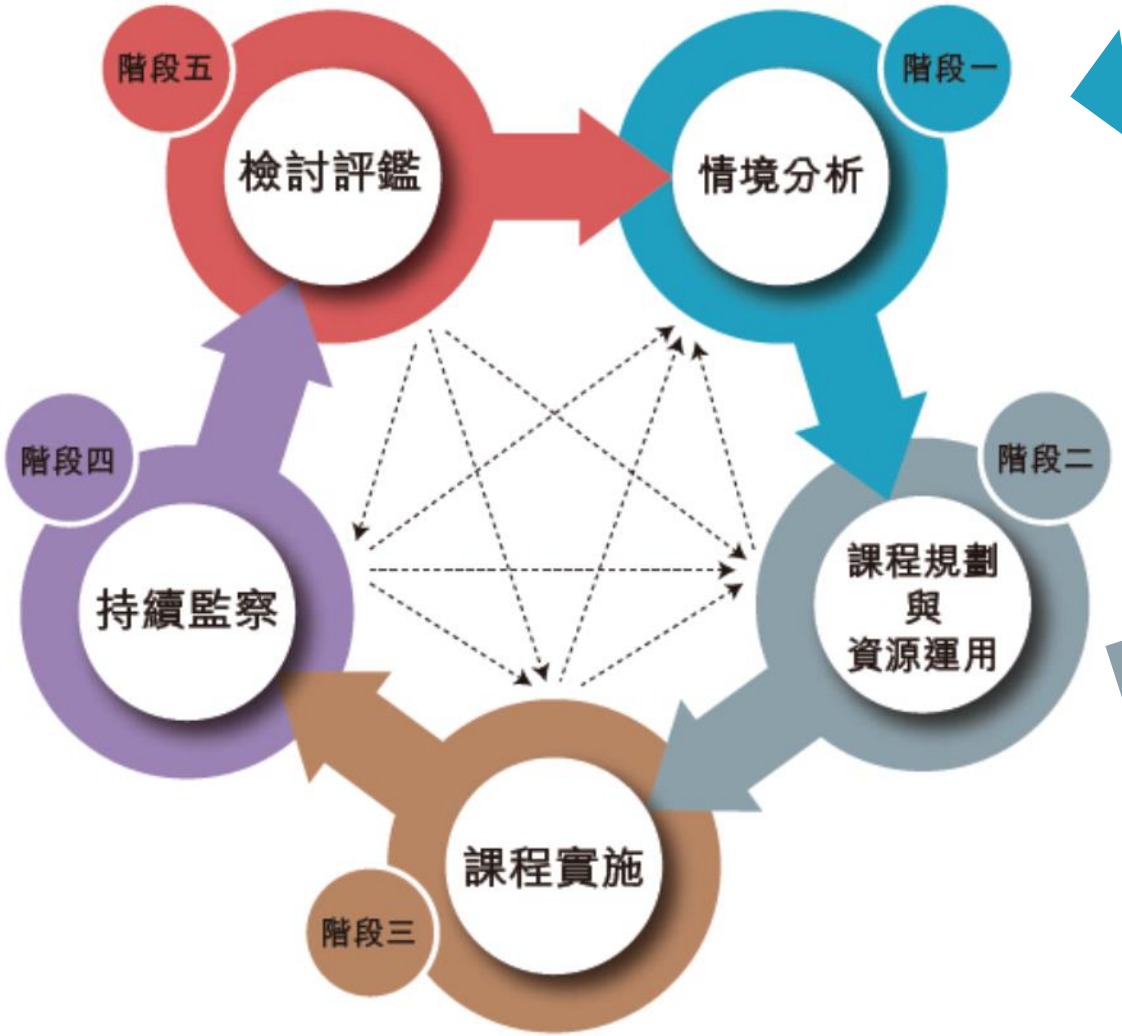
透過校本資訊科技課程推行編程教育

區建強



《基礎教育課程指引－聚焦·深化·持續（小一至小六）》(2014)

學校發展周期的關注事項

- 提升學生的共通能力

2015

- 推動STEM教育

2016

- 在小學推動STEM教育的一筆過津貼

2017

- 小學常識科課程指引
- 計算思維－編程教育：小學課程補充文件

- 「運算思維可培養學生的創新、解難及邏輯思維能力，是廿一世紀學生必須具備的學習技能。」(張仁良, 2017)

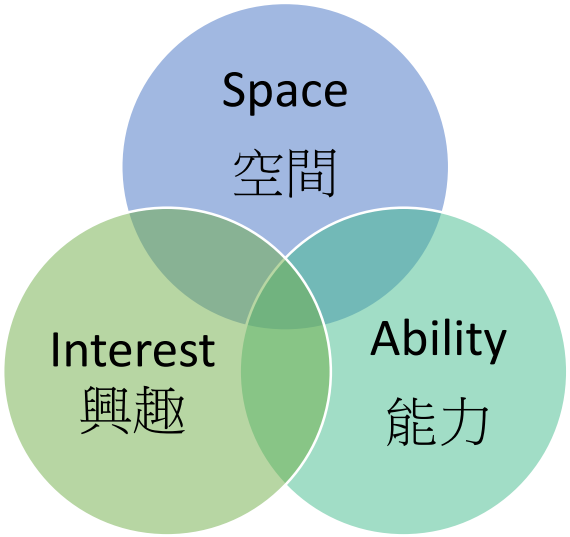
- 我們的目的：
  - 培養學生的創造力、協作和解決問題的能力，以面對二十一世紀所帶來的挑戰
  - 社會上有不少聲音，希望學生能擁有藉編程來處理信息和計算思維的知識及技能，以滿足人力市場的需求

科本領導的重要性

- 科主任應擔任本科的課程領導，除管理科務工作及教學資源外，亦須帶領本科的教學團隊，進行課程規劃，以落實擬定的學與教策略。

- 科主任宜掌握教學團隊的優勢， 組織學習社群，讓具不同大專資歷的教師一起探討相關主題的活動，讓教師在互相觀摩和學習，發展專業。

"I can't this weekend, I'm doing a teacher triathlon - lesson plans, grading, *and* report cards."



