to measure the size of a force. 我們可以用彈簧秤測量力的大小。
    - The spring stretches more when the force is greater. 力量愈大，彈簧伸得愈長。
  - Balance 力的平衡
    - When the pushes or pulls on opposite sides are the same, the object stays still. 左右兩邊施力一樣，物體不動。
- Friction 摩擦力
  - Size 摩擦力的大小
    - Rough surfaces have greater friction. 粗糙面摩擦力大。
    - Smooth surfaces have less friction. 平滑面摩擦力小。
  - Uses 摩擦力的應用
    - Tread patterns of shoes create more friction. 鞋底的紋路可增加摩擦力。
    - Wheels of shoes create less friction. 推車的輪子可減少摩擦力。
- Speed of motion 運動狀態的快慢
  - Energy of motion 認識動能
    - When things move faster, they have more energy of motion. 物體運動速度快，具有的動能愈大。
  - Speed 速度的快慢
    - If you travel the same distance in less time, it means that you move faster. 距離固定，移動的時間愈短，表示速度愈快。
    - If you use the same amount of time but travel a greater distance, it means that you move faster. 時間固定，移動的距離愈長，表示速度愈快。

WORDS AND PHRASES
單字與片語

4-1 Measuring force 力的測量

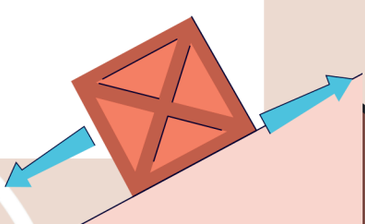
force	力	contact force	接觸力
push	推力	pull	拉力
non-contact force	非接觸力	gravity	重力
magnetic force	磁力	measure	測量(v.)
spring scale	彈簧秤		

4-2 Friction 摩擦力

friction	摩擦力	balance	平衡
opposite	相反	texture	紋路
rough	粗糙	smooth	平滑
coin	硬幣	iron ruler	鐵尺
sandpaper	砂紙	stretch	拉
tread	胎紋		

4-3 Speed of motion 運動狀態的快慢

motion	運動	speed	速度
fast	快	slow	慢
distance	距離	time	時間
cheetah	獵豹		



KEY CONCEPTS
課程焦點

4-1 Measuring force 力的測量

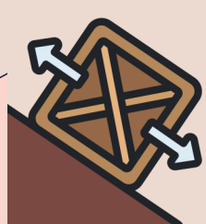
1. A contact force is a push or pull that happens when objects touch each other.
   接觸力是物體須接觸才可以產生作用的力。
2. A non-contact force is a force that acts on objects without touching them.
   非接觸力是不須接觸也可以產生作用的力。

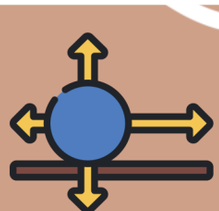
4-2 Friction 摩擦力

1. Friction makes an object move slower.
   摩擦力會使物體移動速度變慢。
2. Rough surfaces have greater friction.
   粗糙面摩擦力大。
3. Smooth surfaces have less friction.
   平滑面摩擦力小。

4-3 Speed of motion 運動狀態的快慢

1. When things move faster, they have more energy of motion.
   物體運動速度快，具有的動能愈大。
2. If you travel the same distance in less time, it means that you move faster.
   距離固定，移動的時間愈短，表示速度愈快。
3. If you use the same amount of time but travel a greater distance, it means that you move faster.
   時間固定，移動的距離愈長，表示速度愈快。





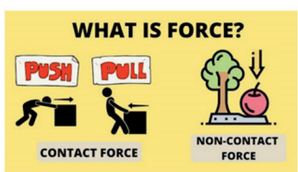
SCIENCE VIDEOS
教學參考資源

4-1

Push and Pull

4-1

What Is Force?



4-1

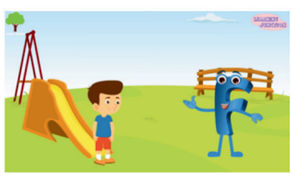
Work, Force, and Energy

4-2

What Is Friction?

4-2

What Is Friction?

