

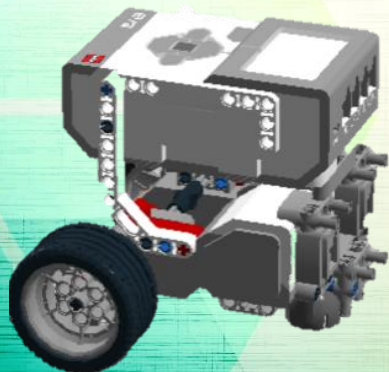
# Alternative Curriculum-Scientific Inquiry

彈性課程-科學探究

## Bee Secret 蜜密

中山國中課程研發團隊

Sharer : Ya-Jan Yang



# The idea comes from...

**WITH BEES**



**WITHOUT BEES**



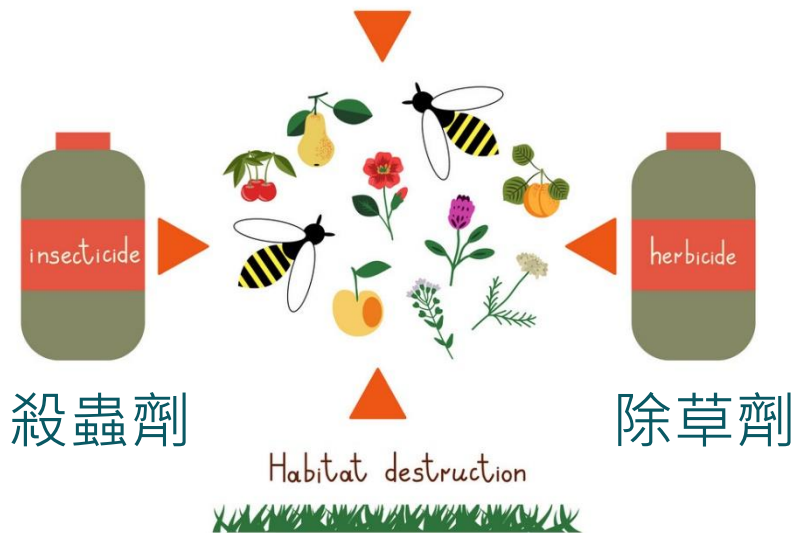
If the bee disappears from the surface of the earth, man would have no more than four years to live.

**Albert Einstein**

# Colony Collapse Disorder (CCD)

蜂群崩潰症候群

Colony collapse disorder



- Worker bees disappear
- Unknown reason:
  1. climate change 氣候變遷
  2. overuse of pesticide 農藥
  3. others



