Dajia Elementary School 大佳國小

6th Grade Science - 1st Semester

配合南一書局 自然與生活科技 6上

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Chapter 1 - Weather 🌧️

Content

- **Water**
- **Satellite and weather report**
- **Typhoon**

Vocabularies:

- Temperature
- Gas
- Liquid
- Solid
- Cloud
- Fog
- Water vapor
- Rain
- Snow
- Dew
- Frost
- Ocean
- Evaporation (n.)
  Evaporate (v.)
- Condensation (n.)
  Condense (v.)
- Precipitation (n.)
  Precipitate (v.)
- Water cycle
- Ground water
- Particles
- Water droplets
- Ice crystals

Water

Experiment (textbook page 7)

Introduction:

- When the temperature is cold, the water vapor in the air turns into tiny water droplets or ice crystals. These water droplets and ice crystals float in the air and become **clouds**.
- When the temperature drops, the water vapor in the air will condense. If it occurs near the ground and horizontal visibility is less than one kilometer, it is called **fog**.

Clouds and fog are formed by the condensation of water vapor in the air. Can we create a simulation of clouds and fog in the classroom?

Hypothesis: Yes we can.

Equipments:

- Hot water
- Incense
- Lighter
- 100ml laboratory cylinder
- Ice cubes
- Zip bag

Methods:

Step 1 - Pour hot water into a 100 ml measuring cylinder.

Step 2 - Use an ice pack to cover the measuring cylinder.

Step 3 - Insert a lighted incense to create little particles.

Step 4 - Cover the measuring cylinder completely with the ice pack.

Step 5- Then remove the ice pack from the measuring cylinder. You will see artificial clouds and fog in the bottle rim.

Discussions:

Question: Why do we need to add hot water in the cylinder? Answer: We put hot water in the cylinder so that the water vapor in the cylinder will cool down when contacting the ice bag.

Question: What's the purpose of the incense? Answer: The purpose of the incense is to create particles so the water vapor can attach on them.

Conclusion:

Yes, you can create simulation of clouds and fog in the classroom.

Water occurs in 3 states: **gas**, **liquid** and **solid**.

Experiment (textbook page 10)

Introduction:

Create dew and frost.

Equipments:

- stainless steel cup
- crushed ice
- water
- salt
- thermometer

Methods to create dew:

Step 1 - Add crushed ice in the stainless steel cup.

Step 2 - Measure the temperature inside the cup.

Step 3 - Observe the outside of the cup.

Methods to create frost:

Step 1 - Add small amount of crushed ice and add water in the stainless steel cup.

Step 2- Measure the temperature inside the cup.

Step 3- Add a layer of salt on top of the ice and then another layer of crushed ice.

Step 4 - Add one more layer of salt on top,

Step 5: Observe the outside of the cup.

Conclusion:

Both dew and frost's formations are due to the water vapor condensing and attaching on objects with lower temperature.

- Besides cloud and fog, other weather phenomena (天氣現象) include **rain**, **snow**, **drew** and **frost**.
- Changes in temperature will change the form of water.

Questions in Class

- Water is all around us. It is in the sky, on the ground and in the air. Water continually changes its form. In nature, water exists in 3 states - gas, liquid and solid. Where do we see water in gas form, liquid form, and solid form in nature?
  - (Students raise their hands and answer.)

- What are the differences between cloud and fog?
  - Elevation, 能見

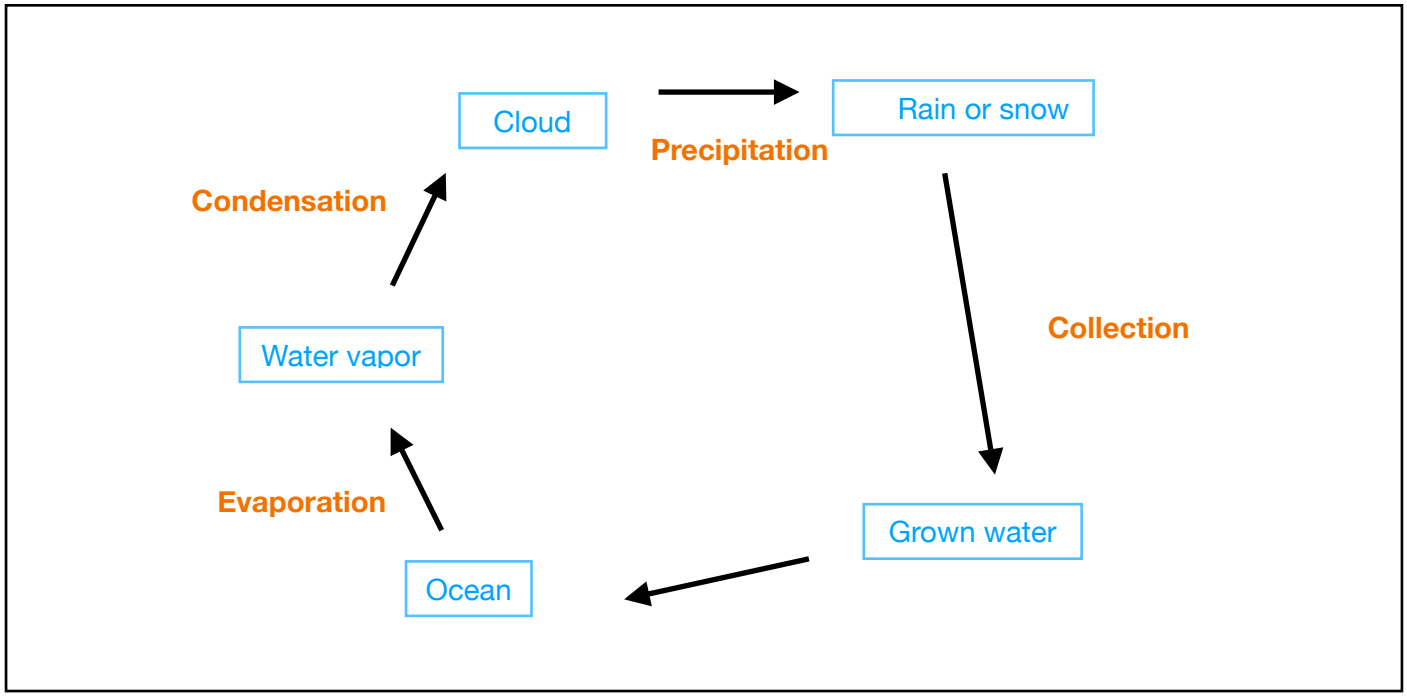
- Can we see water vapor itself?
  - Technically no, we saw it because it's attached to particles

- What are the causes of rain, dew, frost, and snow?
  - Water droplets or ice crystals in the clouds gather together and grow larger. They fall to the ground

as they become heavier. Water droplets drop directly and ice crystals melt into water and drops, and create “rain”. If the ice crystals in the clouds don’t melt and fall directly when falling to the ground, they will become “snow” On a clear and windless night, when the air comes in contact with objects with lower temperature, the water vapor in the air will condense into water droplets on the objects, This is called “dew”. When water droplets in the air encounter ground temperature below 0°C, they will become crushed ice crystals called “frost”.

- Different temperatures can change the form of water, such as clouds, fog, rain, dew, ice, snow, frost and invisible water vapor. How do these changes occur?
  - From the previous experiment, we have learned that ice and frost will be formed when the water temperature is lower than 0°C, and snow, water, dew and rain will be formed when the water temperature is higher than 0°C. Last when the temperature reaches 100°C or at room temperature, invisible water vapor will be formed.