學習時間的靈活運用

- 引入外間資源，協助學校策劃及優化校本編程教育課程，為學生提供應用計算思維和編程技巧的機會。

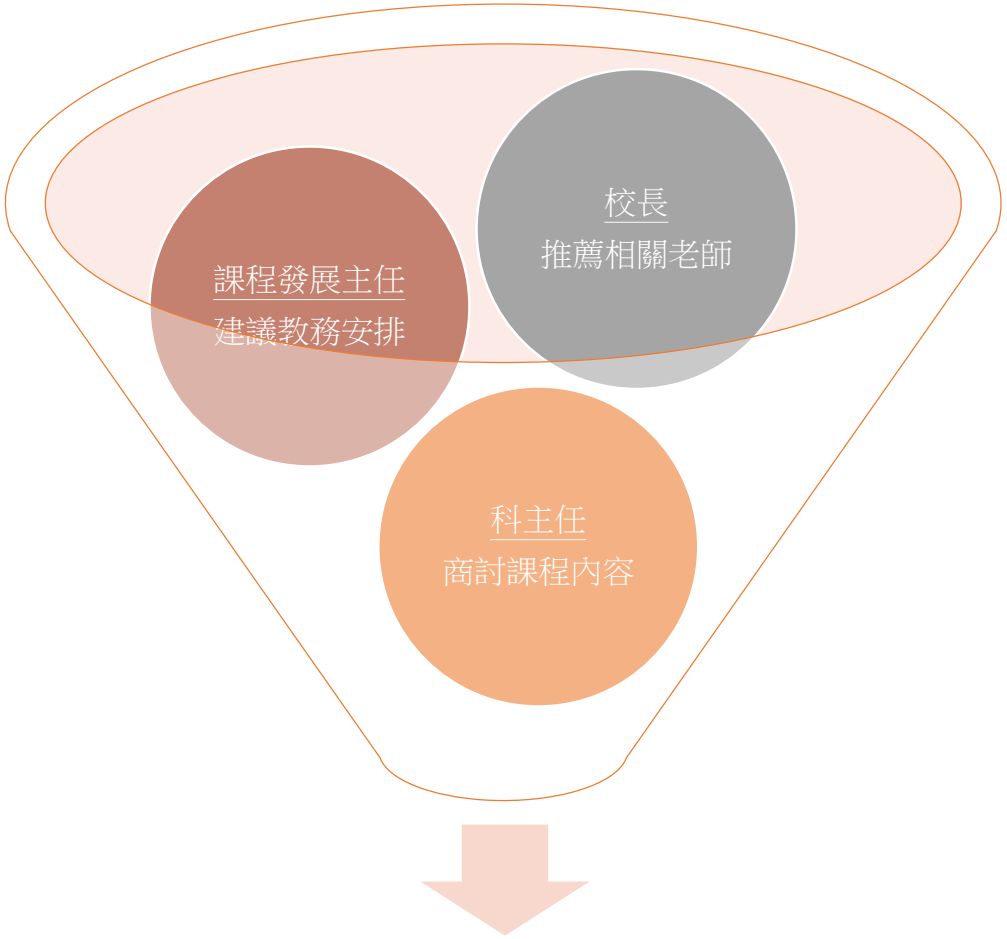
- 學校於課外活動時段均引入編程教學，本年度與資訊科技教育相關的課外活動有：

星期一	星期二	星期三	星期四	星期五
	小五、小六 (mBot)		小五、小六 (micro: bit)	小三、小四 (unplugged)

