Empowering Hong Kong STEM Secondary Students' Reading Abilities through a School-based Reciprocal Reading Programme and An Online Learning Platform

City University of Hong Kong, Department of English
&
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Tutorial 4: Strategy 2, Self-Questioning

Student handout

Introduction

- What is self-questioning?
- Surface versus under-the-surface questions
- Practice: Self-questioning as you read

I. Warming up

What is self-questioning?

Self-questioning is a typical reading strategy for the reader to engage with a text by asking themselves questions as they read. This strategy of generating questions before, while and after reading can help focus your attention as a reader on the major issues arising from a text through activating and reflecting upon your prior knowledge and evaluating the new information you obtain from the text. Self-questioning is an effective reading strategy for you to realise what you truly know and do not know about a text.

While the predicting skills you learnt in the previous lesson is also a kind of self-questioning, in this lesson you will learn to raise *not only surface questions but also under-the-surface and critical questions* to meet more complex reading demands.

Reading "on the surface","under the surface" and "in a critical stance"

Read the following text about some research findings concerning the plastic waste in the ocean. Work in pairs to judge whether the six statements below the text describe something you can easily spot on the surface of the text, whether they raise issues that are not directly stated in the text, or you have to develop a critical stance on the scientific text. Put a tick in the spaces provided to indicate your judgement. You will be invited to give reasons verbally to justify your answers.

> The scientists saw the most plastics inside the gyres (i.e., circular patterns of ocean currents), as expected. Most particles were between 1 and 4 mm (roughly the width and length of an ant). The largest amount of plastic waste (by weight), however, was composed of particles with a diameter of 200 mm (roughly the size of a volleyball). The North Pacific gyre had the highest estimate of plastic and the Indian Ocean had the next highest. The total estimate of plastics across all five gyres was 5.25 trillion particles and 270,000 tons (or the combined weight of 54,000 elephants). [1]

[1] Eriksen, M., Lebreton, L., Carson, H., Thiel, M., Moore, C., Borerro, J.,…Reisser, J. (2015). Where did my plastic go? *Science Journal for Kids*. https://www.sciencejournalforkids.org/articles/where-did-my-plastic-go/

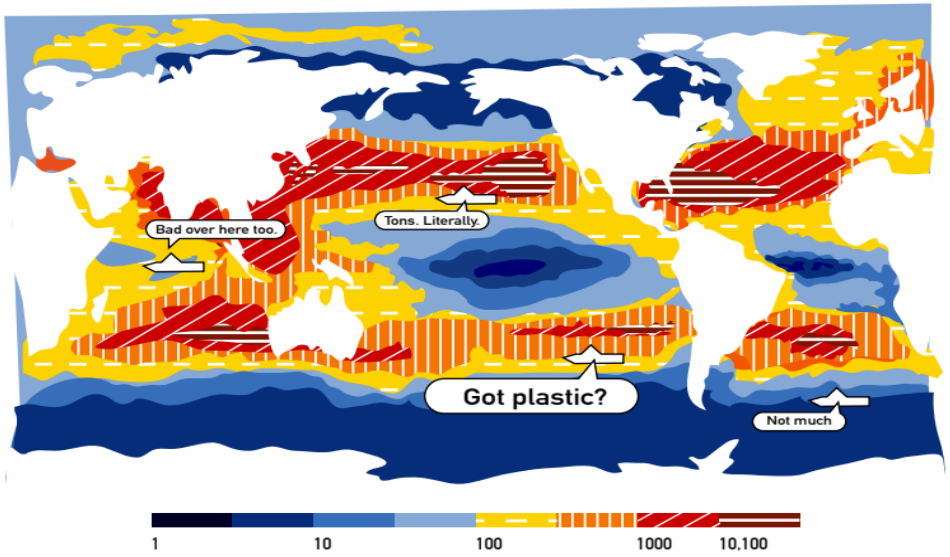


Figure 2. Distribution of plastic waste around the world's oceans. Dark blue means that the scientists only found 1 gram of plastic per kilometer-squared. (This is like 1 small lego block per 150 soccer fields.) Stripy dark red means they found up to 20 pounds of plastic in the same area. (This is like 4 toddler bikes per 150 soccer fields.)

