

怎樣設計多元評估的科學科課？

--培養創意的學習和評估方法



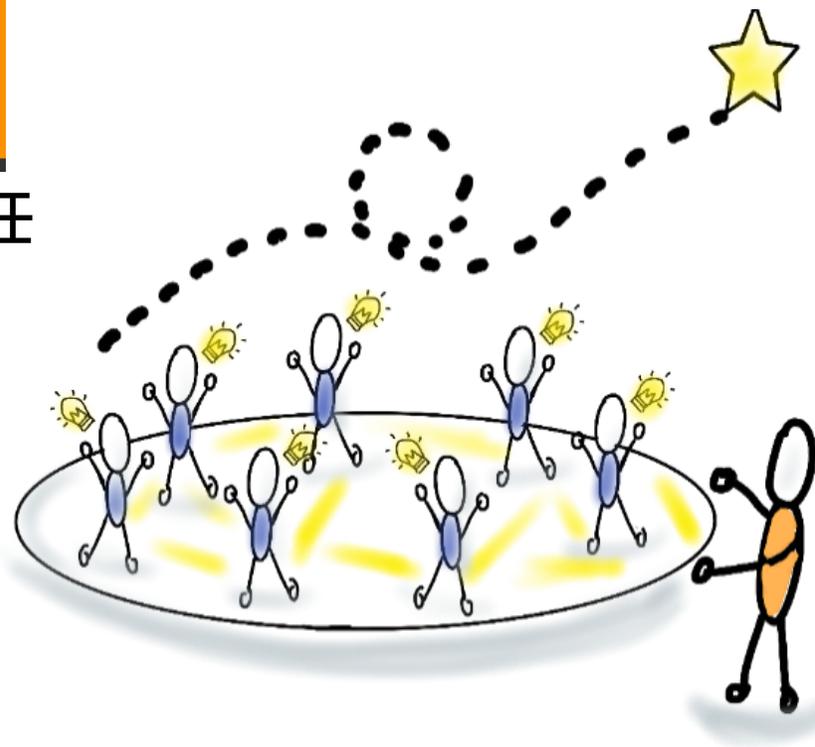
蕭煒炘老師

德蘭中學

理科及**STEM**/推廣電子學習統籌主任

香港翻轉教學協會

科學科召集人

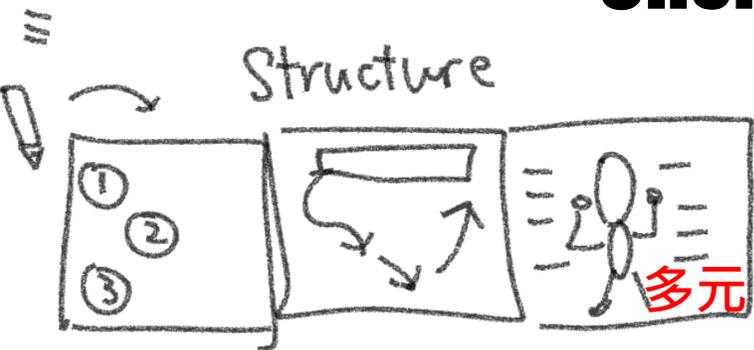


德蘭中學
St. Teresa Secondary School



FLiPEdu
- HONG KONG -

Science Chemistry



視覺化教學

**Making Learning
Visible**



*Teaching
is a work
of heart.*



自主學習

Motivating every students



翻轉+創新教學

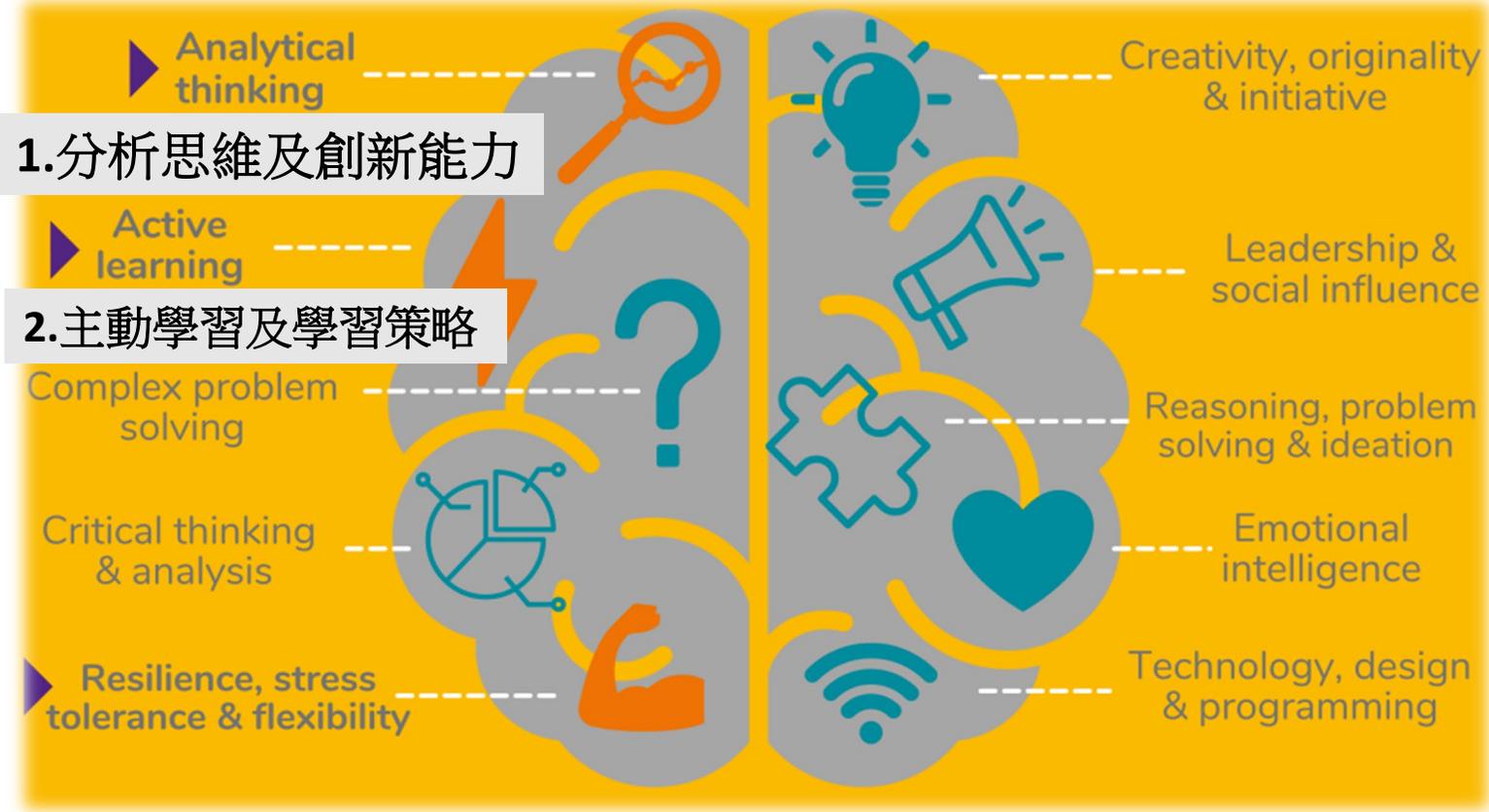
**Flipped Learning
+ Creative approach**

怎樣設計**多元**評估的科學科課？

--**培養創意**的學習和評估方法



According to a [recent World Economic Forum report](#), the **TOP skills in the lead-up to 2025** :



**2025年
最重要項人才技能
TOP Skills in
2025**



Fig.1
How has remote learning affected '21st century skills'? (2021). Retrieved 7 December 2021, from <https://www.cambridge.org/gb/education/blog/2021/05/20/how-has-remote-learning-affected-21st-century-skills/>

Top 10 skills of 2025

-  Analytical thinking and innovation
-  Active learning and learning strategies
-  Complex problem-solving
-  Critical thinking and analysis
-  Creativity, originality and initiative
-  Leadership and social influence
-  Technology use, monitoring and control
-  Technology design and programming
-  Resilience, stress tolerance and flexibility
-  Reasoning, problem-solving and ideation

- Type of skill**
-  Problem-solving
 -  Self-management
 -  Working with people
 -  Technology use and development

Advanced nations will expect these in future from human resources as the future supply chain skews toward regions south of Tropic of Cancer due to connectivity, leading to rate dilution and better bang for the dollar

in 2020

1. Complex Problem Solving
2. Critical Thinking
3. Creativity
4. People Management
5. Coordinating with Others
6. Emotional Intelligence
7. Judgment and Decision Making
8. Service Orientation
9. Negotiation
10. Cognitive Flexibility

in 2015

1. Complex Problem Solving
2. Coordinating with Others
3. People Management
4. Critical Thinking
5. Negotiation
6. Quality Control
7. Service Orientation
8. Judgment and Decision Making
9. Active Listening
10. Creativity

in 2030

1. Judgment & Decision Making
2. Fluency of ideas
3. Active Learning
4. Learning Strategies
5. Originality
6. System Evaluation
7. Deductive Reasoning
8. Complex Problem Solving
9. Systems Analysis
10. Monitoring

Your next job move could be easier (or more difficult) than you think --depending on self-development, skills you acquire and trainings you seek, other than "degree and years of experience"

in 2030

1. Judgment & Decision Making
2. Fluency of ideas
3. Active Learning
4. Learning Strategies
5. Originality
6. System Evaluation
7. Deductive Reasoning
8. Complex Problem Solving
9. Systems Analysis
10. Monitoring

TOP skills in the lead-up to 2025 :

1.分析思維及創新能力

Analytical thinking and innovation

2.主動學習及學習策略

Active Learning and Learning Strategies

TOP skills in the lead-up to 2030 :

1.判斷力及決策力

Judgement and Decision making

2.意念/思維流暢度

Fluency of ideas

3.主動學習

Active Learning

2022 Skills Outlook

Growing

- 1 Analytical thinking and innovation
- 2 Active learning and learning strategies
- 3 Creativity, originality and initiative
- 4 Technology design and programming
- 5 Critical thinking and analysis
- 6 Complex problem-solving
- 7 Leadership and social influence
- 8 Emotional intelligence
- 9 Reasoning, problem-solving and ideation
- 10 Systems analysis and evaluation

Declining

- 1 Manual dexterity, endurance and precision
- 2 Memory, verbal, auditory and spatial abilities
- 3 Management of financial, material resources
- 4 Technology installation and maintenance
- 5 Reading, writing, math and active listening
- 6 Management of personnel
- 7 Quality control and safety awareness
- 8 Coordination and time management
- 9 Visual, auditory and speech abilities
- 10 Technology use, monitoring and control

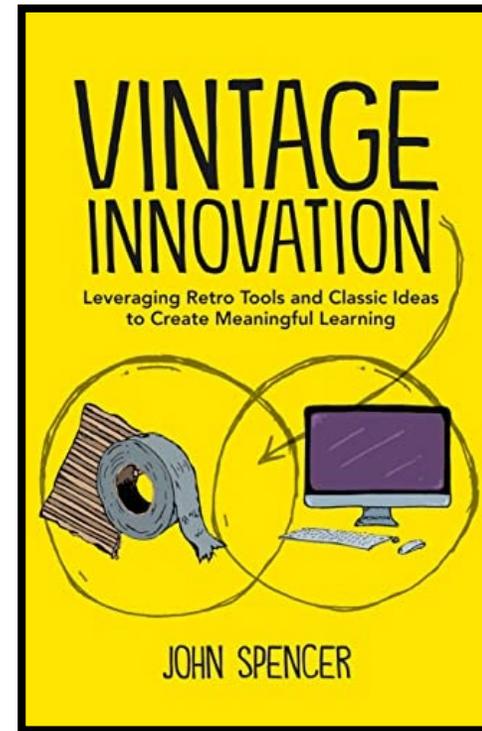
COMMITTED TO
IMPROVING THE STATE
OF THE WORLD

WORLD
ECONOMIC
FORUM

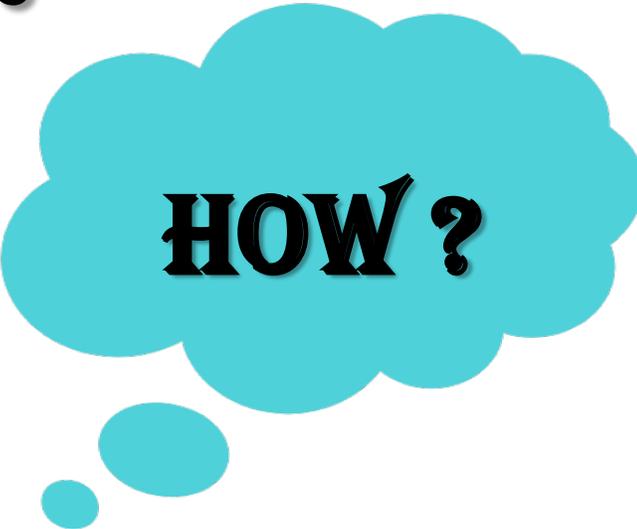
COMMITTED TO
IMPROVING THE STATE
OF THE WORLD

If we want to
prepare students
for the FUTURE,
we need to
empower them
in the PRESENT.

-John Spencer



EMPOWER?

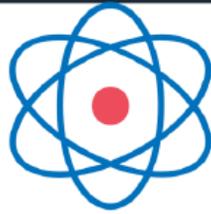


HOW?

