


# 生物策略表

類別	生物策略 (Strategy)
生物策略 STRATEGY	參與教學以傳授複雜的課程 (Engaged Teaching Passes on Complex Lessons)
生物系統 LIVING SYSTEM	哺乳類 (Mammals)
功能類別 FUNCTIONS	#學習 #Learn
作用機制標題	黑猩猩透過積極主動和被動地教導幼小，保留了使用複雜工具的文化 (Chimpanzees maintain a culture of complex tool use by being both proactive and reactive in teaching their young.)
生物系統/作用機制 示意圖	
作用機制摘要說明 (SUMMARY OF FUNCTIONING MECHANISMS)	
<p><b>介紹</b> 黑猩猩作為廣為人知的工具使用者以及與人類最接近的現存近親，可以初步為研究人員提供關於哺乳類學習能力的解答。</p> <p><b>策略</b> 黑猩猩群體之間的多樣性，展現了不同群體如何在每個世代之間傳授教學行為。</p> <p>位於剛果共和國 (Republic of Congo) 的一個黑猩猩族群會使用各種複雜的工具來達到目的，例如捕魚或抓白蟻。此族群的幼年個體 (juvenile) 透過動作 (gesture) 跟發聲 (vocalization) 請求使用成年個體 (adult) 的工具，這比牠們自行使用較簡單工具組的頻率高出很多，牠們向成年個體的求助通常都會被答應。而且，若此族群的幼年個體在使用工具時遇到困難，成年個體會主動交出自已的工具給牠們使用。</p> <p>坦尚尼亞的黑猩猩族群使用一套較為簡略的工具組來捕捉白蟻。研究人員觀察此群組時發現，成年個體通常會拒絕讓幼年個體使用成年的工具。而當幼年個體在使用工具時遇到困難，成年個體也不會主動提供自己的工具給幼年個體使用。</p> <p><b>潛力</b></p>	

這些模式說明，當教學時付出較多努力或教學意願較高時，黑猩猩族群可以維持更複雜的工具使用模式。也許一開始在教學方面的投入是得以持續使用複雜工具的原因之一。這也支持了人類之間的教學概念，科技的進步與對教育的投入齊頭並進。

### **Introduction**

Chimpanzees, as renowned tool users and humans' closest living relatives, can provide some initial answers to the researches about mammals' learning ability.

### **The Strategy**

The diversity between chimpanzees groups show that how distinct groups pass the teaching behavior down to each generation.

One population of chimpanzees in the Republic of Congo use a variety of complex tools to reach their purposes, such as fishing for termites. Using gestures and vocalizations, juveniles in this group request to use the tools of adults much more often than juveniles in groups with a simpler toolkit, and their requests are granted more often. Also, when juveniles of this population struggle in using tools, adults take the initiative to hand over their own tools for the juveniles to use.

A chimpanzee population in Tanzania uses a much simpler tool set for fishing termites. When researchers observed this group, juvenile's requests to use adult tools were usually denied. And when juveniles struggled in using tools, adults didn't take the initiative to provide their own tools for juveniles to use.

### **The Potential**

These patterns suggest that chimpanzee communities can maintain more complex tool use patterns when the teaching effort or teaching willingness is relatively high. Investments in this kind of education appear to be part of what allows complex tool use to persist, and perhaps to come about in the first place. It lends support to the idea that among humans, too, advancement of technology may go hand in hand with an investment in education.

### **文獻引用 (REFERENCES)**

「在這項研究中，我們系統性地比較了Goulougo和Gombe兩個族群黑猩猩各自的工具轉讓行為，發現這種形式有著明顯的族群差異。這些差異可能與不同地區工具作業的複雜程度有關，這表示社交學習，尤其是一個群體擁有較大的社會援助 (prosocial helping)時，對於維持複雜技能在世代之間傳遞有增強作用。」(Musgrave et al. 2020: 974)

“In this study, we systematically compared tool-transfer behavior between Goulougo and Gombe chimpanzees and found significant population differences in this form of scaffolding. These differences could be related to the complexity of tool tasks differing between sites, suggesting an enhanced role of social learning in the transmission and maintenance of complex skills over generations, particularly when it intersects with a flexible capacity for prosocial helping.” (Musgrave et al. 2020: 974)

### **參考文獻清單與連結 (REFERENCE LIST) Harvard 或 APA 格式**

Musgrave, S., E. Lonsdorf, D. Morgan, M. Prestipino, L. Bernstein-Kurtycz, R. Mundry, and C. Sanz . (2020). Teaching varies with task complexity in wild chimpanzees. *PNAS* 117: 969-976 (<https://www.pnas.org/content/117/2/969>)

延伸閱讀: Harvard 或 APA 格式 (取自 AskNature 原文; 若為翻譯者補充, 請註明)

Stier, S. C., (2020). Engineering education for the next generation: a nature-inspired approach. *AskNature*. Retrieved from:  
<https://asknature.org/resource/engineering-education-for-the-next-generation-a-nature-inspired-approach/>

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