Statement	On-the-surface information	Under-the-surface information	Critical stance
1. The largest amount of plastic waste concentrates in the North Pacific gyre and the Indian Ocean.			
2. Most of the plastic waste in the ocean is very small and hardly visible.			
3. The plastic waste pollution in the ocean is a very serious global problem.			
4. The plastic waste problem may be underestimated as the scientists only measured the surface of the water but not deeper waters.			

5. There may be a considerable amount of unmeasured plastic waste eaten by wildlife.			
6. The text does not report on the method to measure the amount of plastic waste.			
7. The text does not report the identity of scientists and where the data comes from.			

II. Self-questioning: Surface questions VS Under-the-surface questions VS Critical questions

Exercise 1: Watch the clip from the short film *Pip* (https://youtu.be/07d2dXHYb94). Brainstorm and write down two *surface* questions, two *under-the-surface* questions, and two critical questions based on what you understand and do not fully understand about the clip. Then work in pairs and invite your partner to try answering your questions. Discuss the answers you disagree on and report one disagreement to the class.

***Key concepts**

What are *surface* versus *under-the-surface* questions versus *critical* questions?

Surface questions	Under-the-surface questions	Critical Questions
✔ Can be answered with information in the text ✔ Include basic details, descriptions, or background information ✔ Who, what, where, when, how	✔ Must look beyond the manifest details and read between the lines to understand and evaluate complex ideas ✔ Use what we know from the text to	✔ Hold a scientific belief to read the text ✔ Question the scientific evidence and methods to support the argument

	✓ make inferences about a bigger picture ✓ Why, how, should, could, would	✓ Explain how our scientific knowledge develops over time ✓ Must, why, how, what
Examples **Who** travels to space for long missions? **What** are foodborne pathogens? **Where** is it difficult to grow fresh food? **When** do astronauts eat processed food? **How** might astronauts get sick eating fresh foods?	**Examples** **Why** are micronutrients more important for astronauts compared to someone on Earth? **How** is living in space different from that on Earth? **Should** the government spend money researching how to grow fresh food in space? **Could** astronauts find other ways to stay healthy without fresh foods? **Would** astronauts' experiences change if they ate more fresh foods? **Raising under-the-surface questions can help improve your critical thinking!*	**Examples** **Must** our knowledge about the possibility of living on the Earth stay the same? **Why** shouldn't we believe everything scientists say about processed food? **How** do scientists test the safety of processed food? **What** evidence do scientists use to support the safety of processed food?

	My questions	**My partner's answers**
Surface questions	**1.** **2.**	**1.** **2.**
Under-the-surface questions	**1.** **2.**	**1.** **2.**

Critical questions	**1.** **2.**	**1.** **2.**

III: Self-questioning with texts: Strategies, steps, and sharing

Strategies:	1. What to underline in the text: ● Key vocabulary ● New information or unfamiliar concepts ● Cited sources (i.e., What expert opinions are cited in the text? Are their ideas the same or different?) 2. Identify, evaluate and reflect on: ● Scientific concepts ● Cited sources and research findings ● People or things affected by the problem ● Certainty and source of scientific knowledge 3. Brainstorm: ● Are there any other concepts, ideas or phenomena which are similar to those mentioned in the text? ● Are there any solutions to the problem? ● What else do you want to know? ● Where do these concepts come from? ● What are the methods and evidence used to arrive at these findings? ● Can we be certain about the evidence in the text? ● Will the findings change in the future?
Steps:	1. *Find* key details (e.g., vocabulary, new information or unfamiliar concepts, cited sources) 2. Write *surface* questions that describe the research. 3. *Evaluate, reflect and brainstorm* (e.g., research findings, similar concepts, solutions, what else to be known) 4. Write *under-the-surface* questions that demonstrate your inference on the text 5. Ask critical questions that show your scientific belief on the text
Sharing:	Share your predictions with the group:

	1. Ask the surface questions. Let the group members answer the questions. 2. Ask the under-the-surface questions. Discuss and debate everyone's ideas. 3. Ask critical questions. Discuss and debate everyone's ideas.