Water cycle (textbook page 12)



Temperature (補充)

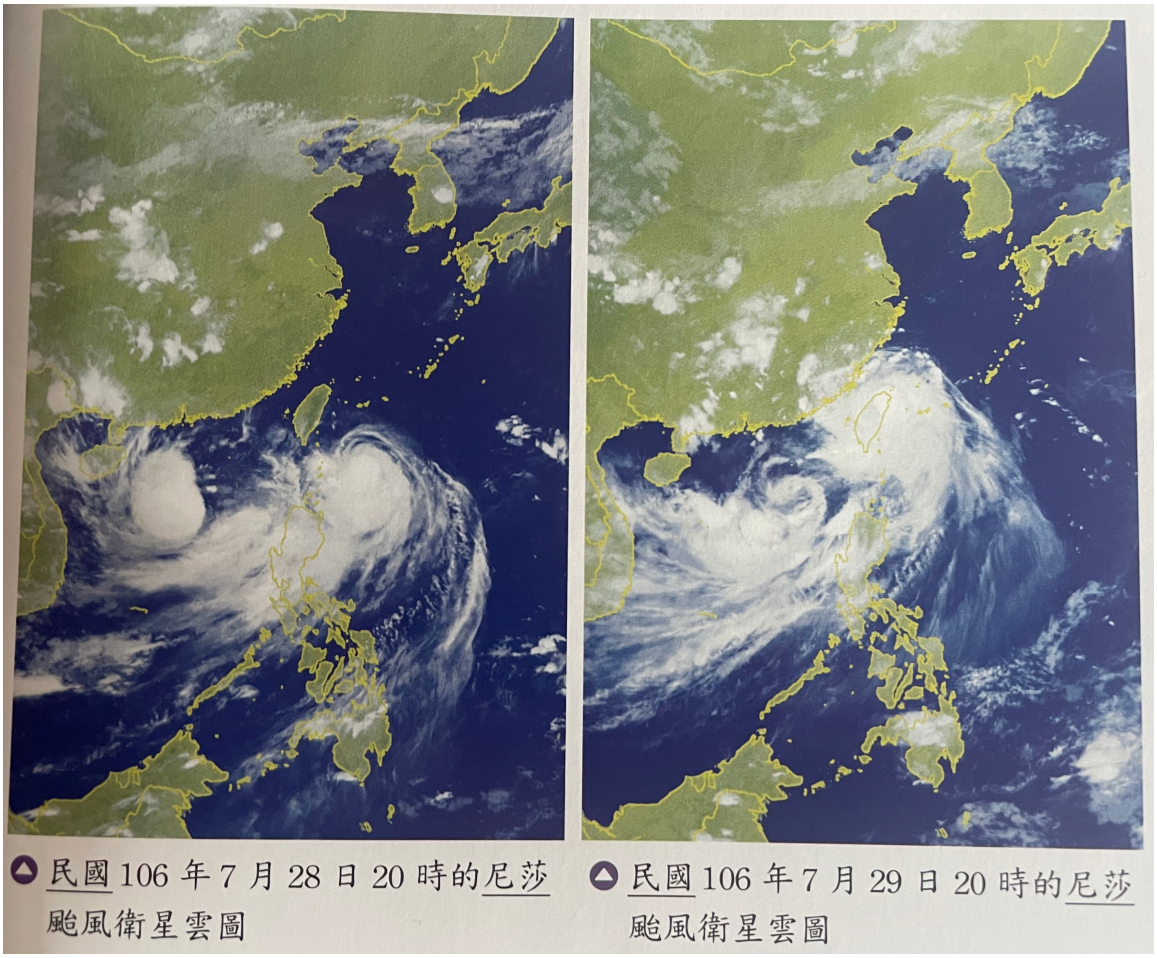
We use a **thermometer** to measure the temperature of an object. Temperature is usually measure in **degrees**. The “ ° ” symbol after a number means degrees.

Practice writing temperature in words:

1. 25°C : Twenty-five degrees Celsius
2. 0°C: zero degrees Celsius
3. -7°C : Minus seven degrees Celsius
4. 37°F : Thirty-seven degrees Fahrenheit

Reference: https://englishstudypage.com/vocabulary/the-temperature-in-english/

Satellite & weather report



民國106年7月28日20時的尼莎颱風衛星雲圖

民國106年7月29日20時的尼莎颱風衛星雲圖

Practice reading satellite images (textbook page 15)

Discussions:

1. According to the satellite images, can you tell where the clouds are?

(students raise their hands and answer)

2. How did the clouds move from July 28th to July 29th?

(students raise their hands and answer)

Typhoon

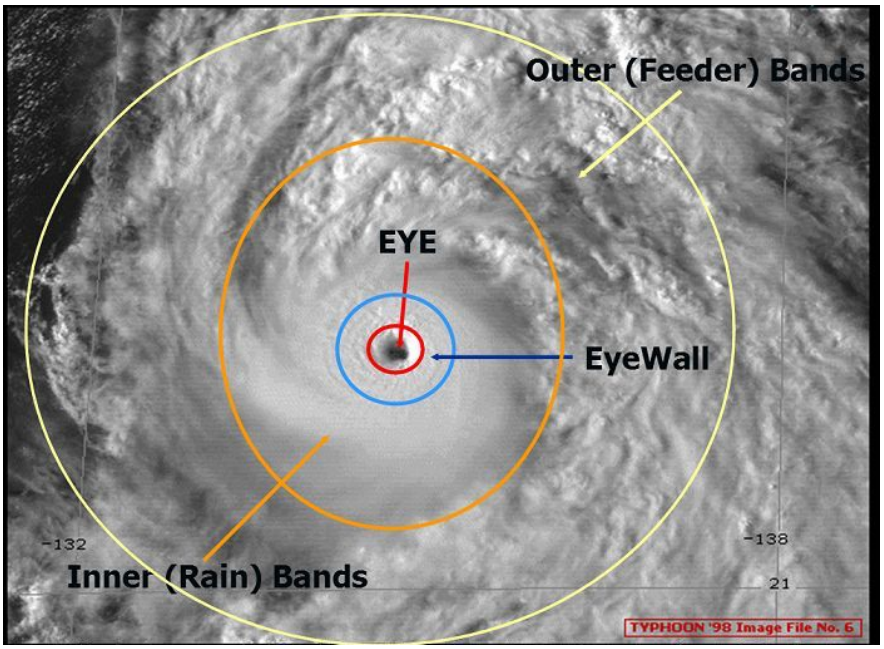
Tropical cyclones go by different names in different places. In North America and the Caribbean, they are called “hurricanes”. In the Indian Ocean, they are called “cyclones”. In Southeast Asia they are called “typhoons”.

How typhoons are formed:

1. Typhoons start off as tropical thunderstorms. The strong winds pull in moisture from the oceans.

2. The thunderstorms convert the moisture into heat. The heat causes more air to flow to the centre of the storm causing evaporation.
3. All the heat and air flow toward the eye creating the typhoon.

Parts of typhoons:



•Eye: This is the center. It's the calm part of the typhoon.

•Eye wall: This part is around the eye. This part has the strongest winds and rains.

•Rain bands: These are the clouds that spin outside the eye wall.

What to do when typhoon comes:

- Build an emergency kit and make a family emergency plan.
- Know your surroundings.
- Learn the elevation level of your property and whether the land is flood-prone, which will help you know how your property will be affected when storm surge or tidal flooding are forecasted.
- Identify levees and dams in your area and determine whether they pose a hazard to you.
- Learn community hurricane evacuation routes and how to find higher ground.
- Determine where you would go and how you would get there if you needed to evacuate.
- Make plans to secure your property
    1. Cover all of your home's windows with permanent storm shutters or 5/8-inch marine plywood, cut to fit and ready to install (tape does not prevent windows from breaking!)
    2. Install straps or additional clips to securely fasten your roof to the frame structure.