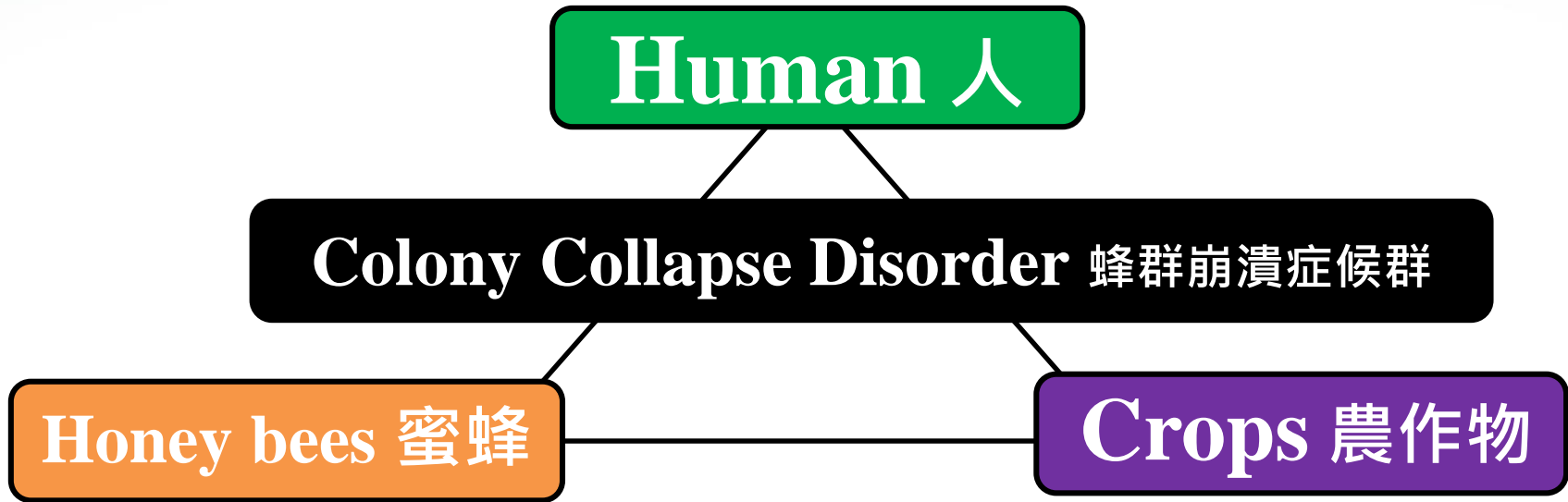
# Concept

**Human 人**

**Colony Collapse Disorder 蜂群崩潰症候群**

**Honey bees 蜜蜂**

**Crops 農作物**



# Outline

Induction  
感應



Communication  
溝通



Bee dance  
蜜蜂舞蹈



Bee robot  
蜜蜂仿生

Bee experience  
蜜蜂體驗



Human & bee  
人類與蜂



Honey plant  
蜜源植物

CCD  
蜜蜂迷航



Organic farming  
有機農業



TAP  
產銷履歷



School lunch  
營養午餐

Induction  
感應



Communication  
溝通




Bee dance  
蜜蜂舞蹈




Bee robot  
蜜蜂仿生

Measure “reaction time” by game, and discuss the reasons why everyone’s speed is different.

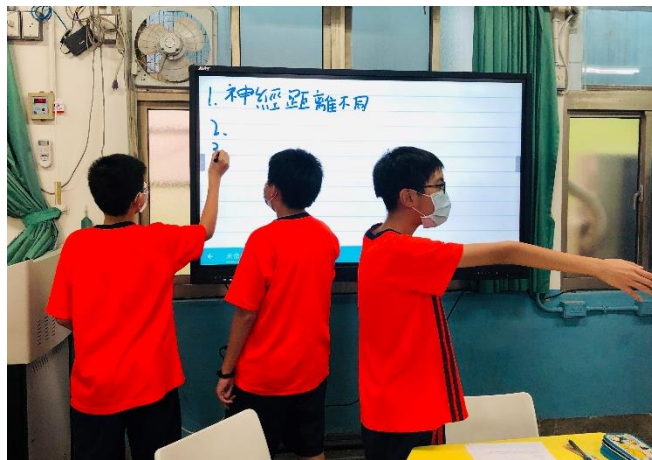


**Induction 感應**  
**Organisms Respond to Environment**

- How fast is your response time? **Q1**
- <https://www.arealme.com/reaction-time-test/zh/>



1. Red circle changes to green circle
2. Click quickly
3. Repeat five times
4. Calculate the average



Induction  
感應



Communication  
溝通



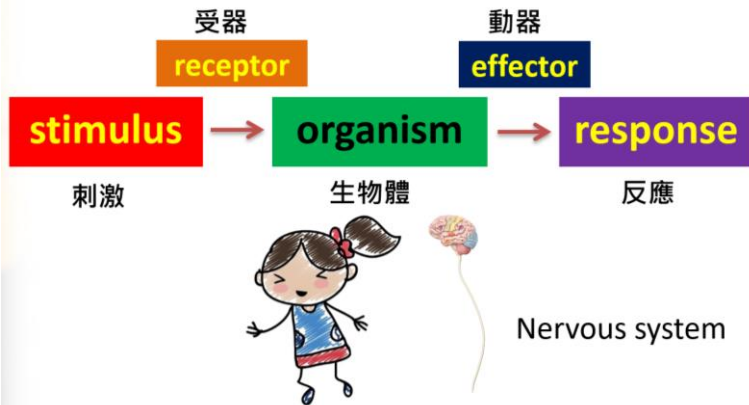
Bee dance  
蜜蜂舞蹈



Bee robot  
蜜蜂仿生

Practice the human induction pathways and share the results.

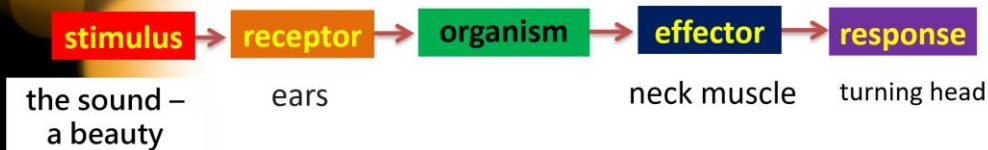
### Induction 感應 Organisms Respond to Environment



Q4

Let's practice

- Example
- When hearing someone call me a beauty , I turned my head.