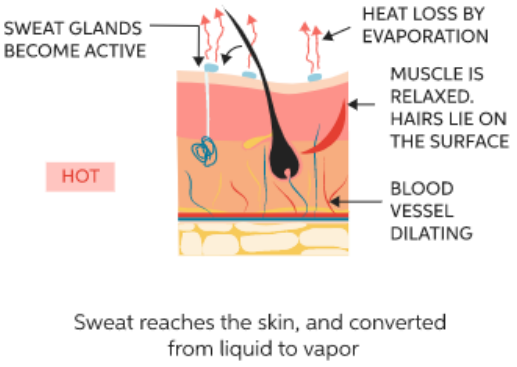
Exercise 2: As a class, complete the *strategies, steps,* and *sharing* components for the text below.

How heat kills: The human body is good at cooling itself off — but only up to a point[2]

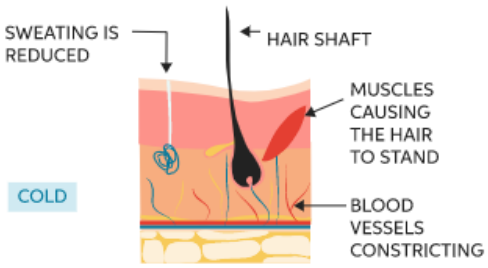
[1] The human body cannot handle **excessive** heat. If someone's core body temperature goes higher than 36° or 37° Celsius (96.8° to 98.6° Fahrenheit), health problems may arise.

[2] Jonathan Samet, the dean of the Colorado School of Public Health in the United States, works to help people stay safe during the summer months. Samet explains that when the body is too hot it needs to cool down. This process is called thermoregulation, which **regulates** the temperature of the body through the skin, blood vessels, body hair, and sweat glands.

[3] In hot temperatures the body uses thermoregulation to cool down. First, the blood vessels in the skin **dilate**, or expand. At the same time, the heart begins **beating** faster. That pushes blood flow to the skin. Then, the blood can **release** heat to cool down. **Meanwhile**, the body sweats to cool down the skin.



[4] When people experience high temperatures again and again, their bodies can get better at regulating excess heat. That explains why someone can move from cold countries, like Russia, to hot countries, like Thailand, and **adjust** to the hot or humid temperatures.



[5] However, there is a limit to *how much* the body can adjust. That limit depends on an individual's health, age, and the temperature or **humidity** outside. If the outside temperature is higher than that of the body, blood at the skin will not release heat. If the humidity levels are too high, sweating will not cool the skin. That is because the sweat cannot evaporate.

[6] These processes involve "heat convection". Heat convection occurs when heat from the body is transferred to cooler air outside. Heat convection is an important physical process because it stops the body from overheating and helps the body during thermoregulation. Therefore, if the air outside is too hot or humid, the heat from the human body cannot be transferred.[3]

[7] In 2008, two scientists suggested that humans cannot cool off well if they spend extended time at a wet-bulb temperature over 35° C, or 95° F. Wet-bulb temperatures are measurements that combine heat, humidity and other factors.

[8] If the body has to keep dealing with heat without a break, it will be worn out. People can experience **heat exhaustion**, which causes weakness, dizziness, confusion, and nausea. This **signals** that the body's ability to regulate heat has broken down. This can allow core body temperature to climb as high as 40° C (104° F). Without treatment, death may follow.

[3] Sokolova, I. (2019). Temperature regulation. In B. Fath (Ed.), *Encyclopedia of Ecology* (2 ed., pp. 633-639).

[9] No one is immune to heat, but it hits some groups harder than others. The elderly are considered the most vulnerable because they have fewer sweat glands. However, their bodies also respond more slowly to rising temperatures. Children, too, are at risk because they have not fully developed the ability to regulate heat. Pregnant women may also struggle because of the demands that the fetus puts on the body.

