國立臺灣大學 教學發展中心
Center for Teaching and Learning Development

教學實務與技巧

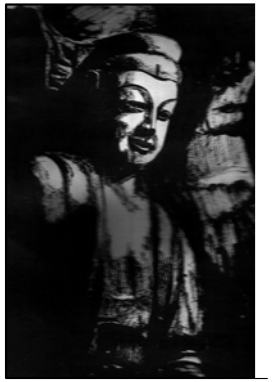
幫助學生。成就自己

經營教學心得　　教學歷程檔

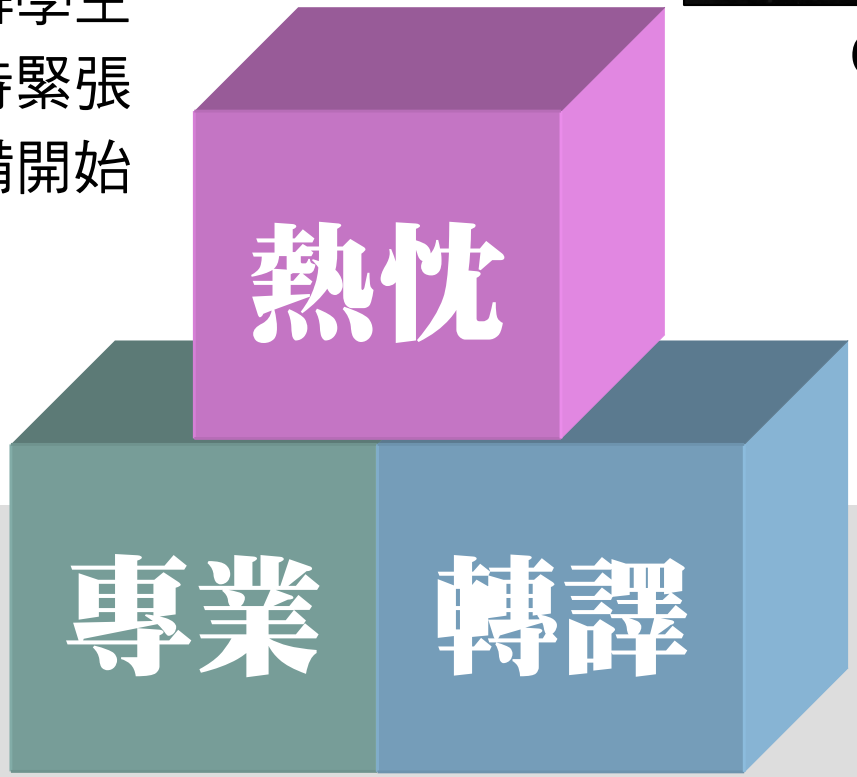
國立臺灣大學
教學發展中心主任 莊 榮 輝
生命科學院 生化科技學系

教學經營的三個關鍵因素

(1) 無熱忱易被識破
(2) 主動去瞭解學生
(3) 平常心看待緊張
(4) 以專業準備開始



Great Mentors



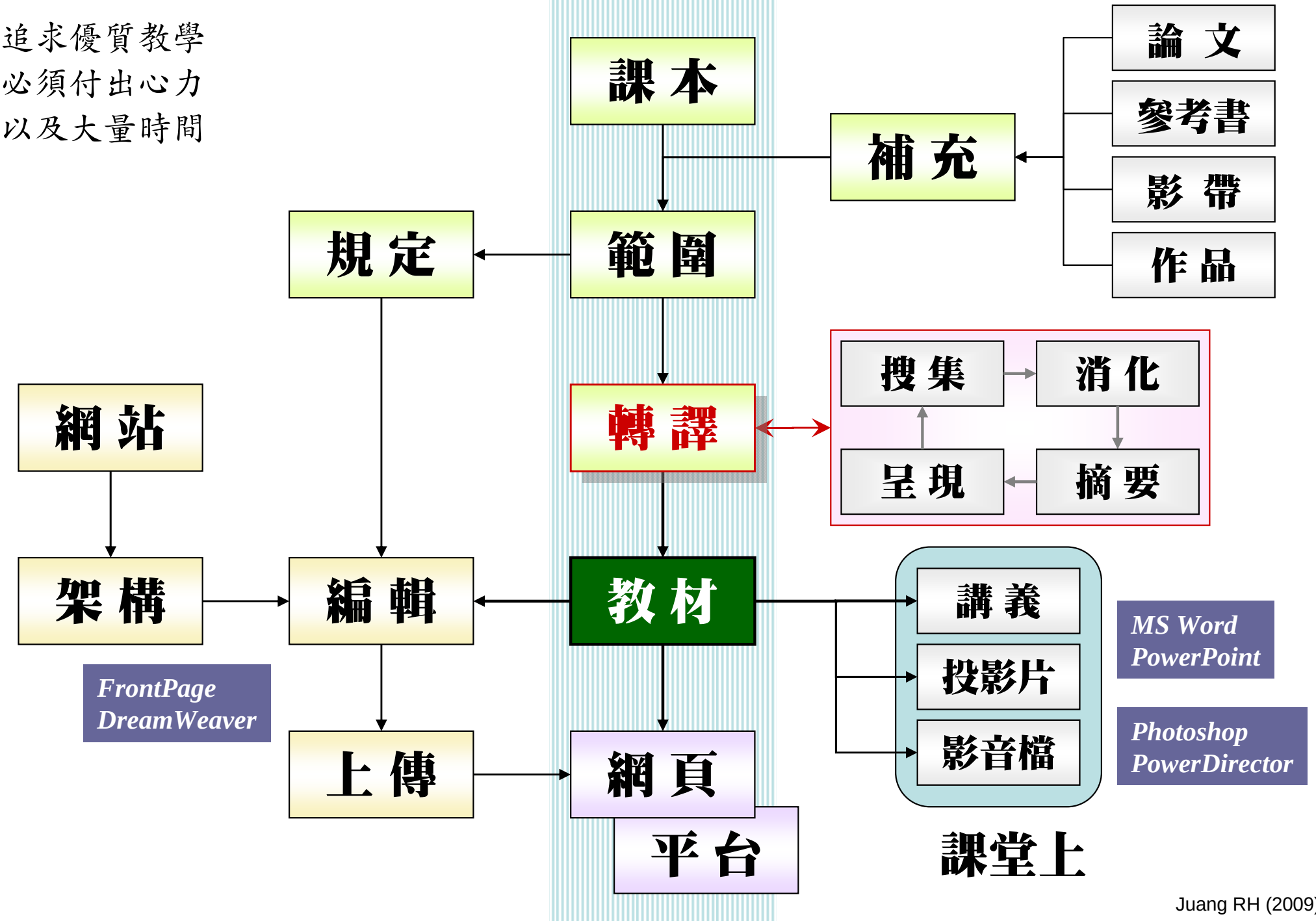
(1) 專業素養要深厚
(2) 自己先累積趣味
(3) 要配合學生背景
(4) 啟發知識與見識