Induction  
感應



Communication  
溝通

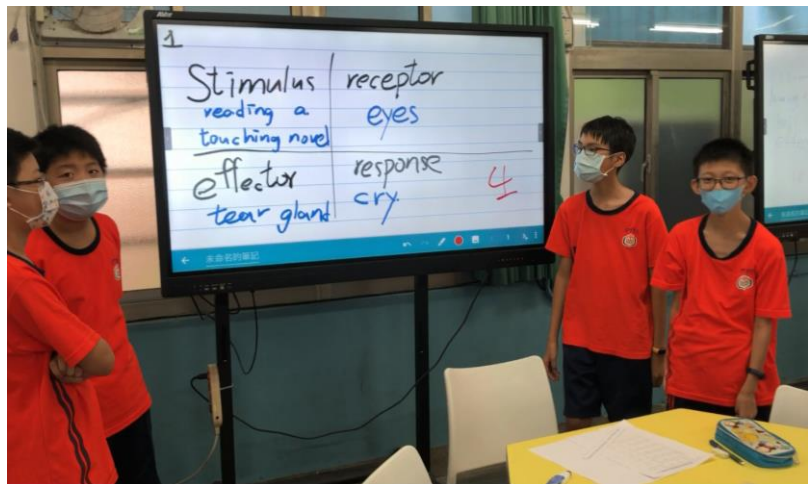


Bee dance  
蜜蜂舞蹈

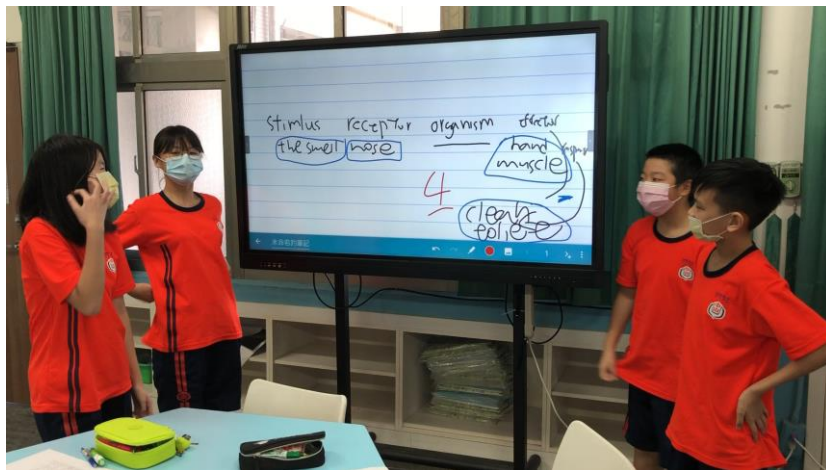


Bee robot  
蜜蜂仿生

Practice the human induction pathways and share the results.



Because the smell was bad , I cleaned the toilet.





Induction  
感應



Communication  
溝通



Bee dance  
蜜蜂舞蹈



Bee robot  
蜜蜂仿生

Learn different kinds of inductions about plants and animals.

## Respond 反應

- Plant induction

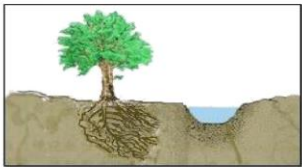
Q1

### 1. Tropism

Hygrotropism 向溼性

Phototropism 向光性

Gravitropism 向地性



### 三、Animal induction Q2

1 courtship behavior 求偶行為	2 childcare behavior 育幼行為	3 migration 遷移
4 orientation 定位	5 communication 溝通	6 phototaxis 趨光性

Induction  
感應



Communication  
溝通

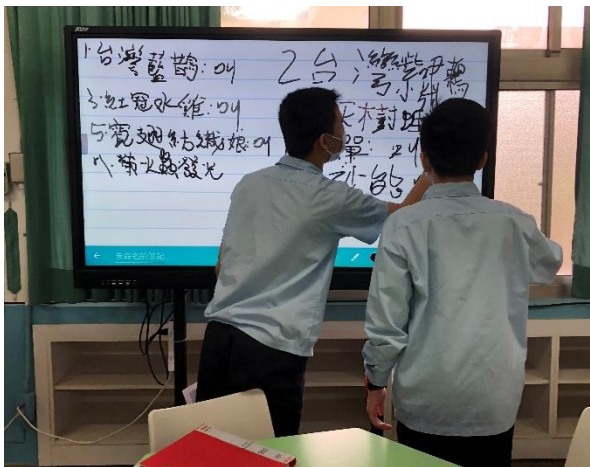


Bee dance  
蜜蜂舞蹈



Bee robot  
蜜蜂仿生

## Animal communication video exploration.



四、Write down the organisms you observe in the film and the communication methods they use. Q3

	物種/organisms	溝通方式/communication methods
1.	臺灣藍鵲	鳴叫
2.	紅冠水雞	鳴叫 (求偶)
3.	西天樹蛙	鳴叫 (求偶)
4.	寬翅的繡鸚	鳴叫
5.	高砂熊	鳴叫
6.	華山熊	鳴叫
7.	黑翅螢	發光
8.	曙鳳蝶	氣味
9.	厚蝶幼蟲	氣味
10.	森斯	聲音
	臺灣黑熊	鳴叫

