

Professional Development Programme:
**Enriching and Extending Students' Learning Experiences through Reading and Writing across the Curriculum at the
Secondary Level**

Session 2

Dr Simon Chan

Organised by the INSTEP, Faculty of Education, The University of Hong Kong
and
commissioned by the Education Bureau, The Government of the HKSAR

Science is one of the 8 Key Learning Areas (KLAs) of the HK school curriculum

Learning to Learn 2+ — The Hong Kong School Curriculum

A broad and balanced curriculum with diversification and specialisations (choices) for academic, professional and vocational development according to students' needs

Nurturing lifelong & self-directed learning capabilities

Fostering whole-person development

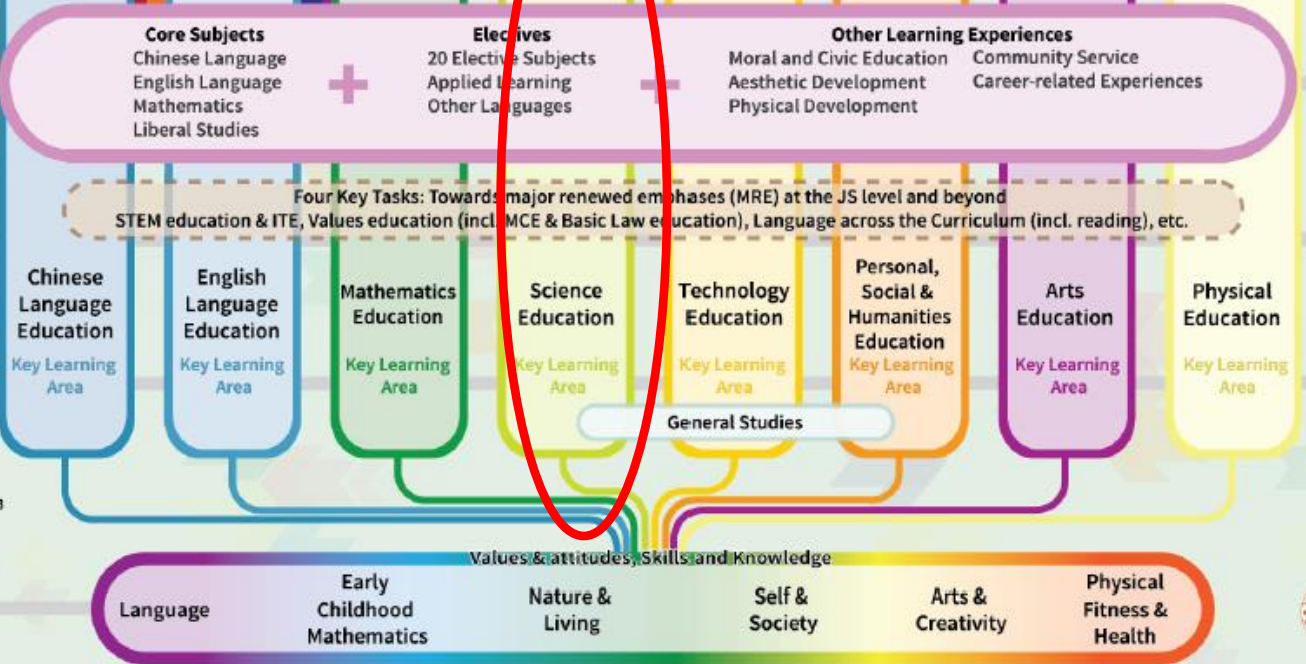
Multiple pathways

SEVEN LEARNING GOALS

FIVE ESSENTIAL LEARNING EXPERIENCES

Moral and Civic Education Intellectual Development Community Service Physical and Aesthetic Development Career-related Experiences

Secondary 4-6
SS
 Secondary 1-3
JS
 Primary 1-6
P
 Kindergarten 1-3
KG



- Values & attitudes
- Seven priority values
- Perseverance
 - Respect for Others
 - Responsibility
 - National Identity
 - Commitment
 - Integrity
 - Care for Others
- Generic skills
- Basic Skills
- Communication Skills
 - Mathematical Skills
 - IT Skills
- Thinking Skills
- Critical Thinking Skills
 - Creativity
 - Problem Solving Skills
- Personal & Social Skills
- Self-management Skills
 - Self-learning Skills
 - Collaboration Skills



▶ **Direction**

- ▶ The emphasis of science education is to enhance students' scientific thinking through progressive learning activities that involve planning, measuring, observing, analysing data, designing and evaluation procedures, and examining evidence. Learning science will enable our students to lead a fulfilling and responsible life by encouraging them to **learn independently, deal with new situations, reason critically, think creatively, make wise decisions and solve problems.**
- ▶ Through science activities, students should develop an interest in science and thus they will be motivated to become active learners in science. Students should also develop an understanding of science, technology and society (STS). **They should be able to make informed decisions based on evidence.**
- ▶ Students with high ability or a strong interest in science need more challenging learning programmes. These programmes should stretch the students' science capabilities and offer opportunities for students to develop their potential to the full.