3. Be sure trees and shrubs around your home are well trimmed so they are more wind resistant.
4. Clear loose and clogged rain gutters and downspouts.
5. Reinforce your garage doors; if wind enters a garage it can cause dangerous and expensive structural damage.
6. Plan to bring in all outdoor furniture, decorations, garbage cans and anything else that is not tied down.
7. Determine how and where to secure your boat.
8. Install a generator for power outages.
9. If in a high-rise building, be prepared to take shelter on or below the 10th floor.
10. Consider building a safe room

What to do during a typhoon:

- Listen to the radio or TV for information and keep your weather radio handy
- Secure your home, close storm shutters and secure outdoor objects or bring them indoors
- Turn off utilities if instructed to do so. Otherwise, turn the refrigerator thermostat to its coldest setting and keep its doors closed
- Turn off propane tanks
- Avoid using the phone, except for serious emergencies
- Moor your boat if time permits
- Ensure a supply of water for sanitary purpose such as cleaning and flushing toilets: fill the bathtub and other larger containers with water
- Find out how to keep food safe during and after an emergency

Chapter 2 - Heat 🔥

Content:

- **Heat**
- **Heat transfer**

Vocabularies:

- Heat
- Transfer (v.)
- Hot air rises
- Cold air sinks
- Thermal expansion
- Thermal contraction
- Heat conduction
- Heat convection
- Heat radiation
- Insulator

Heat

Discussions: (students raise their hands and answer.)

1. Why do we need heat? To cook food, to stay warm…
2. When you cook food using heat, does the food change in any way after it's cooked? Describe. When cooking meat, meat turns from red to brown. When heating up chocolate, chocolate melts. When cooking egg, it turns from liquid form to solid form and never goes back to liquid form…
3. What changes when a piece of meat is cooked? Volume, shape, color.
4. What changes when a piece of chocolate melts? Volume, shape.
5. What changes when a raw egg is cooked? Volume, shape, form (liquid - solid), color.

Experiment (textbook page 35)

Introduction:

Does an object's volume change when receiving heat?

Equipments:

- Thermometer
- Transparent straw
- Room temperature water
- Cold water
- Hot water
- A conical flask
- Rubber stopper
- 2 larger containers
- Color dye
- A marker

Methods:

Step 1 - Dye the room temperature water and pour it in the conical flask.

Step 2 - Insert the straw inside the rubber stopper and put in on the conical flask.

Step 3 - Mark the current water level on the straw with a marker.

Step 4 - Dip the conical flask in a large container 1/3 filled with cold water.

Step 5 - After couple minutes, mark the current water level on the straw with a marker.

Step 6 - Take out the conical flask from the cold container and then dip it in another large container 1/3 filled with hot water.

Step 7 - After couple minutes, mark the current water level on the straw with a marker.

Discussion: (students raise their hands and answer)

1. Are all the marks on the straw on the same level? If not, compare them. No they are not on the same level. The one dipped in cold water is lower than the room temperature one, The one dipped in hot water is higher than the room temperature one.
2. From previous question, can you tell me if the volume of the water changed? If yes, how did it change? The volume of the water did change. We can judge by the changes of the water level. When the temperature drops, the volume of the water becomes smaller. When the temperature raises, the volume of the water becomes bigger.

Conclusion:

When an object receives heat, its volume will change. In this experiment, we've proven that the changes in temperature will change an object's volume.

When the temperature drops, object's volume will contract; when the temperature raises, object's volume will expand. We call this **thermal expansion** & **thermal contraction**.

Examples of thermal expansion & thermal contraction:

Bridges, tiles, hot air balloon, thermometer, train rails, etc…

Heat Transfer

Heat conduction

Heat flows from a hotter object to a cooler object. It occurs through contacting.

Experiment (textbook page 41)

Introduction:

Let's find out how heat transfers (or travels).

Equipments:

- A round aluminum plate
- A stand
- A candle
- A small candle holder (could be a plate)
- Lighter (will be lighted by adults only)

Methods:

Step 1 - Light the candle and drop candle wax on the aluminum plate several times. (at different spots. Spread them out)

Step 2 - Wait a second to let the wax drips cool down.

Step 3 - Attach the candle on the candle holder and light it up.

Step 4 - Place the candle in the center underneath the aluminum plate.

Step 5 - Observe which wax drip melts first, and then the second, then the third…

Step 6 - Move the candle in the bottom to the edge of the plate.

Step 7 - Observe the melting order.

Discussions:

1. When the lighted candle was in the center underneath the plate, which wax drip melted first? Answer: The one that was the closest to the lighted candle.

2. When the lighted candle was near the edge underneath the plate, which wax drip melted first? Answer: The one that was the closest to the lighted candle.
3. According to your observation, how did the heat transfer in this experiment? Answer: The heat transfers through contacting object, from higher temperature to lower temperature

Conclusion:

According to the melting order of the wax drips, we have proven that heat transfers from higher temperature to lower temperature by contacting objects.

Let's say if I have a very hot metal bar that is 100 degree Celsius and a very cold metal bar that is 10 degree Celsius. When I put these 2 bars together in contact, the heat is going to flow from the hot region to the cold region and this will continue till the temperatures of both metal bars are the same (55 degree Celsius).

Heat convection

Experiment (textbook page 45)

Introduction:

To see how heat transfer in liquid.

Equipments:

- Sesames
- A stand
- An alcohol burner
- Hot water
- A 500ml beaker
- A piece of ceramic fiber mesh

Methods:

Step 1 - Put the ceramic fiber mesh on top of the stand, and the beaker on top of the mesh.

Step 2 - Add about 300ml of hot water in the 500ml beaker.

Step 3 - Add a spoon of sesames in the beaker.

Step 4 - Light up the alcohol burner and put it under the stand.

Step 5 - Move the burner to the left. It should still be underneath the edge of the beaker.

Step 6 -Observe the movement of the sesames.

Step 7 - Move the burner to the right. It should still be underneath the edge of the beaker.

Step 8 -Observe the movement of the sesames.

Discussions:

1. When the burner was heating up the water in the beaker, how did the sesames move? Answer: When the burner was burning from the bottom left underneath the beaker, the sesames move from bottom left to mid top to bottom right (clockwise). When the burner was burning from the bottom right underneath the beaker, the sesames move from bottom right to mid top to bottom left (counterclockwise).
2. According to your observation, how did the heat move in liquid in this experiment? Answer: Hot water rises, cold water sinks. Because the bottom of the beaker was continually heated so the liquid near the bottom of the beaker will always be hotter than the liquid near the top. It creates a non-stop circulation.

Heat convection is the way heat transfers in water and air.

Examples: heater, air conditioner.

Heat radiation

This type of heat transfer doesn't require contacting any objects. Like the sun. You can feel and see the "heat" from the sun. But there's noting contacting in between. This type of transfer travels through electromagnetic radiation waves.

Examples: sun, microwave.

Chapter 3 - Minerals & Rocks💎

Content:

- Minerals & rocks
- Properties
- Upstream, midstream and downstream

Vocabularies:

- Rock
- Mineral
- Color
- Texture
- Luster
- Hardness
- Soft
- Properties
- Rough
- Smooth
- Shiny
- Reflective
- Upstream
- Midstream
- Downstream
- Steep
- Narrow

Minerals & rocks

Minerals

- Minerals are solid pure substances found in the earth.
- When it comes to making things, we need materials. Materials are made of minerals which are used to make nearly every items we use in our daily lives. For example, pencils are made of graphite. Stainless steel table is made of iron.