Induction  
感應

Communication  
溝通

Bee dance  
蜜蜂舞蹈

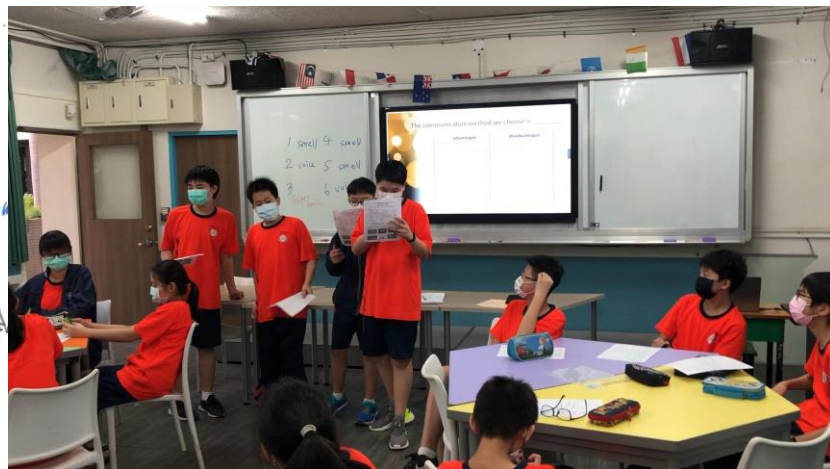
Bee robot  
蜜蜂仿生

Choose a method of communication  
and explore the advantages and disadvantages.

五、Choose a communication method. Explore the advantages or disadvantages  
of this communication way for its survival **Q4**

The communication method we choose is 鳴叫

advantages 優點	disadvantages 缺點
Can communicate without seeing 不用看到也能溝通	easy to find out by enemies 天敵易發現
Easy to communicate 方便傳達	距離遠難傳達 -difficult to chat with
Convenient to remind similar 方便警告同類逃跑	Noisy environment 嘈雜環境易被干擾
Good difference 好區別其他動物	is easy to interfere





Induction  
感應



Communication  
溝通



Bee dance  
蜜蜂舞蹈



Bee robot  
蜜蜂仿生

Introduce the bees communication by Morse code game.





Induction  
感應



Communication  
溝通



Bee dance  
蜜蜂舞蹈



Bee robot  
蜜蜂仿生

Introduce the bees communication by Morse code game.

二、 Do you have any thoughts or feeling after playing the no voice communication-Morse code? Q1 29/ hornet 虎頭蜂

這個遊戲需要團結合作，一個人心不在焉，就會影響到全組，如果大家都用這種方式溝通，那可能會發生很多爭執。

二、 Do you have any thoughts or feeling after playing the no voice communication-Morse code? Q1 虎頭蜂

在玩過這項遊戲後，我覺得不用聲音來溝通很不方便，有時會誤解對方的意思。

After I played this game, I think it isn't convenient if we can't use voice.



Induction  
感應



Communication  
溝通

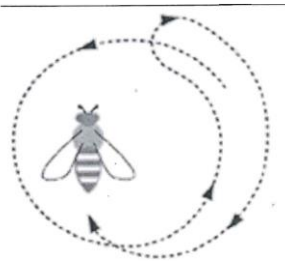


Bee dance  
蜜蜂舞蹈



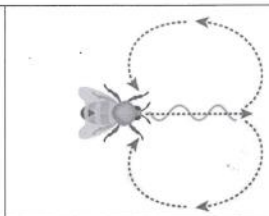
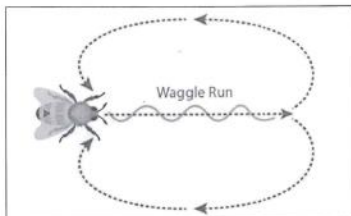
Bee robot  
蜜蜂仿生

Introduce bee dance : Round dance and Waggle dance.