以學生之立場與角度

(1) 學識要經過轉譯
(2) 以投影片為舞台
(3) 充分預習與掌握
(4) 利用問題與個案

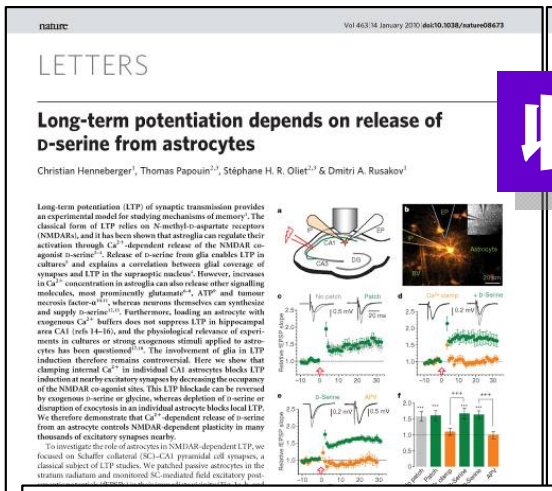
準備課程之關鍵流程

追求優質教學
必須付出心力
以及大量時間



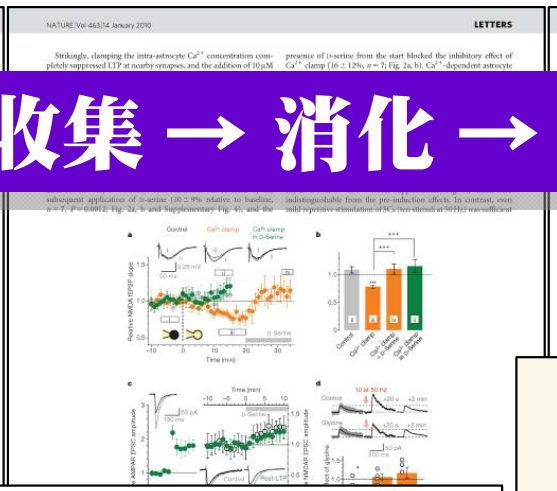
知識要經過轉譯才能變成教材

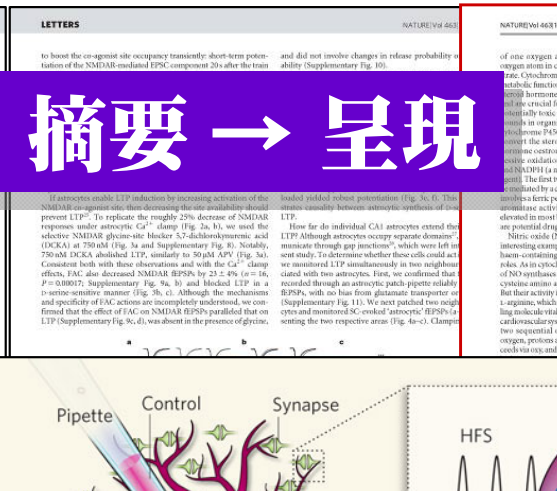
收集 → 消化 → 摘要 → 呈現



Long-term potentiation depends on release of D-serine from astrocytes

Christian Henneberger[1], Thomas Papouin[2,3], Stéphane H. R. Oliet[2,3] & Dmitri A. Rusakov[1]

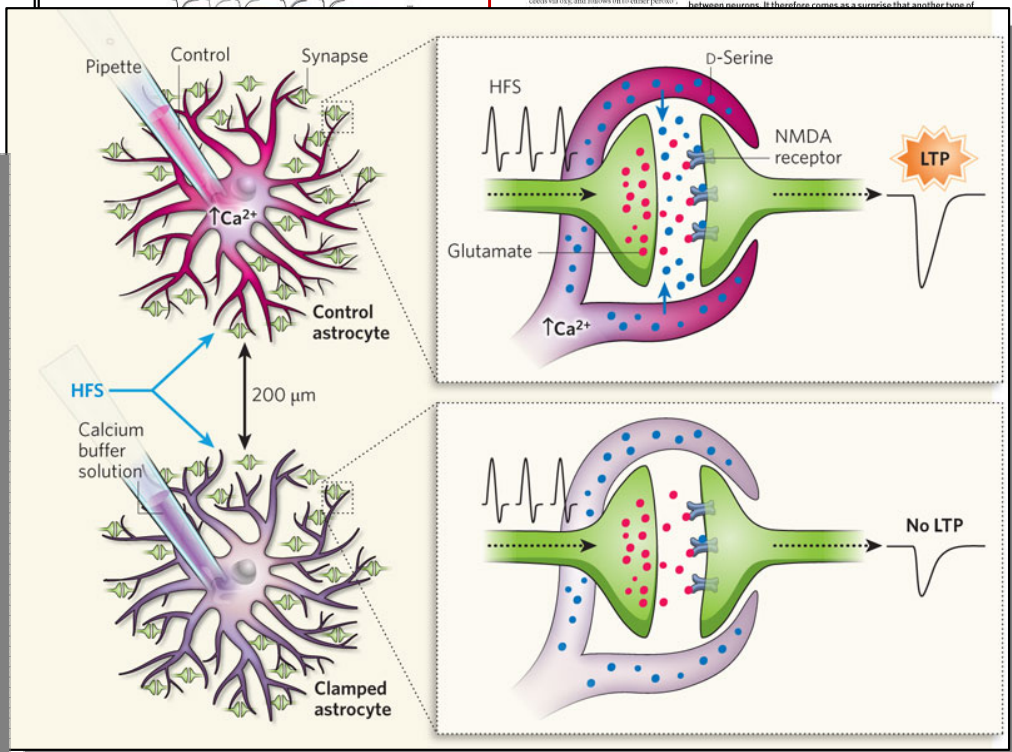




NEUROSCIENCE

Astrocytes as aide-mémoires

Mirko Santello and Andrea Volterra



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NEUROSCIENCE

Astrocytes as aide-mémoires

Mirko Santello and Andrea Volterra

Memory formation is known to occur at the level of synaptic contacts between neurons. It therefore comes as a surprise that another type of brain cell, the astrocyte, is also involved in establishing memory.

of NO synthases contain a haem bound to a cysteine amino acid (the base, B, in Fig. 1b). But their activity is confined to the amino acid L-arginine, which it converts to NO — a signalling molecule vital to the nervous, immune and cardiovascular systems. The chemistry involves two sequential oxidations, each requiring oxygen, protons and NADPH. Each step proceeds via oxy, and follows on to either peroxo[2], hydroperoxo or cpd I intermediates.

