

香港中文大學 教育學院 課程與教學學系

STILLS 通識教育支援計劃

「科學、科技與環境」學習範圍的學與教

The Learning & Teaching on Science, Technology &
Environment
in NSS Liberal Studies



保良局姚連生中學

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毛霉菌 Mucor

- True fungus
- commonly known as bread mould
- Aseptuous hyphae
- Saprophytic
- Where from?
 - Wooden chopsticks?
 - ???
- Why found growing in rectum?
 - Become obligate parasite ?
 - Dead tissues on inner lining of rectum ?

Fundamental Scientific Belief

- There is a reason for every transformation / variation
- simple cause and consequence relationship makes beautiful explanation
- Scientifically proven results are those that can be demonstrated repeatedly under scenarios spanning the full spectrum of different combinations of multiple controllable factors
- Reality could be the complicated manifestation of multiple factors
- Complex reality could be a result of interacting factors PLUS negative and positive feedbacks

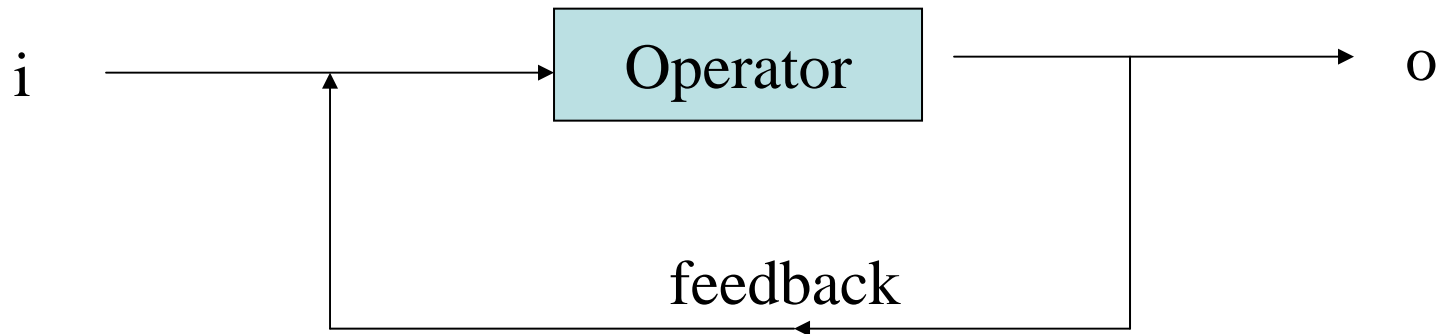
垂直風車 — 未想通的設計？



能源、科技 與 6h n環境

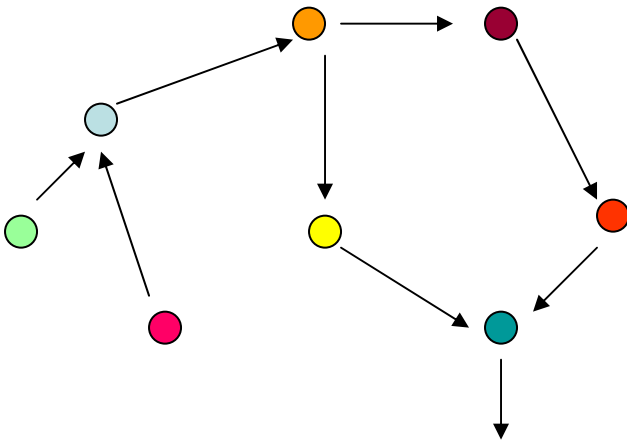
- 可持續發展
- 系統概念：負回饋 vs. 正回饋

Systems basic



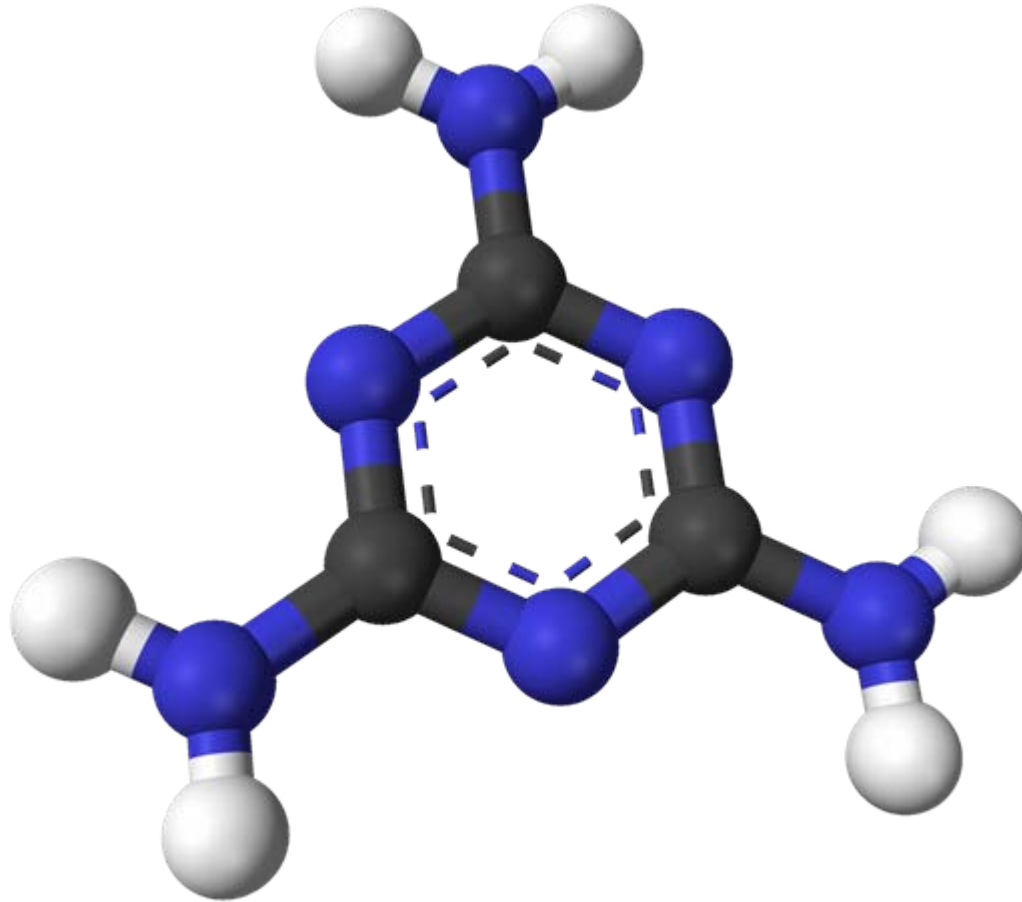
System-system interactions

Integrated Ecosystem Approach:
A Systems Perspective



INTERACTION SEED SYSTEMS

2,4,6-Triamino-s-triazine



1. 毒奶粉中三聚氰胺 (Melamine)