Round dance 圓形舞    Waggle dance 搖擺舞(8字舞)

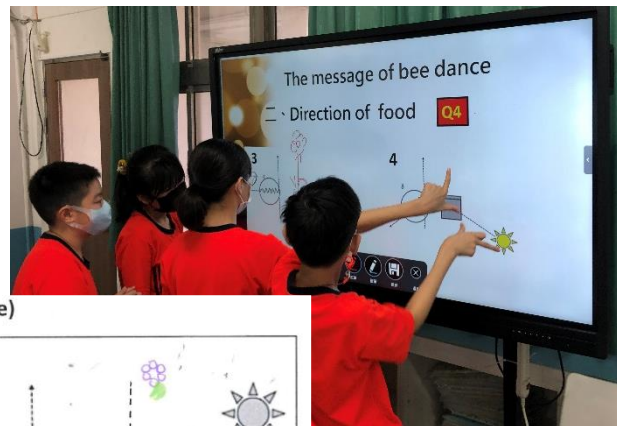
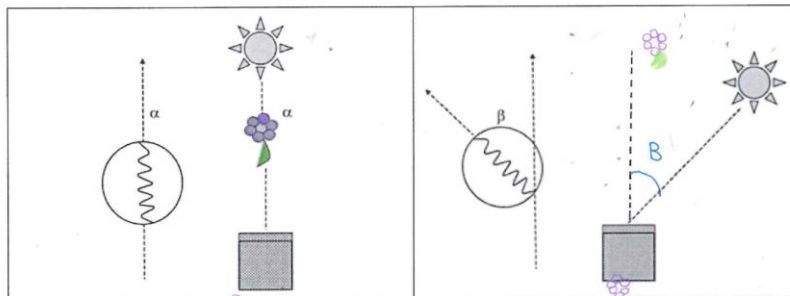
1. Distance 距離 of food: (only in waggle dance)



Farther from the hive

Closer from the hive

2. Direction 方向 of food: (only in waggle dance)



Induction  
感應



Communication  
溝通



Bee dance  
蜜蜂舞蹈



Bee robot  
蜜蜂仿生

Imitate the bee dance through LEGO robots.

## Mission one

- Assemble and beautify the bee robot.
- The score will be based on the correct assembly and creativity.





Induction  
感應



Communication  
溝通

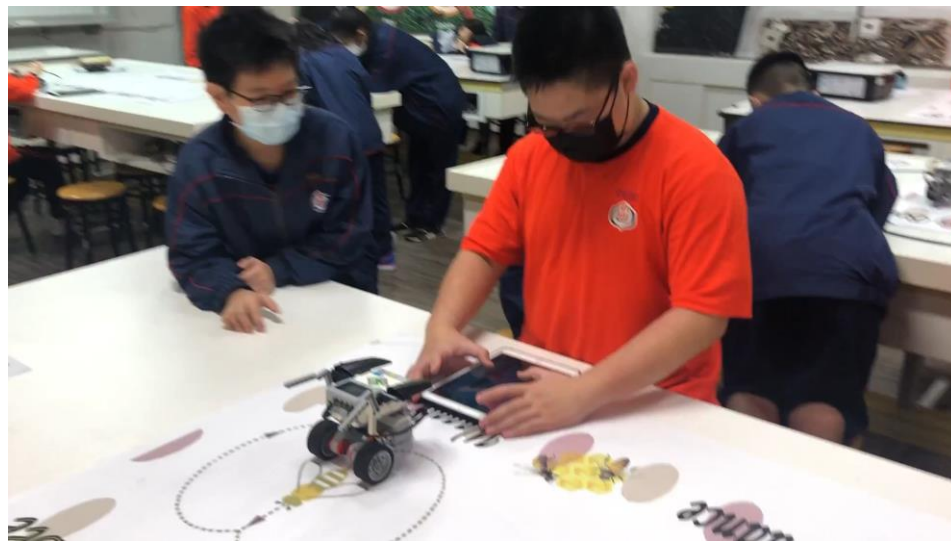


Bee dance  
蜜蜂舞蹈



Bee robot  
蜜蜂仿生

Imitate the bee dance through LEGO robots.





Induction  
感應



Communication  
溝通

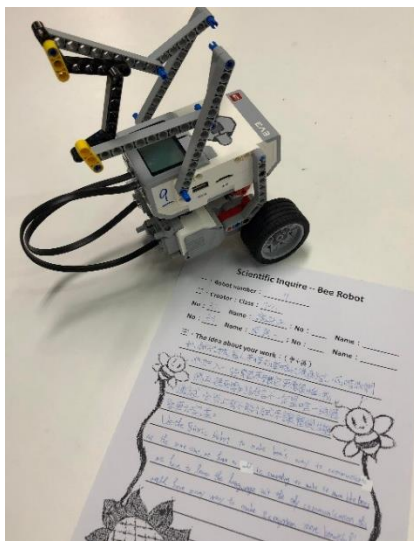
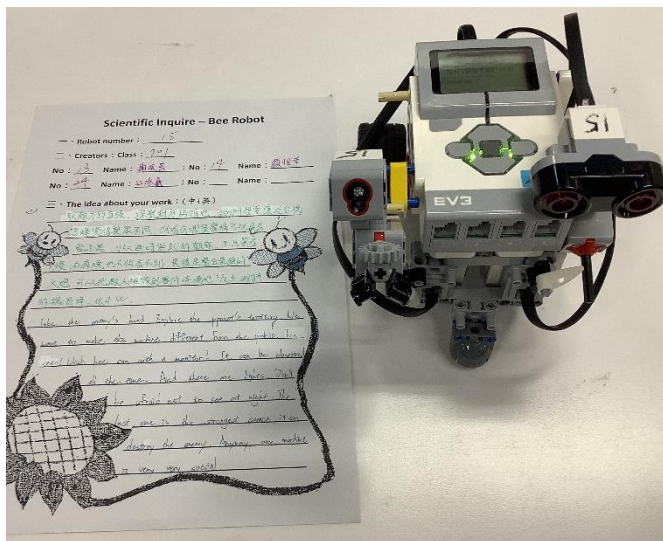