理科老師
2023 vs 2003

推廣科學素養

Promoting Scientific Literacy in classroom



Science Process Skills

Nature of Science

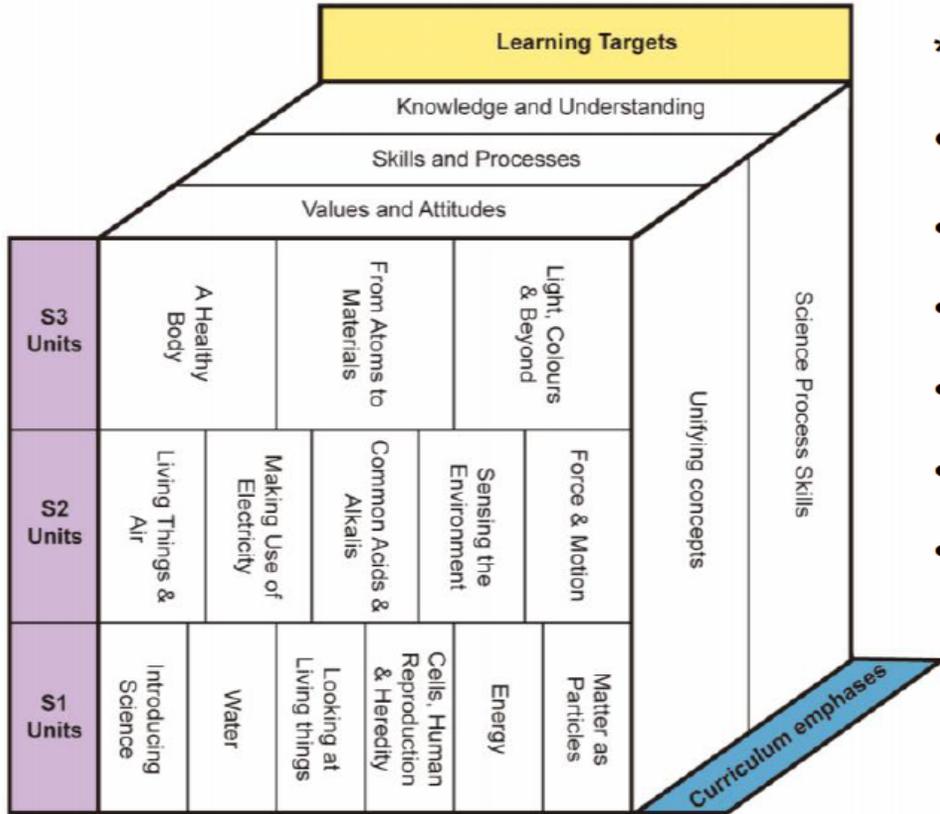
1. Science curriculum guide(EDB updated 2017)



Science Education

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

1.Science curriculum guide(updated 2017)

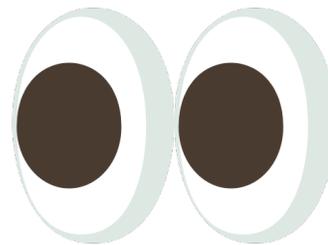


*Science Process Skills

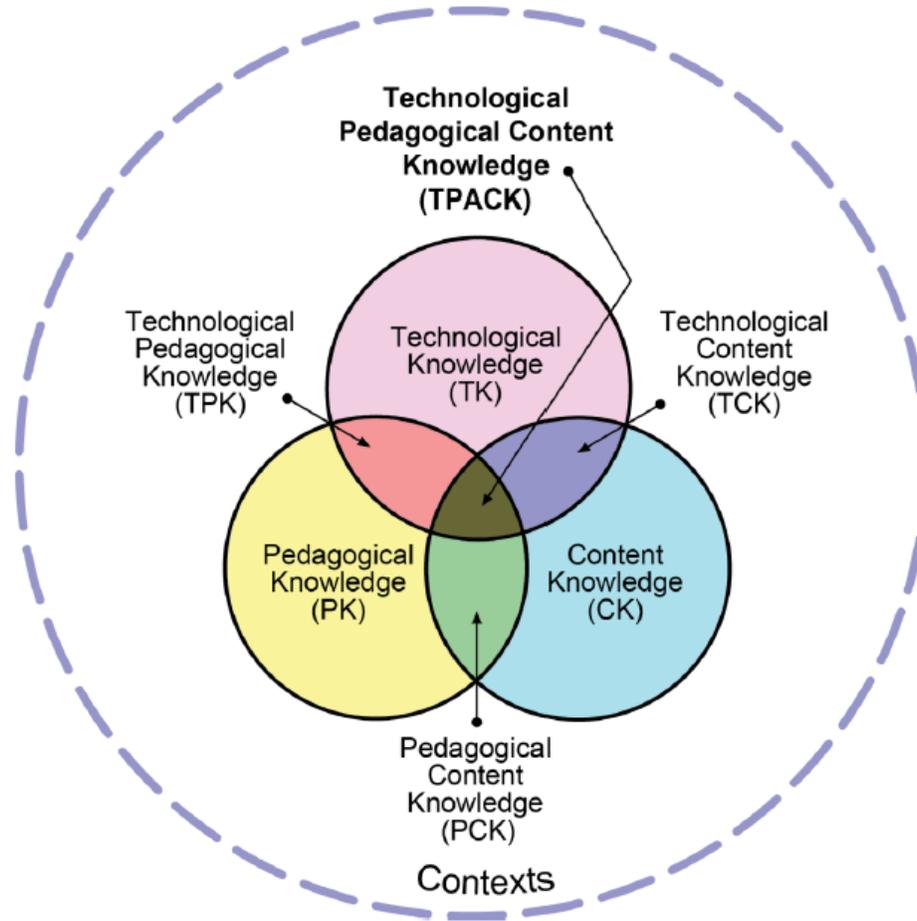
- Observing
- Classifying
- Designing investigations
- Conducting practical
- Inferring
- Communicating



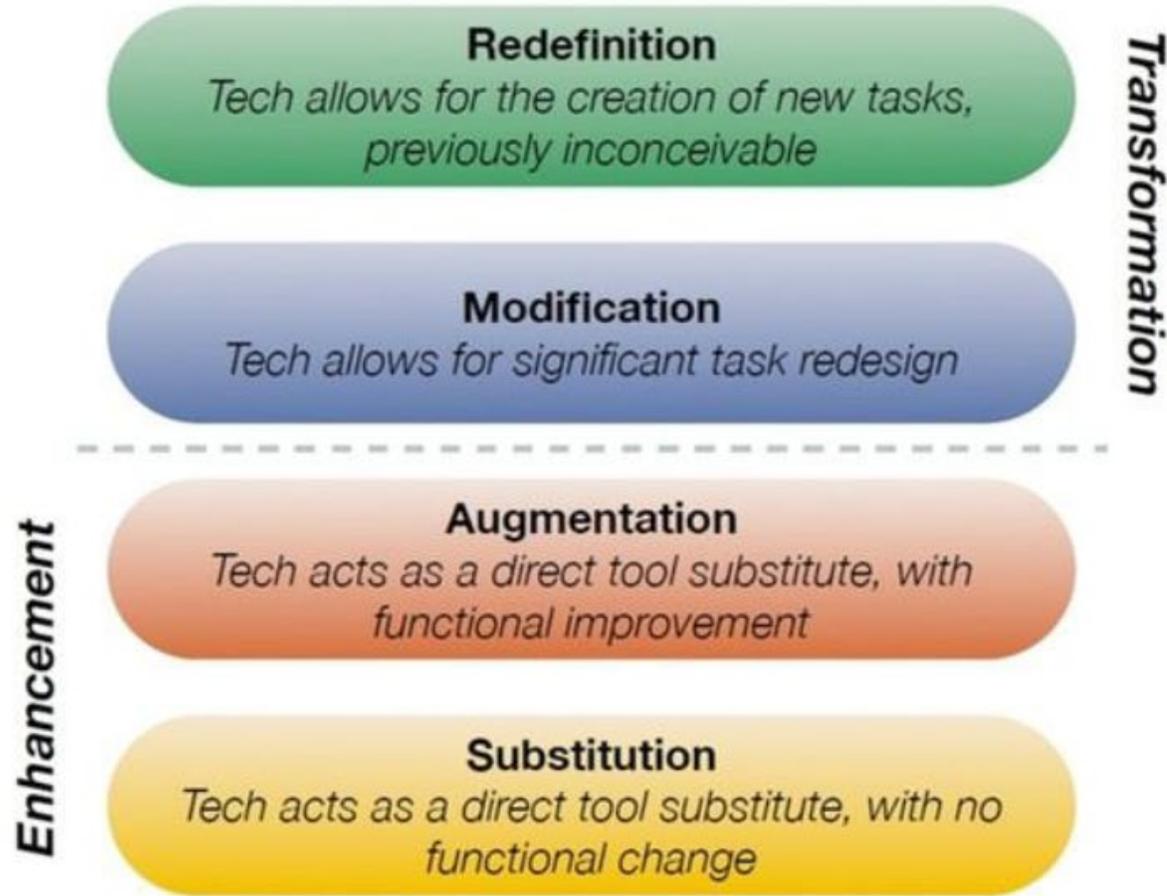
Figure 2 Diagrammatic Representation of the Science (S1-3) Curriculum Framework



2.TPACK and Science Teaching

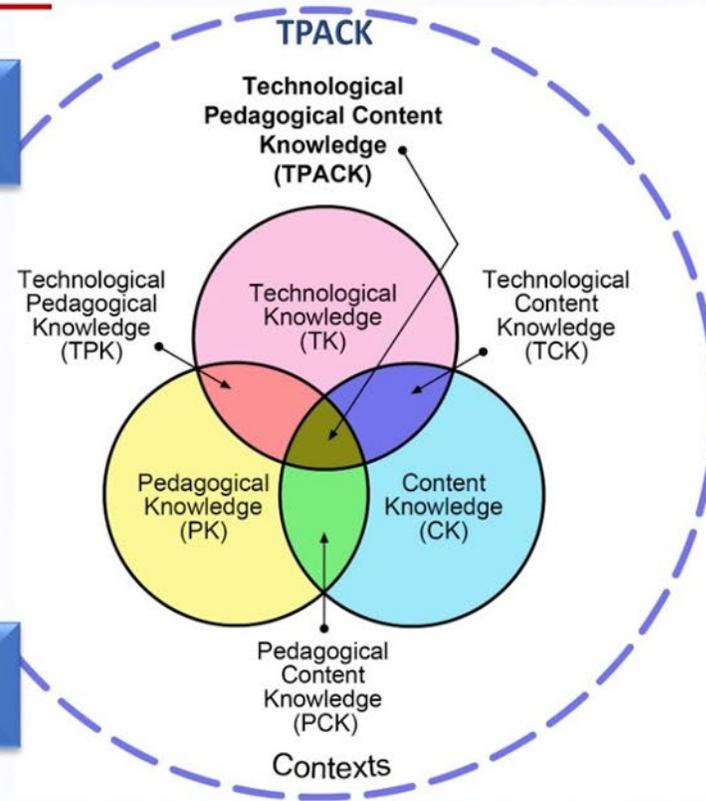
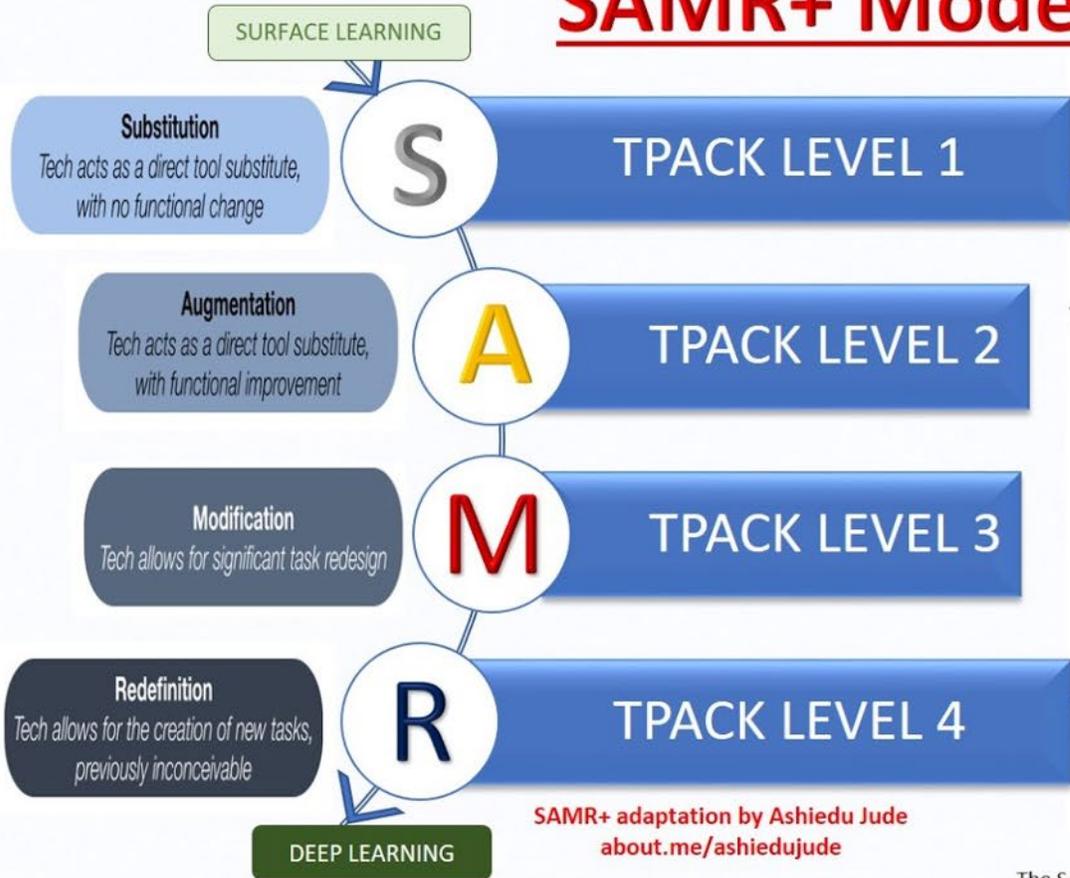


3. SAMR model



4. SAMR X TPACK

SAMR+ Model

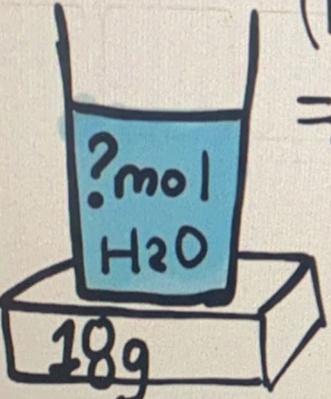


The SAMR model provides hierarchical structure for the learning outcomes. While the TPACK model provides the competence for teachers to integrate technology, pedagogy and content skills within the SAMR hierarchy.

<https://youtu.be/SC5ARwUkVQg>

新常態下的教育現場

Molar mass
of water (H_2O)
($1 \times 2 + 16$)
 $= 18 \text{ g mol}^{-1}$

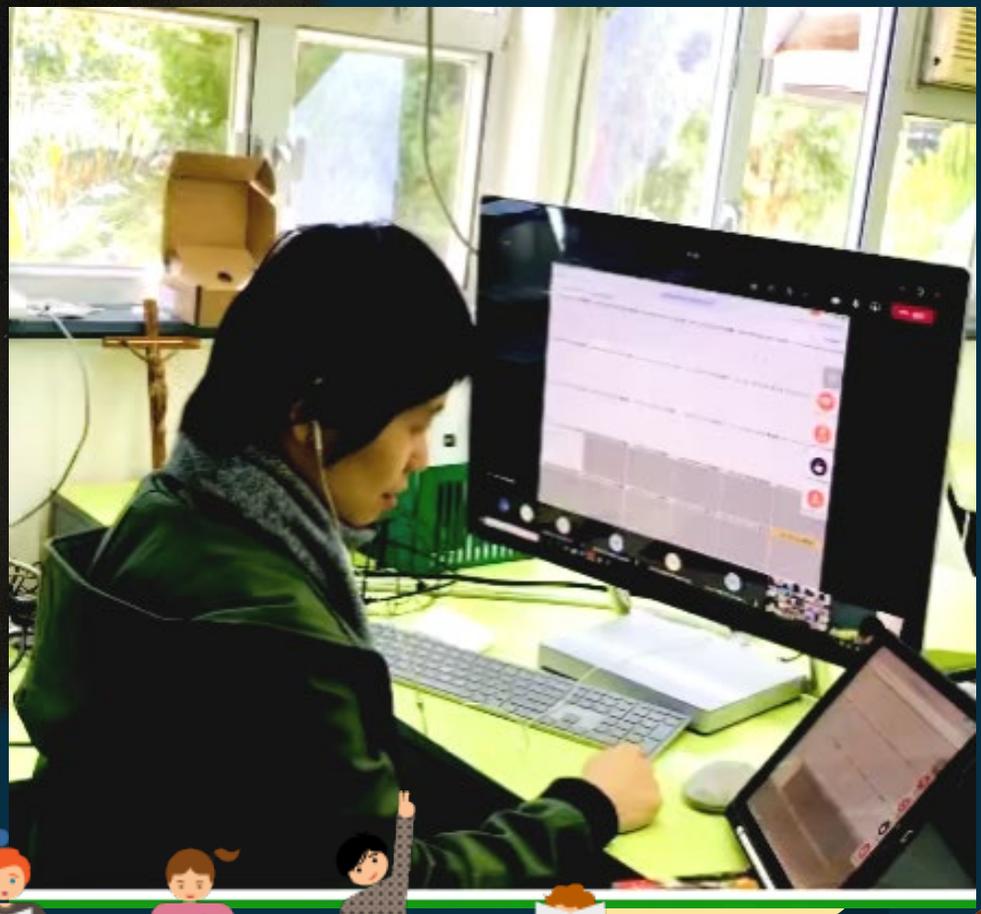


1 mol
of water

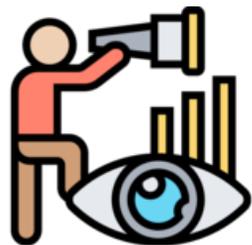
Handwritten Chinese characters: 下 (bottom), 上 (top), 一 (one)

課堂太多
單向教學

內容太抽象

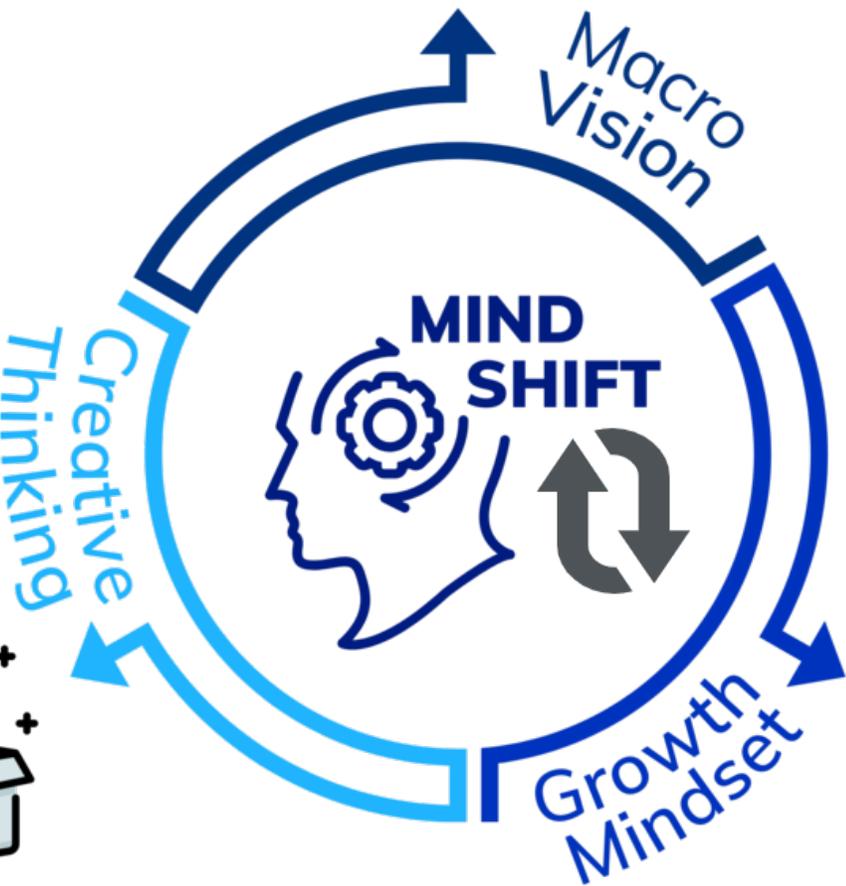


後疫時代
新常態



為未來而教

創新/創意
思維



不斷學習



IF WE WANT STUDENTS
TO **INNOVATE** IN
THE FUTURE, WE NEED
THEM TO OWN THE
PROCESS **NOW.**

-John Spencer

學生主導學習

Take Ownership
of their learning

||

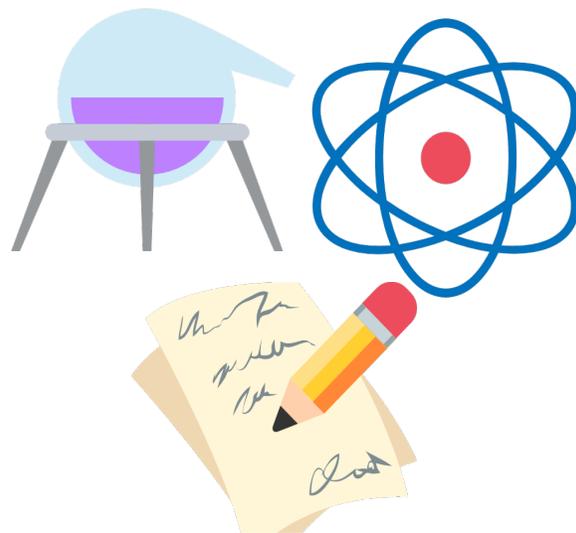
信念 → 設計

Believe → Design



如何推動**多元化**學習 及評估學生的學習表現?

理科
知識+技能+態度
A.S.K



多元化方式
進展性評估
(e.g. STEAM活動)

科本[英文]生字/定義
讀寫能力
Rac/Lac

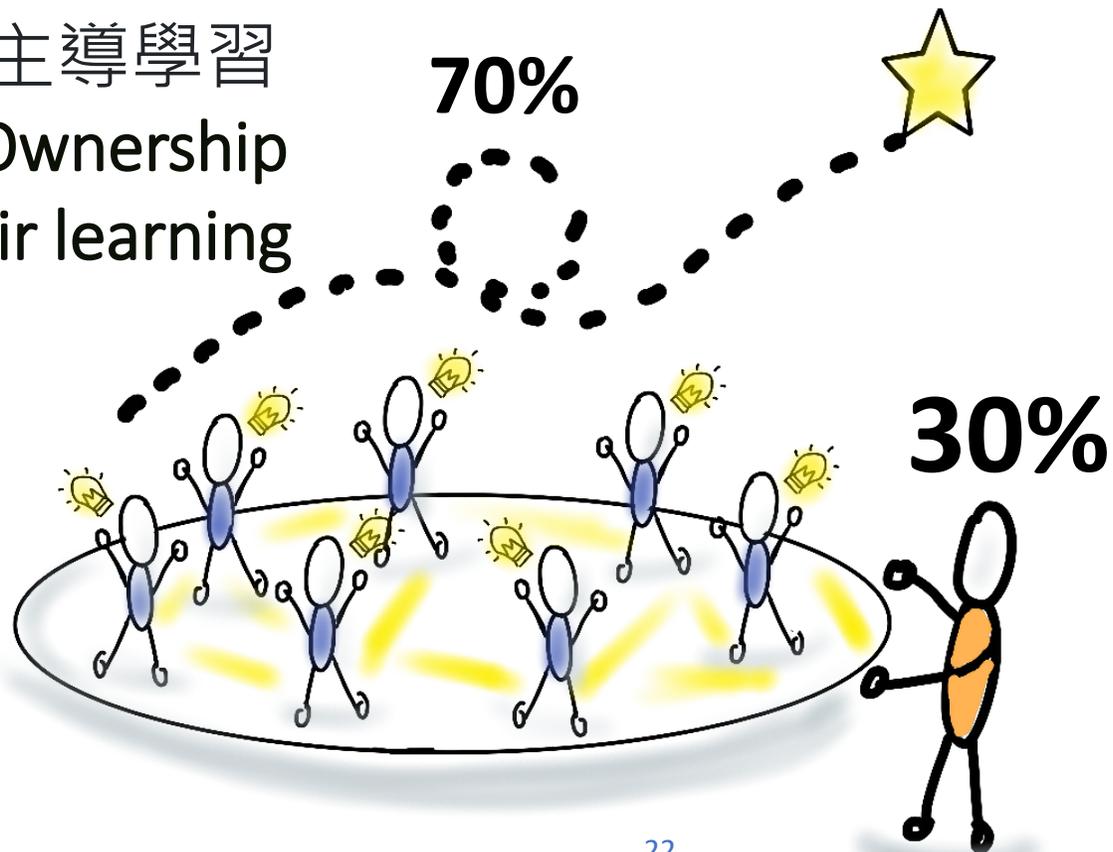
推動**多元化**學習

如何從教學中協助學生**建構知識**及
評估學生的學習表現？



學生主導學習
Take Ownership
of their learning

70%

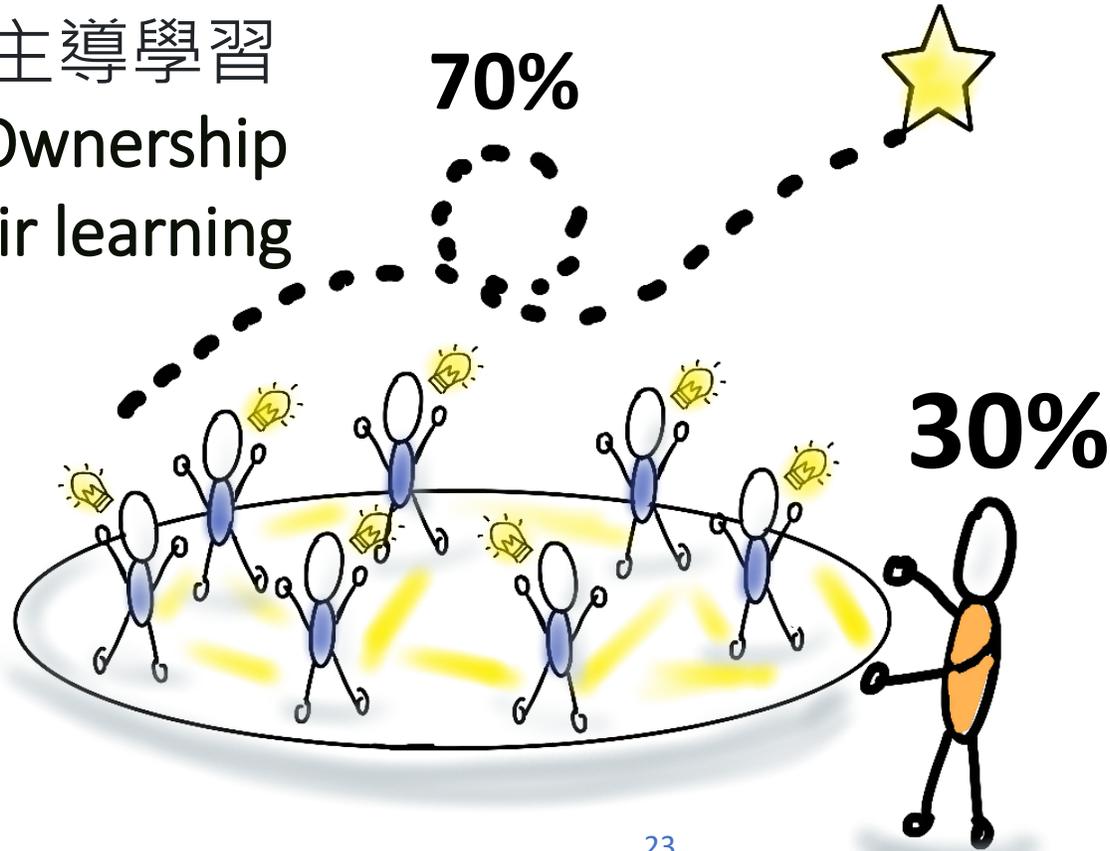


22

老師作為引導者 (Facilitator)
→ 不再是單向教授知識

學生主導學習
Take Ownership
of their learning

70%



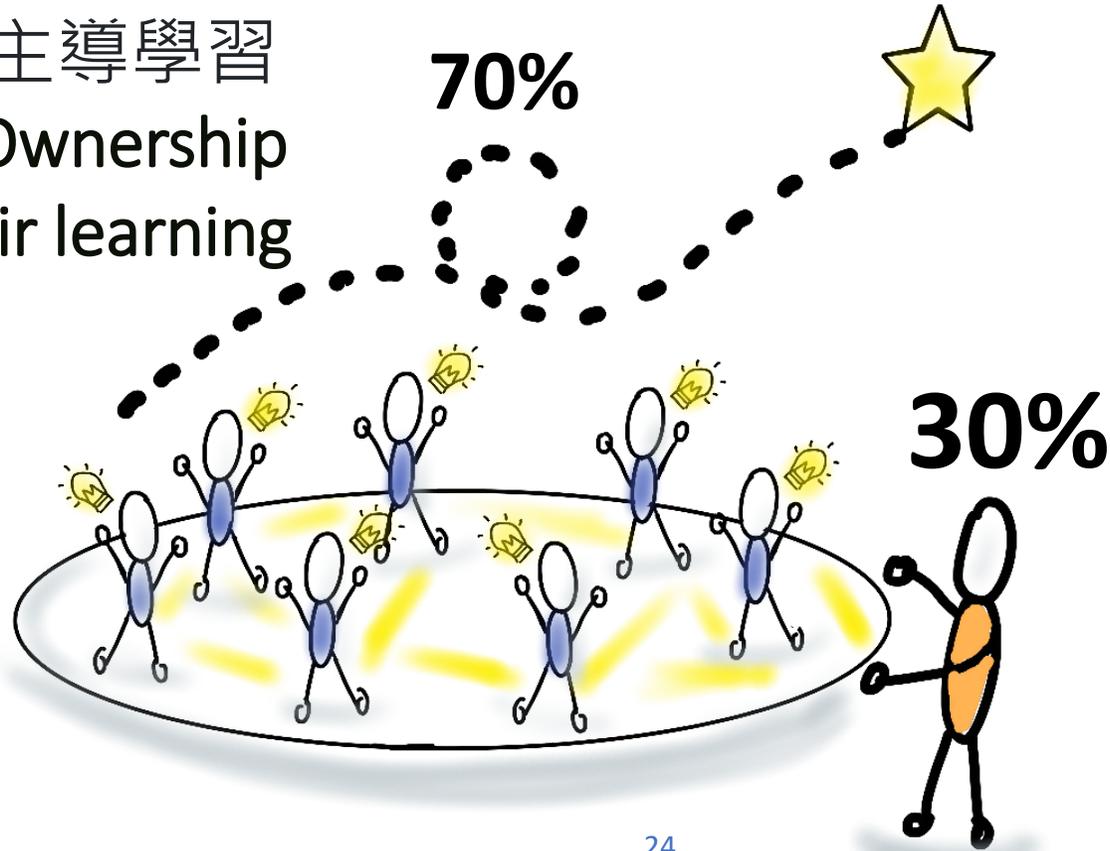
! ?
HOW ?

23

老師作為引導者 (Facilitator)
→ 不再是單向教授知識

學生主導學習
Take Ownership
of their learning

70%



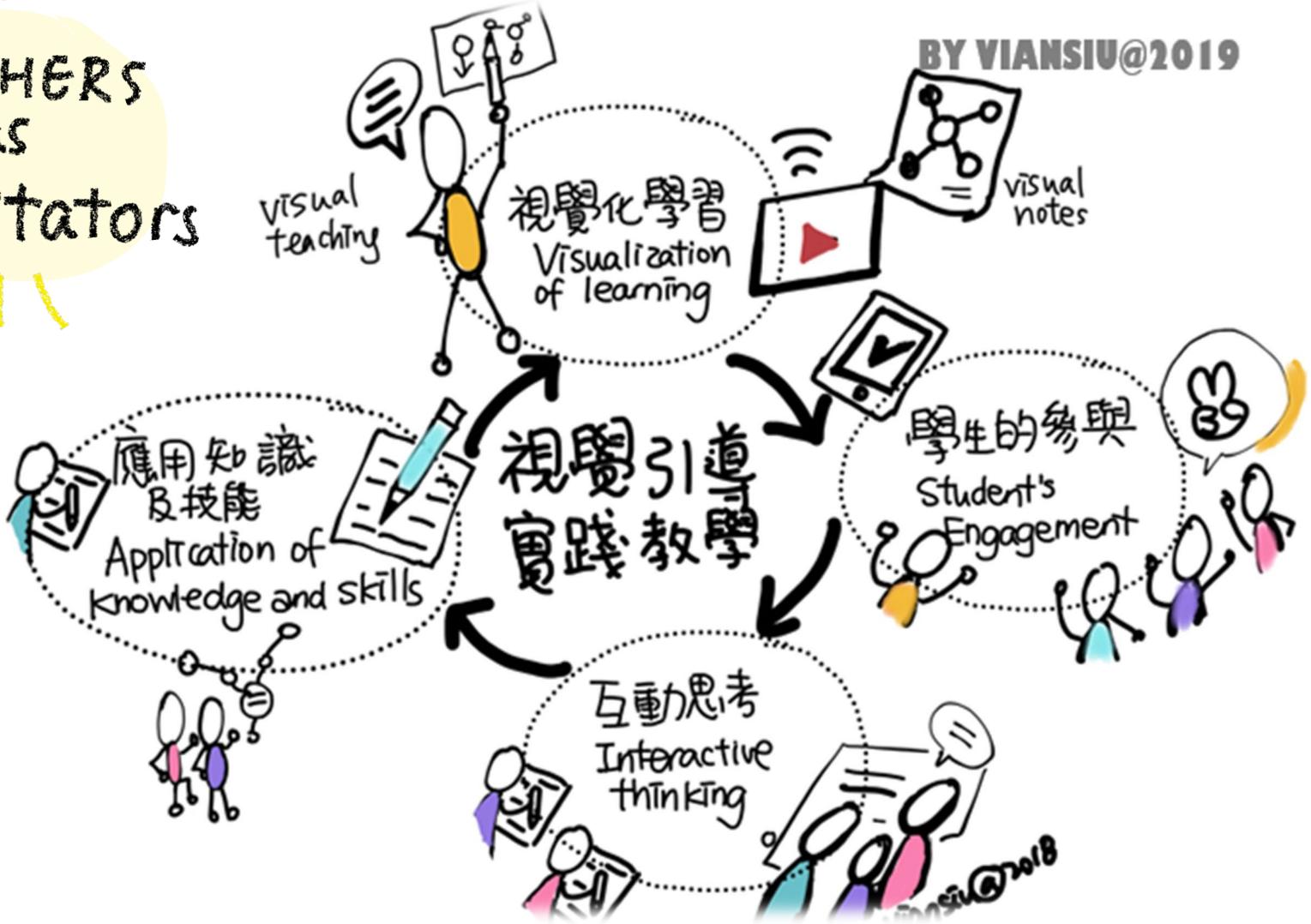
以視覺化的方式
引導學生思考

24

老師作為引導者 (Facilitator)
→ 不再是單向教授知識

學與教的設計 Learning and Teaching Design

TEACHERS
as
Facilitators



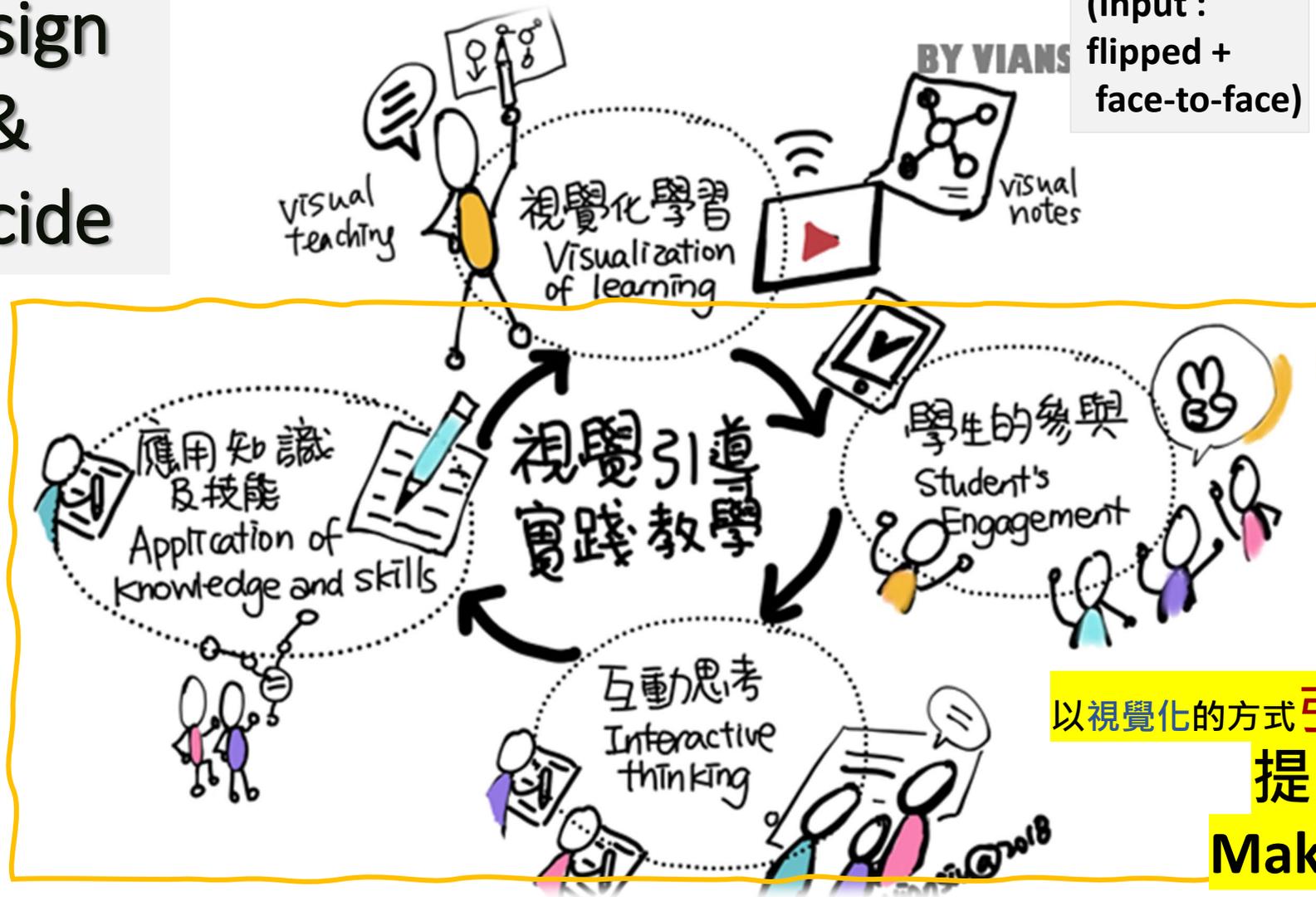
- Ownership of learning
- Voice & Choice & Active participation
- Engaging Thinking

學與教的設計 Learning and Teaching Design

Design
&
Decide

30%

(Input :
flipped +
face-to-face)



70%

(Output :
games, WS,
takenote projects)

推動**多元化**學習

從教學中協助學生**建構知識**
及**評估**學生的學習表現

*有效運用**科技及電子資源**

1. **設計** + 配合課題活動
2. **選擇** 合適電子資源/工具
3. **評估** 學習表現的工具



為了什麼評估學生學習表現？

測試
教學方式



啟動
學生學習動機

了解學生對
知識點掌握/理解

照顧
學生學習多樣性

如何推動**多元化**學習

選擇合適線上(評估)**工具**

評估學習表現的**設計**



1. 設計 + 配合課題活動

以科學科為例



- 量性與質性
評估學生學習表現

基本教學重點

實時互動

學習筆記

傳統操練(功課)

創意功課/回饋

線上/傳統測試

面授? 線上?

2. 選擇合適電子資源 + 工具

測試學生
對知識點
理解

啟動學生
學習動機

掌握學生
學習表現

Teaching Resource Centre

Lesson Preparation Multimedia Resources Continuous Assessment STEM Resources Skills Extra Items

Design and Make

Book: 1A 1B 2A 2B 3C

Reset Show

The following are the latest updated resources

Book 1A

Select	Description	Download	File size
<input type="checkbox"/>			



多元教學
資源

2. 選擇合適電子

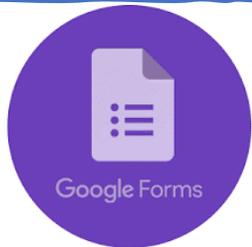
資源/工具

測試學生
對知識點
理解

啟動學生
學習動機

掌握學生
學習表現

量性評估學習表現的工具



形式: MC/填圖/TF/有標準答案

目標: 評估基礎知識

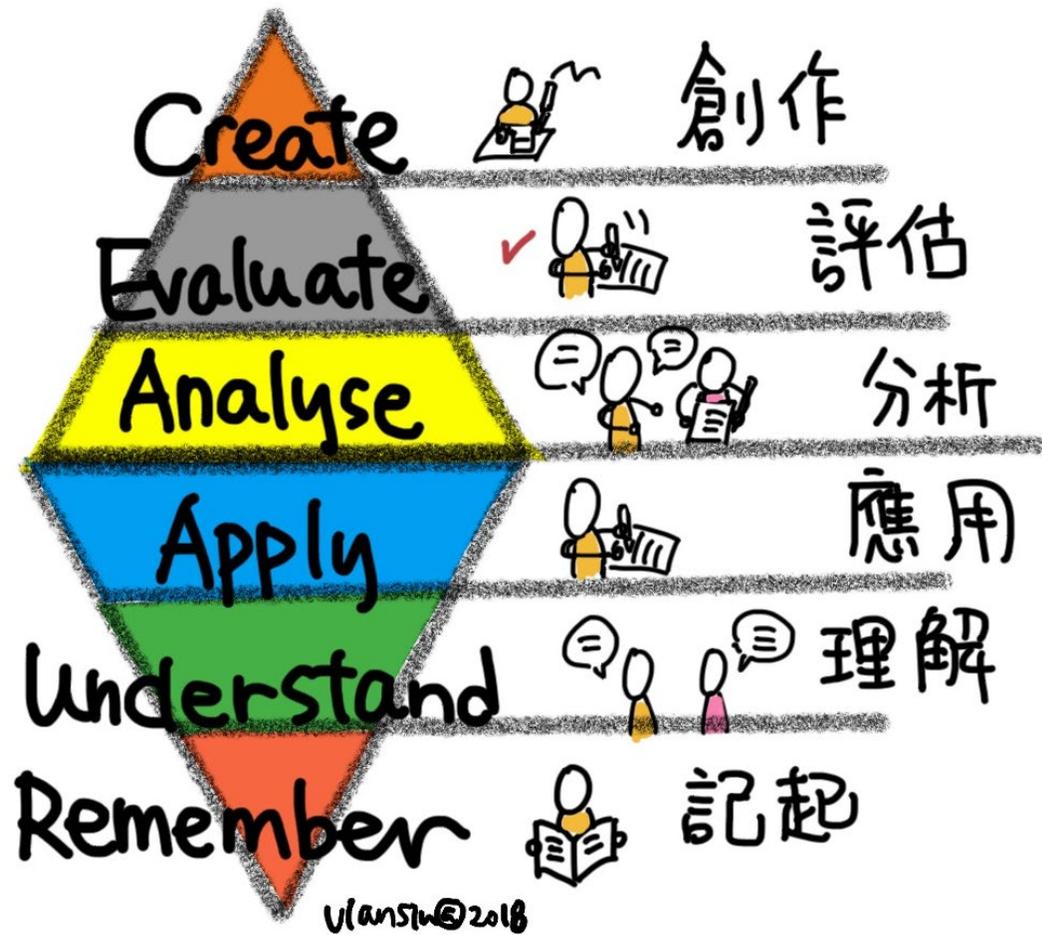
- 了解/考核學生對課題理解情況

功能:

- 即時聯繫學生
- 直接・簡單
- 自動批改
- 數據收集

Kendle, A., & Northcote, M. (2000). The struggle for balance in the use of quantitative and qualitative online assessment tasks.

Bloom's Taxonomy Flipped



2. 選擇合適電子

資源/工具

測試學生
對知識點
理解

啟動學生
學習動機

掌握學生
學習表現

質性評估學習表現的工具



LOILONOTE
SCHOOL



形式:開放式問題/任務
個人選擇

目標:

- 評估個別學生對內容的理解
- 鼓勵創意回饋

功能:

- 可供空間讓學生展示所學
- 多功能/易用/創意
- 老師可批改/回饋
- 同儕交流

Kendle, A., & Northcote, M. (2000). The struggle for balance in the use of quantitative and qualitative online assessment tasks.

基本教學重點

實時互動

學習筆記

傳統操練(功課)

創意功課/回饋

線上/傳統測試

eaching part of the water cycle. (請各位同學要看教學影片!! 重點係學!!!! 唔止係完成功課!!!)



Which of the following is NOT a process in the water cycle? *

- boiling
- transportation
- condensation
- evaporation

What is the process that occurs when water changes from a liquid to a gas, caused by heat energy from the sun?

Short answer text

Which of the following is NOT a process in the water cycle? *

- boiling
- transportation
- condensation
- evaporation

What is the process that occurs when water changes from a liquid to a gas, caused by heat energy from the sun? *

Short answer text

設計配合課題活動

線上持續性評估設計

以科學科為例

基本教學
重點

實時
互動

學習
筆記

傳統
操練(功課)

創意
功課/回饋

線上/
傳統測試

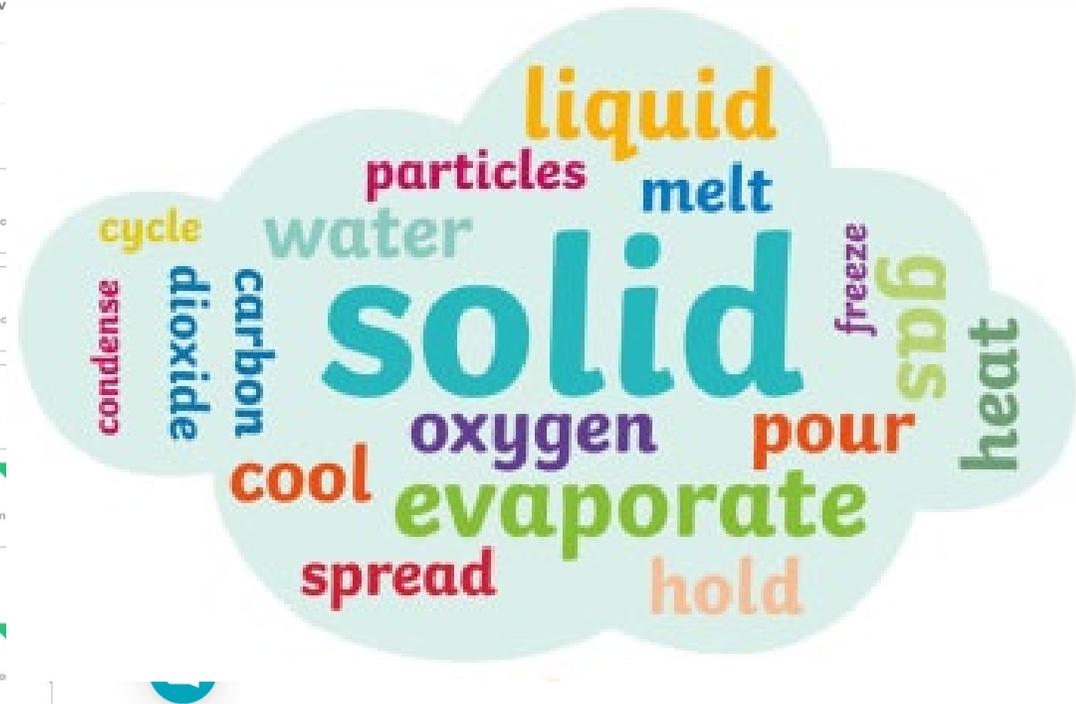


Mentimeter

Word Cloud

Picture Cloud

The screenshot shows the Mentimeter web interface. The browser address bar displays 'mentimeter.com'. The page title is 'First Lesson Science - Mentimeter'. The main content area shows a presentation slide with the question 'What is science?' and a sub-question 'What did you learn in the summer bridging...'. The interface includes a navigation menu with options like 'Templates', 'Theme', 'Configure', and 'Help'. A settings panel on the right allows for customizing the question type, including options like 'Multiple Choice', 'Image Choice', 'Scales', 'Open Endac', 'Ranking', '2 x 2 Grid', 'Q&A', and 'Quick Form'. A 'Quiz Competition' section is also visible at the bottom.



基本教學重點

實時互動

學習筆記

傳統操練(功課)

創意功課/回饋

線上/傳統測試



The Water Cycle

7.1k favorites 99.2k plays 929.5k players

A public kahoot

5th grade water cycle kahoot

 kldrbauch
Created 4 years ago

1- Quiz
When water is heated in the ocean and turns into water vapor



2- Quiz
When water vapor is cooled and forms droplets-

3- Quiz
After condensation the water droplets fall to the Earth in different forms of-

1- Quiz
When water is heated in the ocean and turns into water vapor

2- Quiz
When water vapor is cooled and forms droplets-

3- Quiz
After condensation the water droplets fall to the Earth in different forms of-



Mentimeter



Google Forms

基本教學重點

實時互動

學習筆記

傳統操練(功課)

創意功課/回饋

線上/傳統測試

Chapter 1 Introducing science Pre-lesson worksheet 3

1.How to light a Bunsen Burner?

<https://www.youtube.com/watch?v=2SCMWfaA5y0>



a)What is the use of a heat-proof mat / insulating mat?

b)What happens if the gas tap is turned on without a burning match?



Lighting up Bunsen Burner



Ch 1 how to light a Bunsen Burner (2017-1A2)



<https://youtu.be/tEtmxVhLhsc>

<https://youtu.be/AoX3aOIOQ78>

持續性評估設計

以科學科為例

基本教學重點

實時互動

學習筆記

傳統操練(功課)

創意功課/回饋

線上/傳統測試



Name of the process: Precipitation

too much water vapour join together

too heavy

rain, snow or hail

Definition:
When the clouds get heavy enough, water droplets fall back to the ground in the form of rain, snow or hail.

Name of the process: Evaporation

water vapour

heat up water

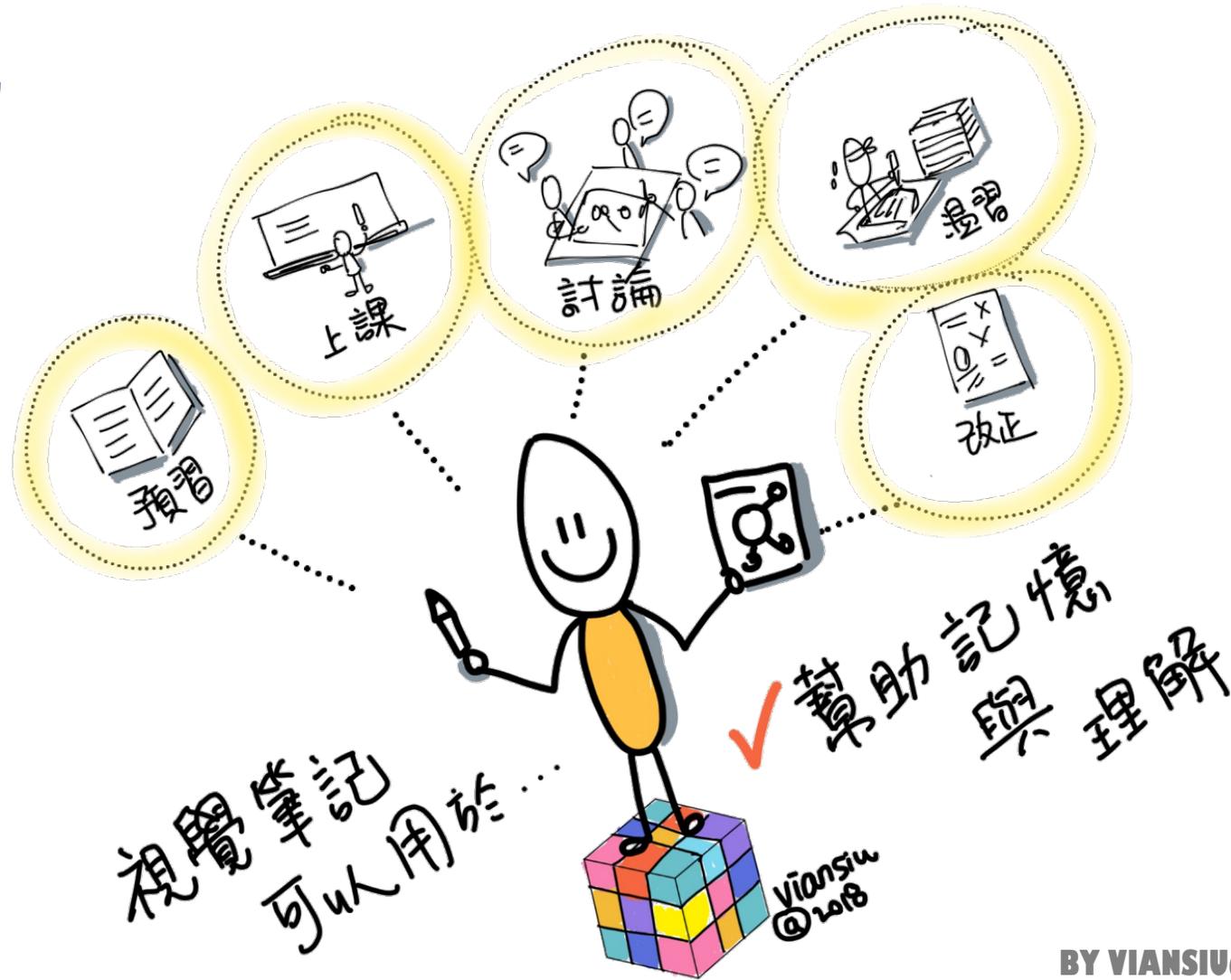
Ocean

evaporation

Definition:
When the sun heat up the water. The water absorbs heat energy and becomes water vapour and rise to the sky

New word	Draw a picture	Definition (A24)
Water cycle		There is no beginning or end to this cycle. The way water circulates in nature is called water cycle.
Evaporation		When the sun heats up the water in Oceans, rivers or on the land, the water absorbs heat energy and becomes water vapour and rises up to the sky.
Transportation		The clouds are carried by wind to other places in the sky.
Condensation		The water vapour cools down and forms water droplets. Water droplets join together to form clouds in the sky.
Precipitation (or raining)		When the clouds get heavy enough, water droplets fall back to the ground in the form of rain, snow or hail.

學生在學習過程中如何運用 視覺筆記

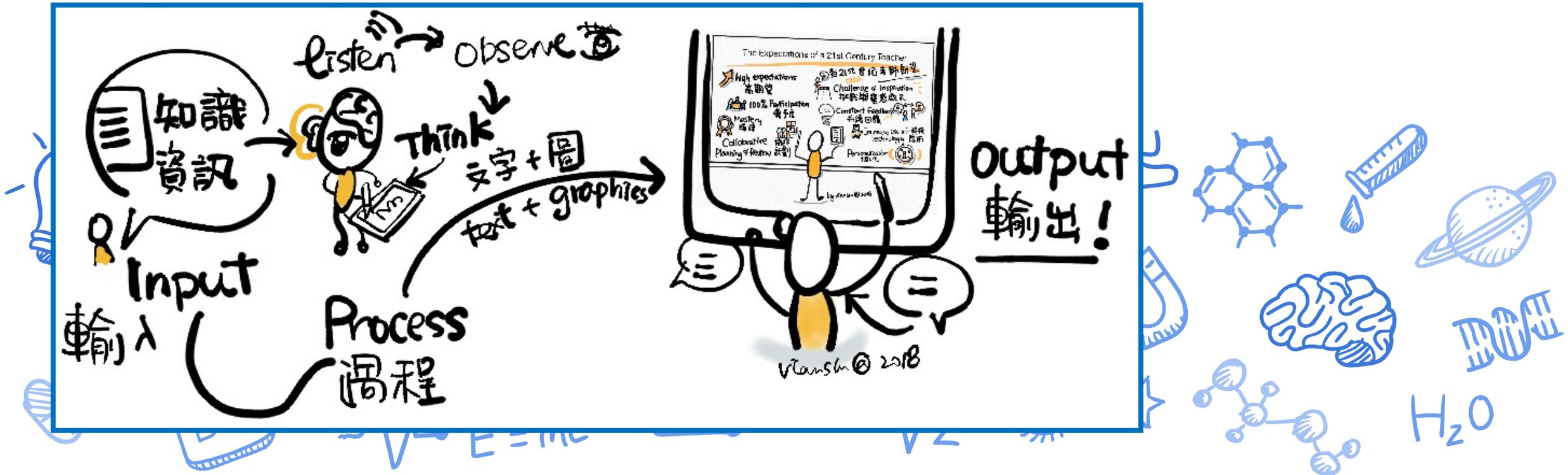


BY VIANSIU@2019

視覺學習筆記 Visual-sketch Notes



學習策略 Learning Strategies



學生的視覺筆記-課堂回顧

Visual Lesson View

Describes the qualities and work of scientists

Curious
Curious and Creative Mind
For discovering and creating new things

Discover
Discover

Eyes
To look and discover

Ears
To listen to the ideas and help solve problems

Mouth
To share your ideas and help solve problems

Tools
To help you succeed

Hands
To do experiment and writing your ideas

Feet
To discover and explore the world

1/3/16

the 7 characteristics of living things

- react to stimuli
- can move
- need air
- need food
- can excrete
- can reproduce
- grow

this is living thing

F1 Science Ch 3 The story of the Sperm and the Egg

need sperm

I see!!

Sperms swim through the vagina

fertilization

Become baby

LOVE

Lesson Review 11/3/16

solution

sugar (solute) + water (solvent) → sugar (solution)

Soluble eg: ✓
salt solution
chalk powder solution

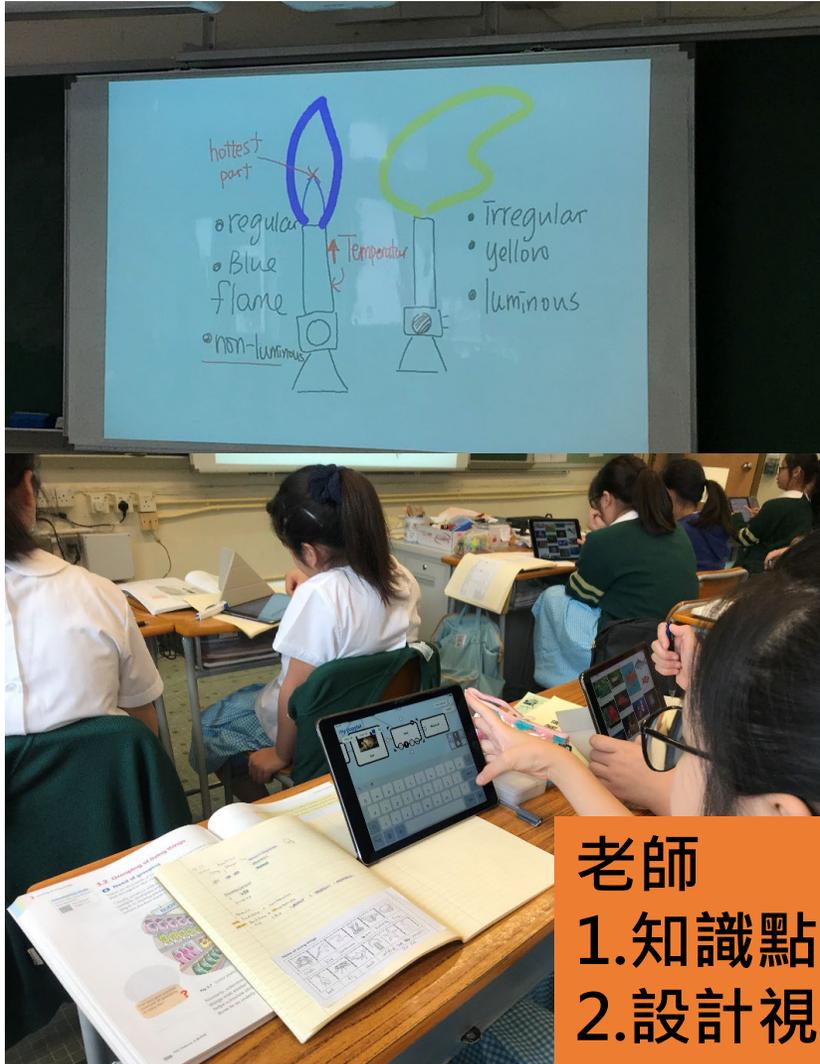
Insoluble eg: ✗
oil + water
petrol + water

Dissolving ≠ **Melting** ✓

Need three things to 溶解
- solvent
- solute
- solution ✓

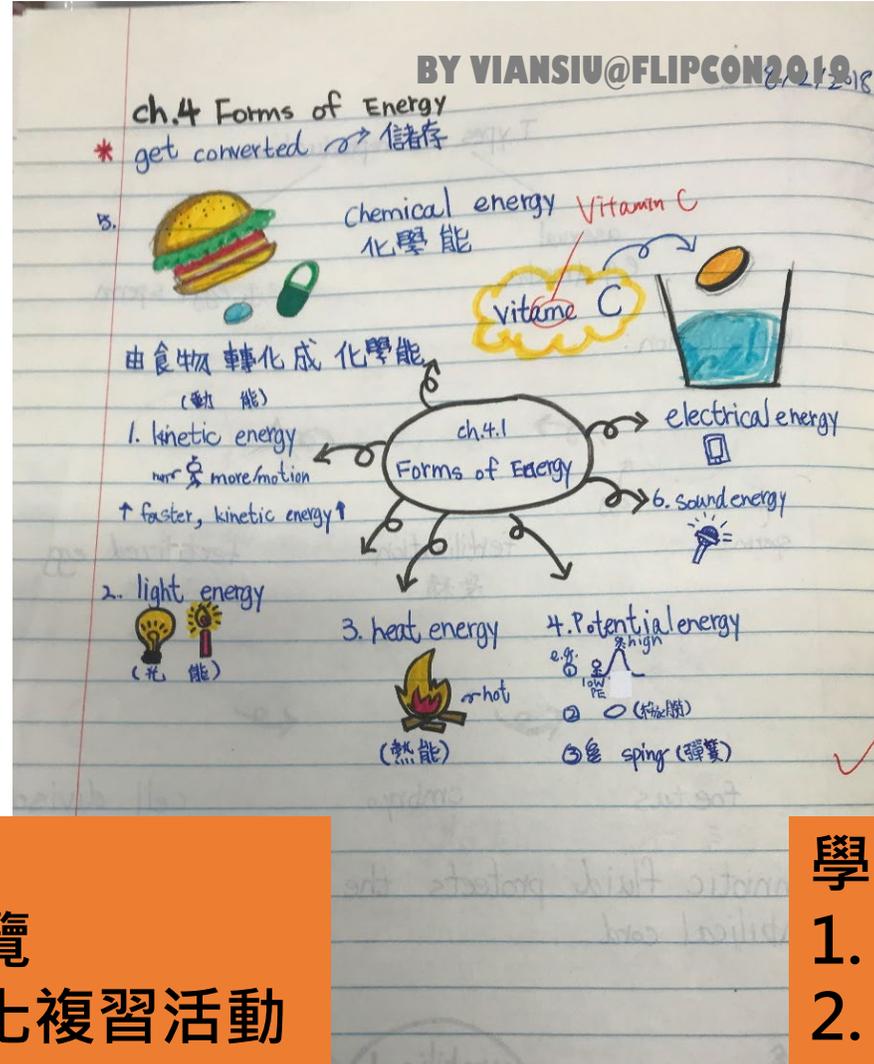
Need one things of 融冰
ice
↓
water
↓
gas ✓

視覺筆記在教學中的應用-科學科



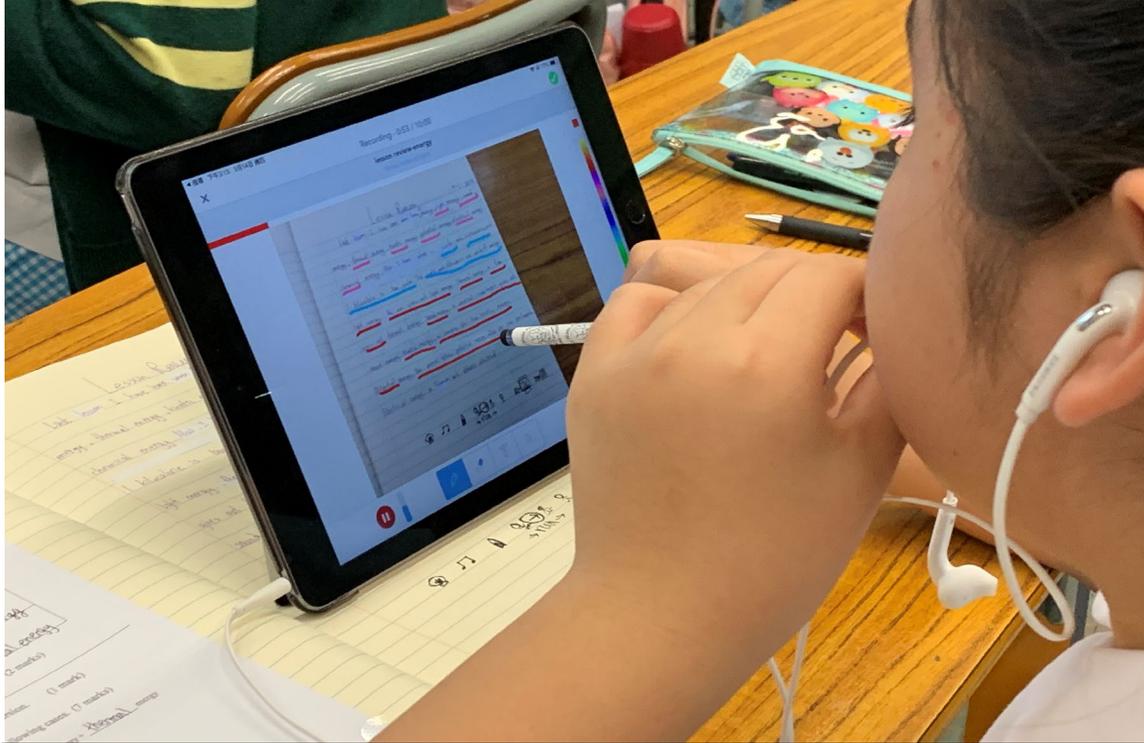
老師

1. 知識點博覽
2. 設計視覺化複習活動



學生

1. 製作視覺化筆記
2. 課堂回顧



Simple chemical cell VISUAL notes

Ch 29 Simple chemical cell Video note

► Example 1:

Observations:

- Zn metal becomes thinner.
- Cathodic gas bubbles evolve at the copper electrode.
- $[H^+] \downarrow \rightarrow$ pH value \uparrow

no matter / breaker/breakers.

Reaction between Zn and dilute $H_2SO_4(aq)$.

e^- flow from Zn to Cu through the electric wire.

Zn electrode: $Zn(s) \rightarrow Zn^{2+}(aq) + 2e^-$

Cu electrode: $2H^+(aq) + 2e^- \rightarrow H_2(g)$

Overall ionic eqn: $Zn(s) + 2H^+(aq) \rightarrow H_2(g) + Zn^{2+}(aq)$

► Example 2:

Ag, Cu \rightarrow not reactive

\rightarrow both Ag, Cu will not react with acid.

在此裝置中何者不會有反應

- Result: No Reaction.
(both Ag and Cu will not react with dilute $H_2SO_4(aq)$)

► Example 3:

Observations:

- Zn metal becomes thinner.
- Cu metal becomes thicker.
- The blue colour of copper(II) nitrate solution fades out.

From reactivity series, Zn is more reactive than Cu.

e^- flow from Zn to Cu through the electric wire.

Zn electrode: $Zn(s) \rightarrow Zn^{2+}(aq) + 2e^-$

Cu electrode: $Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$

Overall ionic eqn: $Zn(s) + Cu^{2+}(aq) \rightarrow Zn^{2+}(aq) + Cu(s)$ [displacement reaction]

\therefore **two banks**
 \rightarrow not same!

Summary:

Simple chemical cell
 \rightarrow reaction between metal and electrolyte
 \rightarrow convert chemical energy into electrical energy through wire.

One breaker

\rightarrow metal may react with electrolyte directly

Half cell \rightarrow avoid side reactions

Will metal react with electrolyte?

* No reaction if metal don't react with electrolyte. ✓



APPS with drawing

draw it!



Post Session Report

Full equations and ionic equations

Full equations: $\text{CuSO}_4 + \text{Zn} \rightarrow \text{Cu} + \text{ZnSO}_4$

Ionic equations: $\text{Cu}^{2+} + \text{Zn} \rightarrow \text{Cu} + \text{Zn}^{2+}$

Q.3 $\text{NaCl(aq)} + \text{AgNO}_3(\text{aq}) \rightarrow \text{AgCl(s)} + \text{NaNO}_3(\text{aq})$
 $\text{Na}^+\text{Cl}^- + \text{Ag}^+\text{NO}_3^- \rightarrow \text{AgCl} + \text{Na}^+\text{NO}_3^-$
 $\text{Ag}^+ + \text{Cl}^- \rightarrow \text{AgCl(s)}$

Q.4 $\text{Zn(s)} + 2\text{HNO}_3(\text{aq}) \rightarrow \text{Zn(NO}_3)_2(\text{aq}) + \text{H}_2(\text{g})$
 $\text{Zn(s)} + 2\text{H}^+ + 2\text{NO}_3^- \rightarrow \text{Zn}^{2+} + 2\text{NO}_3^- + \text{H}_2$
 $\text{Zn(s)} + 2\text{H}^+ \rightarrow \text{Zn}^{2+} + \text{H}_2$

Q.3 $\text{NaCl(aq)} + \text{AgNO}_3(\text{aq}) \rightarrow \text{AgCl(s)} + \text{NaNO}_3(\text{aq})$
 $\text{Cl}^-(\text{aq}) + \text{Ag}^+(\text{aq}) \rightarrow \text{AgCl(s)}$

Q.4 $\text{Zn(s)} + 2\text{HNO}_3(\text{aq}) \rightarrow \text{Zn(NO}_3)_2(\text{aq}) + \text{H}_2(\text{g})$
 $\text{Zn(s)} + 2\text{H}^+(\text{aq}) \rightarrow \text{Zn}^{2+}(\text{aq}) + \text{H}_2(\text{g})$

Weak Van der Waal's force

van der Waal's force

Wood



Beaker

Beaker

Beaker

Exit

Edit

Share Screen

持續性評估設計

以科學科為例

基本教學重點

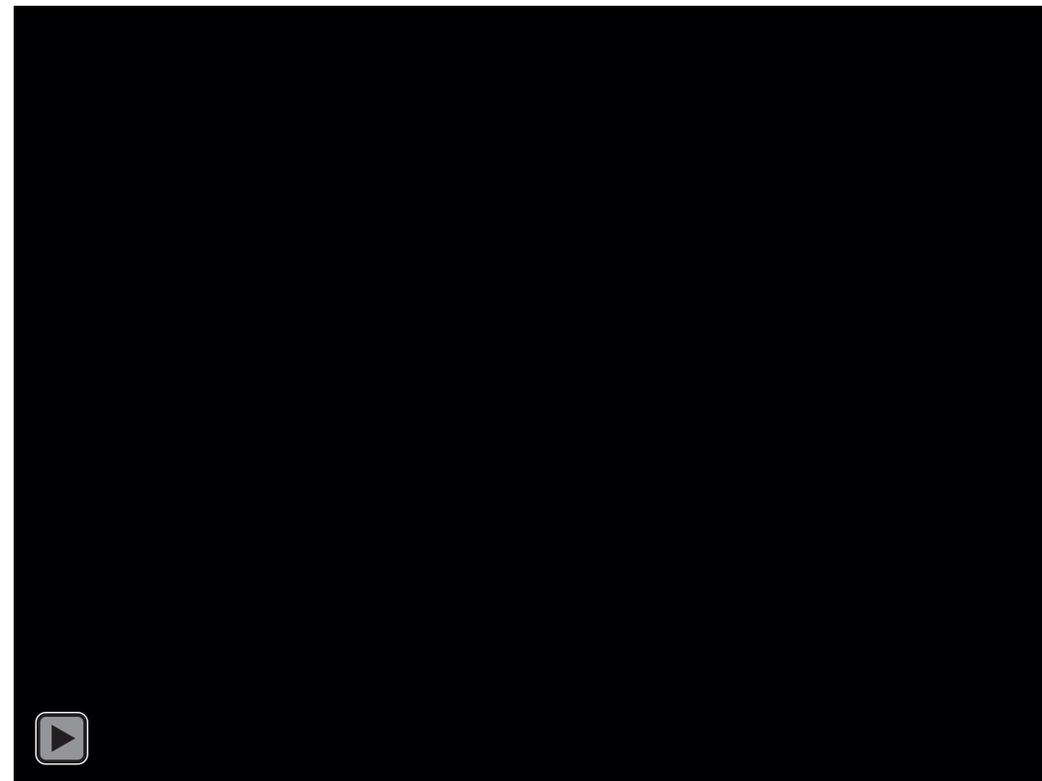
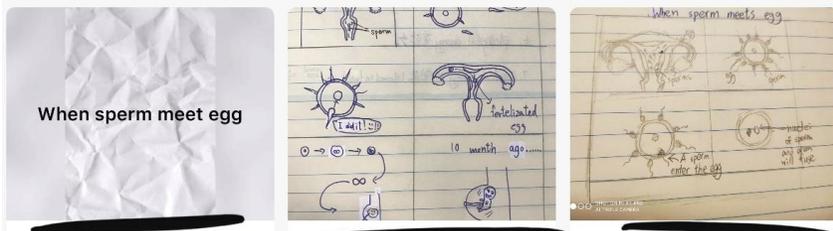
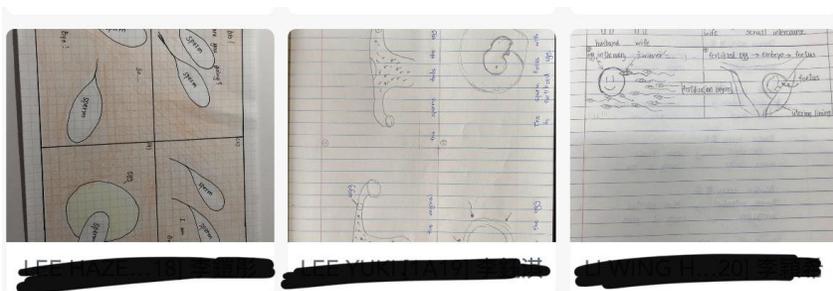
實時互動

學習筆記

傳統操練(功課)

創意功課/回饋

線上/傳統測試



持續性評估設計

以科學科為例

基本教學重點

實時互動

學習筆記

傳統操練(功課)

創意功課/回饋

線上/傳統測試

LOILONOTE
SCHOOL



Seesaw



Google Classroom

Chapter 2 Ex.1 (2.1-2.3) (total marks = 39) Date: _____ Marks: _____

A. True or false (5 marks)

1. Melting(融化) of ice and freezing of water take place at the same temperature.	_____
2. During the boiling of water, the temperature of water keeps changing.	_____
3. Condensation(凝結) of water vapour can take place at above 0°C.	_____
4. Water is kept cycling in Nature in liquid state.	_____
5. In a sugar solution(糖溶液), the solvent is sugar and the solute is water.	_____
6. Salt has different rates of dissolving at different temperatures.	_____
7. A sugar cube takes more time to dissolve than when it is crushed into powder.	_____
8. The higher the temperature, the lower the rate of evaporation of water.	_____

B. Fill in the Blanks (5 marks)

Water in the seas, rivers and on land absorb heat energy from the sun and becomes water vapour. This process is called _____. When the water vapour cools down in the higher sky, the water particles stick together to form _____. This process is called _____. Water droplets in the sky join together to form _____. As the water droplets gather and become heavy, they finally fall as _____.

C. Multiple Choice (8 marks)

1. Which of the following about the energy changes during the processes of change of state of water is INCORRECT?

Process	Energy absorbed(吸收) or released(釋放)
A. Boiling	Energy absorbed from the surroundings(環境)
B. Freezing	Energy released to the surroundings
C. Evaporation	Energy absorbed from the surroundings
D. Melting	Energy released to the surroundings

2. The diagram below shows the set-up to simulate the formation of rain.

Colourless liquid droplets are formed at the bottom of the metal dish after some time. Which process leads to the formation of the droplets?

A. Condensation	B. Freezing
C. Melting	D. Boiling

6. What are processes X and Y respectively?

A. ^X Evaporation	^Y Freezing
B. ^X Evaporation	Condensation
C. Condensation	Raining
D. Condensation	Evaporation

7. Which of the following statements about the evaporation of water is correct?

A. Water changes from liquid water to water vapour.
B. Evaporation of water happens at 100°C only.
C. Water disappears(消失).
D. Water evaporates faster when the temperature is lower.

8. Which of the following is the correct sequence of the processes involved in the water cycle?

(1) Condensation into water droplets
(2) Formation of clouds
(3) Evaporation of water
(4) Falling as rain

A. (1), (2), (3), (4) B. (2), (3), (1), (4) C. (1), (2), (4), (3) D. (4), (3), (2), (1)

Ch 2 ex 1 explanation

設計配合課題活動

線上持續性評估設計

以中一科學科為例 主題: Water Cycle

基本教學
重點

實時
互動

學習
筆記

傳統
操練(功課)

創意
功課/回饋

線上/
傳統測試



Chan Man Yiu + 19 • 18天
2C 的科學學習日記
貼上筆記、詞語抄寫、問題等等...

詞語讀寫 (5) Due 29/1

SCI HW 5
PDF document
padlet drive

評級

添加评论

詞語讀寫 (3) Due 15/1

opposing 對抗
contact force 接觸力
non-contact 非接觸力
slides 滑竹
arises 出現
Air resistance 空氣阻力

Due 15/1

1. average speed 平均速度 average speed 平均速度
average speed 平均速度 average speed 平均速度

2. distance 距離 distance 距離
distance 距離 distance 距離

3. force 力 force 力
force 力 force 力

詞語讀寫 (4) Due 22/1

2C22 王可儿

Due 22/1

1. air resistance 空氣阻力 air resistance 空氣阻力
air resistance 空氣阻力 air resistance 空氣阻力

2. ball resistance 圓球阻力 ball resistance 圓球阻力
ball resistance 圓球阻力 ball resistance 圓球阻力

3. wheel 輪 wheel 輪 wheel 輪
wheel 輪 wheel 輪 wheel 輪

4. lubricant 潤滑劑 lubricant 潤滑劑
lubricant 潤滑劑 lubricant 潤滑劑

筆記 (11/1-15/1)

姓名+學號

詞語讀寫 (1) Due 29/1

指引



5. contact force contact force contact force contact force 接觸力

6. friction friction friction friction

7. sliding sliding sliding sliding

8. surface surface surface surface

0:00 / 0:09

基本教學重點

實時互動

學習筆記

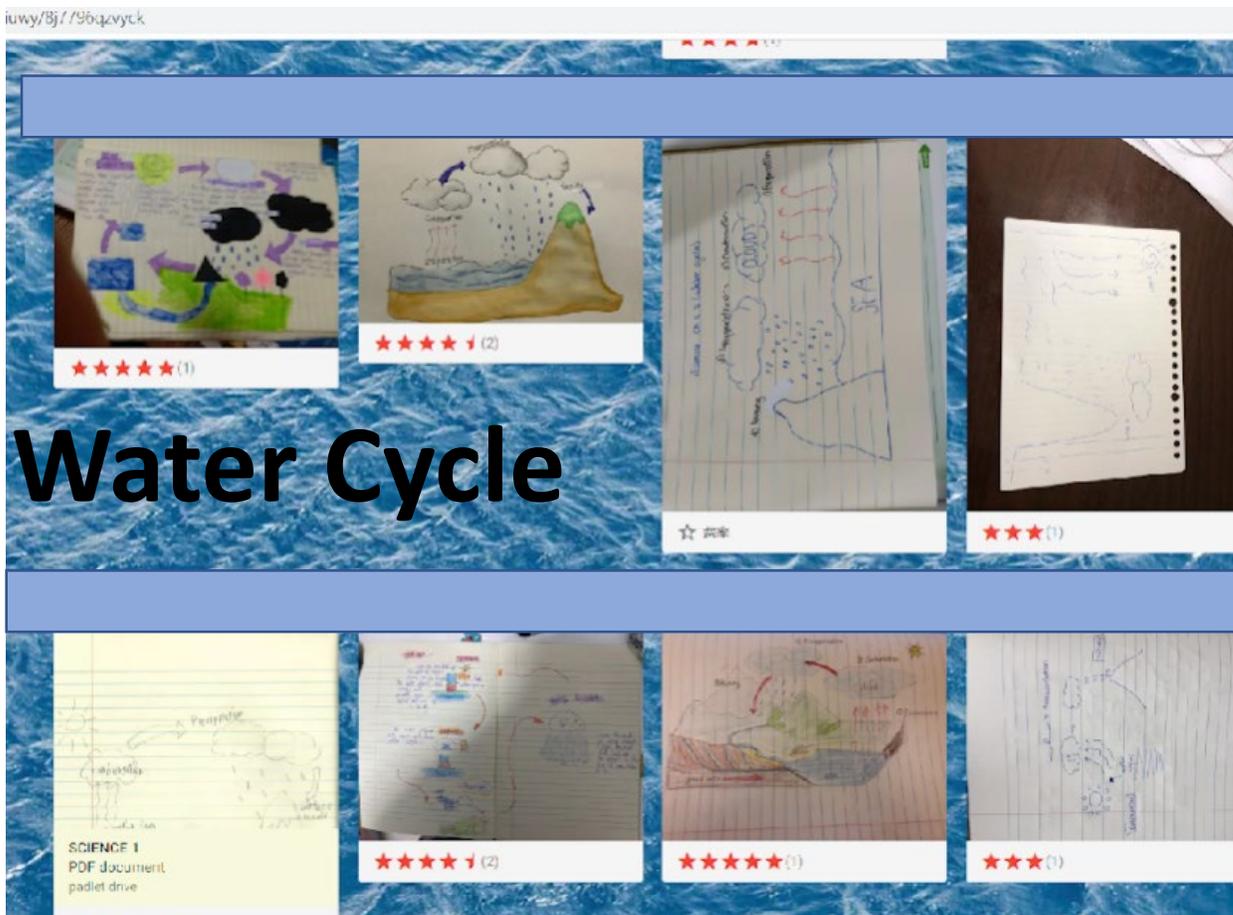
傳統操練(功課)

創意功課/回饋

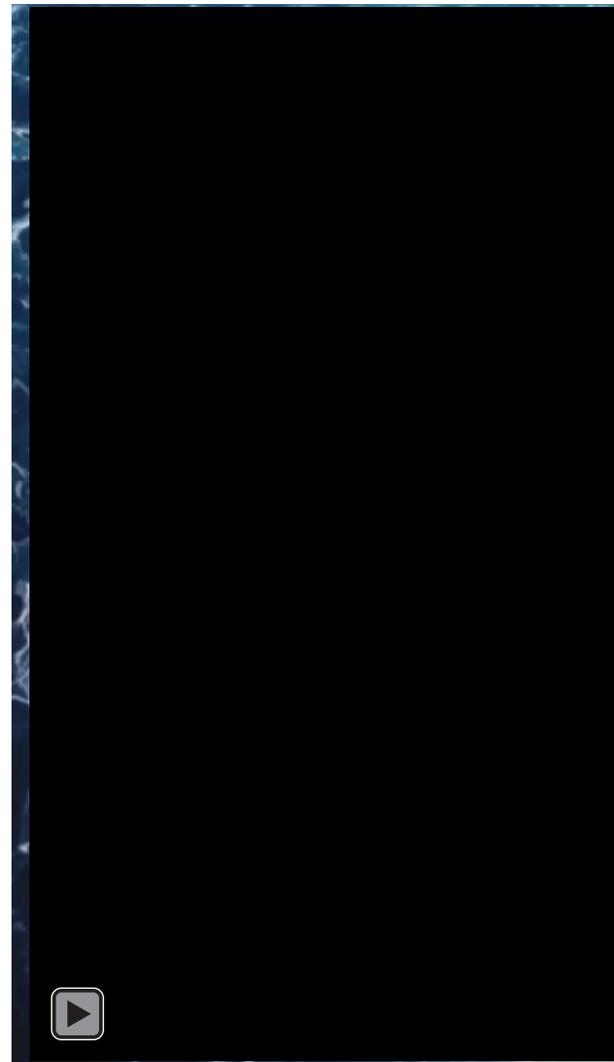
線上/傳統測試



iuwy/Bj/796qzvycK

A screenshot of a Padlet board titled "Water Cycle" with a blue ocean background. The board displays eight student-submitted drawings and diagrams of the water cycle. Each submission includes a star rating: (1) or (2). The drawings show various stages of the cycle, including evaporation, condensation, precipitation, and collection. One drawing includes the word "Ouro" and another includes "SEA".