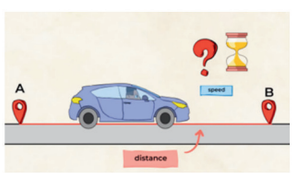


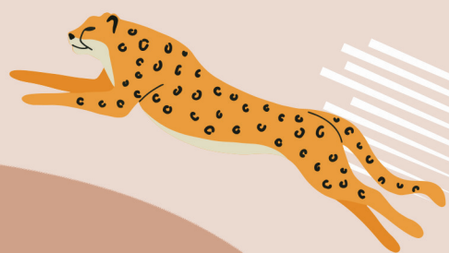
4-2

Friction

4-3

Understanding Speed





Unit 1

Stars
星星的世界

Lesson Overview
課程簡介

We can learn about constellations by looking at the stars in the sky. We can also rotate a star wheel based on the date and time. We can learn about stars. We can use a compass to know the direction of star. We can use the number of fists to measure the vertical angle of a star. The starry sky changes with time and the seasons. While Polaris stays in the same place, other stars move from east to west. To find Polaris, look for the Big Dipper or Cassiopeia.

我們透過觀星以及星座盤的操作學習星座,也藉由指北針來了解星星的方位、利用拳頭數來認識星星的高度角;星空會隨著時間和季節而變化。北極星在天空中的位置幾乎不會改變,而其他星星則是由東向西移動。要找到北極星,可以利用北斗七星或仙后座來尋找。

Stars
星星的世界

Stargazing 認識星空

Stars 恆星

- Stars shine in the sky and give off heat.
  恆星會發光發熱。
- The Sun is a star.
  太陽是恆星。

Constellations 星座

- A constellation is a group of stars that form a pattern in the sky.
  人們將星空中的恆星連接起來，形成各種圖案組合，稱為星座。

Planets 行星

- The eight planets of the solar system are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune.
  太陽系的八大行星有水星、金星、地球、火星、木星、土星、天王星和海王星。

Observe stars 觀測星空

- Use a star wheel to identify stars.
  使用星座盤觀測星空。
- Use a compass to tell the direction of a star.
  利用指北針確認星星方位 。
- Use your clenched fists to measure theheight of a star above the horizon.
  用拳頭測量星星高度角。
- Use apps to observe stars.
  使用觀星軟體觀測星空。

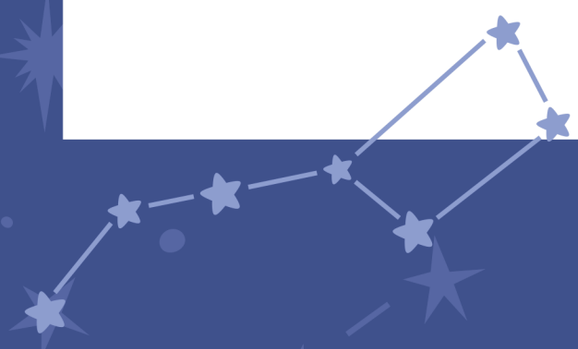
The movement of stars 星星的移動

- Stars appear to move from east to west.
  一天中，星星會有東升西落的移動現象。
- In different seasons, we see different constellations in the night sky.
  不同季節的夜晚，我們看到的星座也不相同。
- Polaris stays in nearly the same place in the sky at all times.
  北極星在天空中的位置幾乎不會改變。

WORDS AND PHRASES
單字與片語

1-1 Know the constellations 認識星座

star	恆星	planet	行星
constellation	星座	star wheel	星座盤
observation point	觀測點	Mercury	水星
Venus	金星	Earth	地球
Mars	火星	Jupiter	木星
Saturn	土星	Uranus	天王星
Neptune	海王星	dwarf planet	矮行星



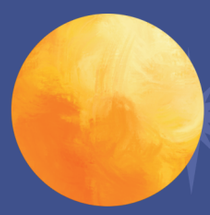
1-2 Observing the starry sky 觀測星空

starry sky	星空	compass	指北針
direction	方位	north	北
south	南	east	東
west	西	number of fists	拳頭數
vertical angle	高度角	watch	手錶
flashlight	手電筒	rotate	旋轉
clenched fists	握緊的拳頭		