Rocks

- Rocks are a mixture of one kind or many kinds of minerals.
- Rocks can be as big as a mountain or as small as a grain of sand.

Properties

Before we memorize or recognize the names of minerals and rocks, we have to observe and describe them first. To describe the rocks and minerals, we can look at some of their properties, such as **color**, **texture**, **luster** and **hardness**.

- **Properties** (特性) are traits that tell you something about an object. Properties that help geologists identify a mineral in a rock are color, texture, luster, hardness, etc.
- **Color**: For example, shale (頁岩) can be dark gray or black. Azurite is bright blue.
- **Texture**: describes the way an object feels. Some rocks have a rough texture, and they are really bumpy. Some rocks have a smooth texture.
- **Luster**: describes how a rock or mineral reflects light. Some rocks don't reflect a lot of light. Some rocks are metallic and shiny.
- Hardness: Diamond is the hardest mineral. Talc (滑石) is the softest mineral.

Practices:

(Students raise their hands and answer)

Question:
What is the texture of these rocks?

Texture

Smooth ? **Rough ?**

Answer: Smooth.

Question:
What is the luster of this mineral?

Luster

Reflective ? **Non-reflective ?**

Answer: It is reflective.

Question:
What is the color of this rock?

Color

Red

Answer:
The color of this rock is red.

Question:
Is this mineral hard or soft?

Hardness

Hard ? **Soft ?**

Answer:
This mineral is hard.

Please select or fill in the correct answer:

1. This rock is made of many kinds of minerals.
2. Its colors are red and black.
3. Luster of this rock is non-reflective.
4. but it is a little bit shiny because only some of the minerals in this rock are shiny.

1. This rock is made of ~~**(one kind of mineral)**~~.
(many kinds of minerals).

2. Its colors are **red** and **black**.

3. Luster of this rock is **(non-reflective)**.
(~~reflective~~).

4. Is it **shiny** at all?

Please connect the boxes to the rock and mineral they each describe.

This rock is **yellow, rough, dull and soft.**

This rock is **grey, rough, dull and soft.**

This rock is **shiny, reflective and hard.**

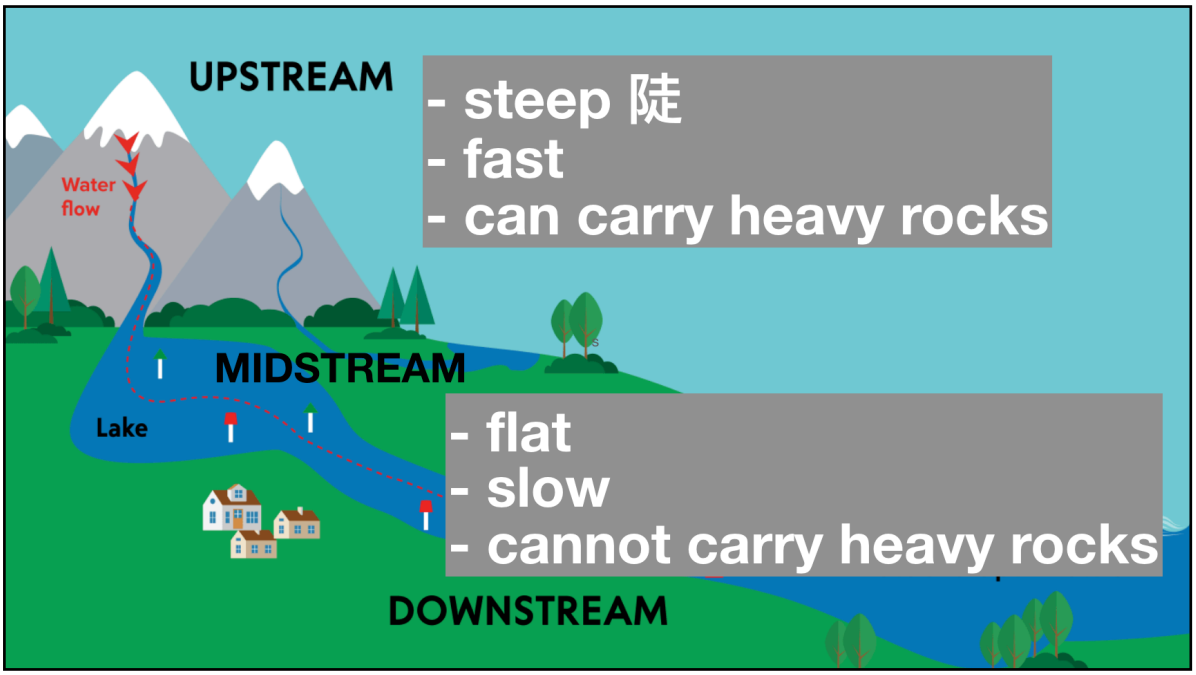
Pick 2 rocks or minerals provided by the teacher and describe them by finishing the 5 sentences below.

These words describe rocks and minerals:

bright 明亮的	dark 暗的	colorful 鮮豔的	smooth 平滑的	glassy 光滑的
rough 粗糙的	grainy 有坑洞的	dull 無光澤的	reflective 反光的	non-reflective 不反光的
shiny 閃耀的/有光澤的	hard 硬度大的	soft 脆弱的		

1. This is a (mineral / rock).
2. **Color**: The colors of this (mineral / rock) are _____.
3. **Texture**: This (mineral / rock) feels_____.
4. **Luster**: Its luster is _____.
5. **Hardness**: _____ is harder than _____.

Upstream, midstream, downstream



Chapter 4 - Magnetism & Electromagnetism 🧲

Content:

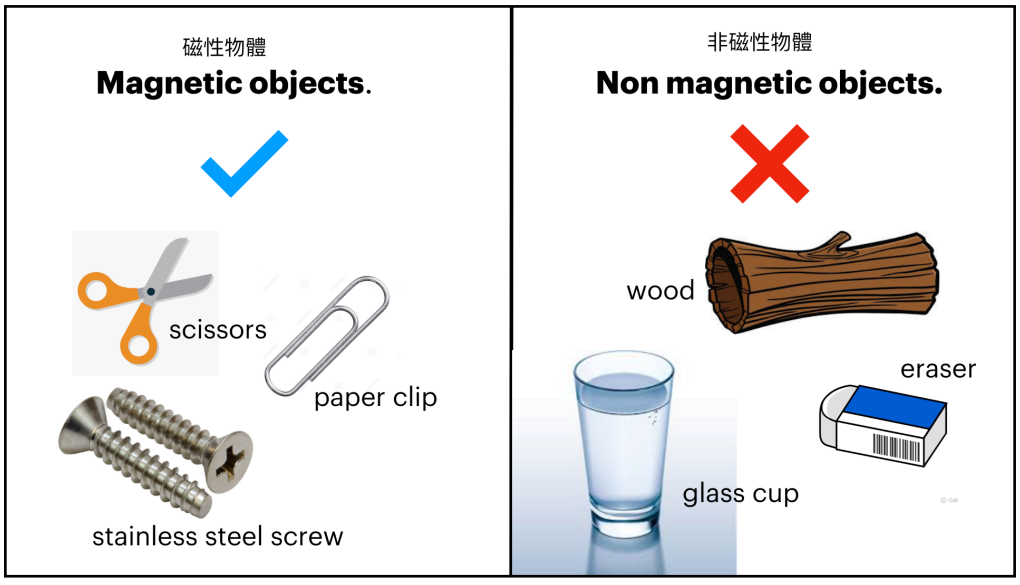
- **Magnet**
- **Compass**
- **Electromagnet**
- **Magnet and electromagnet comparison.**
- **Applications.**