(from: <http://www.edb.gov.hk/en/curriculum-development/kla/science-edu/index.html>)

Science Education

Science education provides learning experiences for students to develop scientific literacy with a firm foundation in science, realise the relationship between science, technology, engineering and mathematics, master the integration and application of knowledge and skills within and across KLA's, and develop positive values and attitudes for personal development and for contributing to a scientific and technological world.

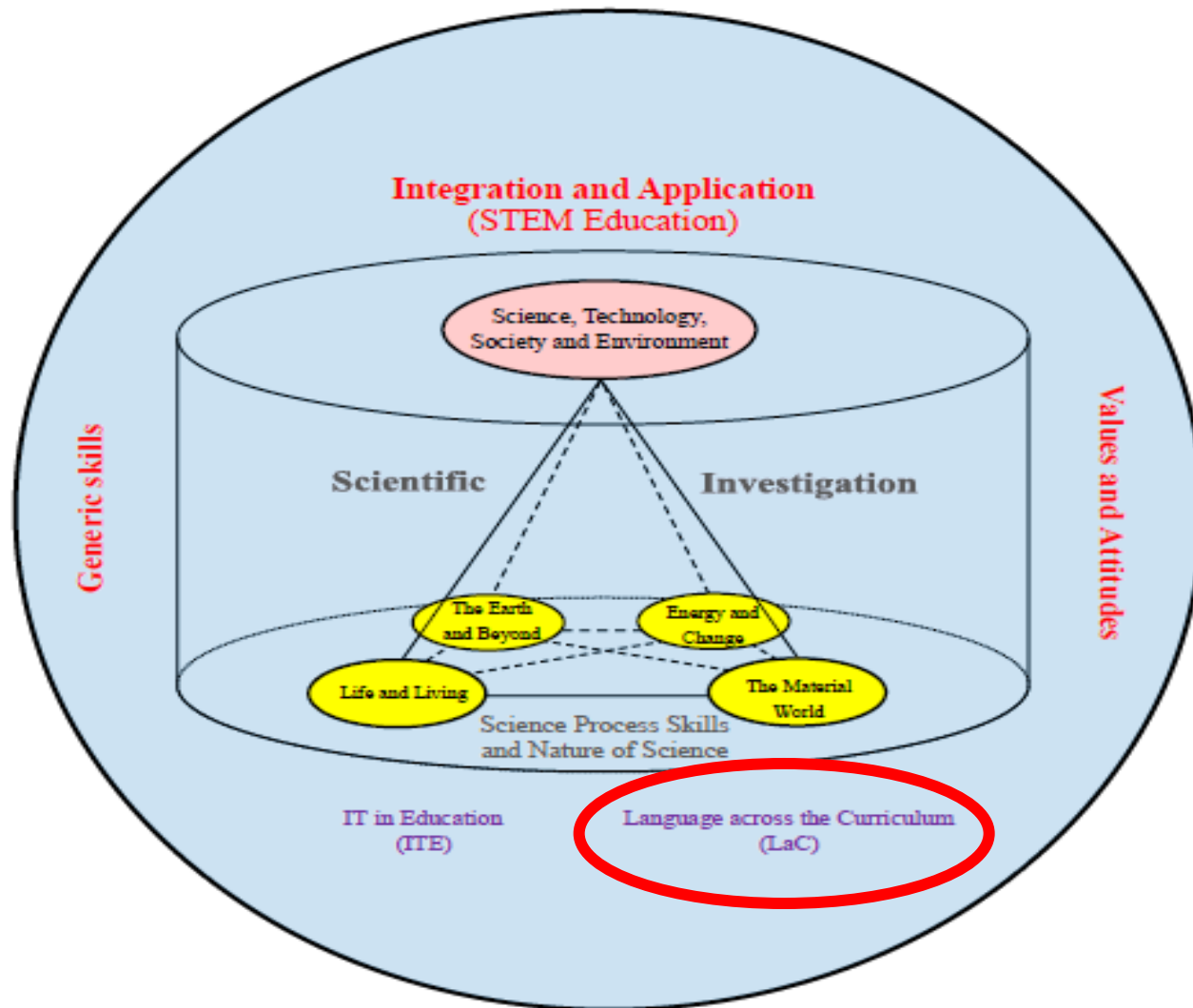


Figure 2.1 Diagrammatic Representation of the Science Education Curriculum Framework

Learning targets for students at the junior secondary level (Key Stage 3, Secondary 1 - 3) are to:

- develop curiosity and interest in science and appreciate the wonder of nature and the technological world;
- acquire basic scientific knowledge and concepts for living in and contributing to a scientific and technological world;
- develop science process skills to define problems, plan and design investigations to find solutions, conduct practical work, analyse and interpret the results, and present the findings;
- apply scientific knowledge, science process skills and relevant generic skills, to solve some daily life problems;
- use basic science language to communicate;
- recognise the relationship between science, technology, society and the environment, and develop an attitude for responsible citizenship;
- recognise the usefulness and limitations of science and the evolutionary nature of scientific knowledge;
- apply their understanding of science to maintain personal health and develop an awareness of safety issues in everyday life, understand the reasons behind, and take proper actions to avoid accidents and reduce risks; and
- consider the effects of human activities on the environment and act sensibly for sustainable development of the environment.

Let's
explore
the
nature
of
Science
language
in this
session.

Learning targets for students at the senior secondary level, (Key Stage 4, Secondary 4 - 6) are to:

- sustain and further develop the interest and curiosity in science, as well as appreciate the wonder of nature and the technological world;
- have an understanding of the essential scientific knowledge and technological developments for living in and contributing towards a scientific and technological world;
- be able to construct and apply knowledge of science and master the science process skills;
- be able to integrate and apply knowledge and skills of science with other STEM-related disciplines, and develop an entrepreneurial spirit with positive values and attitudes;
- have the ability to make inquiries about science by employing scientific methods and solve daily life problems with innovative solutions;
- use the language of science to communicate ideas and express views on science-related/STEM-related issues;
- make informed judgements and decisions based on scientific evidence, and take responsible actions on safety issues;
- understand and evaluate the social, ethical, economic, environmental and technological implications of science, and develop an attitude for responsible citizenship;
- understand the different aspects of the nature of science and their implications, and also the limitations of science and technology; and
- understand the effects of human activities on the environment and be committed to act responsibly for the sustainable development of the world.

Language demands in relating Science to everyday life:

- descriptions;
- comparing;
- stating reasons /consequences;
- giving instructions etc.

(cf. data-based questions in HKDSE in Science subjects)



c.f. One of the two overall aims of the English Language Education curriculum:

*“to enable every student to prepare for the changing socio-economic demands resulting from **advances in information technology**; these demands include the **interpretation, use and production of materials** for pleasure, study and work in the English medium”*

https://www.edb.gov.hk/attachment/en/curriculum-development/kla/eng-edu/Curriculum%20Document/ELE%20KLACG_2017.pdf

How is Science Education realised in schools?

	Subjects offered
Primary education	<ul style="list-style-type: none">• General Studies• Science
Junior secondary (S.1 - S.3)	<ul style="list-style-type: none">• Science (S1 - 3) (i.e. “<i>Science</i>”)
Senior secondary (S.4 - S.6)	<ul style="list-style-type: none">• Physics• Chemistry• Biology• Integrated Science• Combined Science

Let's focus on this

More details & curriculum documents: <http://www.edb.gov.hk/en/curriculum-development/kla/science-edu/curriculum-documents.html>

Brainstorming task:

- ▶ What are some characteristics of Science language/texts (e.g. as found in textbooks of Science subjects like Science, Physics, Chemistry, Biology)?

Language features of science texts (General)

▶ Technical terms/ subject specific terminology

e.g. molecule, polymer, polymerisation, superconductor, element, compound, chemical change, acid, alkali, mitochondria, chloroplasts

▶ Complicated noun phrases

e.g. “**The number of mitochondria in a particular cell** depends on the cell’s energy needs.”

e.g. “A vacuole is **a fluid-filled space within the cytoplasm, surrounded by a membrane called the tonoplast.**”

▶ Modality

▶ e.g. “However, many scientists think that the evidence is not conclusive. More studies **should** be done to find out the effects of using mobile phones on health.”

- Sentence structures/ patterns

- Use of conditional sentences

e.g. “**If** the disease is left untreated, the tooth may become loose and eventually fall off.”

- Use of the passive voice

e. g. “All nucleic acids **are built up** from similar repeating subunits called nucleotides.”

“Glycogen, starch, and cellulose are examples of polysaccharides. They **are made up of** glucose molecules joining in different patterns.”

- Use of relative clauses

e.g. “Enzymes are important proteins **that regulate almost all biochemical reactions that occur in cells.**”

Can you guess what the most common use of relative clauses in Science texts is?

▶ Text structures

- With some fixed structures/ frameworks of presenting ideas

e.g. Introduction → Illustration under different sub-headings (with paragraphs and topic sentences) → Conclusion

▶ Text Purposes

- To introduce/ define a term/ concept

e.g. to define photosynthesis

- To describe a phenomenon

e.g. to describe sexual production

- To explain the processes or development of something

e.g. to explain the water cycle

Difficulties our students face

1. Abstract & complicated concepts (content)
 2. Technical terms/ Vocabulary
 3. Complex noun phrase and sentence structures
 4. Different types of registers/ genres
- In both comprehension & production
- How can RWaC help alleviate these problems?



From Reading to Writing

Example 1



Level: KS3

Theme / Topic: Food as source of energy (S2 Science) ↔
Healthy eating (English)

Genre: information report → story (narrative)

Brainstorming

1. What kind of content support will be needed for this RWaC activity?
2. What kind of language support will be needed for this RWaC activity?
3. Do you know any other topics in Science that can also be used for prompting RWaC? What kind of support and resources will be needed for this type of collaboration between the two subjects?
4. Any ideas in using the activity to promote higher order thinking and/or positive values on the part of the students?
 - e.g. integrating information from different texts (c.f. texts in Paper 3 of HKDSE English Language)
 - e.g. comparing and contrasting perspectives
 - e.g. writing a moral at the end of the story

From Reading to Writing

Example 2



Level: junior secondary

Why script, but not a story?

Theme / Topic: Effects of drugs, alcohol and solvents on our senses (S3 Science) ↔ Teen problems (English)

Genre: explanation text → script

Text Grammar Challenge: Identify all examples of modal verbs used in Texts 1 & 2.
Can you explain their uses?

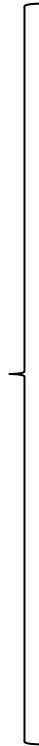
Discussion #2

1. What kind of content support will be needed for this RWaC activity?
 2. What kind of language support will be needed for this RWaC activity?
 3. Do you know any other topics in Science that can also be used for prompting RWaC? What kind of support and resources will be needed for this type of collaboration between the two subjects?
1. Shall we ask students to write a story? Or shall we ask our students to write a drama script and perform it? Which genre is more likely to promote students' creativity?