1-3 Motion of stars 星星的移動

horizon	地平線	Polaris	北極星
Big Dipper	北斗七星	Cassiopeia	仙后座

KEY CONCEPTS
課程焦點



1-1 Know the constellations 認識星座

1. The Sun is a star.
   太陽是恆星。
2. A constellation is a group of stars that form a pattern.
   星座是指天上一群群的恆星組合。
3. Rotate the star wheel based on the date and time to find the constellations.
   操作星座盤是依據觀測的日期和時刻,來認識星座。

1-2 Observing the starry sky 觀測星空

1. Use a compass to know the direction of a star.
   利用指北針來認識星星的方位。
2. Use the number of fists to measure the vertical angle of a star.
   利用拳頭數來測量星星的高度角。
3. Use a star wheel to understand the starry sky.
   利用星座盤來認識星空。

1-3 Motion of stars 星星的移動

1. Stars move from east to west.
   大部分的星星會由東向西移動。
2. Polaris stays in the same place while other stars move around it.
   北極星在天空中的位置幾乎不會改變,而其他星星則是圍繞它移動。
3. Polaris is almost directly above the North Pole.
   北極星的位置接近正北方。
4. Look for the Big Dipper or Cassiopeia to find Polaris.
   可以用北斗七星、仙后座協助辨認北極星的位置。
5. The starry sky changes with time and the seasons.
   星空隨四季時間變化。

SCIENCE VIDEOS
教學參考資源

1-1

Stars

1-1

What Are Stars?

1-1

The 12 Star Signs

1-1

Eight Planets

1-2

How Do We Study the Stars?

1-2

How to Read the Stars in the Night Sky

1-3

How to Navigate Using the Stars

1-3

What Are Stars and Constellations?

Unit 2

Air

認識空氣

Lesson Overview
課程簡介

Oxygen gas is colorless, odorless, and supports burning. We can make oxygen by combining carrots and hydrogen peroxide. Carbon dioxide gas is also colorless and odorless, but does not support burning. We can make carbon dioxide by combining baking soda and vinegar. Fire is formed when there is oxygen, heat and fuel. Removing one of these will stop fire. To use a fire extinguisher, follow PASS: pull, aim, squeeze, and sweep. We should know fire precautions. For example, pay attention to what we are cooking and do not overload an electrical outlet. When there is fire, walk outside while staying low and do not use the elevator.

氧氣是一種無色、無味的氣體，可以幫助燃燒；透過操作胡蘿蔔和雙氧水混合的方法可以製造氧氣。二氧化碳也是一種無色、無味的氣體，但無法幫助燃燒；利用醋與小蘇打粉的作用製造二氧化碳。燃燒的要素需有氧氣（助燃物）、燃點以及可燃物，缺乏一種燃燒的要素，就可以滅火。使用滅火器的口訣是，拉、瞄、壓、掃。了解火災的防範與應變須知（如果我們注意我們正在烹飪的東西並且不要使電源插座過載， 我們就可以遠離火災。火災發生時，身體蹲低離開現場，且不使用電梯。）

Air
認識空氣

Oxygen 氧氣

- We can make oxygen. 我們可以製造氧氣
  - Add carrots to hydrogen peroxide to make oxygen. 將胡蘿蔔加入過氧化氫中以產生氧氣
    - Oxygen is colorless and odorless. 氧氣是無色無味的氣體
- Oxygen has features 氧氣的特性
  - Incense burns in a bottle of oxygen 線香可以在氧氣瓶內燃燒
    - Oxygen supports burning. 氧氣幫助燃燒
- Oxygen is useful 氧氣的用處
  - Oxygen is used in the hospital and aquarium. It is mixed with acetylene to cut steel. 氧氣用於醫院和水族館，氧氣與乙炔混合可切割鋼

Carbon dioxide 二氧化碳

- We can make carbon dioxide 我們可以製造二氧化碳
  - Add baking soda to vinegar to make carbon dioxide 利用蘇打粉加醋來製造二氧化碳
    - Carbon dioxide is colorless and tasteless. 二氧化碳是無色無味的氣體
- Carbon dioxide has features 二氧化碳的特性
  - Incense does not burn in a bottle of carbon dioxide 線香在二氧化碳瓶內不會燃燒
    - Carbon dioxide does not support burning 二氧化碳不會幫助燃燒
    - Carbon dioxide turns limewater turbid. 會使澄清石灰水變（混濁）
- Carbon dioxide is useful 二氧化碳的用處
  - Carbon dioxide is used in fire extinguisher, carbonated drink and dry ice 二氧化碳用於滅火器、碳酸飲料和乾冰