In some enzymes, such as haem oxygenases (HOs), ferric hydroperoxide is the oxidizing species[14], and the substrate is the haem itself. HOs are found in many organisms, and in mammals the oxidation products are biologically vital: biliverdin, which acts as an antioxidant; liberated iron(II) ions, which are recycled for use elsewhere (primarily in haems); and carbon monoxide, which is used as a neurotransmitter. Reactions mediated by the enzyme cytochrome *c* oxidase, a member of the haem–copper oxidase (HCO) superfamily, probably also proceed through a ferric hydroperoxo complex, which then undergoes O–O cleavage and formation of cpd II (ref. 15). HCOs facilitate proton pumping across mitochondrial membranes, which generates a proton

Memory is the result of long-lasting changes in synaptic activity usually involving the activation of NMDA receptors (NMDARs) — a special class of receptor for the excitatory neurotransmitter glutamate. Memory formation has always been thought to depend on events occurring exclusively in neurons. But the brain possesses another cell population, glial cells, which include the highly ramified, star-shaped astrocytes. Despite their abundance — they make up 90% of all human brain cells — astrocytes have been relatively overlooked in the search for mechanisms of memory formation because they lack electrical excitability and do not communicate like neurons do. But astrocytes are

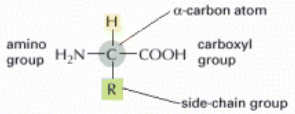
the first direct evidence for this proposal. The authors induce long-term potentiation (LTP) of excitatory synapses in the hippocampus using a high-frequency-stimulation protocol, which involves applying repetitive electrical stimuli to the presynaptic fibres. LTP is the sustained increase in synaptic strength associated with memory formation, and the authors monitored this synaptic potentiation locally, in domains roughly corresponding to the territories of individual astrocytes. They did this by recording the electrical signal generated by the ensemble of synapses in the territory, using an extracellular electrode or, alternatively, directly through the astrocyte.

Nature: News & Views
Science: Perspectives
Scientific American

二十種基本胺基酸

THE AMINO ACID

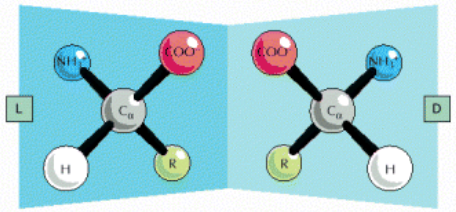
The general formula of an amino acid is



R is commonly one of 20 different side chains. At pH 7 both the amino and carboxyl groups are ionized.

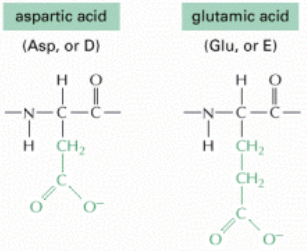
OPTICAL ISOMERS

The α-carbon atom is asymmetric, which allows for two mirror image (or stereo-) isomers, L and D.

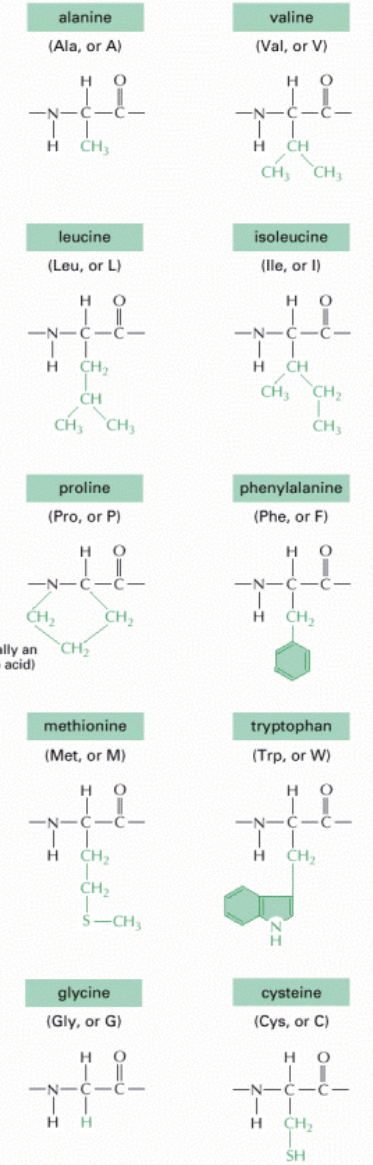


Proteins consist exclusively of L-amino acids.

ACIDIC SIDE CHAINS



NONPOLAR SIDE CHAINS



Disulfide bonds can form between two cysteine side chains in proteins.