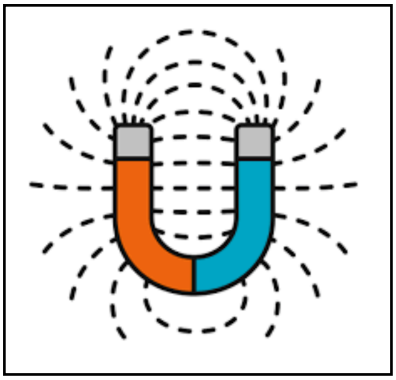
Vocabularies:

- Magnet (magnetic/ magnetism)
- Electromagnet (electromagnetic/ electromagnetism)
- Electricity
- Compass
- North Pole
- South Pole
- Attract (v.)
- Repel (v.)
- Battery
- Iron
- Battery holder
- Paper clips
- Enameled copper wire
- Straw
- Sandpaper
- Stick
- Wood
- Aluminum
- Clockwise (adj.)
- Counterclockwise (adj.)
- Reverse (v.)
- Strength
- Polarity

Magnet

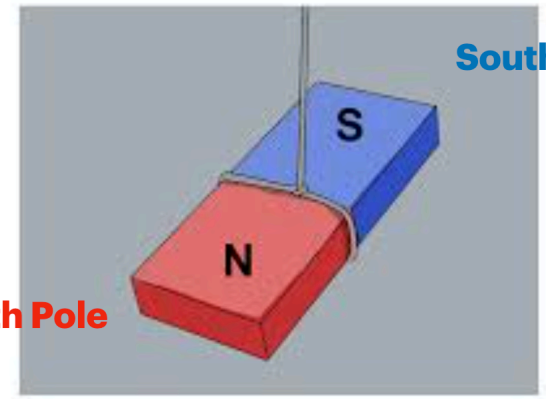
- Magnets are made of **magnetic metals: iron, nickel and cobalt**(鐵，鎳，鈷). Only any of these metals can create magnet. (Iron is the most common magnetic metal.)
- Only objects that contain any of these metals can be magnetized. We call those objects "**magnetic objects**".





•Magnet creates **magnetic force** around it, we call this force **Magnetism**.

•The magnetic force is around the magnet. This area is called **magnetic field**. (see image on the left)

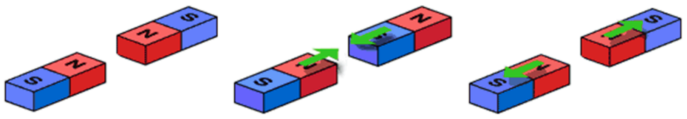


- A magnet has two poles. One end is **North Pole**, the other end is **South Pole**.

- **Same Poles repel, opposite Poles attract.** (see images on the right)

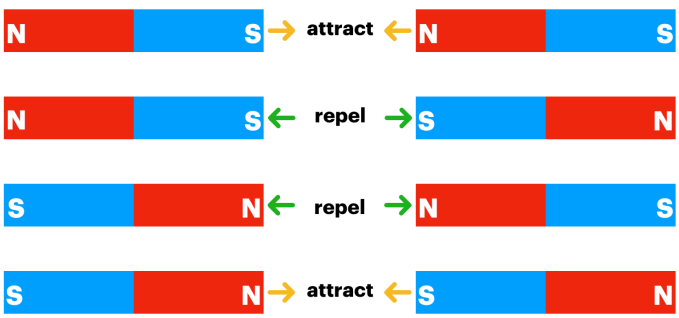
排斥
Bring the **same poles** near, the magnets will **repel** each other.

Bring the **opposite poles** near, the magnets **attract** each other.
吸引



Same poles repel, opposite poles attract.
同極相斥，異極相吸

Practices (quick review):



Compass

Experiment (textbook page 86 & 87)

Goal: To discover what the compass needle is made of.

Equipments:

- Compass
- Magnet

Methods:

Step 1 - Put the compass on the table and wait until the needle stops moving

Step 2 - Once the needle stops moving, move the magnet's North Pole close to the compass and observe the needle's movement.

Step 3 - Move the magnet away from the compass and wait till the needle stops moving.

Step 4 - Once the needle stops moving, move the magnet's South Pole close to the compass and observe the needle's movement.

(continue on next page…)

Discussions:

Question 1: When magnet's N Pole got close to the compass, what happened to the compass needle? Answer: The tip of the compass needle moved away (repelled)from the magnet's N Pole. That means the tip of the needle is also magnetic N Pole.

Question 2: When magnet's S Pole got close to the compass, what happened to the compass needle? Answer: The tip of the compass needle moved towards (attracted) the magnet's S Pole. That means the tip of the needle is magnetic N Pole.

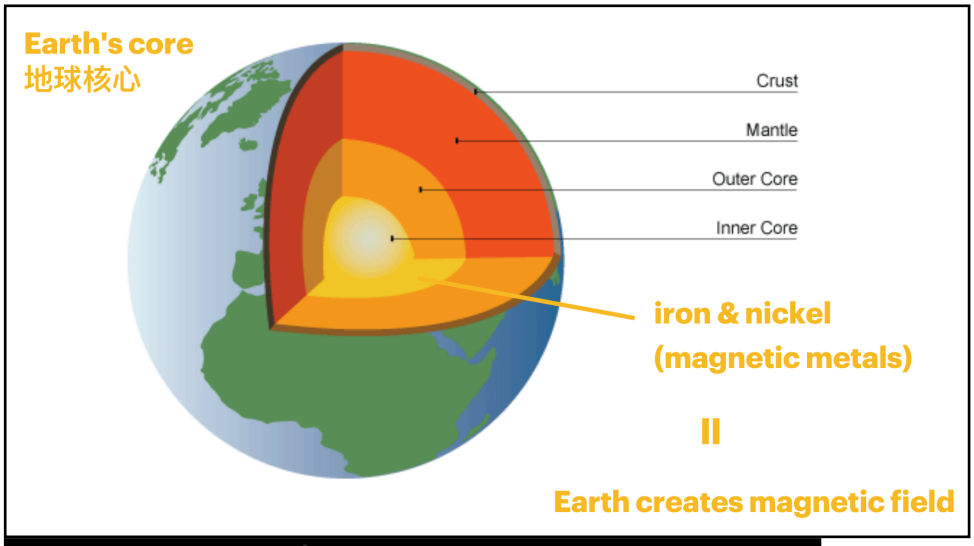
Question 3: According to the answers of question 1 and 2, what do you think the compass needle is made of? Answer: The compass needle is made out of magnet, because same Poles repel and opposite Poles attract.

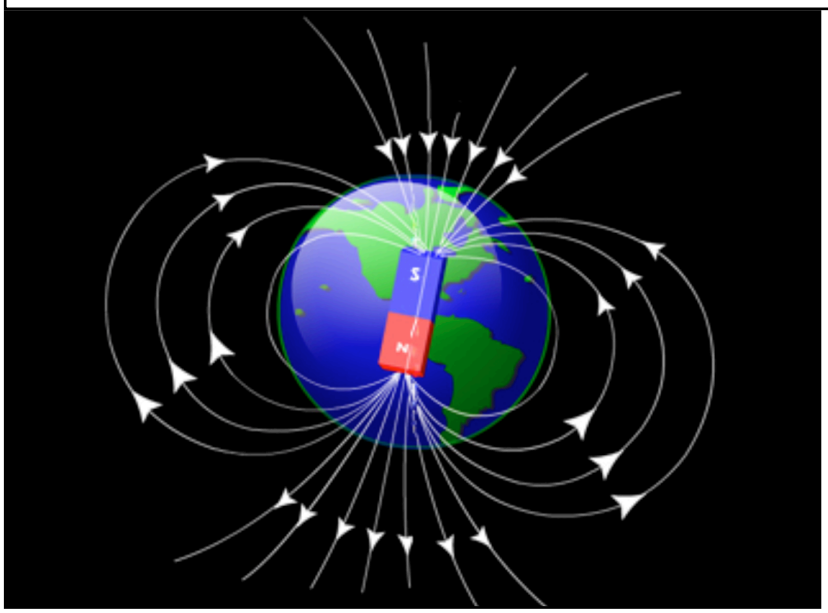
Conclusion:The compass needle is a magnet. The tip of the compass needle is magnetic N Pole.