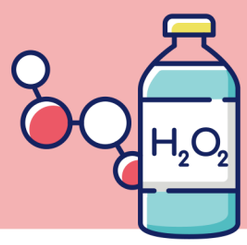
Air and Burning 空氣與燃燒

- Three elements are needed to make fire. 生火需要的元素
  - oxygen 氧氣
    ignition temperature 燃燒
    fuel 燃料
    - Removing one of these elements will stop fire. 移除其中一個元素就會停止燃燒
- There is a right way to use a fire extinguisher 正確使用滅火器
  - PASS:
    Pull, Aim, Squeeze, Sweep(拉)，(瞄)，(壓)，(掃)
- Fire safety is crucial for protecting lives and property. 消防安全對於保護生命財產安全至關重要。
  - Watch what you are cooking, and do not overload an electrical outlet. 注意烹調的安全，不要超載電源插座。
  - When there is fire, walk outside while staying low and do not use the elevator. 火災發生時，身體蹲低離開現場，且不使用電梯。

Air
認識空氣

- The main factors contributing to rust 影響鐵生鏽的因素
  - Water 水
    - The human body is about 50 percent water. 人體約50%是水。
    - People used to come to this city to take the waters. 人們過去常來這座城市享用這裡的泉水。
  - Air 空氣
    - Air is composed mainly of nitrogen and oxygen. 空氣主要由氮氣和氧氣組成。
  - Acidic solutions 酸性溶液
    - The acidic solution revitalized the tissue, that favouring the propagation of anaerobic infection. 酸性溶液使組織恢復活力，有利於厭氧菌感染的傳播。
- Preventing rust 防止鐵生鏽的方法
  - Isolate water 隔絕水
    - Water is passed through a filter to remove particles and contaminants. 水透過過濾器去除顆粒和污染物。
  - Isolate from the air 隔絕空氣
    - Use vacuum sealing. 使用真空密封。
  - Isolate acidic solutions 隔絕酸性溶液
    - Use distillation to heat to its boiling point, turn into vapor, and then cool and condense back into liquid form, leaving behind impurities. 使用蒸餾加熱至沸點，變成蒸氣，然後冷卻並冷凝回液體形式，留下雜質。

WORDS AND PHRASES
單字與片語

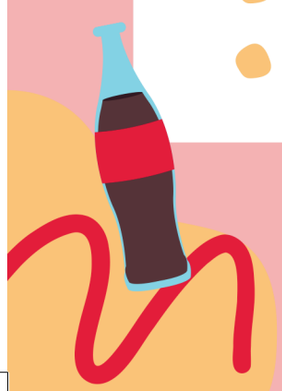


2-1 Oxygen
氣氣

air	空氣	burning	燃燒
oxygen	氧氣	hydrogen peroxide	雙氧水
feature	特性	colorless	無色的
odorless	無味的	incense	線香
hospital	醫院	aquarium	水族館
acetylene	乙炔	steel	鋼材

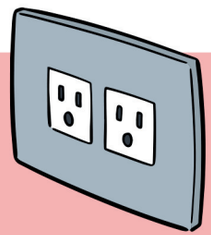
2-2 Carbon dioxide
二氧化碳

carbon dioxide	二氧化碳	baking soda	小蘇打粉
vinegar	醋	limewater	石灰水
turbid	混濁	fire extinguisher	滅火器
carbonated drink	碳酸飲料	dry ice	乾冰



2-3 Air and Burning
空氣與燃燒

element	要素	heat	加熱
fuel	燃料	pull	拉
aim	瞄準	squeeze	壓
sweep	掃	overload	過度乘載
electrical outlet	插座	elevator	電梯
precautions	保護、預防措施		



2-4 Air and Rust
空氣與生鏽

iron products	鐵製品	heat	電鍍
rust	生鏽	pull	隔絕
steel wool	鋼棉	prevent rust	防鏽
acidic solution	酸性溶液	water	水
material	材料		

