



運用科技進行有意義的學習

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Meaningful Learning with Technology

-Jane L. Howland, David Jonassen, Rose M. Marra. (2012)

① Characters of meaningful learning

- ◆ Active (Manipulative/Observant)
- ◆ Constructive (Articulative/Reflective)
- ◆ Intentional (Goal-directed/Regulatory)
- ◆ Authentic (Complex/Contextual)
- ◆ Cooperative (Collaborative/Conversational)

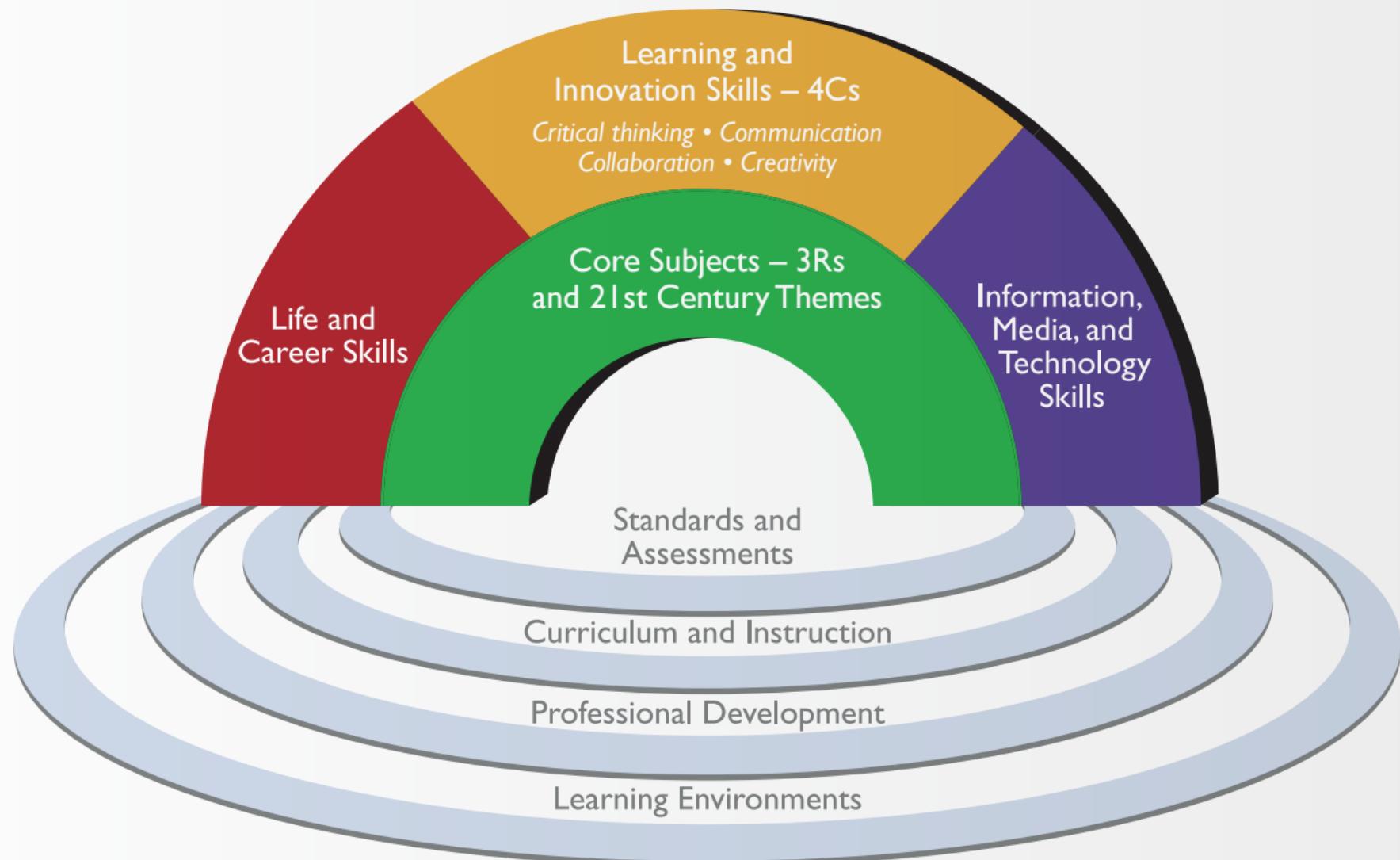


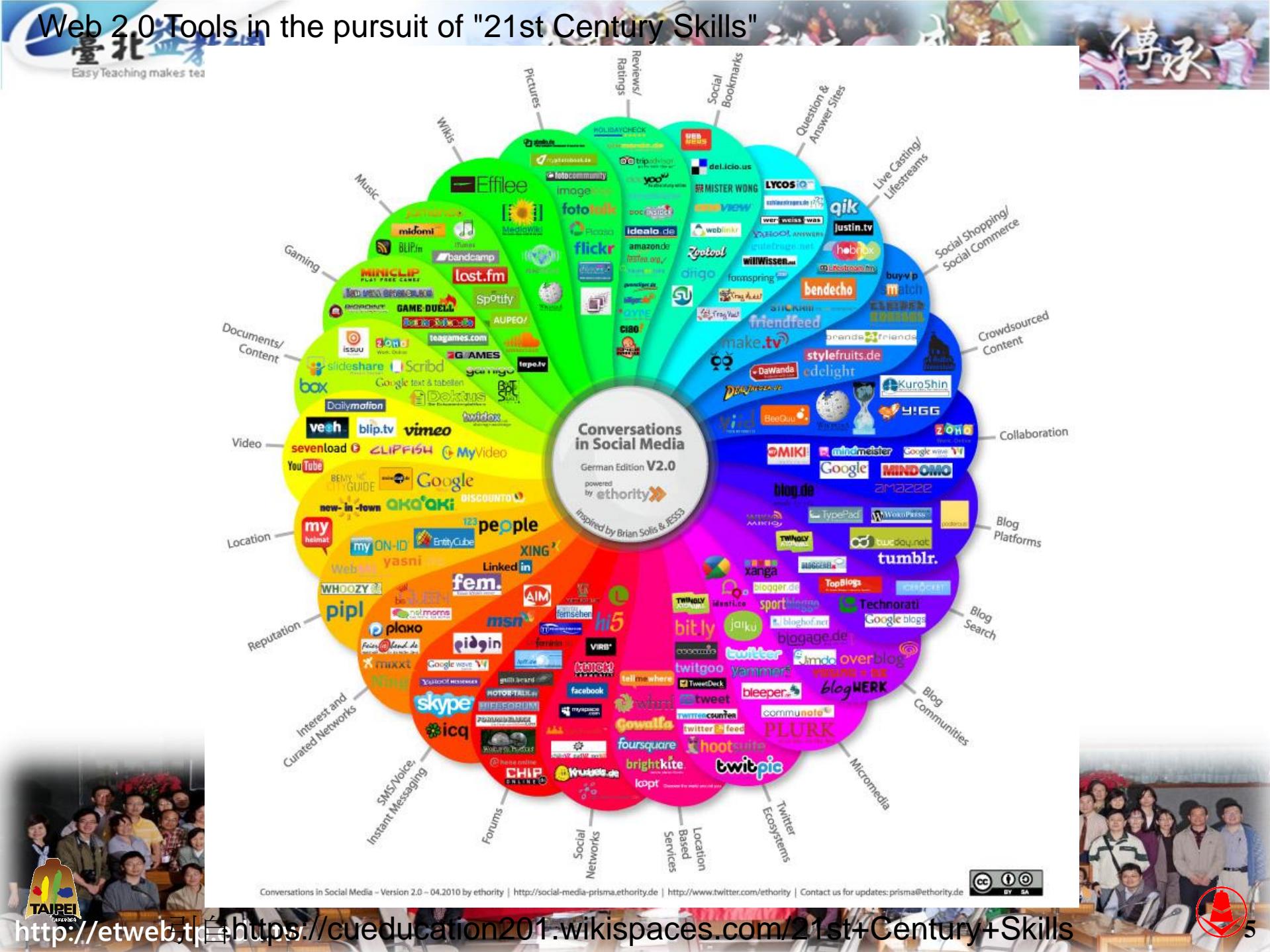


- ⑧ Inquiring with Technologies
- ⑧ Experimenting with Technologies
- ⑧ Designing with Technologies
- ⑧ Communicating with Technologies
- ⑧ Community Building and Collaborating with Technologies
- ⑧ Writing with Technologies
- ⑧ Modeling with Technologies
- ⑧ Visualizing with Technologies
- ⑧ Assessing Meaningful Learning and Teaching with Technologies



21st Century Student Outcomes and Support Systems





Web 2.0 Tools in the pursuit of "21st Century Skills"