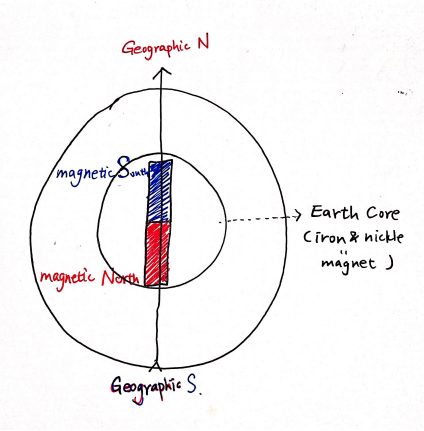
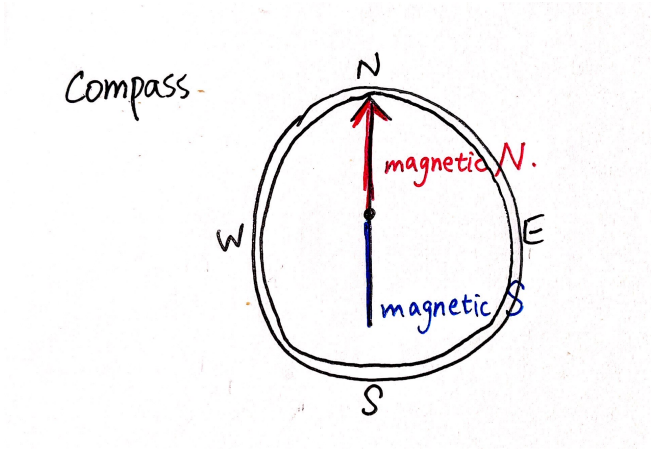
- Compass needle is a magnet, and the tip is magnetic North Pole.

Earth's core

- Earth core is a giant magnet that creates magnetic field. (There is a huge amount of iron and nickel in the center of Earth)
- "Opposite Poles attract". We've learnt that the tip of the compass needle is magnetic N Pole and it always points to the Earth's geographic N Pole. It means that the Earth's geographic N Pole is close to the Earth's magnetic S Pole, and the Earth's geographic S Pole is close to the Earth's magnetic N Pole. (see images below)





Earth' Geographic Poles & Magnetic Poles	Compass needle's Poles
	

Electromagnet

Experiment (textbook page 88 & 89)

Goal: To create electromagnetism.

Equipments:

- Compass
- A AA battery
- A battery holder

Steps:

Step 1 - Put the compass on the table and wait till the needle stops moving.

Step 2 - Connect both wires on the battery holder together.

Step 3 - Put the wires on top of the compass. Align the wires and the compass needle.

Step 4 - Put the AA battery in the battery holder.

Step 5 - Observe the needle's movement.

Step 6- Take out the battery.

Step 7 - Flip the battery's positive charge and negative charge by moving the whole battery set to the other side of the compass (wires will still be sitting on top of the compass)

Step 8 - Align the wires and the needle again.

Step 9 - Put the battery in the battery holder.

Step 10 - Observe the needle's movement.

Step 11 - Take out the battery again.

Step 12 - Put the battery holder set back to the original position but this time put the wire underneath the compass.

Step 13 - Align the wires and the needle.

Step 14 - Put the battery in the battery holder.

Step 15 - Observe the needle's movement.

Discussions:

1. Did the needle move before the battery was put in the battery holder? Answer: No, it didn't move.
2. Did the needle immediately move after the battery was put in the battery holder the first time? Answer: Yes, the needle moved.
3. After the battery's positive charge and negative charged got switched, how differently did the needle move comparing to the first one? Answer: The needle moved to different direction.
4. After the wires were moved tp underneath the compass, how differently did the needle move comparing to the second one? Answer: The needle moved to different direction.
5. What is different in this experiment than the magnet experiment? Answer: We added electricity.
6. What is it that made the needle move? The electrified wires created magnetic fields that made the needle move.

Conclusion:

Electricity can create electromagnetism. Electromagnet's magnetic fields can be changed.

Experiment (textbook page 92)

Goal: To increase the strength of electromagnetism. Method 1.

Equipments:

- Enameled copper wire
- Straw (about 10cm)
- Sandpaper
- A AA battery
- A battery holder
- Paper clips
- A wooden stick
- An aluminum stick
- An iron stick

Steps:

Step 1 - Use the enameled copper wire to wrap around the straw to create 30 loops.

Step 2 - Cut the enameled copper wire. Leave about 5cm on both ends of the enameled copper wire.

Step 3- Use a piece of sandpaper to sand off the paint on both ends of the enameled copper wire.

Step 4 - Connect the enameled copper wire to the battery holder wires

Step 5 - Insert the wooden stick inside the straw.

Step 6 - Put the battery in the battery holder.

Step 7 - Use the wooden stick ends to attract paper clips.

Step 8 - Observe and record the amount of paper clips the wooden stick attracts.

Step 9 - Take out the battery.

Step10 - Insert the aluminum stick inside the straw.

Step 11 - Put the battery in the battery holder.

Step 12 - Use the aluminum stick ends to attract paper clips.

Step 13 - Observe and record the amount of paper clips the aluminum stick attracts.

Step 14 - Take out the battery.

Step 15 - Insert the iron stick inside the straw.

Step 16 - Put the battery in the battery holder.

Step 17 - Use the iron stick ends to attract paper clips.

Step 18 - Observe and record the amount of paper clips the iron stick attracts.

Discussions:

1. How many paper clips did each stick attract? Students answer their own datas. Wooden - 0. Aluminum - 0. Iron -?
2. Which stick attracted the most paper clips? Answer: the iron stick.

Conclusion:

Only inserting an iron stick inside an electrified wire could attract paper clips. This means that inserting iron stick can increase the strength of electromagnetism.

Experiment (Textbook page 94)

Goal: To increase the strength of electromagnetism. Method 2.

Equipments:

- Enameled copper wire
- Straw (about 10cm)
- Sandpaper
- 2 AA batteries
- 2 battery holders
- Paper clips
- An iron stick

Steps:

Step 1 - Use the enameled copper wire to wrap around the straw to create 30 loops.

Step 2 - Cut the enameled copper wire. Leave about 5cm on both ends of the enameled copper wire.

Step 3- Use a piece of sandpaper to sand off the paint on both ends of the enameled copper wire.

Step 4 - Connect the enameled copper wire to the battery holder wires.

Step 5 - Insert the iron stick in the straw.

Step 6 - Put the battery in the battery holder.

Step 7 - Use the iron stick ends to attract paper clips.

Step 8 - Observe and record the amount of paper clips the iron stick attracts.

Step 9 - Take out the battery

Step10 - Connect one more battery (includes one extra battery holder set)

Step 11 - Put the batteries in the battery holders.

Step 12 - Use the iron stick ends to attract paper clips.

Step 13 - Observe and record the amount of paper clips the iron stick attracts.

Discussions:

1. How many paper clips did the iron stick attract when it was only connected to one battery? Students answer their own datas.
2. How many paper clips did the iron stick attract when it was connected to 2 batteries? Students answer their own datas. The amount should be more than the first one.