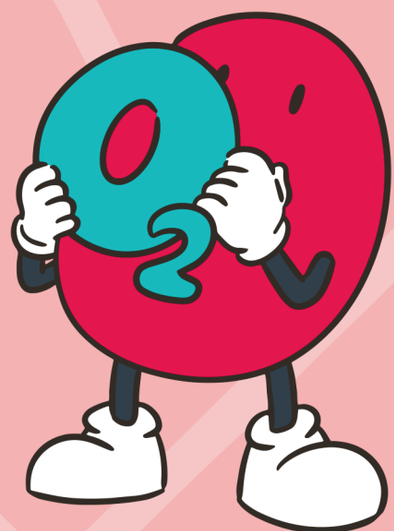
KEY CONCEPTS
課程焦點

2-1 Oxygen 氧氣

1. Oxygen is a colorless and odorless gas.
   氧氣是無色、無味的氣體。
2. Oxygen supports burning.
   氧氣幫助燃燒。
3. Oxygen is used in the hospital and aquarium. It is mixed with acetylene to cut steel.
   氧氣用於醫院和水族館，與乙炔混合可切割鋼。

2-2 Carbon dioxide 二氧化碳

1. Carbon dioxide is a colorless and odorless gas.
   二氧化碳是無色、無味的氣體。
2. Carbon dioxide does not support burning.
   二氧化碳不會幫助燃燒。
3. Carbon dioxide turns limewater turbid.
   二氧化碳會使澄清石灰水變混濁。
4. Carbon dioxide is used in fire extinguisher, carbonated drink and dry ice.
   二氧化碳應用在滅火器、碳酸飲料和乾冰。



2-3 Air and Burning 空氣與燃燒

1. Oxygen, heat, and fuel are needed to make fire.
   燃燒需要氧氣(助燃物)、燃點和可燃物。
2. Pay attention to what you are cooking and do not overload an electrical outlet.
   注意你正在烹飪的東西並且不要使電源插座過載。
3. When there is fire, walk outside while staying low and do not use the elevator.
   火災發生時，身體蹲低離開現場，且不使用電梯。

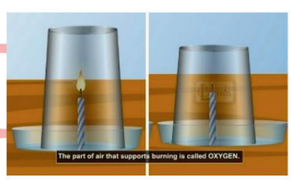
2-4 Air and rust 空氣與生鏽

1. Iron rusts due to a chemical reaction between iron and oxygen in the presence of moisture or water.
   鐵生鏽是由於鐵和氧氣在濕氣或水存在的情況下發生化學反應。
2. The main factors contributing to rust are water, air, and acidic solutions.
   導致生鏽的主要因素是水、空氣、酸性溶液。

SCIENCE VIDEOS
教學參考資源

2-1

Air Contains Oxygen Experiment

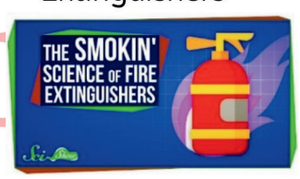


2-1

Chemical Change Making Oxygen Gas

2-1

The Smokin' Science of Fire Extinguishers



2-1

Fire Safety - Top 10 Tips to Keep You Safe at Home

2-1

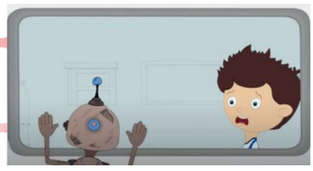
Rust : Prevention & Treatment |Environmental Chemistry | Chemistry | FuseSchool