Bee dance  
蜜蜂舞蹈



Bee robot  
蜜蜂仿生

Beautify the robot , write the worksheet and share their work .



Bee experience  
蜜蜂體驗



Human & bee  
人類與蜂



Honey plant  
蜜源植物

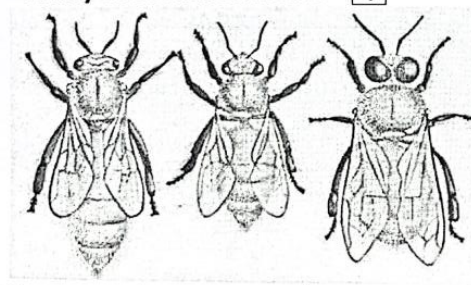


CCD  
蜜蜂迷航

Observe the honey bees by observation box.



三、Honey Bee Social Structure Q2



Queen	Worker	Drone
蜂王	工蜂	雄蜂

Fill in the blanks based on the following words:

Drone / Queen / Worker

蜂王 / 工蜂 / 雄蜂

Bee experience  
蜜蜂體驗

Human & bee  
人類與蜂

Honey plant  
蜜源植物

CCD  
蜜蜂迷航

Observe the honey bees by observation box.

四、What's the difference between the three types of honey bees? Q3

Fill in the blanks based on the following words:

provide sperms / fatter / long abdomen / lay eggs / large compound eyes / build and clean hive / collect food / only one / hundreds / with sting / tens of thousands / no sting / take care of larvae

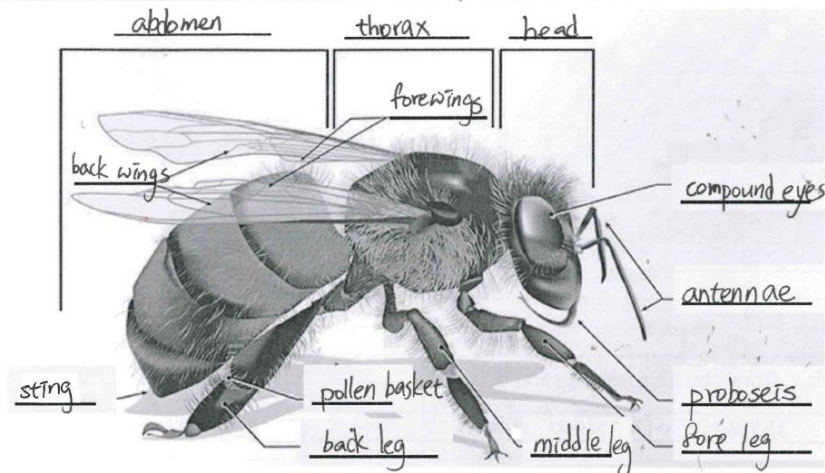


Type	Queen	Worker	Drone
Gender	female/ male	female/ male	female /male
How many in a hive	only one	tens of thousands	hundreds
What they do	lay eggs (2,000 eggs a day)	build and clean hive, collect food, take care of larvae	provide sperms
Feature	long abdomen	with sting	fatter, large compound eyes no sting

七、Honey bee body parts Q5 ✓

Fill in the blanks based on the following words:

head/ backwings / pollen basket / middleleg / foreleg / compound eyes/ backleg / sting / forewings / thorax / proboscis / antennae / abdomen





Bee experience  
蜜蜂體驗



Human & bee  
人類與蜂



Honey plant  
蜜源植物



CCD  
蜜蜂迷航

Observe the honey bees by observation box.

八、Insects Life Cycles Q6

Type	Holometabolous 完全變態	Hemimetabolous 不完全變態
Picture	<p>Egg</p> <p>Larvae</p> <p>Pupa</p> <p>Adult</p>	<p>Egg</p> <p>Young Nymph</p> <p>Later Nymph</p> <p>Adult</p>

十、Draw the hive you observed. Q8

shape is : \_\_\_\_\_





Bee experience  
蜜蜂體驗

Human & bee  
人類與蜂

Honey plant  
蜜源植物

CCD  
蜜蜂迷航

Understand the importance of bees to humans,  
and learn how to deal with bee stings in the wild.