教師專業發展

發展校本資訊科技課程

調適相關教師的課擔及其他教學職務



教學工具的選取

學生能力的考量

教學內容的調適

外間資源的引入

學習顯證的匯集

以級長身份帶領同工

作為溝通橋樑

推動科務政策

協調活動實施

初代區塊拼圖的概念

教學資源豐富

學校無需行政成本

瀏覽器的編譯環境

方便使用者攜帶

已跟感應器整合

提供更多輸入及輸出裝置

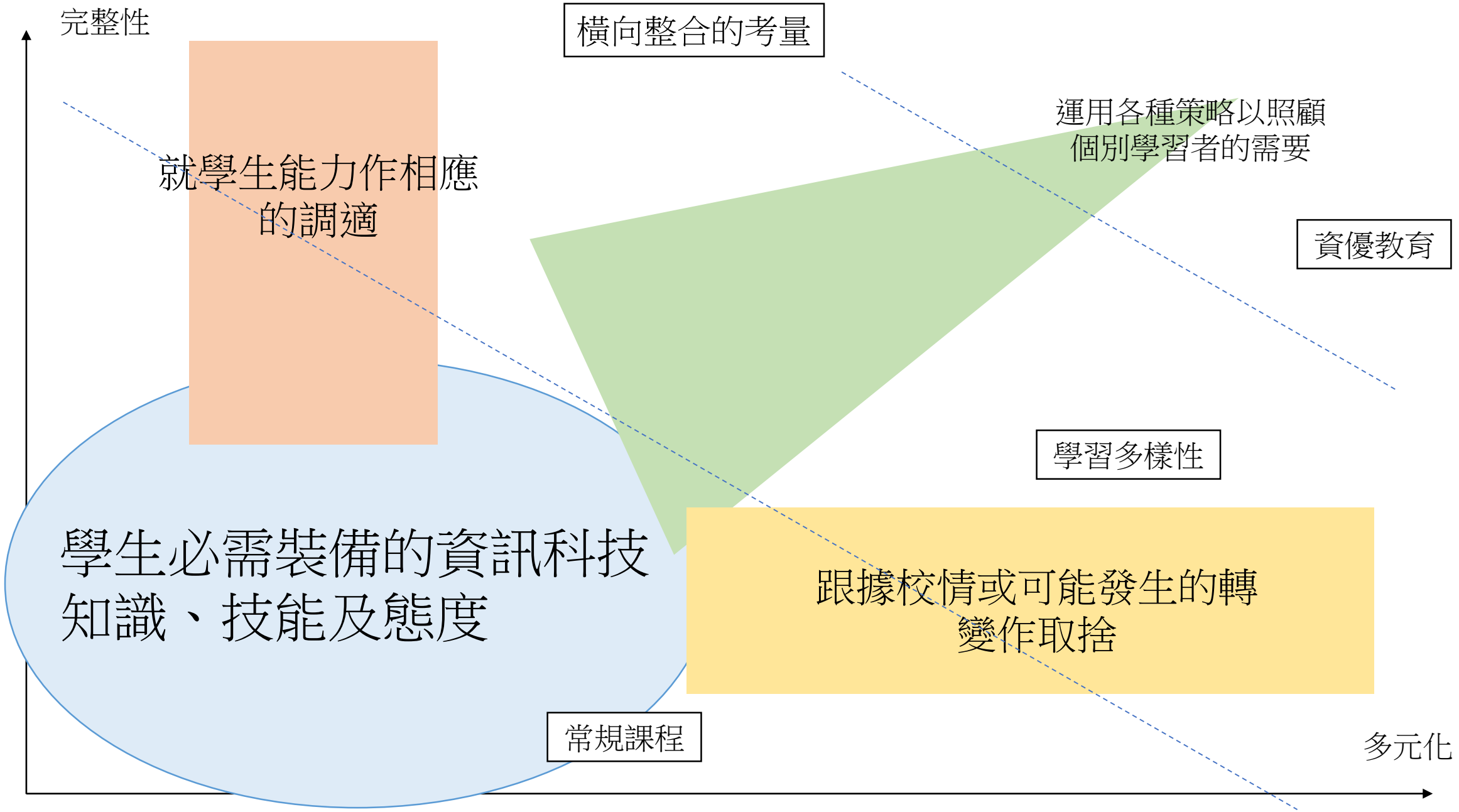
迎合最新資訊科技發展

e.g. 物聯網(IOT) , 人工智能(AI)...

橫向的平衡與縱向的銜接

- 根據各個學習範疇的核心學習元素，撰寫主題和編排橫向整合的學習計劃，讓學生通過實際體驗和日常生活事件學會學習。

- 注意課程螺旋發展與縱向連貫，確保不同學習階段和年級的學習均能互相銜接。


完整性
橫向整合的考量
就學生能力作相應的調適
運用各種策略以照顧個別學習者的需要
資優教育
學習多樣性
學生必需裝備的資訊科技知識、技能及態度
跟據校情或可能發生的轉變作取捨
常規課程
多元化

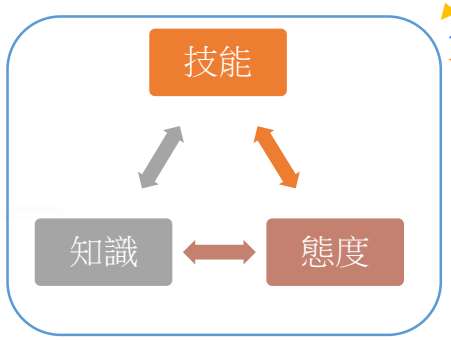
09/2018前 (小六電腦科課程)