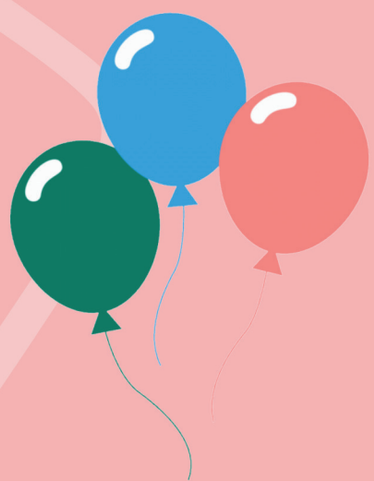
2-2

To Prove the Presence of Carbon Dioxide in Air

2-2

Rusting of Iron





2-3

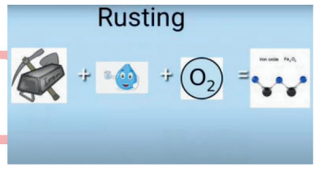
Corrosion and Rust – Science

2-3

Rusting-Iron + water + oxygen = iron oxide

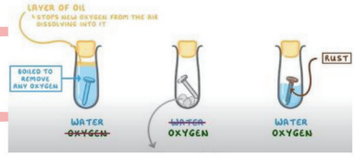
2-3

Prevention of Rusting – Physical and Chemical Changes || Chapter 6 || Class 7



2-3

How to stop rust



Unit 3

Animal Life
動物的生活

Lesson Overview
課程簡介

There are many ways to describe an animal's behavior. They use their muscles, bones and joints to move. They find food based on their body structure. They do different things to avoid predators. They build nests to keep and protect their offspring. They live and work together. Animal reproduction is a process. First, an animal looks for a mate. Together, they produce an offspring. They raise their offspring so that their offspring lives and continues to pass their traits. The traits of parents and offspring are the same in some ways, but different in others. We can classify animals based on their structures and functions.

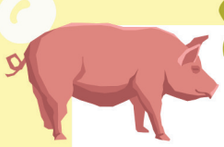
我們可以利用很多方法來描述動物的行為。例如，動物會使用肌肉、骨骼和關節來移動；牠們根據自己的身體結構來尋找食物；牠們會做不同的事情來避開掠食者；牠們築巢是為了繁殖和保護他們的後代；牠們會一起生活和工作。動物的繁殖是一個過程。首先，牠們要先尋找配偶、產生後代並撫養後代，確保後代能夠存活並繼續傳遞牠們的特徵。父母和後代的特徵在某些方面是相同的，但在其他方面卻不同。我們可以根據動物的結構和功能對其進行分類。

Animal Life
動物的生活

- Animal body structures and movements 動物的身體構造和運動
  - Move 運動
    - Animals use their muscles, bones and joints to move. 利用（肌肉）帶動（骨骼）和（關節）來運動
- Animal survival methods 動物求生存的方式
  - Find food 覓食
    - Animals find food based on their body structure. 不同動物的覓食方式和牠們的（身體構造）有關
  - Avoid predators 避敵
    - Animals do different things to avoid predators. 為了避免遭到（獵食），動物會以不同方式避敵
  - Nest 築巢
    - Animals build nests to keep and protect their offspring. 築巢的目的主要是為了（繁殖）和保護下一代
  - Socialize 社會行為
    - Animals live and work together. 動物會分工合作、共同生活稱為（社會行為）

- How animals continue to live 動物延續生命的方式
  - Court 求偶
    - Animals look for a mate. 動物求偶。
  - Give birth 生殖
    - Oviparity 卵生
      - Some animals lay eggs that later become live offspring. 母體將（卵）生出體外，在體外發育成小動物
    - Viviparity 胎生
      - Some animals give birth to live offspring. 卵在（母體）內發育成完整個體，再由母體產下
  - Parents and offspring 親子和子代
    - Parents raise their offspring so that they live and continue to pass their traits. 有些動物有（育幼）的行為，親代會照顧子代
    - The traits of parents and offspring are the same in some ways, but different in others. 親代和子代的特徵（相似），但不完全相同
  - Dichotomous classification 二分法
    - Animals can be classified based on their body structure and function. 先找出（分類標準），再分成符合標準和不符合標準的動物

WORDS AND PHRASES
單字與片語



3-1 Animal behavior 動物的行為

behavior	行為	move	運動
muscle	肌肉	bone	骨骼
joint	關節	body structure	身體構造
predator	捕食者	prey	獵食（物）
nest	築巢	offspring	子代
socialize	社交	avoid	避開、避免

3-2 Animal reproduction 動物的生殖方式

reproduction	繁殖	court	求偶
mate	伴侶	oviparity	卵生(n)
oviparous	卵生的(adj)	viviparity	胎生(n)
viviparous	胎生的(adj)	trait	特質

3-3 Classifying animals 幫動物做分類

classification	分類(n)	classify	分類(v)
dichotomous classification 二分法		structure	構造
function	功能		