FAMILIES OF AMINO ACIDS

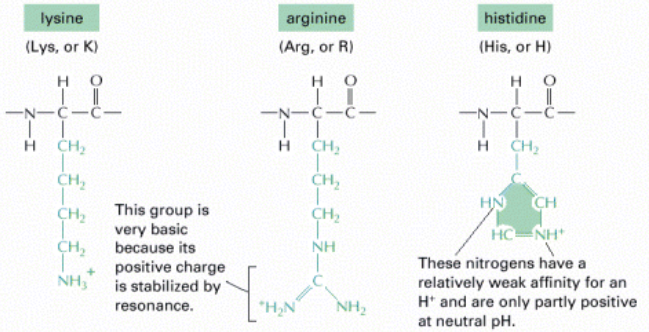
The common amino acids are grouped according to whether their side chains are

- acidic
- basic
- uncharged polar
- nonpolar

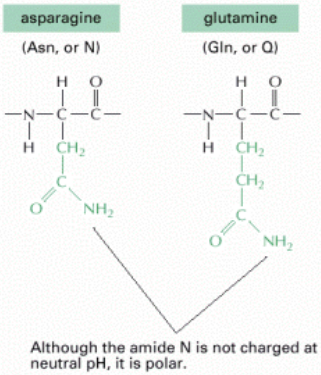
These 20 amino acids are given both three-letter and one-letter abbreviations.

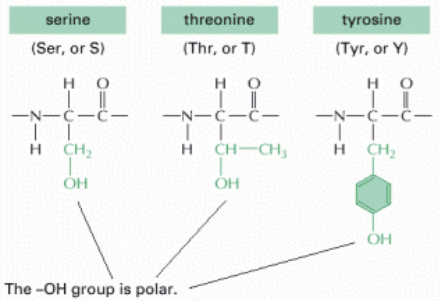
Thus: alanine = Ala = A

BASIC SIDE CHAINS



UNCHARGED POLAR SIDE CHAINS

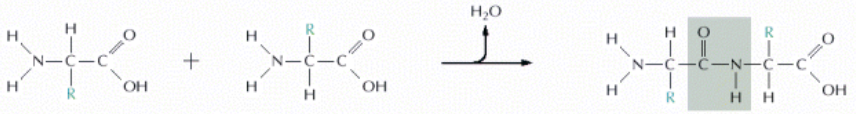




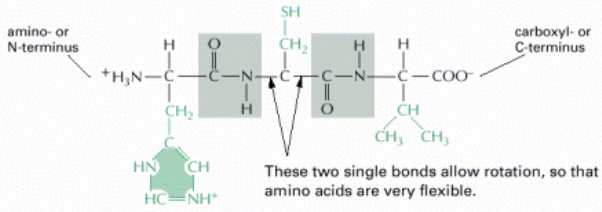
PEPTIDE BONDS

Amino acids are commonly joined together by an amide linkage, called a peptide bond.

Peptide bond: The four atoms in each *gray box* form a rigid planar unit. There is no rotation around the C–N bond.



Proteins are long polymers of amino acids linked by peptide bonds, and they are always written with the N-terminus toward the left. The sequence of this tripeptide is histidine-cysteine-valine.