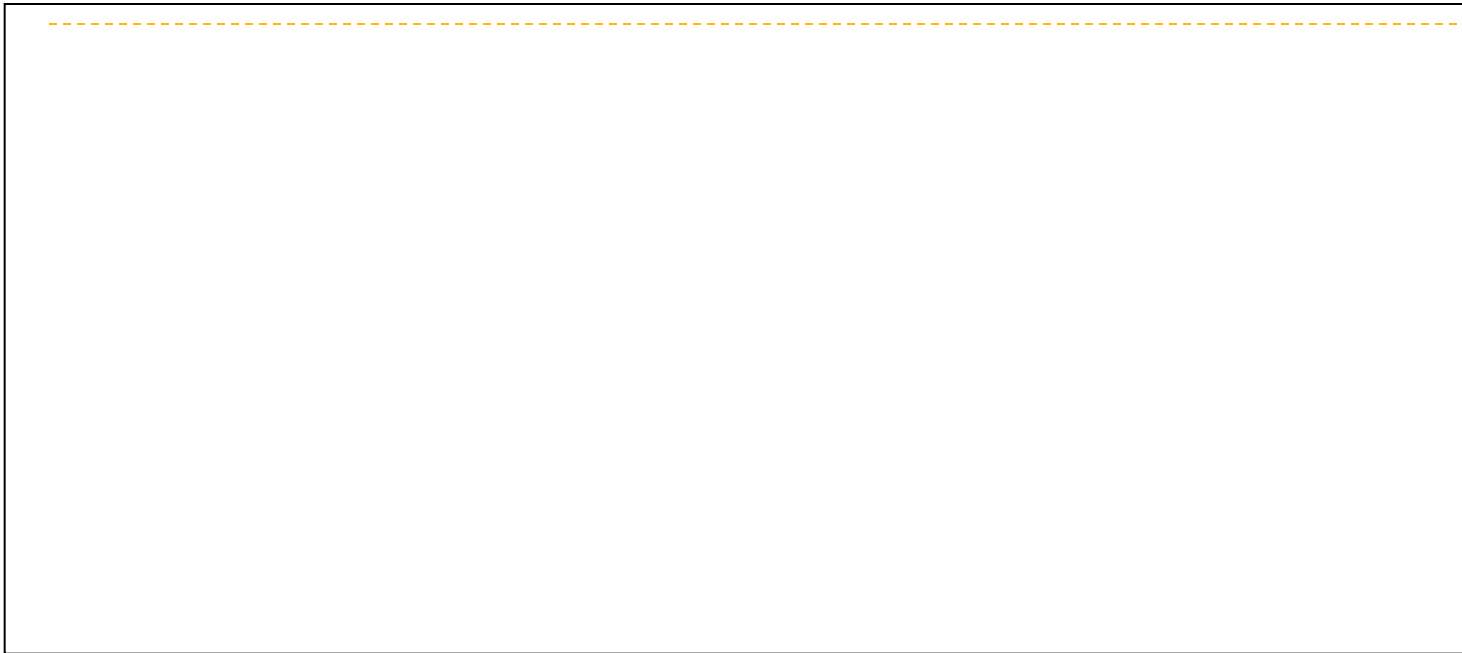
Another
example of
Science RWaC
tried out in
secondary
schools

How about the S. I
topic 'water cycle'?

Story writing
task with the
help of a
graphic
organiser
(example taken
from the
worksheet of a
local school)



Let's read some students' work ...



1. Mr Cheung is one of the rain.
2. He fall in the river.
3. When sun let the river be water vapour.
4. Mr Chueng is a cloud.
5. He fall in the river.
6. Then, the farmer drink the water,

How would you compare the two students' performance?
Any pedagogic implications for us as English teachers?



Overall reflection

- ▶ What do you think of the suggested activities?
- ▶ Have you identified any strategies / skills used?
- ▶ Do you think you can apply some of these strategies / skills? Why or why not?
- ▶ **How can we cater for learner diversity?**

Think from the teachers' perspective:

- What is the activity design?
- What is the purpose of the activity?
- Is there any visible pedagogy to be used with this activity? What do I have to be explicit?
- How to connect or apply this activity in my daily teaching?

Think from your students' perspective:

- What do my students have to do?
- Is this activity at the right level for my students?
- How will my students respond to this activity?

Overall reflection (cont'd)

- ▶ Additional resources: online, multimodal resources (e.g. video clips, online games, quizzes)

Questions:

- ▶ How can we make use of these multimodal resources?
- ▶ What are the demands (language demands + content demands) on students' understanding on the topic using these resources?
- ▶ Who are these multimodal resources suitable for?

Some other useful resources

<http://www.scienceandliteracy.org>

Congratulations! We've completed Part 1 of the workshop

- ▶ We'll proceed to **Session 3** next week.
- ▶ We'll examine two examples on RWaC in PSHE subjects.
- ▶ We'll also reflect on Sessions 1-3 and learn from each other!

Disclaimer

- ▶ The material developers and facilitators do not own the copyright of the text excerpts and videos used in this session.

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▶ Sources of texts

- ▶ Example 1 Text 1: “How does our body obtain energy”, *Longman Interactive Science* (2nd edition), 2A, pp. 26-33. Hong Kong: Longman.
- ▶ Example 1 Text 2: “Be a fit kid”, adopted from <http://kidshealth.org/en/kids/fit-kid.html?ref=search&WT.ac=msh-k-dtop-en-search-clk#>, retrieved on 25th January, 2018.
- ▶ Example 2 Text 1: “Effects of drugs, alcohol and solvents on our senses”, *Longman Interactive Science* (2nd edition), 2B, pp. 209-217. Hong Kong: Longman.
- ▶ Example 2 Text 2: “What you need to know about drugs”, adopted from <http://kidshealth.org/en/kids/know-drugs.html>, retrieved on 25th January, 2018.