KEY CONCEPTS
課程焦點

3-1 Animal behavior 動物的行為

1. Animals use their muscles to make bones and joints move.
   動物利用肌肉帶動骨骼和關節來移動。
2. Animals find food based on their body structure.
   不同動物的覓食方式和牠們的身體構造有關。
3. Animals do different things to avoid predators.
   為了避免遭到獵食，動物會以不同方式避敵。
4. Animals build nests to keep and protect their offspring.
   動物築巢的目的主要是為了繁殖和保護下一代。
5. Animals live and work together.
   動物會共同生活。

3-2 Animal reproduction 動物的生殖方式

1. Animals look for a mate.
   動物會求偶。
2. Oviparous animals lay eggs that later become live offspring.
   卵生動物藉由產卵進行繁殖。
3. Viviparous animals give birth to live offspring.
   胎生動物直接在母體內發育完後生出。
4. Animals raise their offspring so that their offspring lives and continues to pass their traits.
   動物撫養後代，確保後代能夠存活並繼續傳遞牠們的特徵。
5. The traits of parents and offspring are the same in some ways, but different in others.
   親代和子代的特徵相似，但不完全相同。

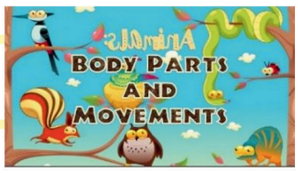
3-3 Classifying animals 幫動物做分類

1. Animals can be classified based on their structure and function.
   動物藉由身體構造與功能來分類。

SCIENCE VIDEOS
教學參考資源

3-1

Animals: Body Parts and Movements



3-1

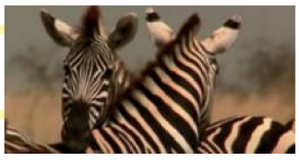
Animals on the Move

3-1

Top 10 Animals with Amazing Camouflage

3-2

Animals that Mate for Life | Nat Geo Wild



3-2

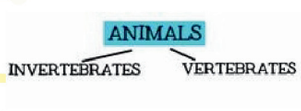
Oviparous and Viviparous Animals

3-2

Animal Parents | Animals for Kids | Wild Animal Families

3-3

Animal Classification for Children: Classifying Vertebrates and Invertebrates for Kids



3-3

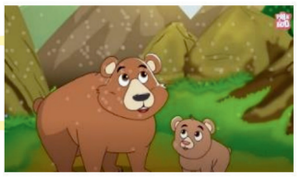
Dichotomous Key

3-3

Dichotomous Keys: Identification Achievement Unlocked

3-3

How Adaptation in Animals Work



Unit 4

Sounds and Musical Instruments

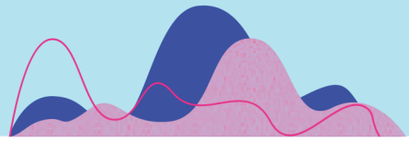
聲音與樂器

Lesson Overview
課程簡介

We can make sound. If an object vibrates, it makes a sound. We can change a sound's volume, pitch and timbre. The more an object vibrates, the higher the volume. The less an object vibrates, the lower the volume. The faster an object vibrates, the higher the pitch. The slower an object vibrates, the lower the pitch. Each object vibrates differently and makes a different timbre. Noise is a type of sound. It can be measured using a decibel meter. We can stop noise because we are all responsible for being quiet.

我們可以製造聲音。物體振動，它會發出聲音。我們可以改變聲音的音量、音高和音色。物體振動越大，音量就越大。物體振動越少，音量越小。物體振動得越快，音高就越高。物體振動越慢，音調越低。每個物體都以不同的方式振動並產生不同的音色。噪音是聲音的一種， 我們可以使用分貝計來測量它。我們可以停止噪音，因為我們都有責任保持安靜。

Sounds and Musical Instruments
聲音與樂器



Three elements of understanding sound.
認識聲音三要素

- **Volume 音量**
  - The more a thing vibrates, the higher the volume.
    物體振動越多，音量越大
- **Timbre 音色**
  - Each thing vibrates differently and makes a different timbre.
    物體振動不一，產生不同的音色
- **Pitch 音調**
  - The faster a thing vibrates, the higher the pitch.
    物體振動越快,音調越高
    The slower a thing vibrates, the lower the pitch.
    物體振動越慢,音調越低