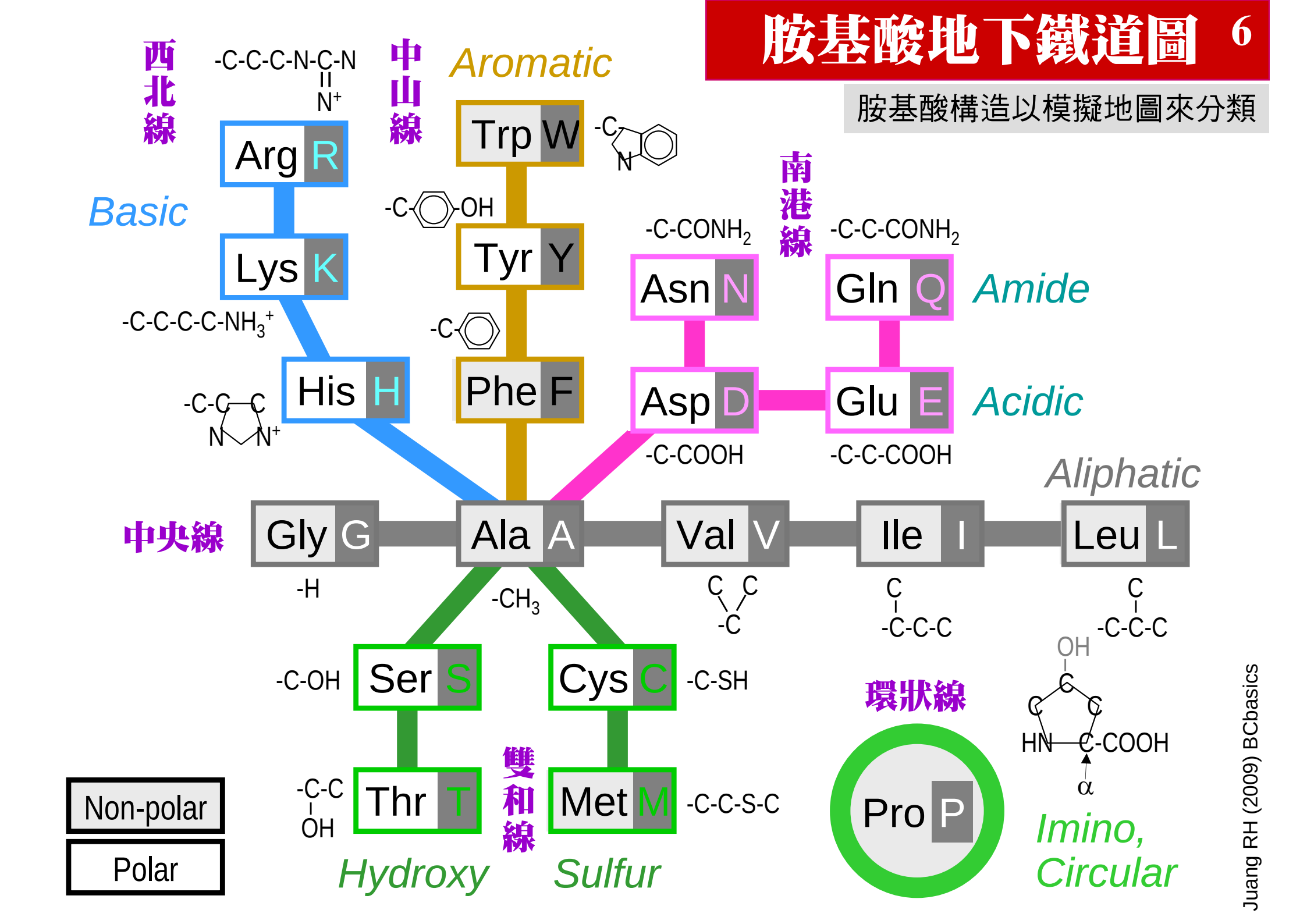
These two single bonds allow rotation, so that long chains of amino acids are very flexible.

Alberts et al (2002) Molecular Biology of the Cell (4e) 131-133

更豐富的圖形說明表及文字

胺基酸地下鐵道圖 6

胺基酸構造以模擬地圖來分類



Juang RH (2009) BCbasics

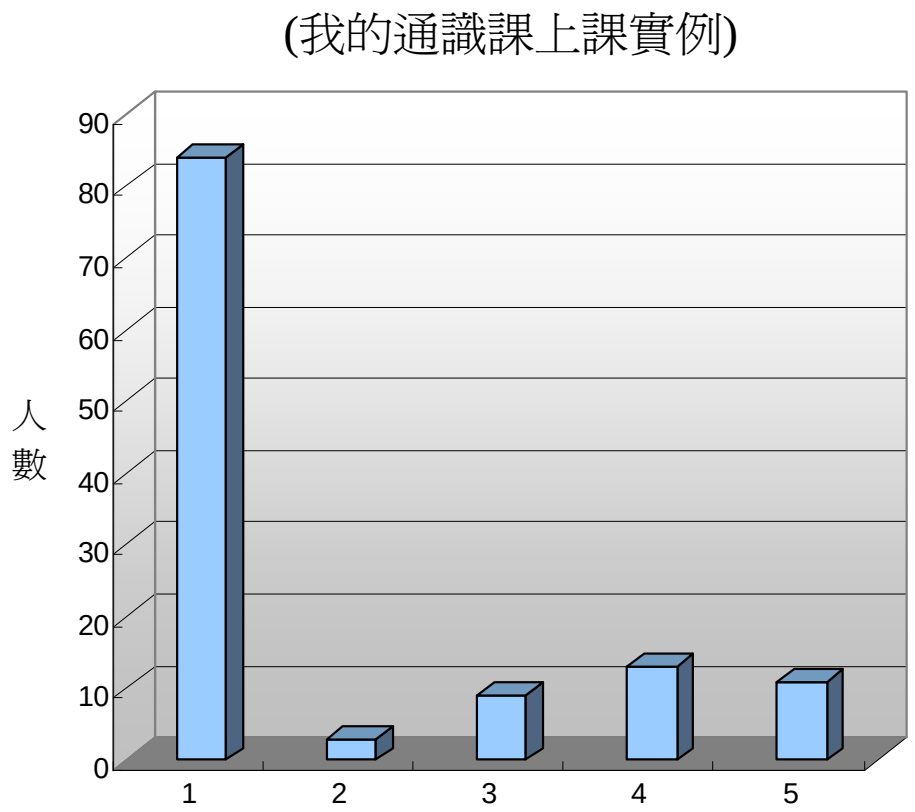
經營課程之建議

上課前	工作提要
基 本	(1) 儘早決定課程範圍，預留足夠 **時間**，以充分準備上課資料。 (2) 把課程內容一一 **轉換** 成教材，記得要以學生的觀點爲出發。 (3) 至少完成所負責課程範圍的 **講義**，可以是文字檔或投影片。 (4) 儘早完成講義 **第一版** (**first draft**)，並不時修改內容及格式。 (5) 把上課資料公佈在 **課程平台**，並讓學生知道所有 **重要規定**。
進 階	(6) 建立自己的 **課程網頁**，適時加入影音資料，提升學習印象。 (7) 申請教學助理，帶領 **TA 團隊**，與學生對話，共同經營班級。