Why bees are so important to human? (At least three reasons) Q1

因為：富有經濟價值。蜂蜜 Honey → 顧客林 80% 蜂 → \$ 顧客 Honey  
而且：人類的食物 1/3 為開花植物，約 80% 需蜜蜂授粉。  
所以：可以穩定生態系。 OK!

One-third of the world's crops are pollinated by bees.

Honey



Beeswax



Pollen



Bee experience  
蜜蜂體驗



Human & bee  
人類與蜂



Honey plant  
蜜源植物



CCD  
蜜蜂迷航

Learn how to plant basil and  
know the importance of honey plants.



9th grade-plant cutting 扦插



7th、8th grades- plant seeding 播種



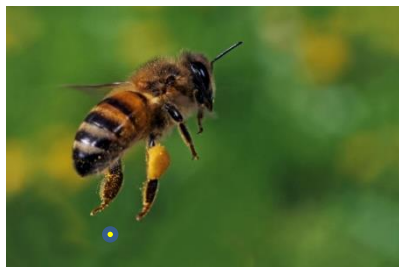
CCD  
蜜蜂迷航

Organic farming  
有機農業

TAP  
產銷履歷

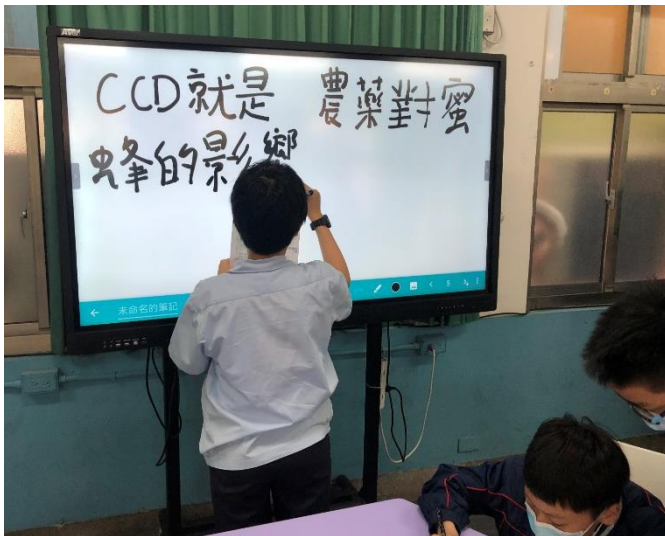
School lunch  
營養午餐

Explore the impact of colony collapse disorder(CCD) on bee ecology.



I'm lost

Q1 What is CCD?



Q5 What can we do after the CCD event?



CCD  
蜜蜂迷航



Organic farming  
有機農業



TAP  
產銷履歷

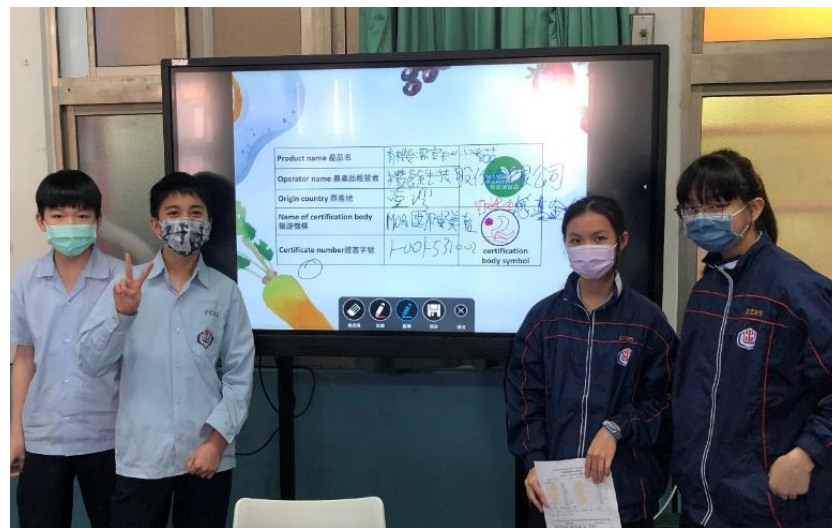
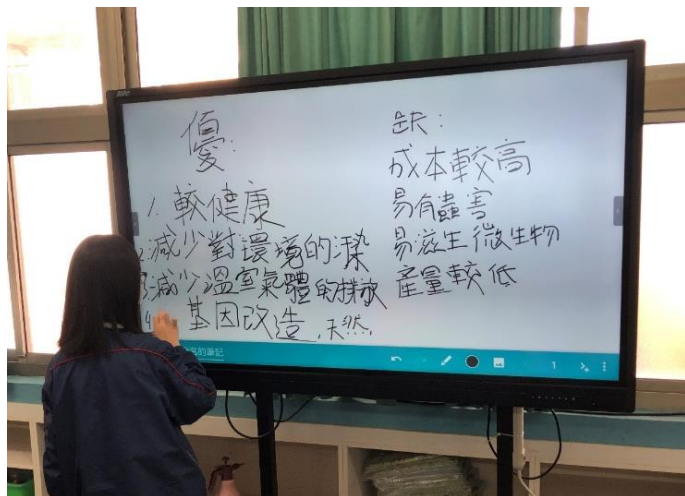