Making simple musical instruments
製作簡易樂器

- **Stringed instrument 弦樂器**
  - Press to control the string length
    按壓控制琴弦長短
    - Small paper box 小紙盒
      Iron box 鐵盒
      Rubber band 橡皮筋
- **Percussion 打擊樂器**
  - The materials are the same, and the keys must be long or short.
    材質一樣且琴鍵必須有長有短
    - Wood chips 木片條
      Bamboo strip 竹片條
      Plastic strip 塑膠條
- **Wind instrument 管樂器**
  - Adjust the length of the air column
    調整空氣柱的長短
    - Straw 吸管
      Water pipe 水管
      Cotton棉花

Noise and prevention
噪音與防治

- Noise is a type of sound.
  噪音是聲音的一種
- Noise can be loud.
  噪音可以很大聲
- We can measure noise.
  測量噪音
  - A decibel meter measures noise level.
    利用分貝器測量噪音
- We can stop noise
  停止噪音
  - We are all responsible for being quiet.
    維護安寧是我們的責任

WORDS AND PHRASES
單字與片語

4-1 World of sound
有聲世界

- vibration 振動(n)
- vibrate 振動(v)

4-2 Changes in sound
聲音的變化

- volume 音量
- loud 大聲
- louder 較大聲的
- loudest 最大聲的
- soft 小聲
- softer 較小聲的
- softest 最小聲的
- pitch 音調
- high 高
- higher 較高（音）的
- highest 最高（音）的
- low 低
- lower 較低（音）的
- lowest 最低（音）的
- timbre 音色
- instrument 樂器
- stringed instrument 弦樂器
- wind instrument 管樂器

4-3 Effects of noise on life
噪音對生活的影響

- noise 噪音
- noise level 噪音程度
- decibel 分貝
- decibel meter 分貝器
- quiet 安靜

KEY CONCEPTS
課程焦點

4-1 World of sound
有聲世界

1. If an object vibrates, it makes a sound.
   物體振動，會發出聲音。

4-2 Changes in sound
聲音的變化

1. The more an object vibrates, the higher the volume.
   物體振動越多，音量越大。
2. The less an object vibrates, the lower the volume.
   物體振動越少，音量越小。
3. The faster an object vibrates, the higher the pitch.
   物體振動越快，音調越高。
4. The slower an object vibrates, the lower the pitch.
   物體振動越慢，音調越低。
5. Each object vibrates differently and makes a different timbre.
   物體振動不一，產生不同音色。

4-3 Effects of noise on life
噪音對生活的影響

1. Noise is a type of sound.
   噪音是聲音的一種。
2. A decibel meter measures noise level.
   利用分貝器測量噪音。
3. We are all responsible for being quiet.
   維護安寧是我們的責任。

SCIENCE VIDEOS
教學參考資源

4-1

What is Sound?

4-1

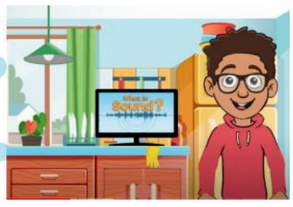
Can Sound Move Objects? Cool Science Experiment

4-1

Sound Wave Demo with Tuning Forks and a Bowl of Water

4-1

What is Sound? For Kids



4-1

What is Sound? The Dr. Binocs Show Learn Videos for Kids

4-2

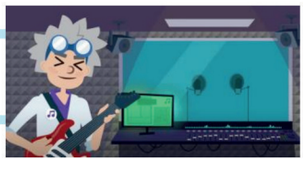
Experimenting with Sound and Pitch

4-2

Length of Rubber Band Determines Pitch I Sound I Physics

4-2

SOUND for Kids Loundness, Pitch and Timbre Science for Kids



4-3

What is Noise Pollution? | What Causes Noise Pollution? | The Dr. Binocs Show

4-3

Why Do Doctors Use Stethoscopes?

國小自然領域雙語教學資源手冊:英語授課用語
[五年級]
A Reference Handbook for Elementary School Bilingual Teachers in Natural Sciences : Instructional Language in English
[5th Grade]

研編單位:國立臺北教育大學雙語教學研究中心

指導單位:教育部師資培育及藝術教育司

撰稿:陳美卿、林雨慶、吳雅蓁、吳芷岑

主編:簡雅臻

執行編輯:吳宛慈、施佩吟

美術編輯:陳巧軒