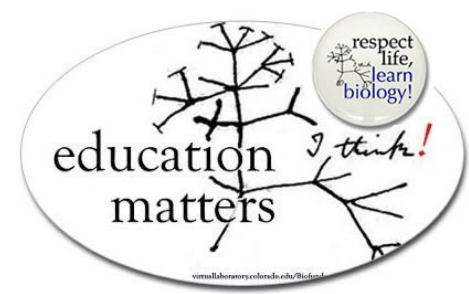


# TaLB - Next Section (tonight) - Klymkowsky

- Review from last time (comments / questions)
- **Today:** How do we make sense of biology?
  - What are core concepts (ideas) in biology?
  - How do we assess scientific understanding



## Update your dossiers

- How has your thinking changed (or has it) from your original canvas response.
- After our discussion, what insights (if any) have you had that are relevant to teaching a particular topic in biology?

## From “Conceptual foundation”

### Evolutionary thinking & mechanisms

modified from Klymkowsky 2010.

- continuity of life (cell theory)
  - stochasticity (noise, mutation, drift)
  - selection → information generation
- } physics & chemistry

### Molecular foundations

- thermodynamics: enthalpic & entropic factors
  - membrane assembly / protein folding
  - bond formation and catalysis
- molecular interactions (affinity, specificity & regulatory (allostery))
- molecular level effects of mutations

### Network behaviors

- non-equilibrium networks
- systems behaviors (feedback/feedforward interactions)
  - homeostatic, adaptive & evolving (development) processes
  - check / decision points
  - processes: i.e. developmental, neural, immunological, ecological (pathogen/prey)

Questions or comments before group?

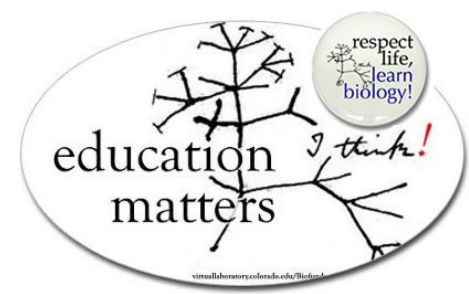
## **Week 2.3: After reading Foundational Concepts in Biology**

### **Pre-group questions / comments**

### **Discuss and report on**

- 1) What you would add or removing from the list of core concepts necessary for understanding biological systems.  
and
- 2) what core concepts from "outside of biology" are essential for understanding biological systems?

### **Report back - Concepts**



**Report back** - McClymer & Knowles: Ersatz Learning, inauthentic testing.

**Pre-group questions / comments? (we could spend all session on this)**

Figure 1	
Thinking Frames: A Descriptive Model	
<i>Information (content)</i>	What every practitioner knows
<i>Problem solving</i>	Familiarity with classic questions and answers in the field
<i>Epistemic</i>	Mastery of styles of analysis prevalent in the field
<i>Inquiry</i>	Ability to undertake original research

**Report back** - McClymer & Knowles: Ersatz Learning, inauthentic testing.

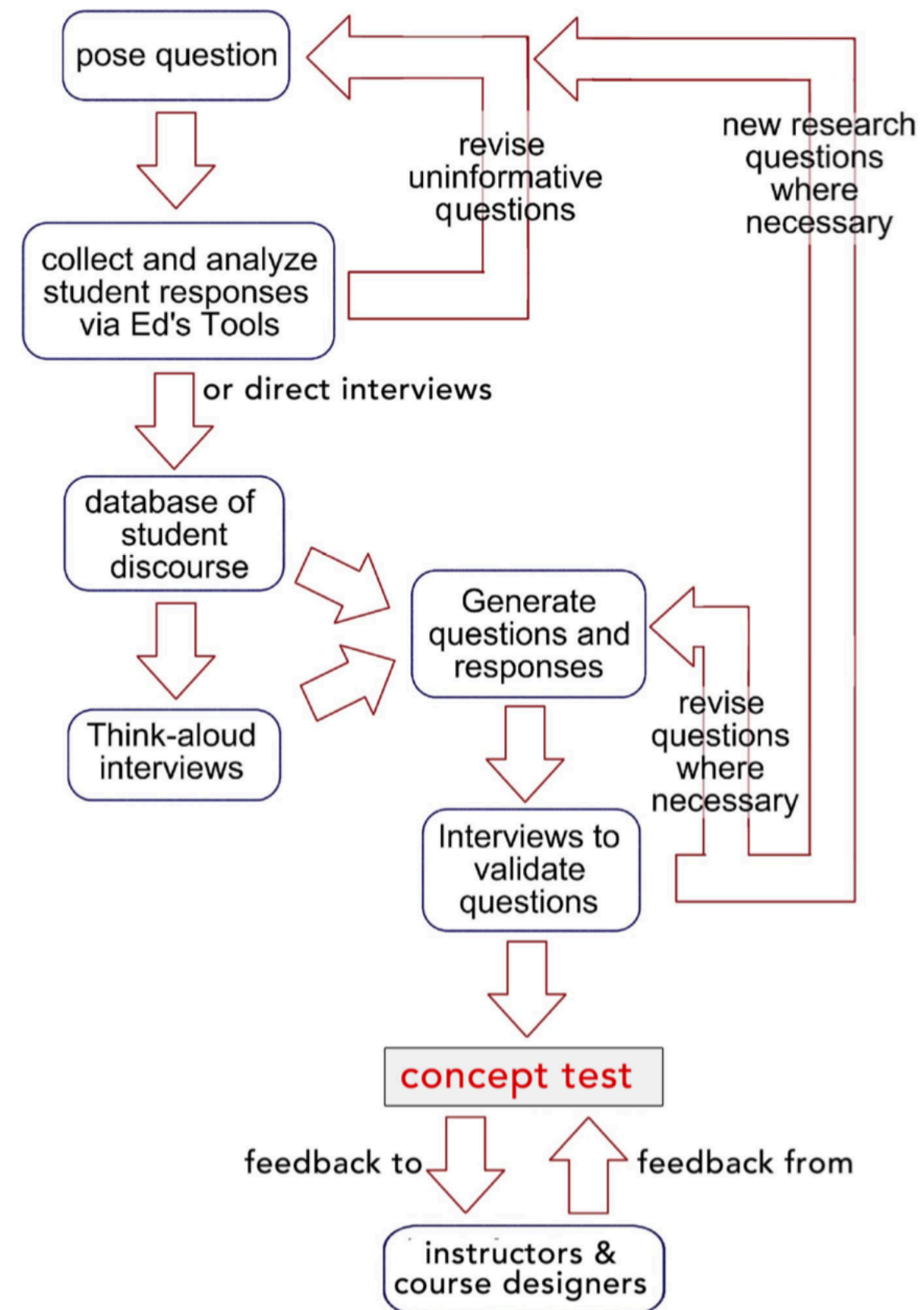
**Discuss and report** on

- Describe the characteristics of an inauthentic test (and an ersatz answer)?
- Develop a short list of what every biology student should (end up) know, and why.
- Consider the premise that unless you can generate a plausible explanatory (mechanistic) model for a biological phenomena, you do not understand it.
- What are the characteristics of a plausible model?

# Read : Klymkowsky & Garvin-Doxas. 2020. [Concept Inventories: Design: Application, Uses, Limitations & Next Steps](#)

## Discuss and report on

- What are the key features of a concept inventory?
- Why are distractors important?



- Are there any BCI questions would you consider "ersatz" questions and why.
- Which seem problematic to you. How might you rewrite them?

<https://edstools.colorado.edu/input/i-multi.php?inv=bci&cond=0>