Conclusion:

In this experiment, we see that connecting 2 batteries attracted more paper clips than when it was only connected to 1 battery. This has proven that increasing the amount of battery will increase the strength of electromagnetism.

Experiment (textbook page 95)

Goal: To increase the strength of electromagnetism. Method 3.

Equipments:

- Enameled copper wires
- 2 straws (each is about 10cm)
- Sandpaper
- A AA battery
- A battery holder
- Paper clips
- An iron stick

Steps:

Step 1 - Use the enameled copper wire to wrap around the straw to create 30 loops.

Step 2 - Cut the enameled copper wire. Leave about 5cm on both ends of the enameled copper wire.

Step 3- Use a piece of sandpaper to sand off the paint on both ends of the enameled copper wire.

Step 4 - Connect the enameled copper wire to the battery holder wires

Step 5 - Insert the iron stick in the straw.

Step 6 - Put the battery in the battery holder.

Step 7 - Use the iron stick ends to attract paper clips.

Step 8 - Observe and record the amount of paper clips the iron stick attracts.

Step 9 - Take out the battery.

Step 10 - Grab another roll of enameled copper wire and use it to wrap around another straw to create 90 loops.

Step 11 - Cut the enameled copper wire. Leave about 5cm on both ends of the enameled copper wire.

Step 12 - Use a piece of sandpaper to sand off the paint on both ends of the enameled copper wire.

Step 13 - Connect the enameled copper wire to the battery holder wires

Step 14 - Insert the iron stick in the straw.

Step 15 - Put the battery in the battery holder.

Step 16 - Use the iron stick ends to attract paper clips.

Step 17 - Observe and record the amount of paper clips the wooden stick attracts.

Discussions:

1. How many paper clips did the stick attract when it was inside 30 loops of enameled copper wire? Students answer their own datas.
2. How many paper clips did the stick attract when it was inside 90 loops of enameled copper wire? Students answer their own datas. The amount should be more than the first one.

Conclusion:

In this experiment, we see that having 90 loops of enameled copper wire attracted more paper clips than 30 loops of enameled copper wire. This has proven that increasing the amount of loops of enameled copper wire can increase the strength of electromagnetism.

There are 3 ways to increase the strength of electromagnetism:

1. Insert an iron stick
2. Increase the amount of battery
3. Increase the amount of loops of enameled copper wire

Magnet and electromagnet comparison (配合習作第46頁)

Magnet	Electromagnet
Doesn't need electricity	Needs electricity to power
Has both North Pole & South Pole	Has both North Pole & South Pole
Opposite Poles attract, same Poles repel	Opposite Poles attract, same Poles repel
Permanent	Temporary
Its strength stays the same	Its strength can be changed
Polarity cannot be reversed	Polarity can be reversed

Applications

Magnet	Electromagnet
Fridge magnet	electric door bell
Compass needle	Industrial lifting elevator
Purse	Loudspeaker
Pencil box	Magnetic lock
	magnetic data storage equipment
	Maglev train

(補充)

Videos

Bill Nye the Science Guy - https://www.schooltube.com/media/Bill+Nye+Magnetism/1_4vlix04y

Movie clips

***You Only Live Twice* James Bond 1967 - (Start at 1:25 giant magnet) -**

https://www.youtube.com/watch?v=7KpMLuWeRh4

Video discussions:

- What is the car made of?
  - Iron (magnetic metal)

- Is the giant magnet that pulls the car up a permanent magnet or an electromagnet?
  - Electromagnet

- How did they drop the car in the river?
  - By turning off the electricity (electromagnet is temporary magnet that needs electricity to power)

***Toy Story 3* - Refuse Incineration Plant 焚化廠**

https://www.youtube.com/watch?v=Na6-URHxOtU

Video discussions:

- What is the dog made of?
  - Iron (magnetic metal)

- What magnetic objects do you see in this clip?
  - (自由回答，可用中文)

***Robots* - Magnetized robot**

https://www.youtube.com/watch?v=WnMpWisv0lc

https://www.youtube.com/watch?v=twFeVgMzdus

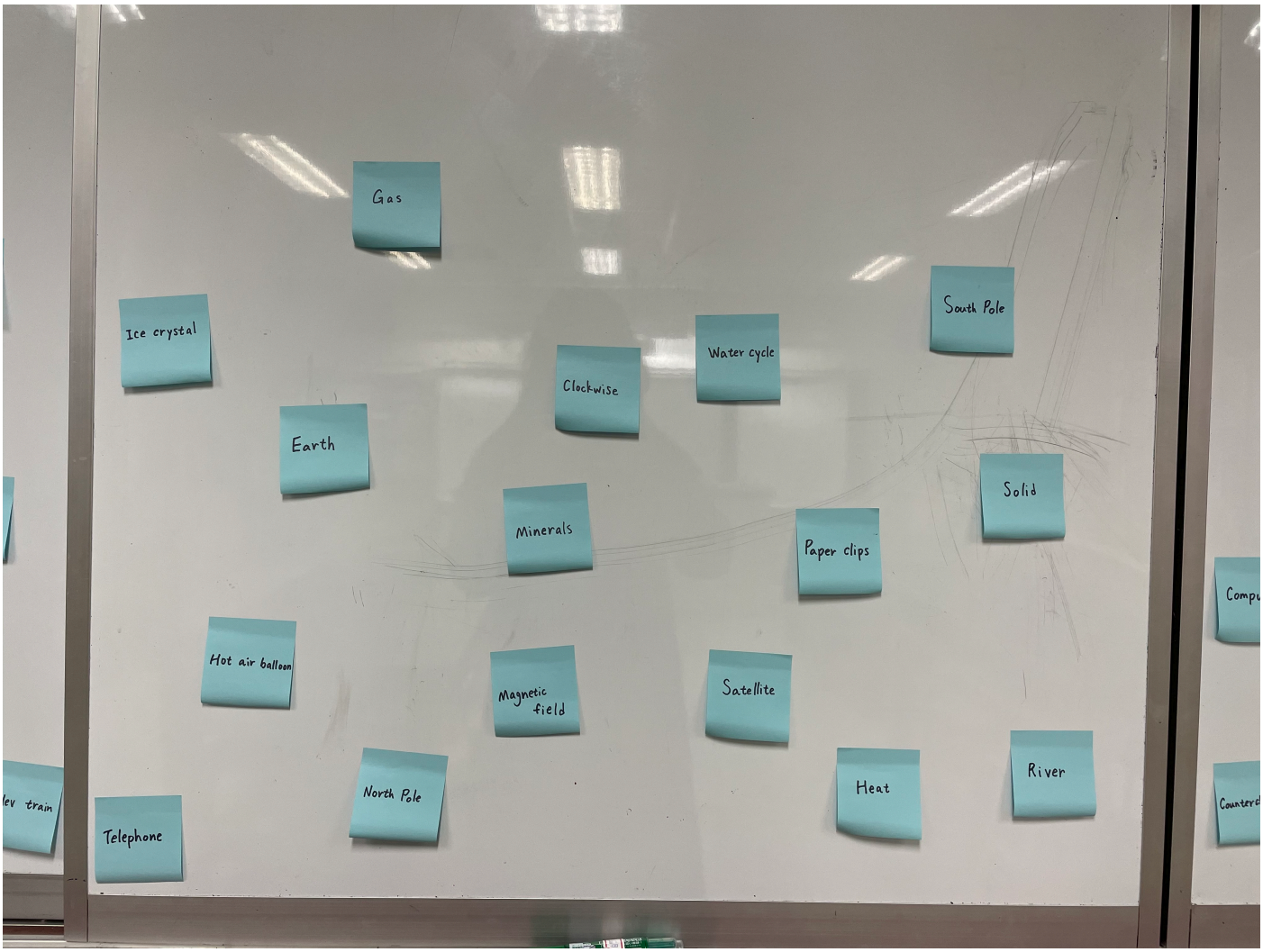
***Wild Wild West* - Magnetic collars & blade (killer weapon)**

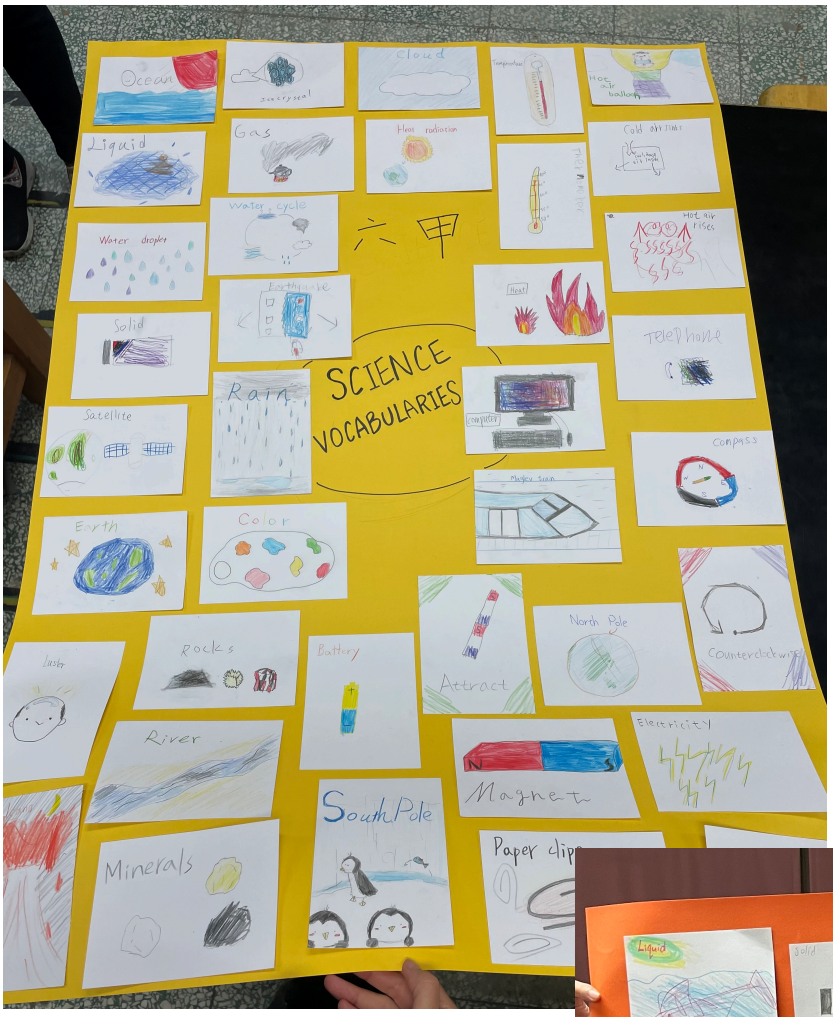
https://www.youtube.com/watch?v=HvIGrLYKRh8

End of semester activity

(Duration: 40 minutes. Amount of students: 20/class)

1. Teacher prepares 40 (twice amount the students) vocabulary cards (write vocabularies on the sticky notes) and stick them on to the whiteboard.
2. Students line up in front of the whiteboard.
3. Teacher counts to “3”. After “3”, each student grabs 2 vocabulary cards on the board. (This might be chaotic.)
4. Pass down 2 pieces of drawing cards to each students.
5. Students will draw the pictures according to the vocabularies they chose. (Drawing supplies will be provided by teacher.)
6. Make sure to include the word itself in the drawing. The words should be large enough and clear.
7. After all the students finish drawing, all the drawing cards will be glued on to a poster. The poster will be hung in their classrooms during next semester for reviewing.
8. Have fun!

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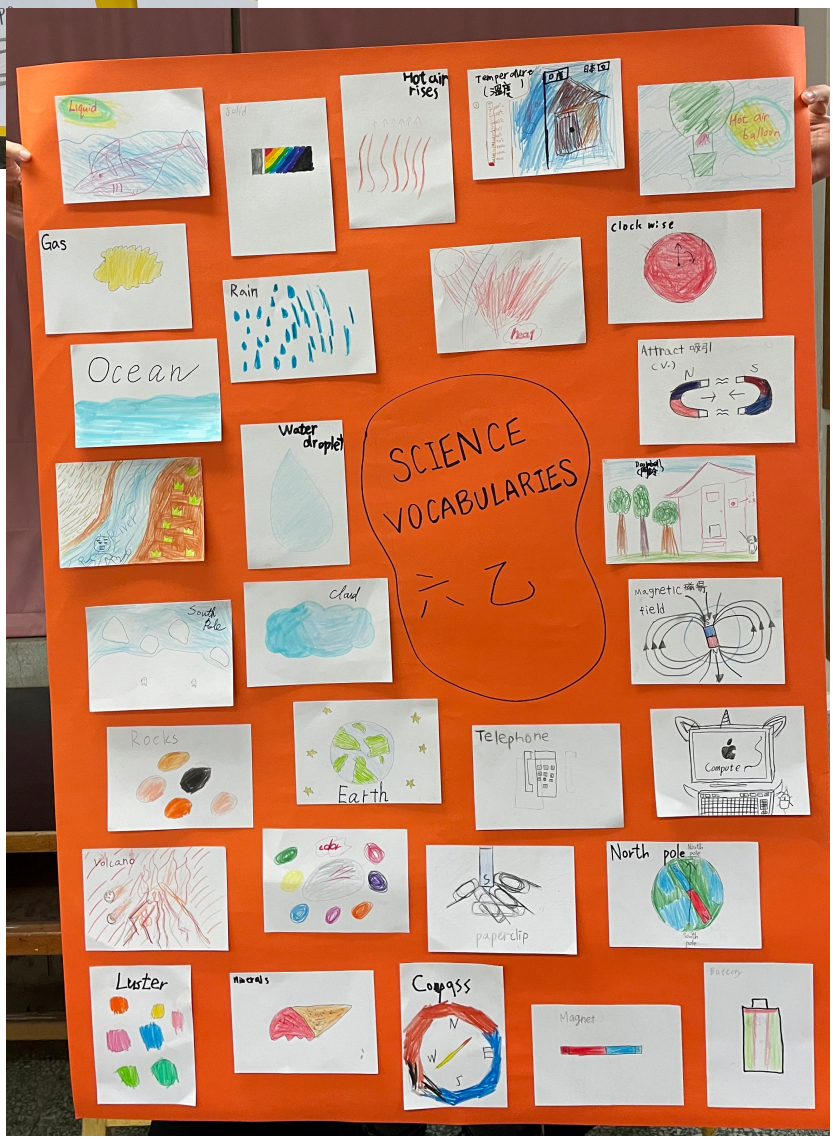
VOCABULARIES
Ocean
Cloud
Liquid
Gas
Water dropler
Water cycle
Solid
Rain
Satellite
Earth
Color
Rocks
Battery
Attract
North Pole
Counterclockwise
Compass
Telephone
Computer
Heat
Hot air rises
Electricity
Magnet
River
Minerals
SouthPole
Paper clip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VOCABULARIES
六乙
Liquid
Solid
Hot air rises
Hot air balloon
Gas
clock wise
Rain
Heat
Ocean
Water dropler
Cloud
Rocks
Earth
Telephone
Computer
Volcano
color
paperclip
North pole
Luster
Compass
Magnet