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Easy Teaching makes tea

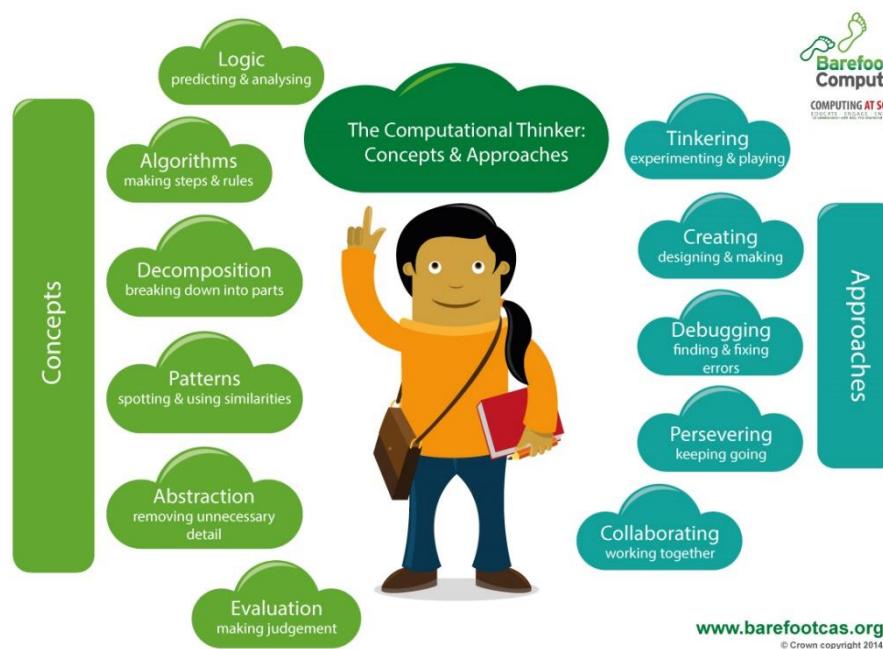
傳承



什麼是運算思維？

@ Google 對運算思維的定義

◆ 運算思維是一種利用運算解決問題所需之「心智歷程」（抽象化、演算法設計、解析、樣式辨識等）與「具體產出」（自動化、資料表示、樣式一般化等）



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臺北益教網 - 二〇一四年六月八日



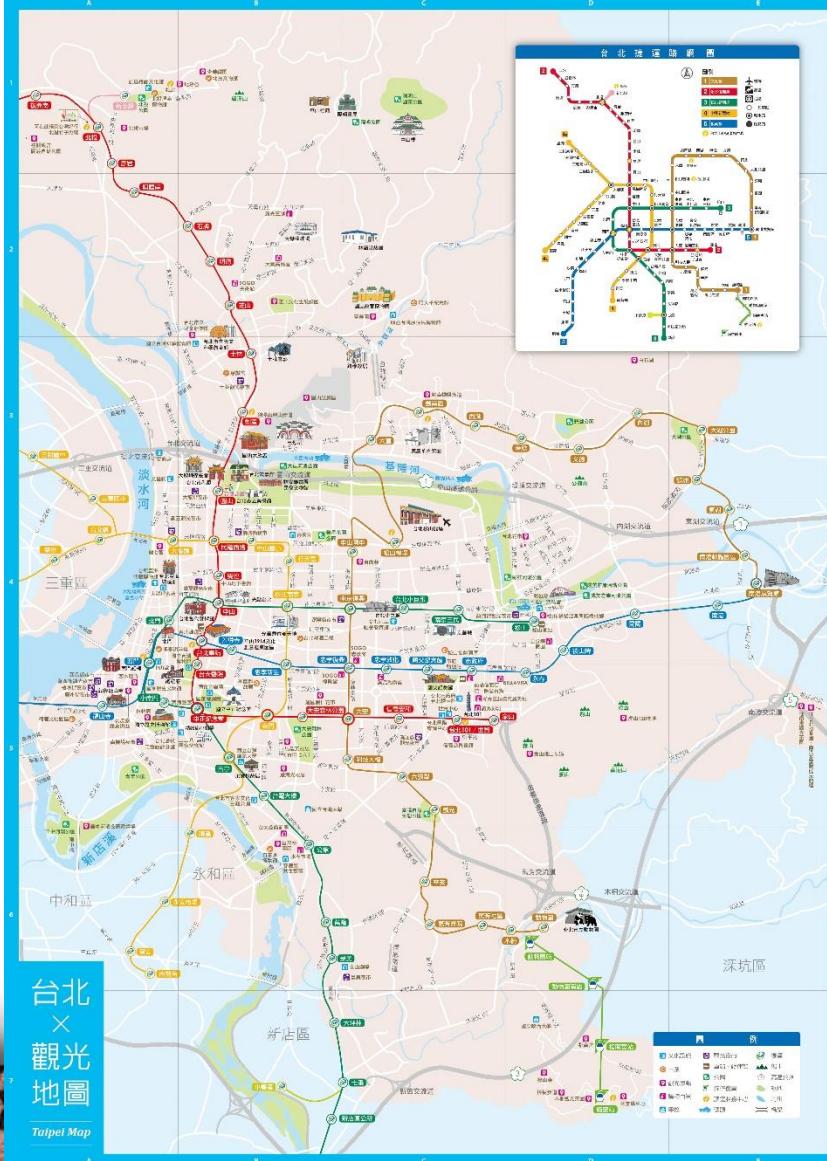


運算思維的內涵（三）

Google Computational Thinking for Educators
(2010)認為具體的運算思維包含的要素有：

1. 拆解問題：將數據、流程或是問題拆解成較小與可管控的部份。
2. 模式識別：觀察數據所呈現出來的模式、趨勢及規律等現象。
3. 抽象化：辨別產生這些模式的一般性原則。
4. 演算法設計：建立一個解決問題或類似問題的執行步驟。



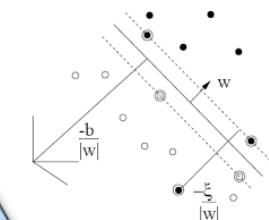
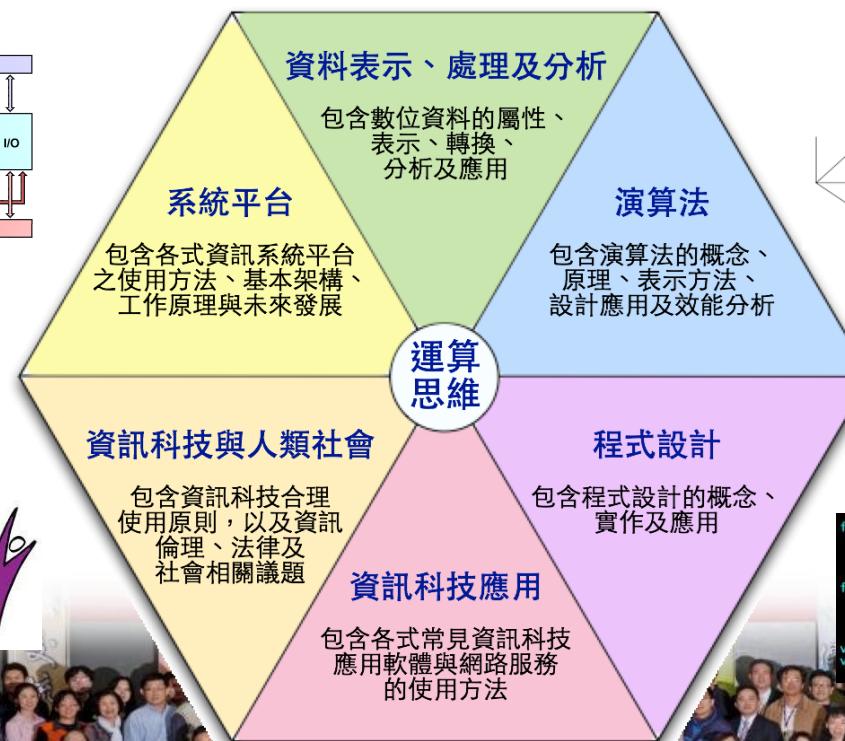
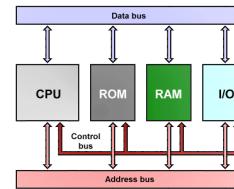
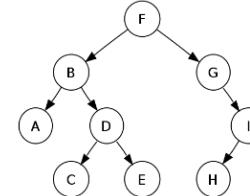


http://www.travel.taipei/frontsite/tw/cms/cmsAction.do?method=goCMSTDetail&listOne=true&contentId=278&menu_id=20126



如何培養-運算思維與資訊科技課綱

◎ 我國課綱與運算思維



```
fun append (xs, ys) =  
  if null xs  
  then ys  
  else hd xs):: append (tl xs, ys)  
  
fun map (f, xs) =  
  case xs of  
  [] => []  
  | x :: xs' => (f x)::(map (f, xs'))  
  
val a = map (increment, [4, 8, 12, 16])  
val b = map (hd, [[8, 6], [7, 5], [3, 0, 9]])
```





參考資料

- ① IEEE spectrum, Jan 2011, 48(1), pp. 24-59
- ② Jane L. Howland, David Jonassen, Rose M. Marra. (2012). *Meaningful Learning with Technology*, 4th ed., Boston: Pearson Education, Inc.

