

## Carmer Ca

#### **Carmel Pak U Secondary School**

- EMI
- Tai Po



### Carmel Pak U Secondary School

- Scientific inquiry skill 🦊
- Motivation?
- Ability?
- Self-directed Learning





•Science Competitions •Setup of Junior Science Team			

## **Science Competitions**



#### - Hong Kong Budding Scientists Award

Science Competi s Setup of Junior Science Team

The Hong Kong Budding Scientists Award (HKBSA) competition is co-organised by the Gifted Education Section of the Education Bureau (EDB) and the Hong Kong Association for Science and Mathematics Education. The competition aims at nurturing the talents of scientifically gifted/ more able students at upper primary (P.4-6) and secondary (S.1-4) levels, and providing them with training in scientific problem solving skills as well as collaboration, creativity, communication and critical thinking skills.







- $3-4 \rightarrow$  Around 10 S2 students
- Physics, Chemistry, Biology -
- Around 2-3 months  $\rightarrow$  Whole year, once a week



### **Connection to Senior Science Team**

Setup o

2009 Start regula trainin

Science



- Project-base scientific investigation

- 2-3 junior teams (usually S3-4 students)
- Joining different local science competitions Hong Kong Budding Scientists Award 香港科學青苗獎

Hong Kong Youth Science and Technology Innovation

Competition

香港青少年科技創新大賽

The Hong Kong Student Science Project Competition

香港學生科學比賽





# Regular Pull-out program on Science subjects

- Teachers involved increased from 1 to 3.
- Around 3 times per month



Science Competitio Setup of Junior Science Te



Science Training				
16/11/2016(Wed)	Phy			
23/11/2016(Wed)	Bio			
30/11/2016(Wed) Chem				
3:45-4:45 @ Bio Lab				



# A Regular Pull-out program on A Science subjects

- Input from Teacher Network (EDB)2021-22

#### Task: Make a prediction

• Which candle(s) will go out first?



A. Candle A

Competition Setup of Junior Science Te

- B. Candle B
- C. Candle C
- D. The three candles go out at the same time



Science Training				
16/11/2016(Wed)	Phy			
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### Involvement of Senior students and Alumni



#### Alumni

2009 • Start regula training • Connection to Senior Science Team Regular Pull-out program on Science subjects

 Science Competition
 Setup of Junior Science Team

- Junior science team trainer
- Rehearse before competition
- Share ideas

2016 • Senior student s and Alumpi 







Learner



Regular Pull-out program Science subjects

tart regul elon self-directe

#### Tiered assignment

- 1. Does high temperature destroy the amount of vitamin C?
- 2. Does 'light' or 'low sugar' drinks contain less sugar?
- 3. Does fat absent in 'fatfree' milk?
- 4. Does low GI food release glucose slowly?



Tomlinson, 1999





Theme	Gifted Education Elements	Differentiation Strategies	Learning Outcome for whole class	Learning Outcome for gifted
Food Test	Higher-order thinking skills, Personal- social Competence Development	SDL-based Tiered Assignment (分層課業)	<ul> <li>Students understand the principle of different food tests.</li> <li>Students can design and carry out a scientific investigation with proper variables.</li> </ul>	<ul> <li>Students can create new quantitative measurements.</li> <li>Students can analyze and explain the result.</li> <li>Students can identify and show their gifted elements, i.e. science, art, etc.</li> </ul>



2008 • Science Competitions • Setup of Junior Science Team		2012 • Regular Pull-out program on Science subjects		2018 • Develop self-directed Learner • Join school network • Develop curriculum in junior science
	ullet	•	•	•
	2009 • Start regular training • Connection to Senior Science		2016 • Senior students and Alumni	

•

Lesson (Duration) 課堂節數	Learning Objectives 學習目標	Enrichment/Differentiat ion Strategy 增潤/適異性教學策略	Process/Activities 過程/活動
Pre-lesson	Understanding the principle of food tests	-	Videos and Google form (flip classroom)
1	Able to carry out different food tests	-	Food test experiments
Pre-lesson	Able to design experiment with suitable variables	Tiered assignment	Group discussion on the choice of topic and experiment design through Google doc (flip classroom)
1	Able to carry out experiment and collect result	Tiered assignment	Food test experiments with different designs and difficulties (students-led practical work)
1 - 2	Able to explain results in presentation	Presentation in various forms like powerpoint, poster, video, etc.	Presentation
Post- lesson	Able to write a full report	-	Report









- 15 F3 students joined Hong Kong Biology Literacy Award
- Connection to pull-out program (Level 2) for students interested or gifted in Biology



#### Learner

#### **IS SDL Reading Scheme**

Sustainable Energywithout the hot air BOOK David MacKay TITLES Many people know that non-renewable energy source are harm to the environment. However, they don Many people know that non-renewable energy source are harm to the environment. However, they don know how much energy is used and eaved Arthur are narm to the environment, nowever, know how much energy is used and saved. This book has mentioned how much energy is used This book has mentioned how much energy is used is the formation of the like the embodied energy in Fires and the embodied energy in Fires humans' economic activities to show how large is the amount of it, like the embodied energy in in foco fertilizers is about 2kWh per day per person in foco and farming. Also, taking a bath uses about 5kWh. Fo fertilizers is about 2kWh Per day per person in foo and farming. Also, taking a bath uses about 5kWh. Fo comparison, taking a shower uses about 1 4kWh. and tarming. Also, taking a bath uses about 3kWr comparison, taking a shower uses about 1.4kWh Moreover, it has also mentioned what can we do Moreover, It has also mentioned what can we do saving energy. It has listed the actions and the amount of energy is saved. We can take actions like chan saving energy. It has listed the actions and the amount of energy is saved. We can take actions like charge the filement bulke to th of energy is saved. We can take actions like change the filament bulbs to the fluorescent bulbs bulbs. They are more energy efficient it can easily the filament bulbs to the fluorescent bulbs or Let bulbs. They are more energy efficient. It can save 4kWh/d. In addition, we can drive less, drive slowly use an electric car or use public transport instead. AKWN/G. IN ADDITION, WE CAN DRIVE LESS, drive slowij Use an electric car or use public transport instead o private cars, or even cycle and walk to a place the use an electric car or use public transport instead of private cars, or even cycle and walk to a place that are not too far. We should also take a shower instead of taking a bath. This book has told us the actual number of energy This book has told us the actual number of energy oc using and saving energy. It reminds us how muci energy we have used and encourages us to save energy in our daily life. We can start saving energy this moment. this moment.