Water Cycle



基本教學重點

實時互動

學習筆記

傳統操練(功課)

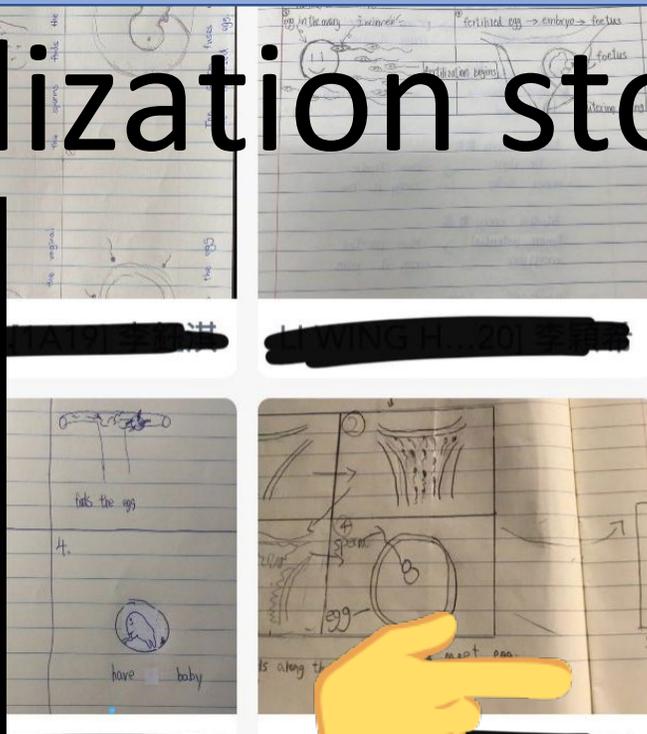
創意功課/回饋

線上/傳統測試



Fertilization sto

F1 Science Ch 3 The story of the Sperm and the Egg



基本教學重點

實時互動

學習筆記

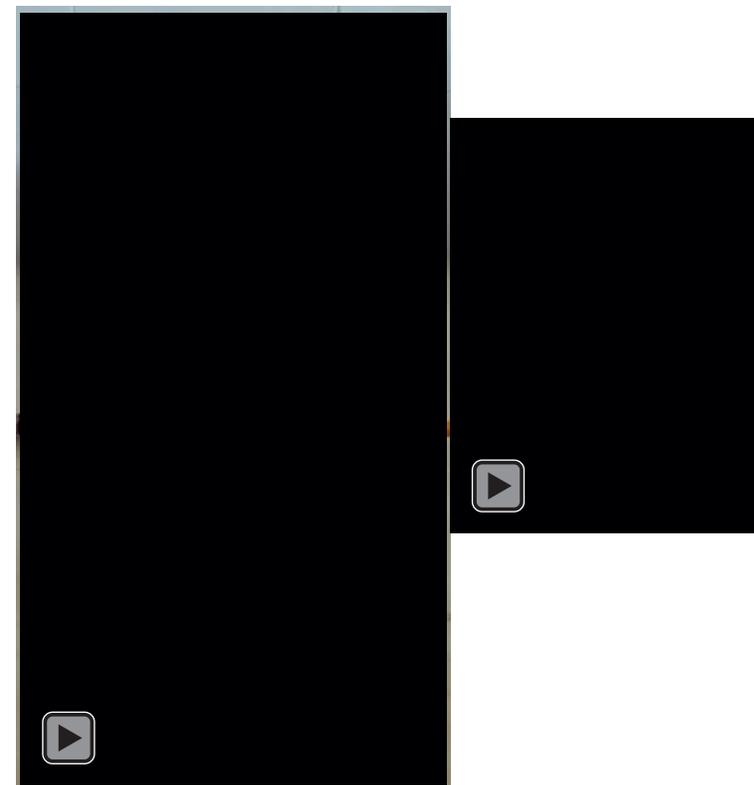
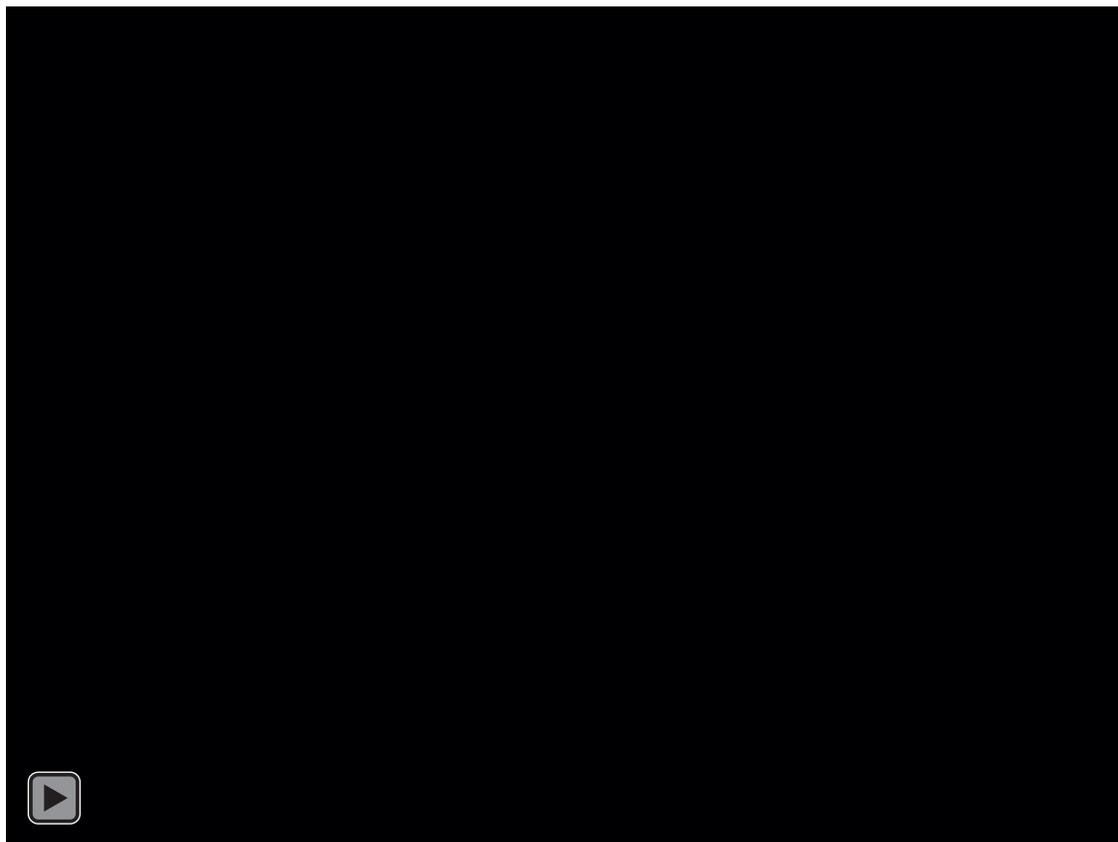
傳統操練(功課)

創意功課/回饋

線上/傳統測試



主題:能量



評估學習表現的工具

以中一科學科為例

基本教學重點

實時互動

學習筆記

傳統操練(功課)

創意功課/回饋

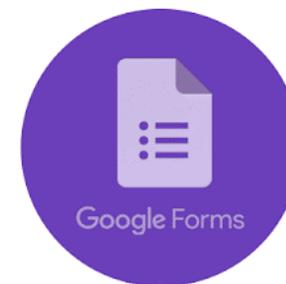
線上/傳統測試



Seesaw



Google Classroom



基本教學重點

實時互動

學習筆記

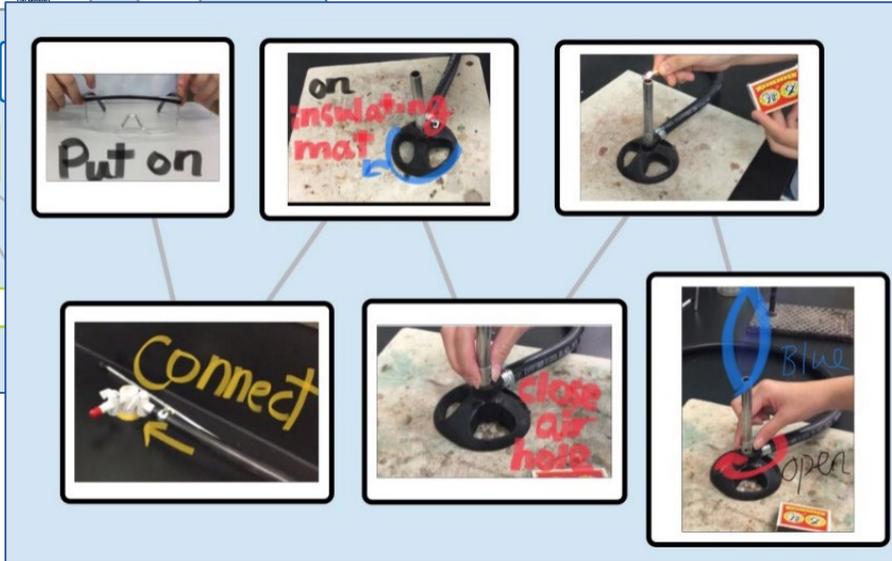
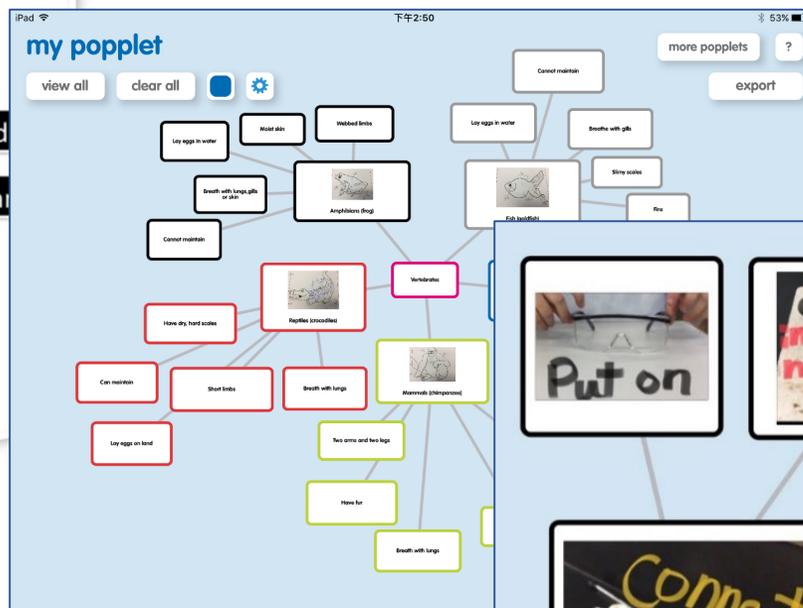
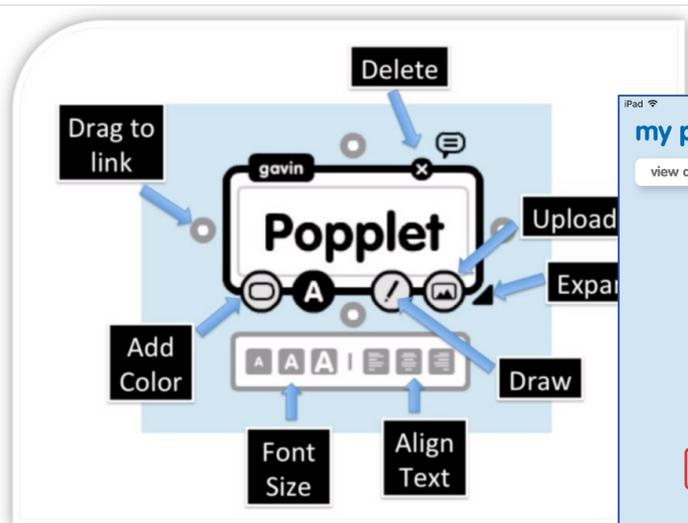
傳統操練(功課)

創意功課/回饋

線上/傳統測試



- 學習反思
- 閱書分享
- 實驗報告



能量的種類

Forms of Energy

FI science Maker Lesson

科學 93 創客

Making Toy

成果分享

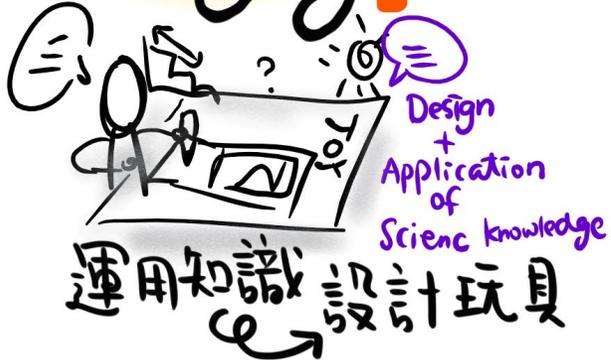
Sharing

短片學習

① Learning



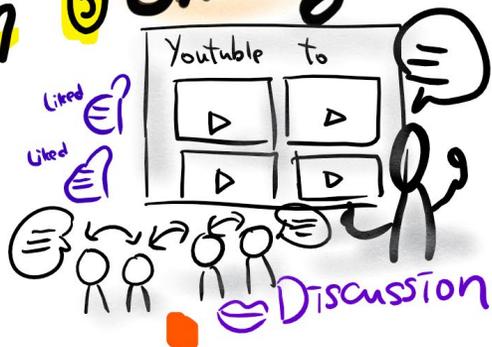
② Designing



③



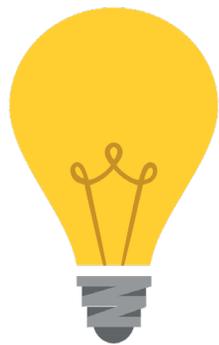
⑤



④ Making Video



反思



- 掌握學生的學習進度，並提供適切的回饋，以提升教學互動，
- 量性vs質性評估vs多元化
- 串連和緊扣

基本教學重點

實時互動

學習筆記

傳統操練(功課)

創意功課/回饋

線上/傳統測試

工具選擇與設計

-沒有一定的方式 → 引發自主學習，激發學生創意。

選擇合適電子資源/工具
設計+配合課題活動
評估學習表現的工具

A Change in Society

Yesterday

- Memorizing A.B.C
- Contents 
- information search 
-  $1, 2 \int dx$
Calculation
- Routine Cognition 



Today & Tomorrow

-  Knowledge Construction
-  21st century skills
-  Information processing
-  Computation calculation
- high-level Cognition 

Well-learning

Viansiu 2009

—Pasi Silander (Finland)

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