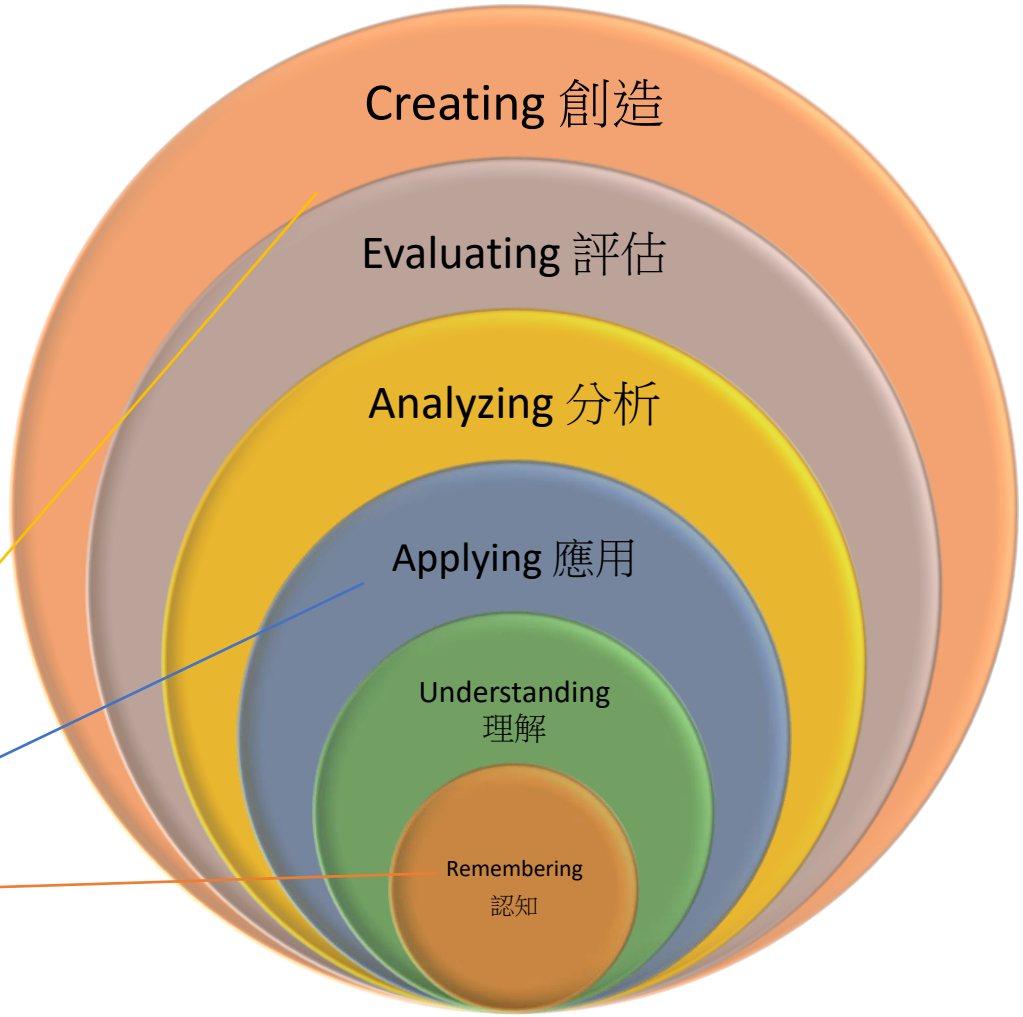
- 資訊處理(30%) Microsoft Excel
- 互聯網應用(40%) G Suite for Education
- 資訊科技對社會的影響(30%) 互聯網上的保安及威脅

09/2018後 (小六電腦科課程)

- 資訊處理(20%) Microsoft Excel
- 互聯網應用(30%) G Suite for Education
- 資訊科技對社會的影響(20%) 互聯網上的保安及威脅
- 程式編寫(30%) mBot

縱向連繫的考量



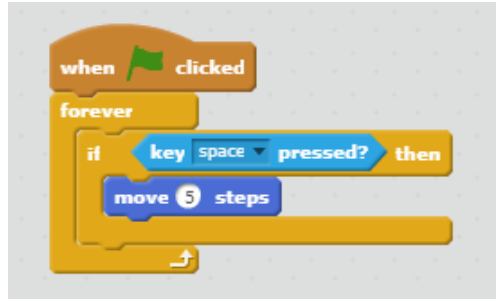


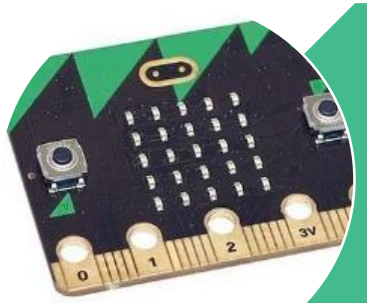
Bloom's revised taxonomy (Anderson & Krathwohl, 2001)

• 循環				• 意識「循環」為設計算法中一個基本結構（組件） • 明白「循環」中的某些步驟需要重覆執行直至被命定或在特定條件成立下停止 • 意識「循環」的重要性，能令電腦進行重覆性的工作。「循環」有助簡化算法。例如：清潔牙齒的算法 • 意識需要設定重覆的步驟及停止的條件。例如於圖書館尋找某本書，晚餐後清洗碗碟。認識「循環」的不同停止條件，例如，計數

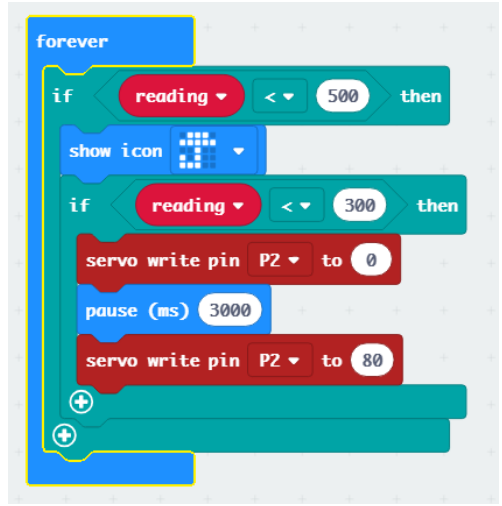
計算思維 – 編程教育 小學課程補充文件(EDB,2017)