Mission: Mars









Science Competit S Setup of Junior Science Team



#### Development Gifted Education in Science



## **Regular Pull-out program**

• In collaboration with EDB, Gifted students are invited to join the program

- The following programs are introduced:
- Candle investigation
- Microscale titration

#### **Traditional teaching**

**V.S**.

#### Pull-out program Gifted Education

- Student-centered
  - Collaborative learning
  - Motivate students to think about higher order questions

- Teacher-centered
- Single-way in knowledge transfer
- Less interested and difficult to motivate students



### Task: Make a prediction

• Which candle(s) will go out first?



- A. Candle A
- B. Candle B
- C. Candle C
- D. The three candles go out at the same time



### Task: Make a prediction

- Which candle(s) will go out first?
- Evidence that supports:

Candle A	
Candle B	
Candle C	
At the same time	



Reference: Learning from TIMSS (2003)





1 Burning requires fuel.	2 Burning requires oxygen.	<b>3</b> Burning consumes oxygen and produces carbon dioxide.
4 Carbon dioxide is denser than air.	5 Carbon dioxide puts out fire.	6 Hot gas floats and cold gas sinks.
7 Burning of candle produces water.	8 Burning gives out heat.	9 Burning requires high temperature.





#### Next stage

Teachers explain the reason(s) behind?

1 Burning requires fuel.	2 Burning requires oxygen.	3 Burning consumes oxygen and produces carbon dioxide.
4 Carbon dioxide is denser than air.	5 Carbon dioxide puts out fire.	6 Hot gas floats and cold gas sinks.
7 Burning of candle produces water.	8 Burning gives out heat.	و Burning requires high temperature.

#### Without telling students about the 'CORRECT' answer,



1.evaluate the evidence collected during the lab demonstration

1

3

1.identify the relevant evidence and eliminate the irrelevant evidence for revising the hypothesis

enhance gifted/ more able students' higherorder thinking skills and creativity

Students learn how to

1.make inquiry based on the cards provided that may support or against their original predictions develop logical and evidence-based explanation based on their investigations



#### Microscale titration



2

'Taste' of microscale experiment in considerably high accuracy Good introduction of titration and quantitively analytical experiment

3

1

Able to learn titration without the previous knowledge of mole calculation Easy to set up a microscale titration without the use of unfamiliar apparatus, including burette and volumetric flask

#### Scenario

- To ensure safety for consumption, the Centre for Food Safety (食物安全中心) conducts regular inspection on food sold in HK to see if they comply with established safety standards.
  - Guidelines for using food additives (preservatives,

colourings etc.)

- Maximum tolerance of harmful substances (natural toxins, heavy metals, microbial matter etc.)
- Legal action against food with false or misleading labels



#### Scenario

- The composition of food is determined by chemical analysis in a laboratory
- A certain brand of vinegar was found to violate the legal requirement on the composition of vinegar, which is

≥4 g acetic acid (醋酸) per 100 cm<sup>3</sup> vinegar

 You are asked to perform chemical analysis on 3 other brands of vinegar to see if they comply well with the legal requirement

#### 新聞公報

食物環境衛生署食物安全中心(中心)今日(十一月十七日)表示, 一個意大利進口的預先包裝醋樣本的醋酸含量不符合法例規定的成分組合 標準,中心正跟進事件。

產品資料如下:

```
產品名稱:Cavedoni Blue Label
10Y Balsamic Vinegar
of Modena
來源地:意大利
生產商:Antica Acetaia
Cavedoni dal 1860
此日期前最佳:二○二五年十二月三十一日
容量:每瓶二百五十毫升
```

中心發言人說:「中心透過恆常的食物監察計劃,從中環一超級市場 抽取上述樣本進行檢測。結果顯示,樣本的醋酸含量為每一百立方厘米三 點三克,低於法定要求的每一百立方厘米不得少於四克。」

「雖然食用醋酸含量少於法定標準的醋不會影響健康,但上述樣本並 不符合法例對『醋』成分組合的規定,違反《食物及藥物(成分組合及標 籤)規例》(第132W章)。」

根據該法例,在本港出售的食物成分組合如不符合法例規定,一經定 罪,最高可被判罰款五萬元及監禁六個月。

中心已知會涉事商戶上述違規事項,指令其停售受影響批次的產品。 如有足夠證據,中心會提出檢控。中心亦會知會業界並會繼續跟進事件, 以保障市民健康。

完

2015年11月17日(星期二) 香港時間18時33分

Data and calculations	Standard acetic acid	Select vinegar	LKK vinegar	Heinz vinegar
<i>M1</i> / g				
<i>M2</i> / g				
<i>M3</i> / g				
Percentage concentration / % $=\frac{(M3 - M2) \times 4.8}{(M2 - M1)}$				



- Online Foundation Course for Teachers - Gifted Education
- Online Foundation Course for Teachers - Affective Education for Gifted/More Able Students
- Advanced Courses (A-F) in Gifted Education
- Affective Education Series
- Gifted Ed School Network