[10] People with **chronic diseases** such as diabetes, heart disease, and obesity also can have trouble cooling their bodies. Moreover, people living in **poverty** often lack air conditioning and other resources to help them cool off.

[11] Many people see heat as more of an annoyance than a threat; but climate change, extreme heat and human health are all connected. As Earth's temperatures climb, extreme heat waves will probably become more common and endanger more people.

Strategies	☑

Strategy 1: Did you underline…	**Key vocabulary**	
	New information or unfamiliar concepts	
	Cited sources	
Strategy 2: Did you identify, evaluate and reflect on…	**Scientific concepts**	
	Cited sources and research findings	
	People or things affected by the problem	
	Certainty and source of knowledge	
Strategy 3: Did you brainstorm…	**Other similar concepts, ideas or phenomena**	
	Solutions to the problem	
	What else do you want to know?	
	● Where do these concepts come from?	

	Do you know the methods and evidence that **are used to** arrive at these findings?	
	Can we be certain about the evidence in the text?	
	Will the finding**s** in the text change in the future? **What if…?**	

Steps	
Step 1: Key details	**Vocabulary** ● ● ●
	New information or unfamiliar concepts ● ● ●
	Cited sources ● ● ●
Step 2: Write *surface* questions	**1.** **2.** **3.** **4.** **5.**

Step 3:
Evaluate, Reflect and Brainstorm

Step 4: Write *under-the-surface* questions	**1.** **2.** **3.**

Step 5: Ask critical questions	1. 2. 3.

IV: Discuss and debate

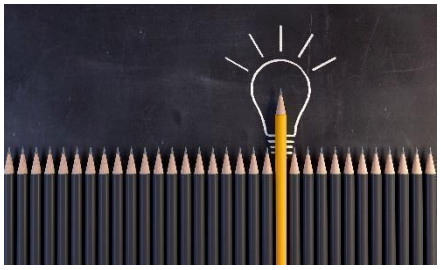
Work in pairs and choose the BEST under-the-surface question from what you and your partner wrote. Write the best question on the paper slip given to you and put it in the lucky draw box. As a class, we will do a lucky draw to choose one question for the in-class debate. The class will be divided into two teams, i.e., the proposition side and the opposition side. Use what you wrote in the previous section and the table below to help you debate.

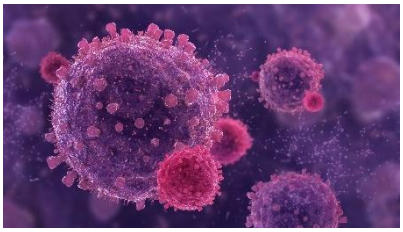
Debate Question:

Proposition Side	**Opposition Side**
Group members:	Group members:
Your Main Argument:	Your Main Argument:
Your Support & Evidence:	Your Support & Evidence:

Rebuttal (Your disagreement with the other team and why):	Rebuttal (Your disagreement with the other team and why):

Glossary

Inference  n. a fact that you decide is true because of the information that you have 推斷	**Release**  v. to stop holding something or stop it from being held so that it can move, fly, fall, etc. freely 釋出
Excessive  adj. greater than what seems reasonable or appropriate 過度	**Adjust**  v. to change something slightly to make it more suitable for a new set of conditions or to make it work better 適應

Regulate  v. to control something by means of rules 調控	**Humidity**  n. conditions in which the air is wet and very warm 濕度
Dilate  v. to become larger, wider or more open 膨脹	**Heat exhaustion**  an illness that happens when you are very active in hot conditions and that makes you feel very weak and sick 虛脫
Heartbeat  n. the movement or sound of the heart 心跳	**Signals**  n. a movement or sound that you make to give somebody information, instructions, a warning, etc. 暗號
Chronic disease  a disease lasting for a long time 慢性病	**Poverty**  n. the state of being poor 貧窮

Mind map summary of this lesson: