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
&
Quality Education Fund

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Tutorial 10: Reciprocal Reading 3, engineering-based texts

Student handout

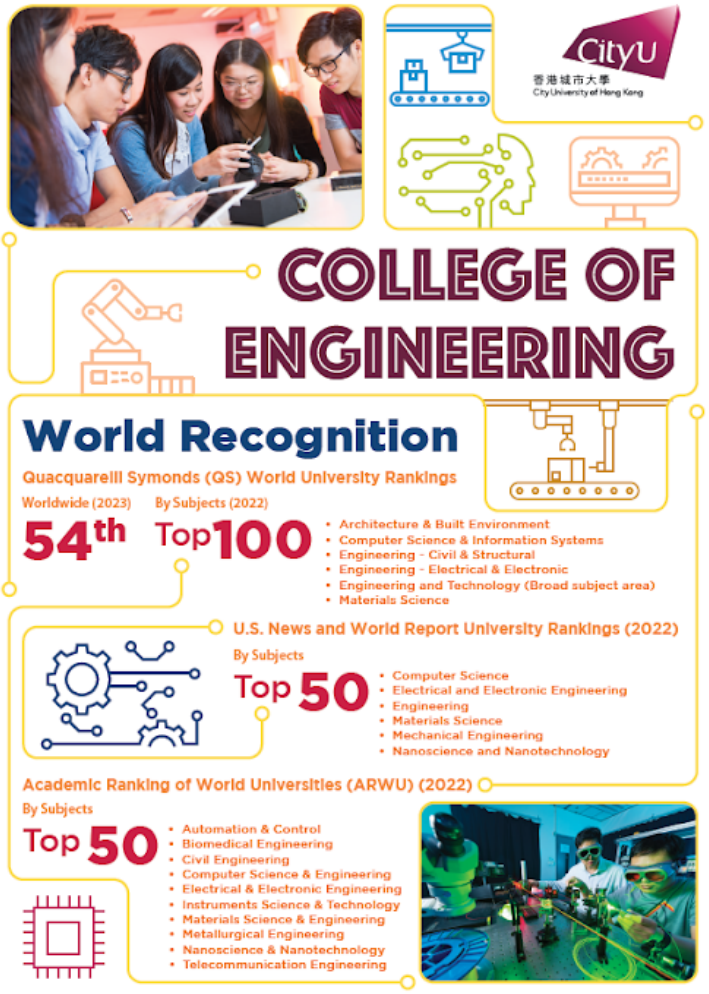
Introduction

- Practice: Reciprocal reading engineering-based texts
- Discuss the recent engineering technology
- Apply: Debate the pros and cons of waste management

Section 1: Reciprocal reading: Engineering-based text

I. Warming up

Study the following poster from the College of Engineering, the City University of Hong Kong. Which engineering subject(s) mentioned in the poster have you or have you not heard of? What do you think these engineering subjects share in common that enlightens your understanding of the meaning of the word "engineering"?



[1]

II. Practise reciprocal reading in an engineering-based text

Exercise 1: Below are two texts from different fields and contexts in engineering. Read the texts as a class. Follow the teacher's instructions to complete the reciprocal reading roles in groups of five.

Instructions:

1. Each student in each group will take up a reciprocal reading role.
2. Within each group, all group members spend 15 minutes in total to complete their reciprocal reading role duties.
3. Each group takes turns to present their discussion results to the entire class.
4. Teachers will give feedback on students' discussion results and comment on whether the five roles in each group are well performed.

The five reciprocal reading roles:

Five roles that correspond to the five reading strategies	**Duties in the role**
Student 1: Predictors (Predicting)	You should make predictions about the text content (i.e., the main ideas and problems discussed) before reading based on the title, headings, and pictures.
Student 2: Questioners (Self-questioning)	You should raise questions (i.e., surface questions and under-the-surface questions) that can help you and group members to understand the gist of the text.
Student 3: Clarifiers (Clarifying)	You should identify confusing parts such as unfamiliar words or phrases that you and your group members do not understand and explain their meanings and usage in the text.
Student 4: Interpreters (Interpreting cohesive ties)	You should identify the relationships between the sentences or paragraphs that are connected by signal or linking words and figure out the deeper meanings and bigger picture.
Student 5: Summarizer (Summarizing)	You should identify the main ideas of each section of the text and make a summary of the text.

[1]

Useful Language for Role Presentations	
Role	**Language**
Predictor	• "This text is about…." • "The main problem is…." • "The researchers will find out…."
Questioner	• Surface questions: Who, what, when, where • Under-the-surface questions: Why, how, should
Clarifier	• "The word __x__ means __y__" • "In the text, __x__ explains/shows…." • "Is there anything that needs to be clarified?"
Interpreter	• "The two linking words __x__ and __y__ show that…." • "Therefore, the bigger picture is…."

Summarizer	• Use the summary writing structure and write in complete sentences
	• Use information from the other roles to enrich the content
	• Ask your teammates to help:
	  ○ "Do you agree that the main idea is…?"
	  ○ "Do you agree that the problem is…?"
	  ○ "What are the research details?"
	  ○ "What findings should we include?"

Text 1

Food-inspired, high-sensitivity piezoresistive graphene hydrogels[2]

I. Introduction

[1] Exercise science is the study of how the body responds to physical activities. Intense exercise may have both positive and negative effects on the body. On the positive side, it can improve cardiovascular health, increase muscle strength and endurance, and boost mental health. However, intense exercise can also cause muscle damage and inflammation, as well as an increased risk of injury. To sustain intense

[2] Adapted from: Aljarid, A. A. K., Doty, K. L., Wei, C., Salvage, J. P., & Boland, C. S. (2023, February 6). Food-inspired, high-sensitivity piezoresistive graphene hydrogels. *ACS Sustainable Chemistry & Engineering*, *11*(5), 1820-1827. https://doi.org/10.1021/acssuschemeng.2c06101

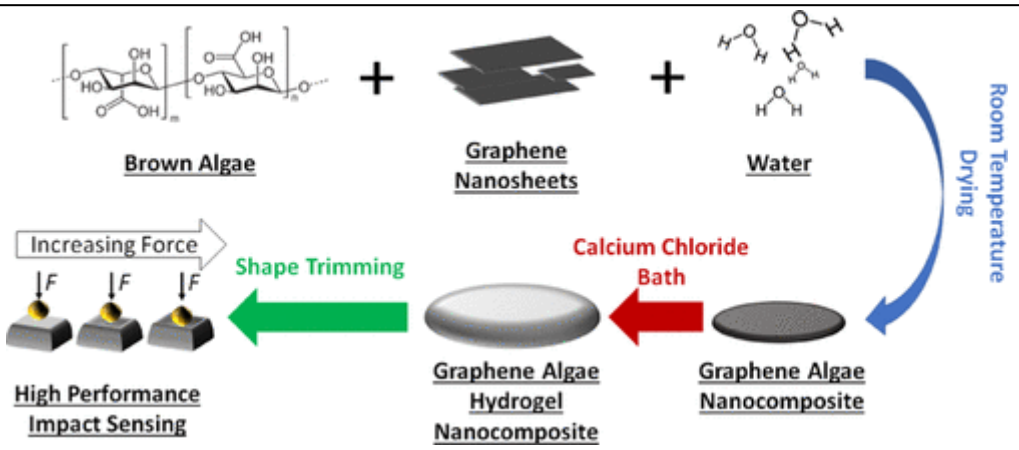
exercise, proper nutrition is essential. A balanced diet that includes sufficient protein, carbohydrates, and healthy fats can help provide the energy needed for exercise and promote muscle recovery.

[2] Biodegradable technology is a type of technology that breaks down an organic matter naturally over time. In healthcare, there are a number of biodegradable materials and products that are used to reduce waste and minimize the impact of medical procedures on the environment. Examples of biodegradable materials in healthcare include surgical sutures made from natural fibers such as silk and collagen, and implants made from biodegradable polymers such as polylactic acid. Biodegradable technology is important for people who exercise because it can help reduce the overall impact of their activities on the environment.

[3] By understanding the effects of intense exercise on the body and ensuring proper nutrition, people can maximize the benefits of physical activity while minimizing the risks. Similarly, by using biodegradable technology, we can help reduce waste and promote sustainable practices that benefit not only ourselves, but also future generations. The present study developed biodegradable health sensors to monitor runners' vital signs, such as heart rate and temperature.

II. Methods

[4] Health monitors were created using natural materials, such as seaweed, salt, and water. These natural products made the devices safe to consume and are completely biodegradable. This means that the devices were environmentally friendly and did not pose health risks to the runners compared to products like plastics that pollute water sources as they degrade. Seaweed was used as an insulator to sustain electric conductivity within the monitor. When the monitor is soaked in salt water, it produces an electrically conductive hydrogel.



III. Results

[5] The sustainable seaweed monitors outperformed existing wearable health monitors. The seaweed monitors were more sensitive, meaning they more accurately recorded the runners' vital signs.

IV. Discussion

[6] The seaweed monitor outperforms those used in previous health monitors since it is more sensitive and responsive to runners' vital signs than currently used health monitors. The seaweed monitor is lightweight, cheaply produced, and effective. Therefore, it may be used in other areas of healthcare and exercise science and may reduce the impact of global pollution.

Text 2

Robotic mental well-being coaches for the workplace[3]

I. Introduction

[1] Burnout is a common problem in many workplaces and is often caused by a variety of stressors. The demanding nature of today's work environment, combined with long hours and little control over one's work, can leave people feeling emotionally exhausted and overwhelmed. It is important for employers to recognize the signs of burnout and take steps to promote employee wellbeing.

[2] Humanoid robots are becoming increasingly popular in research, and researchers

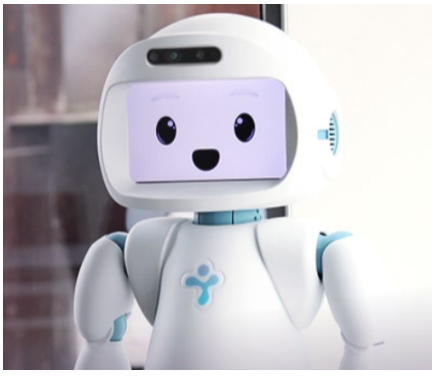
[3] Spitale, M., Axelsson, M., & Gunes, H. (2023, March). Robotic mental well-being coaches for the workplace. *2023 ACM/IEEE International Conference on Human-Robot Interaction*, 301-310. .https://dl.acm.org/doi/10.1145/3568162.3577003

are exploring ways to incorporate realistic facial expressions into their designs. The ability to create realistic facial expressions is essential for humanoid robots to be able to communicate effectively with humans, as facial expressions play a critical role in nonverbal communication. As technology continues to advance, robots will likely become more prevalent in the workplace, and it will be important for people to learn how to effectively interact with them in a way that is mutually beneficial. The present study tested two robots' abilities to increase employees' wellbeing in the workplace.

II. Methods

[3] The present study investigated the effectiveness of two different types of robotic wellbeing coaches in the workplace. Two different robots named QT robot and Misty robot coached 26 workplace employees for a period of four weeks. The robots were programmed to coach the employees using wellbeing exercises once a week. Wellbeing exercises included journaling gratitude or meditation. The two robots had different coaching personalities and different facial expressions. The QT robot was a childlike humanoid robot and was 90 cm tall. The Misty robot was a toy-like robot and only 36 cm tall. The two robots had screen faces to show different facial expressions.

QT robot



Misty robot

III. Results

[4] The employees preferred the Misty robot and were more positive towards the Misty robot than the QT robot. This result can be explained by the "form function attribution bias." This is a cognitive bias that occurs when an individual believes that a device will perform poorly based on how it looks. Since the Misty robot is toy-like, the participants might have assumed that it would perform poorly. However, when the Misty robot

performed well, they were surprised by its abilities and responded more positively. As a result, participants were more interested in learning more about Misty's facial expressions and characteristics compared to the QT robot's.

IV. Discussion

[5] Robots such as the Misty robot are excellent additions to the stressful workplace environment. These robots may help employees when they experience stress and may help prevent burnout.

Complete the following tables during your group discussions on Texts 1 and 2:

Text 1	
Role	**For Note-taking**
Student 1: Predictors (Predicting)	
Student 2: Questioners (Self-questioning)	
Student 3: Clarifiers (Clarifying)	
Student 4: Interpreters (Interpreting cohesive ties)	

Student 5: Summarizer (Summarizing)	

Text 2	
Role	**For Note-taking**
Student 1: Predictors (Predicting)	
Student 2: Questioners (Self-questioning)	
Student 3: Clarifiers (Clarifying)	
Student 4: Interpreters (Interpreting cohesive ties)	

Student 5: Summarizer (Summarizing)	

III. Apply epistemic criteria in understanding the development of SpaceX's Starship

Exercise 2. Read the text from *Scientific American*. Answer the following questions.

SpaceX's Starship and NASA's SLS Could Supercharge Space Science

Starship, by its design, can be refueled by other Starship vehicles in Earth orbit. This means it could, hypothetically, carry a huge amount of mass around the solar system. "You could get a 100-ton object to the surface of Europa," SpaceX's CEO Elon Musk said in a public meeting of the National Academies in November 2021. That is a five times greater performance than the very best the NASA's Space Launch System (SLS) can offer, even in its final configuration with a kick stage. Starship is also forecast to be significantly cheaper, although whether it can hit Musk's optimistic projection of less than $10 million per launch remains to be seen. "If they get anywhere near that cost, it's kind of an analogue to a 747 and a shipping container all in one," says Robin Hague, former head of launch at the U.K. launch company Skyrora. "That's going to be used throughout the solar system."

With 1,000 cubic meters of usable volume, Starship is also big enough to fit the entire Eiffel Tower, disassembled (though not powerful enough to lift it into orbit). This gargantuan capability led Heldmann and her colleagues to publish a paper on what sort of equipment Starship could carry to the lunar or Martian surface. "Refilling Starship in orbit effectively resets the rocket equation, allowing for large payloads to be transported to the Moon and Mars," they wrote, a reference to the fact that the more mass you want to launch, traditionally, the more thrust you need on an exponential scale. Starship is not limited to these destinations, though. "It is not fine-tuned to either the moon or Mars," says Margarita Marinova, a former senior Mars development engineer at SpaceX. "The goal for Starship is to create this more generic, larger-scale exploration capability."

Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
I am certain about the idea in the text.	1	2	3	4	5
The claim about SpaceX's starship needs to be justified by evidence in text.	1	2	3	4	5
The claims about SpaceX's starship in text cannot be challenged.	1	2	3	4	5
The claims about SpaceX's starship in text won't change in the future.	1	2	3	4	5

Exercise 3: Answer the question with reference to the text of *SpaceX's Starship and NASA's SLS Could Supercharge Space Science*.

Write three advantages of Space X's starship mentioned in the text
1.
2.
3.

Exercise 4: The class will be divided into two teams to debate the pros and cons of waste management in Hong Kong. Watch two videos (1) https://www.youtube.com/watch?v=P-oghJtZ-e4 and (2) https://www.youtube.com/watch?v=r-q5V6LDxEY&t=1s before the debate, and then you will be given 10 minutes to brainstorm ideas to support your proposition/opposition arguments. During the debate, write down the respective arguments, reasons and evidence presented by the proposition and opposition teams.

Jot notes while watching the videos and write down your ideas while brainstorming:

Your team is a propositional / oppositional team.

Proposition Team	Opposition Team
Argument 1:	**Argument 1:**

Reason: Evidence/Example:	Reason: Evidence/Example:
Argument 2: Reason: Evidence/Example:	**Argument 2:** Reason: Evidence/Example:
Rebuttal: Reason: Evidence/Example:	**Rebuttal:** Reason: Evidence/Example:

Exercise 5: Read the following text from *Scientific American*. Fill in these questions again. Does your belief on information change? Can you talk to your peers about why your belief has changed or not?

SpaceX's Starship and NASA's SLS Could Supercharge Space Science

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significantly cheaper, although whether it can hit Musk's optimistic projection of less than $10 million per launch remains to be seen. "If they get anywhere near that cost, it's kind of an analogue to a 747 and a shipping container all in one," says Robin Hague, former head of launch at the U.K. launch company Skyrora. "That's going to be used throughout the solar system."

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