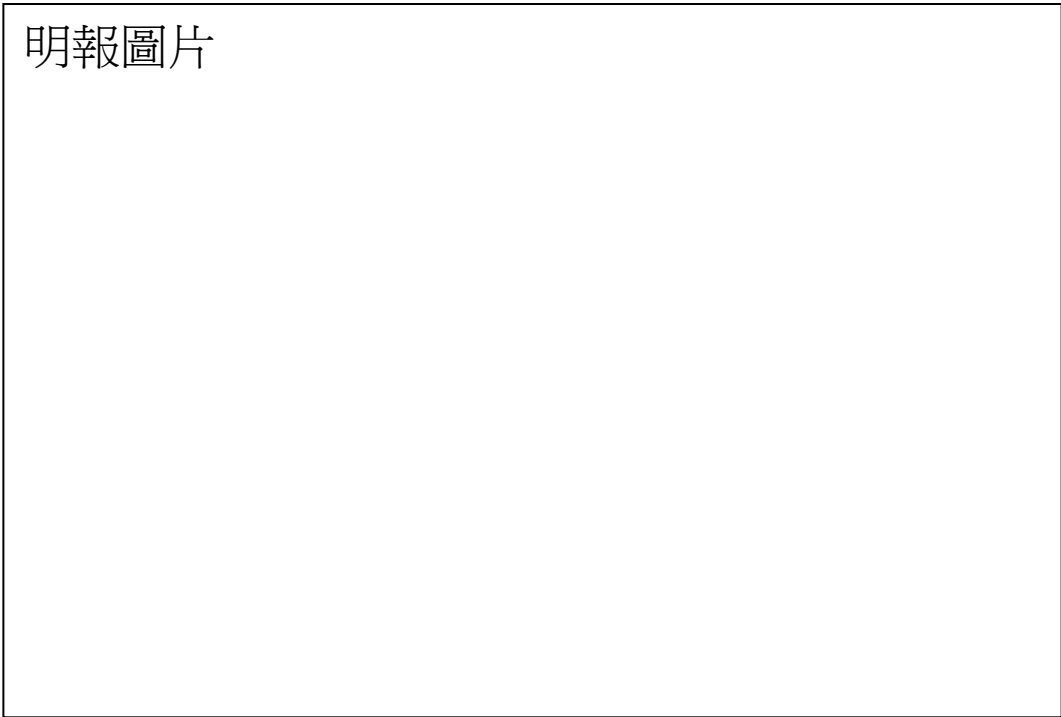
- 「三聚氰胺」是一種用來製成美耐皿餐具的工業塑膠原料，根本不能吃。許多生活周遭常見的美耐皿，就是以三聚氰胺為原料製成；堅固耐摔的美耐皿是小朋友時常使用的餐盤。
- 根據老鼠的動物實驗，三聚氰胺的半衰期為二・七小時，以此推論，人體並非完全無法代謝三聚氰胺，只是在代謝的過程中會造成尿液酸化、結晶，進而衍生腎結石，結晶或腎結石會塞住腎小管、尿管或直接傷害腎臟，引起急、慢性腎衰竭，甚至洗腎的風險。
- 尤其嬰幼兒的腎臟發育還不成熟，腎功能不全，攝取後健康遭到毒害的機率更高。而奶粉是嬰幼兒唯一的食物來源，嬰幼兒餐餐喝毒奶粉，後遺症自然較快出現而且嚴重。

2. Uses of Melamine

- Melamine is combined with formaldehyde to produce melamine resin, a very durable thermosetting plastic used in Formica, and melamine foam, a polymeric cleaning product.
- Melamine derivatives of arsenical drugs are potentially important in the treatment of African trypanosomiasis

3. 仿瓷餐具 melaware

明報圖片



搪瓷
enamel

市面仿瓷餐具 melaware 款式甚多、顏色鮮艷，但消委會指淨色、較少花紋的餐具較安全。(何家達攝 17-3-2009)

