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 1: What is STEM reading? Part One

Student's handout

Introduction

- Types of STEM texts
- Languages in different types of STEM texts

Section 1: Introduction to STEM texts

I. Warming up: What is STEM?

What does STEM stand for?

_____ _____ _____ _____

Speed writing (1 min): List *fields* in STEM based on what you have learnt in related school subjects

_____ _____ _____

_____ _____ _____

_____ _____ _____

_____ _____ _____

_____ _____ _____

II. Think-pair-share

Before reading the text, think about why a sky lantern flies to the sky.

III. Group Discussion

Text 1: Flying tea bag

This experiment can show why a sky lantern flies to the sky, using the tea bag as a model.

1. First, conduct this experiment on a metal or stone surface. Make sure that you have enough space above the surface for the tea bag to float up and extinguish itself.
2. Next, open the tea bags, and carefully unfold them.
3. Then, empty out the tea leaves into a small bowl, and save them for use in other ways if you like. Tea leaves make great garden compost!
4. Afterwards, hollow out the center of the tea bags with your fingers, and stand them up on end on the solid metal or stone surface.
5. Following the above, with a match, quickly light the top tip of each standing tea bag.
6. Lastly, watch as the tea bag burns to the bottom, and then quickly floats up into the sky.

Video: https://youtu.be/iWaJoHVZEfo

Source: https://www.weareteachers.com/7th-grade-science-projects/

Read the above text. Think about the following questions:

1. Have you seen sky lanterns in other places before? How do they look like?
2. What are key vocabulary items in this text? Circle three nouns and three verbs.
3. What is the main idea of this text?
4. Does this text **report information**, **provide explanations**, **describe experimental procedures**, or **argue for a standpoint**? Please find some examples from the text.

IV. Types of STEM texts

	1. What is it?	2. What language?
Reporting Information	Information about the world	Verbs: *is, has* Does not use many connectives E.g., Sky lantern *is* a small-scale hot air balloon made from paper and a bamboo or wire frame, which *has* an open bottom where a candle is suspended.
Providing explanations	Causes <-> Effects	Connectives indicating causal relations: *so, therefore, because* Verbs: *causes, results in, leads to* *Note that there may be single or multiple causes/effects of a phenomenon. E.g., The sky lantern can float and fly *because* the candle fire *causes* the hot air to expand and become lighter than the cold air, *therefore* lifting the lantern up to the sky.
Describing experimental procedures	Procedures and results of experiments	Action verbs: *measure, obtain, watch, observe* Connectives: *first, next, then* E.g., In this experiment, the velocity of the sky lantern will *first be measured*; *then* the impact of the lantern size on the velocity will also *be studied*.
Arguing for a standpoint	Claims <-> Evidence	Verbs: *believes, proposes, suggests, affirms, argues* Modal verb: *could* E.g., *It is believed that* the bigger the sky lantern is, the more air there is inside the lantern, the longer the lantern *could* float in the sky.

Exercise 2: Read the text as a class. (1) Underline the verbs and connectives in the research article abstract. (2) Identify what type of STEM text this abstract belongs to, and (3) write down the key idea of the article abstract.

Should we drink tap water?[1]

[1] Last week, in the city where you live, there was an intense debate about whether people should drink bottled or tap water. This debate followed a local television news broadcast claiming that tap water is not suitable for consumption.

[1] Baytelman, A., Iordanou, K., & Constantinou, C. P. (2020). Epistemic beliefs and prior knowledge as predictors of the construction of different types of arguments on socioscientific issues. *Journal of Research in Science Teaching, 57*(8), 1199-1227.

[2] Authorities and scientists from the government water laboratory argued that tap water is suitable for consumption and there is no danger in consuming it. They also affirmed that tap water costs a lot less than bottled water.

[3] Another group of health experts as well as importers and retailers of bottled water believed that the only safe drinking water is bottled water. Moreover, they argued that although it costs slightly more than tap water, its advantages are so numerous that it is worth buying.

(1) Underline the verbs and connectives in the research article abstract.

(2) Circle the type of STEM text that this research article abstract belongs to:
   (a) Reporting information
   (b) Providing explanations
   (c) Describing experimental procedures
   (d) Arguing for a standpoint

(3) Write down the key idea of STEM text:

Exercise 3: Re-read the text as a class. Underline the field, question, and hypothesis in the research article abstract. Write the field, question, and hypothesis in their appropriate forms.

1. Field (in the form of a noun phrase):

2. Question (in the form of a question):

3. Hypothesis (in the form of an *If …, …* conditional sentence):

V. STEM claim and evidence

What is the difference between claim and evidence?

Claim	Tap water is believed to be safe to drink.
Evidence	The Water Supplies Department constantly monitors water quality from the taps.

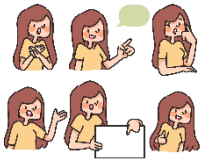
Claim + Evidence = Argument!

Group work: In small groups, write down five scientific claims and pieces of evidence based on what you have learnt in STEM subjects at school. The group that finishes the fastest wins. ALL team members must write the scientific claims and evidence on their worksheet.

Claim	Evidence
1.	
2.	
3.	
4.	
5.	

Double check: Are all your claims supported by evidence?
Choose a team leader. Read your answers to the class. Make an "X" next to any answer the class thinks the claim is not supported by a piece of evidence.

Glossary

1. Claim (n.) 聲稱 	6. Floats (v.) 飄起 
2. Evidence (n.) 證據 	7. consumption (n.) 消耗 
3. Explanation (n.) 解釋 	8. health expert (n.) 健康專家 
4. Argue (v.) 爭辯 	9. retailer (n.) 零售商 
5. Garden compost (n.) 花園肥料 	10. numerous (adj.) 很多