School lunch  
營養午餐

Learn about organic farming and the organic symbol

Describe the pros and cons of organic farming.

Go to the supermarket, search and share one organic product.





CCD  
蜜蜂迷航



Organic farming  
有機農業

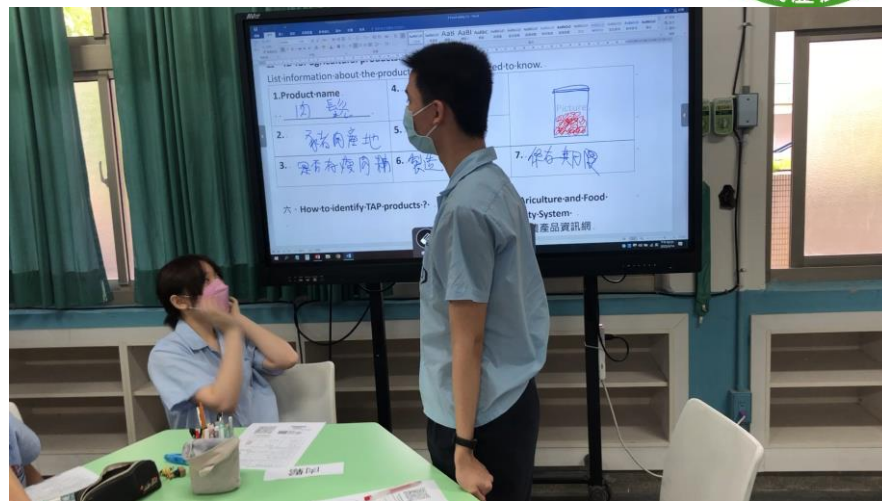
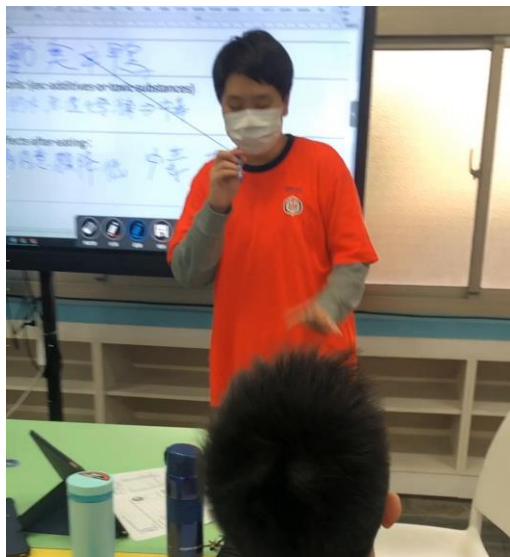


TAP  
產銷履歷



School lunch  
營養午餐

Learn about food safety incidents in Taiwan  
and Traceable Agricultural Products (TAP) 產銷履歷



CCD  
蜜蜂迷航

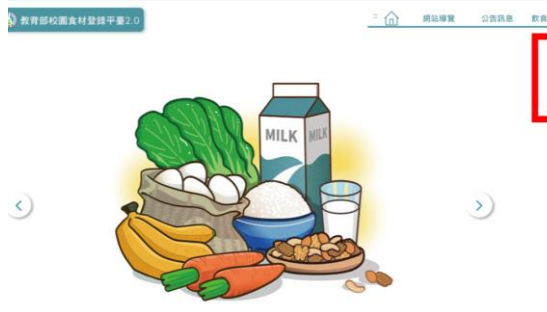
Organic farming  
有機農業

TAP  
產銷履歷

School lunch  
營養午餐

Learn about school lunches and ingredients.

Go to the platform to search ingredients. Play the kahoot about school lunches.



19

What's the price of our school lunch?



▲ \$ 50 a day

◆ \$ 55 a day

● \$ 60 a day

■ \$ 65 a day





*END*

*Thanks for listening*