4. Synthesis of Melamine

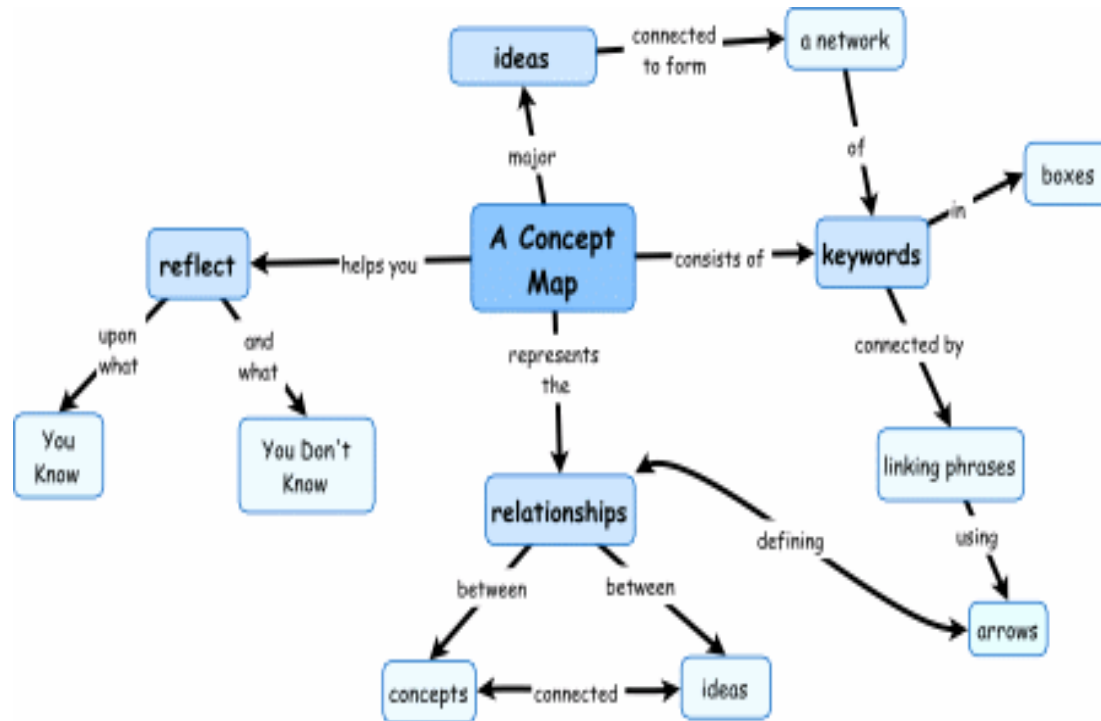
- First, urea decomposes into cyanic acid and ammonia in an **endothermic reaction**:
 - $(\text{NH}_2)_2\text{CO} \rightarrow \text{HCNO} + \text{NH}_3$
- Then, cyanic acid polymerizes to form melamine and carbon dioxide:
 - $6 \text{HCNO} \rightarrow \text{C}_3\text{H}_6\text{N}_6 + 3 \text{CO}_2$
- The second reaction is **exothermic** but the overall process is **endothermic**.

5. Toxicity of Melamine

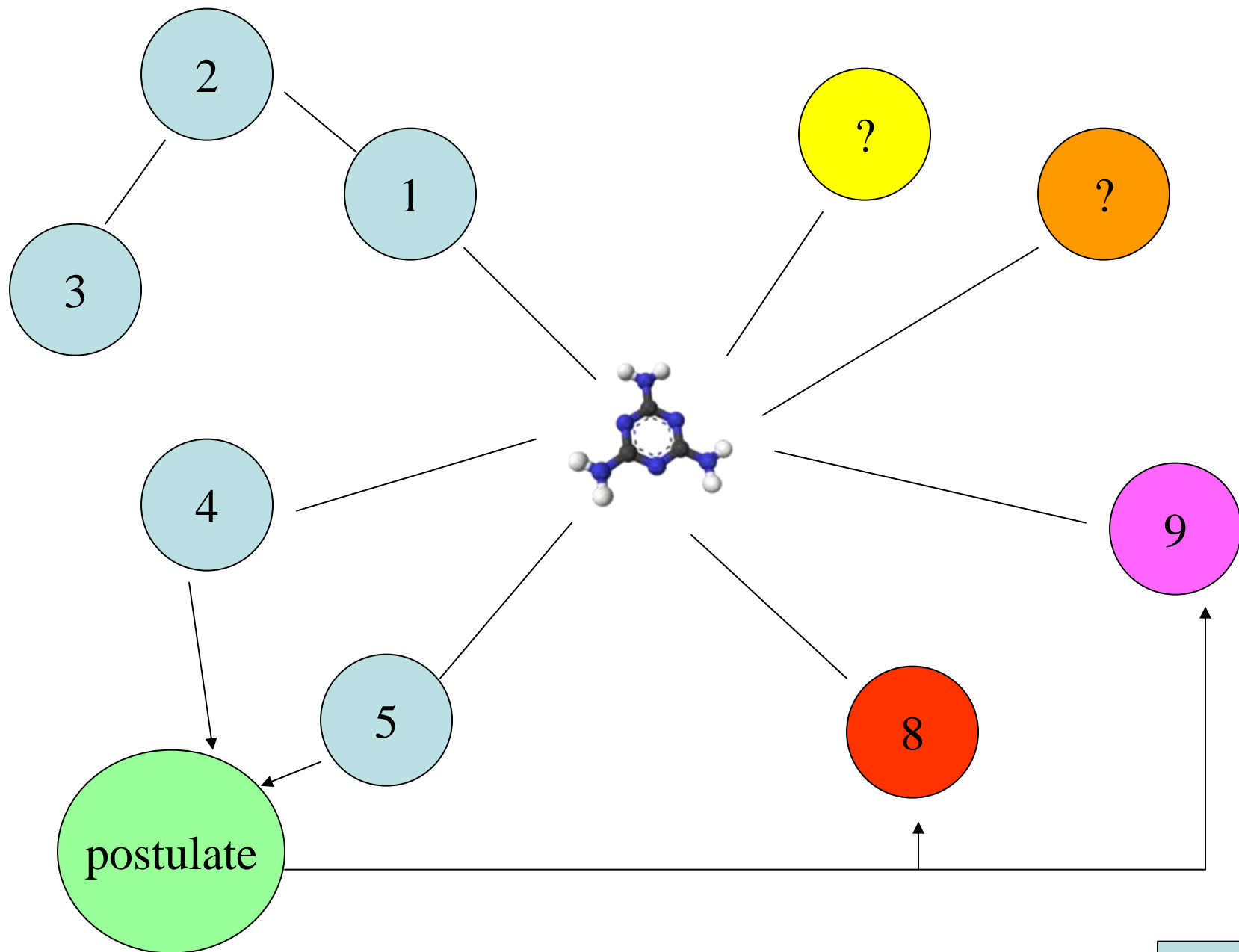
- FDA scientists explained that when melamine and **cyanuric acid** are absorbed into the bloodstream, they concentrate and interact in the urine-filled renal microtubules, then crystallize and form large numbers of round, yellow crystals, which in turn block and damage the renal cells that line the tubes, causing the kidneys to malfunction

Concept Map & Tree Diagrams

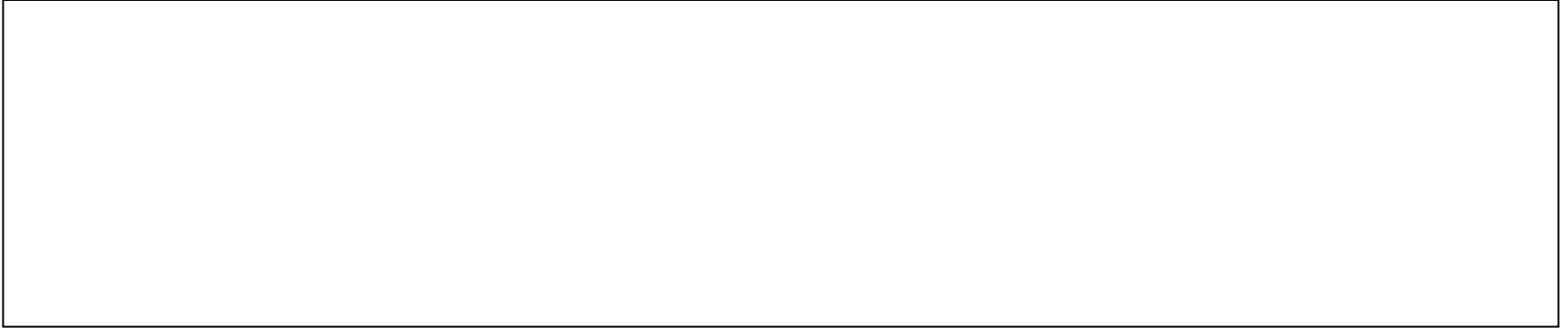
S6 LS
concept map



S6 LS
Tree diag.

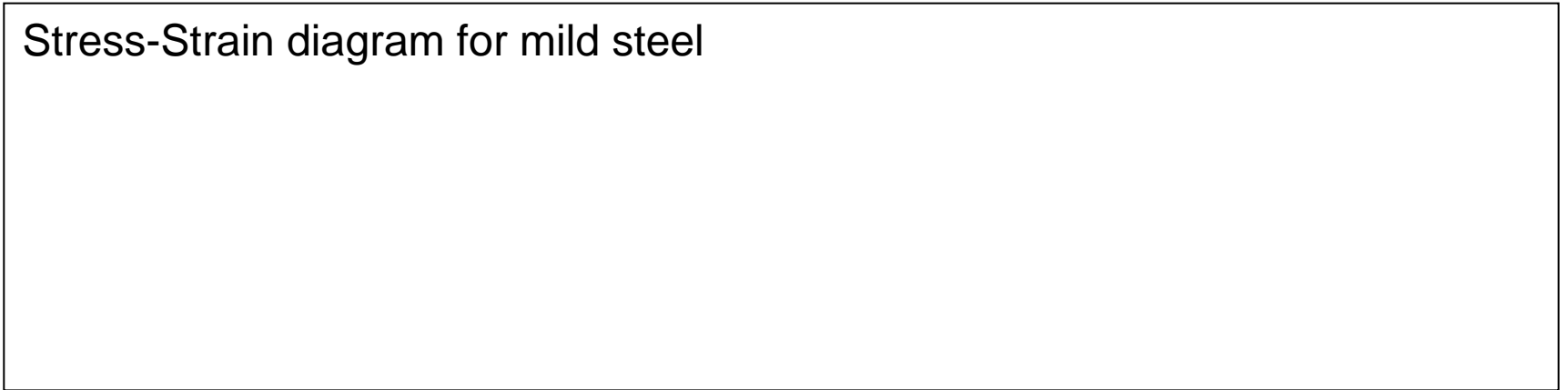


6. Limits of Scientific postulates



7. Utility of Scientific postulates

Stress-Strain diagram for mild steel



8. Political considerations

- Government inspection
- Regulations
 - Local standard
 - National standard
 - International standard
- Community Responses (political acumen)
- Insurance & compensatory judgements

9. Sociological, ontological & Ethical considerations

- Big head babies — Infant Milk thin in protein content
- Check protein density
- Toxicity of chemicals released into box packaged drinks.
- Pressure to yield to protein production targets

Purposes of Education 1

- In the early part of 20th century, education focused on the acquisition of **literacy skills**: simple reading, writing, and calculating.
- It was not the general rule for educational systems to train people to think and read critically, to express themselves clearly and persuasively, to solve complex problems in science and mathematics.
- Now, at the end of the century, these aspects of **high literacy** are required of almost everyone in order to successfully negotiate the complexities of contemporary life.

National Research Council (2000) *How People Learn* p.4

Purposes of Education 2

Y-charts

- 吹水 vs. rational and informed decisions
- Reduce the impact of irrational fears
- More rational independent advice around for the last fortunate
- Mutually supporting citizenship
- maintain community stability

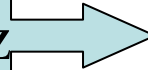
10. Knowledge validity and application

- Should adults worry?
- Would affected babies recover?
- Would the aged people be susceptible?

其他 專題

- SARS 與 禽流感
- 電子煙 / 戒煙
- 基因複製技術 Vs 未來研究
-

YLSc quiz



姚連生中學 老師 的 心得

- AL LB vs. NSS LB



比較



評分標準

幹細胞 / 基因 治療

幹細胞治療

文化差異的考慮

- 鹹魚 與 鼻咽癌
- Coffee mate 與 膽固醇

Finale