上課時	工作提要
基 本	(1) 每堂課前 **充分預習**，熟悉每一張投影片，並條列記下重點。 (2) 一定要控制好 **時間**，不要在規定時間內，塞入太多投影片。 (3) 開始上課就簡要描述當日 **重點**，讓學生預知將要學到什麼。 (4) 難免 **焦慮緊張**，充分備課並熱忱講授，就能得到學生肯定。
進 階	(5) 必要時，可自行在課堂中進行教學效果之 **回饋問卷** (**KQS**)。 (6) 每上課段落，對關鍵性概念提出問題，以 **表決器** 帶動討論。

Juang RH (2009)

有關生命源起的看法？



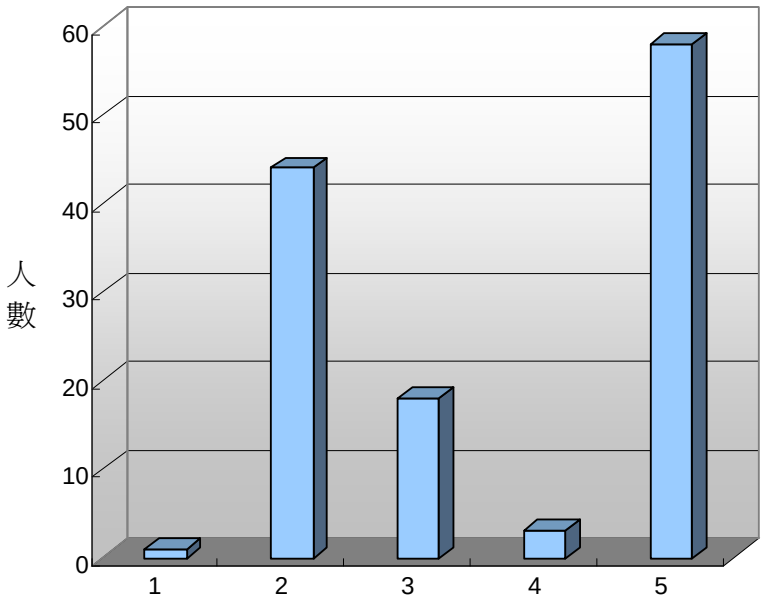
(1) 我支持演化論
(2) 我支持創造論
(3) 我支持智慧設計
(4) 我都可以接受
(5) 都不接受

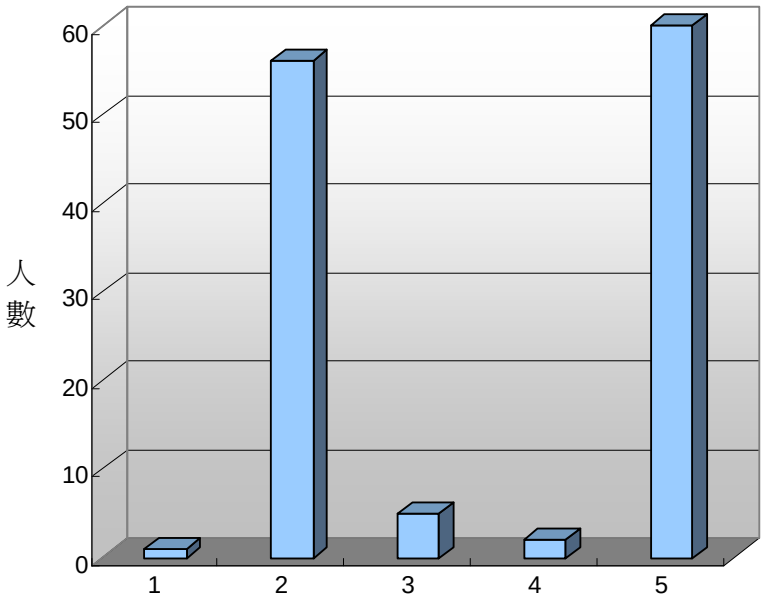
學生很想知道全班表決結果

考試不能考這種題目 | **利用 clicker 即時回應**

Juang RH (2010)

有關遺傳基因何者正確？





(1) 遺傳學理論最早由摩根提出
(2) 基因貯藏在細胞核的染色體
(3) 細胞所有基因表現能力相同
(4) 基因複製不容許有任何錯誤
(5) 基因是由密碼 A,T,C,G 組成

把自己的舞台經營好

文學院演講廳 (卡奈基黑立言先生演講) **10**

潛在因素：有效維護影音設備，環境影響上課品質！

Juang RH (2009)

也要提醒學生方面的努力

(1) 歐美高教轉向：學生學習成效 (learning outcome)。

(2) 1 學分的定義： 課堂 50 分鐘 + 學生自學 2 小時。

(3) 鼓勵學生學習： Office-hour、TA、讀書小組 等。

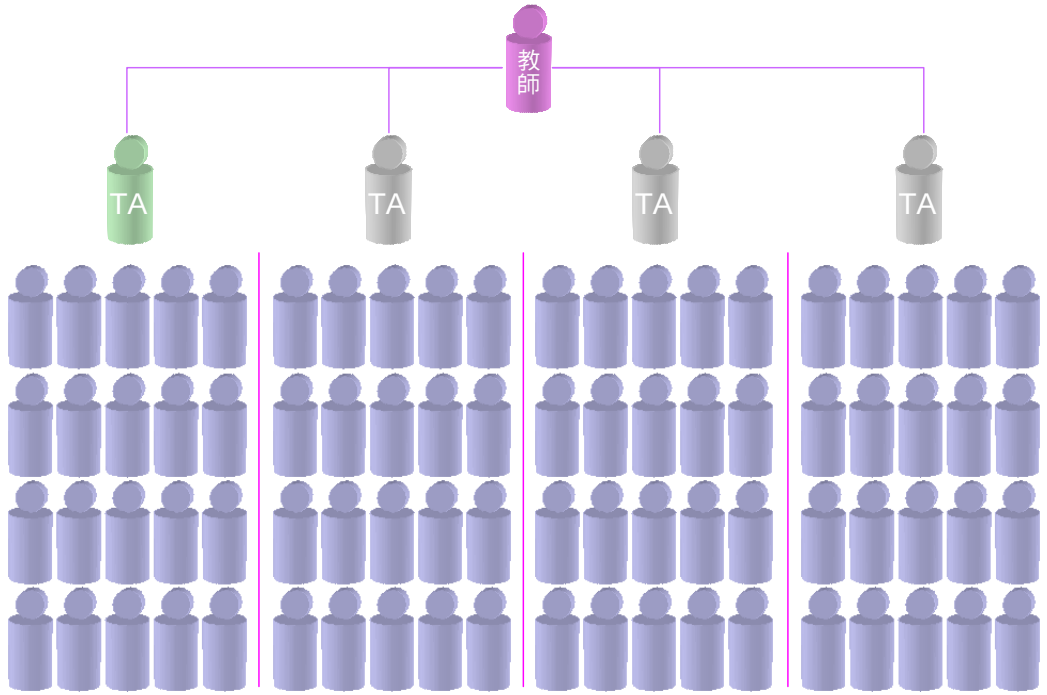
(4) 常常反思：我要讓學生學到什麼？是否達成目標？

(5) 嚴格要求學生的老師，通常都會受到長期的懷念。

大班 TA 要更努力

教學助理 TA 的重要：

教師不再是單打獨門
以 TA 協助帶領學生
TA 是未來的優秀師資



在教學中心服務幾年後 ... 發覺

(1) 新進教師的第一年經驗很重要

(2) 每學期開學的第一堂課很重要

(3) 大學生的第一年生活史很重要

(4) 大學部最後一年收網整合亦然

(5) 研究生第一年的養成也很重要

慎 始

整體心得與感想

一、要全面兼顧教學、研究與服務幾乎是不可能的。

二、需先站穩研究表現，才能追求其他兩塊之卓越。

三、但教學必須及早耕耘，開始沒教好就很難挽回。

四、教學成果將會回饋到研究，因為實驗要靠學生。

五、剛開始不必追求高點數論文，但一定要發出去。

六、若大家研究表現差不多，教學成果將成為關鍵。

七、除了科學成果報告外，校內有很多啟發性演講。

八、找一個與自己興趣相投的服務工作，利人利己。

九、人才絕對是所有問題最終因素，資源才是其次。

十、對個人而言，時間掌控規劃與反思能力最重要。

人才是邁向頂尖的唯一關鍵

Human resource is critical to achieve the university excellence

以教育彩繪臺灣的未來

Education brings Taiwan a colorful future