認識「分支/選擇」的編程結構





意識及明白單一分支IF及
多個IF算法所涉及的步驟



引入組合邏輯以呈現
多於一個「選擇」或「決策」

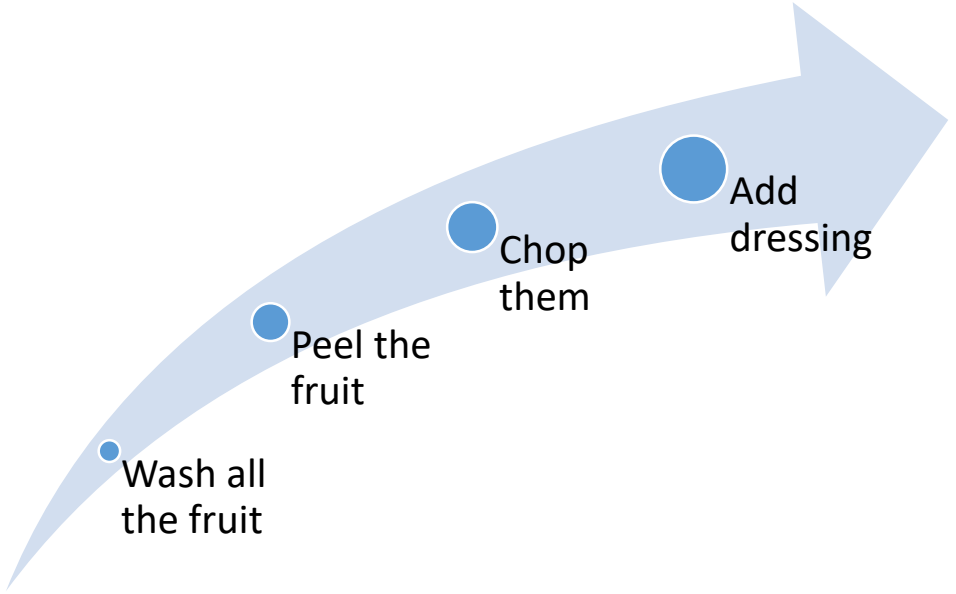
編程教育與STEM的連繫

- 建基於一個學習領域課題的學習活動，讓學生綜合其他學習領域相關的學習元素。

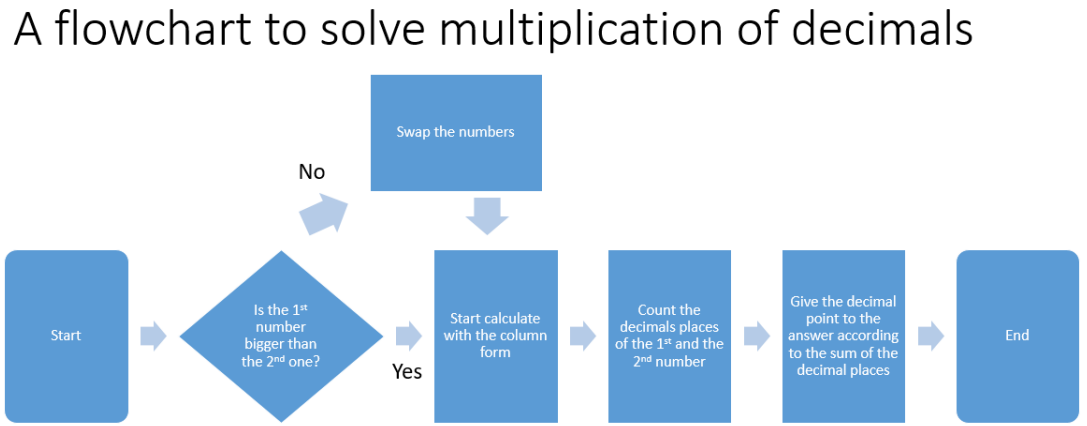
- 透過專題研習讓學生綜合不同學習領域的相關學習元素。

數學科

- 引入運算思維的數學教學



- 拆解(Decomposition)
- 格局圖樣(Pattern Recognition)
- 抽象化(Abstraction)
- 算法設計(Algorithm Design)

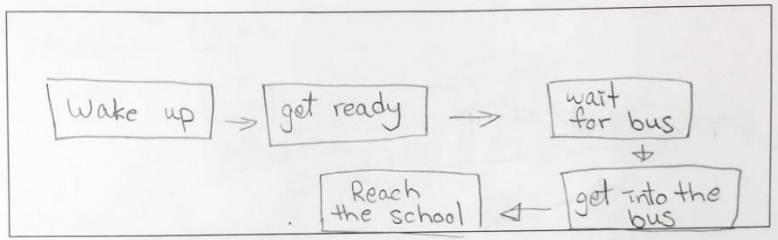


Hong Kong Taoist Association Wun Tsuen School
Mathematics
Division of decimals

Name: Sukhvir, Parwinder Class: CL6

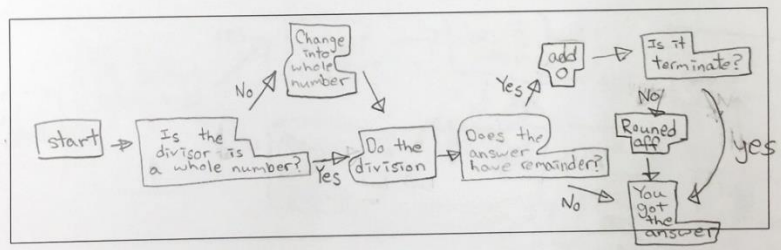
A) Design a flowchart about your daily stuff.

Flowchart of going to school



B) Design a flowchart to solve "Division of Decimals".

Flowchart of solving division of decimals



C) Use the flowchart above to guide you finish the following question.

End

1) 7.8 ÷ 4 = 1.95

2) 3.55 ÷ 0.5 = 7.1
355 5

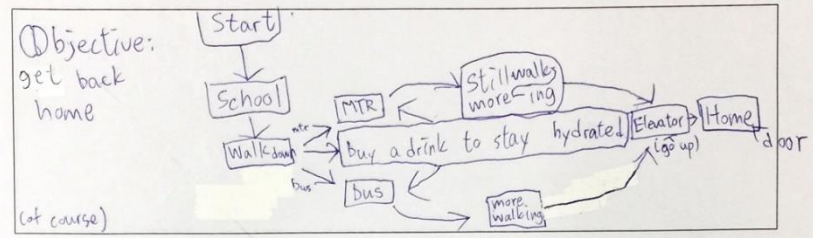
3) 2.2 ÷ 0.7 = 3.14 (rounded off the answer to the nearest hundredth)

Hong Kong Taoist Association Wun Tsuen School
Mathematics
Division of decimals

Name: Wilson, Abeel Class: CL6

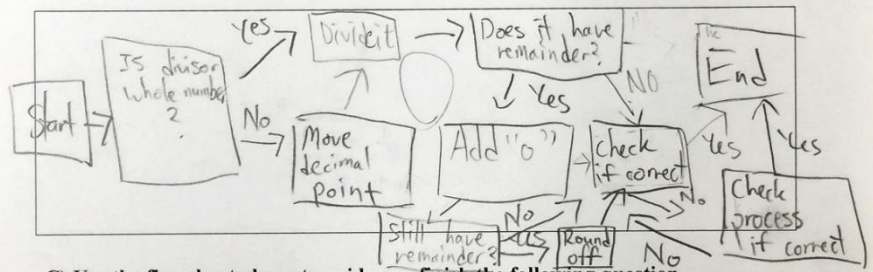
A) Design a flowchart about your daily stuff.

Flowchart of ways of going back home



B) Design a flowchart to solve "Division of Decimals".

Flowchart of solving division of decimals



C) Use the flowchart above to guide you finish the following question.

1) 7.8 ÷ 4 = 1.95

2) 3.55 ÷ 0.5 = 7.1

3) 2.2 ÷ 0.7 = 3.14 (rounded off the answer to the nearest hundredth)

Hong Kong Taoist Association Wun Tsuen School
Mathematics
Problem Solving of Decimals

Name: Parwinder Class: 6

A) Circle the typo mistakes of the article and write the correct one next to it.

During the activity, I take part of the Checking.

B) Solve the following question with your partner.

5 cans of apple juice cost 29 dollars. 3 bottles of orange juice cost 32.4 dollars. 4 children bought 2 cans of apple juice and 1 bottle of orange juice, how much should each child pay on average?

I am **student A**, I need to decompose the question into parts.

The small tasks are…
Price of 1 can of apple juice
Price of 2 cans of apple juice
Price of 1 bottle of orang juice.
Price altogether
How much each child should pay.

After my partner solve each small tasks, I conclude our answer as follow.

$= (5.8 \times 2 + 32.4 \div 3) \div 4$

$= 5.6$

Each child should pay 5.6 dollars on average.

C) Solve the following question with the above method.

8 rolls of tissue cost 21.6 dollars. They are sold at a discount of 0.8 dollars cheaper. Mum want to buy 3 rolls of tissue with 10 dollars. How much change should she get?

Hong Kong Taoist Association Wun Tsuen School
Mathematics
Problem Solving of Decimals

Name: Moiz Class: 6

A) Circle the typo mistakes of the article and write the correct one next to it.

During the activity, I take part of the circling the wrong words.

B) Solve the following question with your partner.

5 cans of apple juice cost 29 dollars. 3 bottles of orange juice cost 32.4 dollars. 4 children bought 2 cans of apple juice and 1 bottle of orange juice, how much should each child pay on average?

I am **student B**, I need to solve each small tasks.

The small tasks are…	To solve it…	The result…
Price of one apple juice	$29 \div 5$	5.8
Price of two cans of apple juice	5.8×2	11.6
Price of one orange juice	$32.4 \div 3$	10.8
Price of altogether	$11.6 + 10.8$	22.4
How much each child should pay?	$22.4 \div 4$	5.6

After got the answer, we need to prepare a pitch desk.

Good morning everyone, …
this is Moiz and Parwinder. This is about decomposation. This is how we do decomposation. First we should find the small task. And this is how we do decomposation.

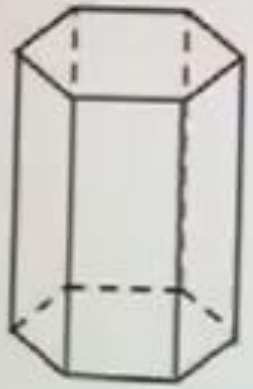
C) Solve the following question with the above method.

8 rolls of tissue cost 21.6 dollars. They are sold at a discount of 0.8 dollars cheaper. Mum want to buy 3 rolls of tissue with 10 dollars. How much change should she get?

Vertices 6

Faces 5

Edges 9



PRISM

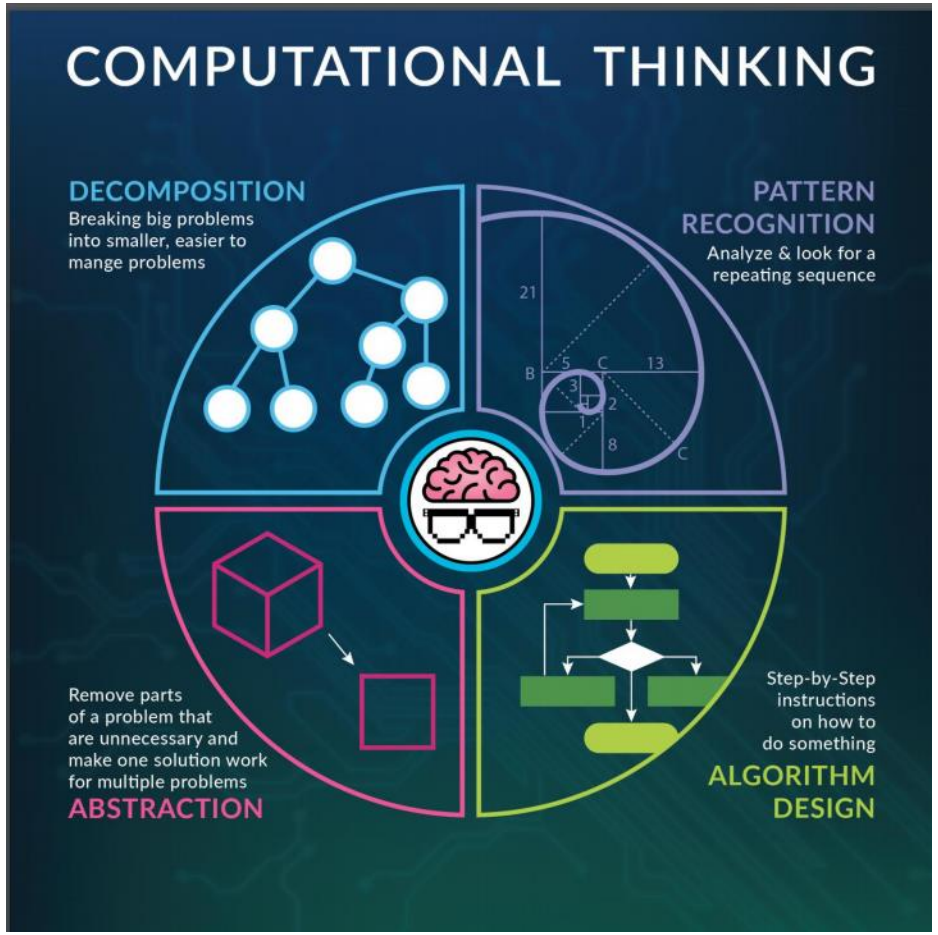
PYRAMID

運算思維 Computational Thinking

- 運用Scratch 編程工具以展示學習成果及鞏固所學

- 引入不同的運算思維元素：
  - 條件 Conditionals
  - 變量 Variables
  - 重用和混合 Reuse and Remix
  - 概念化及模組化

  Abstraction & Modularization



https://www.computationalthinkers.com/product/computationalthinking/

數學表釋 Mathematical Expression

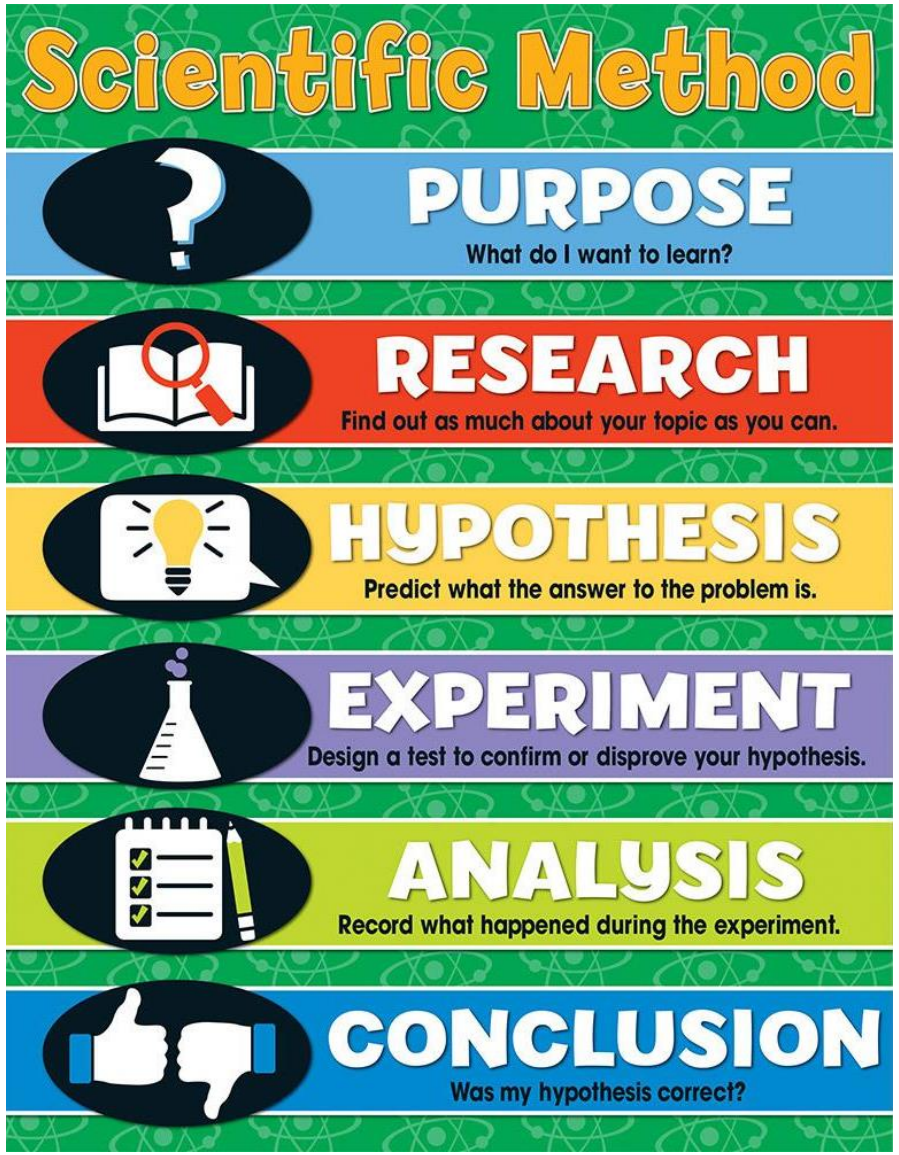
- 運用數學符號依據上下文的規則而組合得成。
- 學生亦需以數學語言以解釋相關表達式的因由。

https://www.weareteachers.com/improving-math-discourse-in-the-classroom/

科學方法 Scientific Method

- 檢查自然現象、獲取新知識或修正與整合先前已得的知識，所使用的一整套技術。

- 配合自主學習，讓學生理解及監控自身的學習經歷。



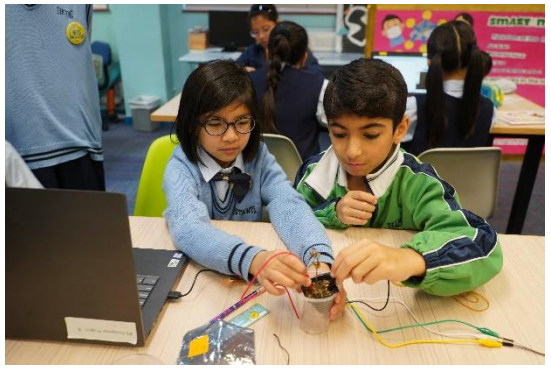
http://iwan-ae.info/scientific-method-chart/scientific-method-chart-the-grade-4-8-6060/

自動灌溉系統

Science

水的用途

水的特性



物料測試

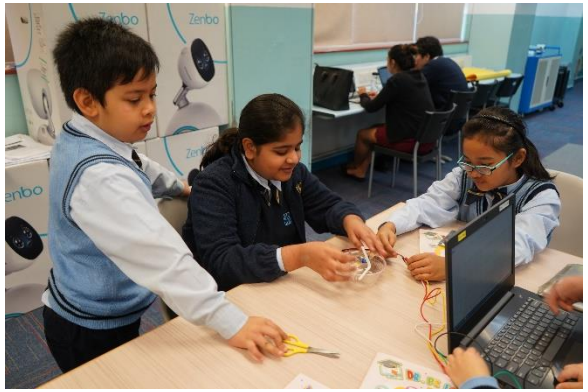
灌溉系統的演變

Technology

程式編寫

設計算法

測試及修復



設計草圖

製作原型

比較及解釋

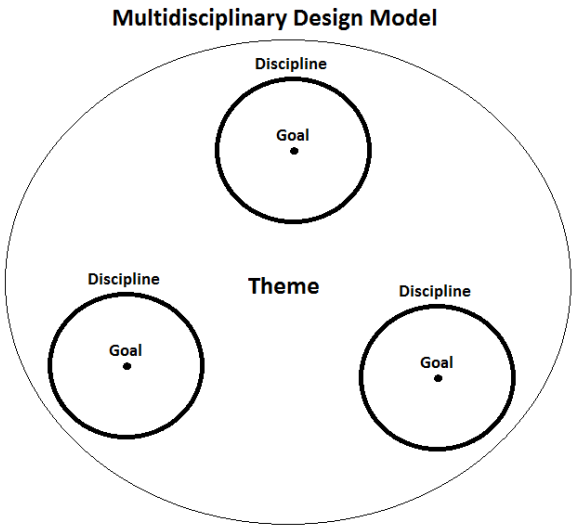
量度數值

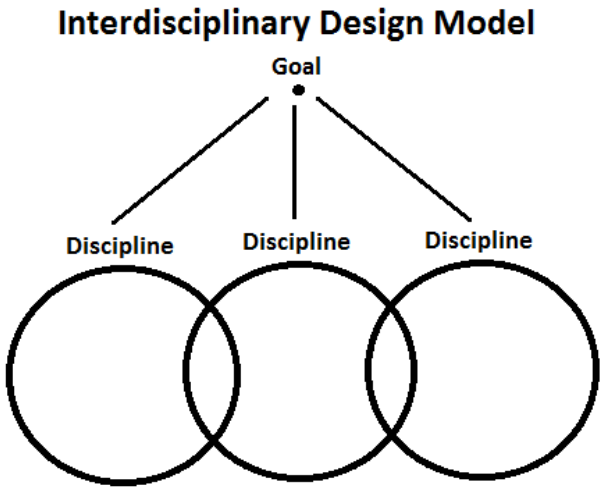
Mathematics

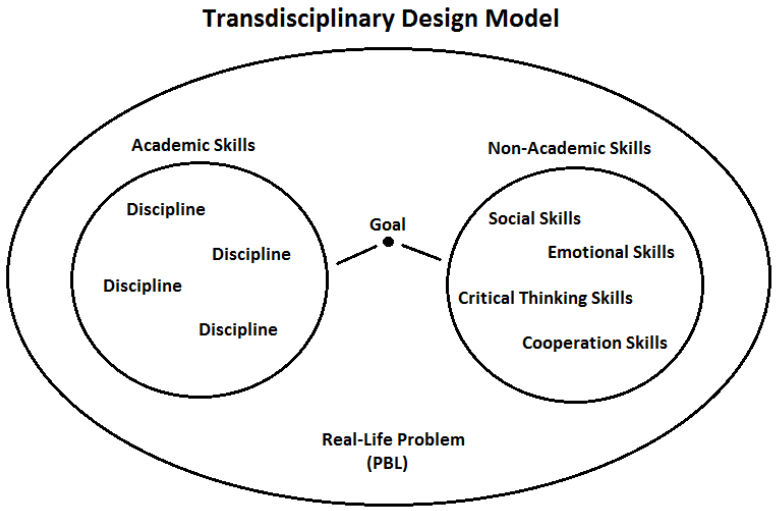
數據處理

Integrated Curriculum as an Effective Way to Teach 21st Century Capabilities (Drake 2018)

- （一）多學科統整取向 (the multidisciplinary approach)
- （二）科際間統整取向 (the interdisciplinary approach)
- （三）超學科統整取向 (the transdisciplinary approach)







HEPA filter
Cotton
face mask
Carbon filter