Teaching → Learning → Performance

Translating the Science of Learning into Effective Teaching

2025 Veterinary Emergency and Critical Care Conference
https://tinyurl.com/Vet-ECC

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I. Introduction

What are two of your biggest challenges in teaching ECC?

II. Science, Science, Science

Instructional Science
experience → learning → performance

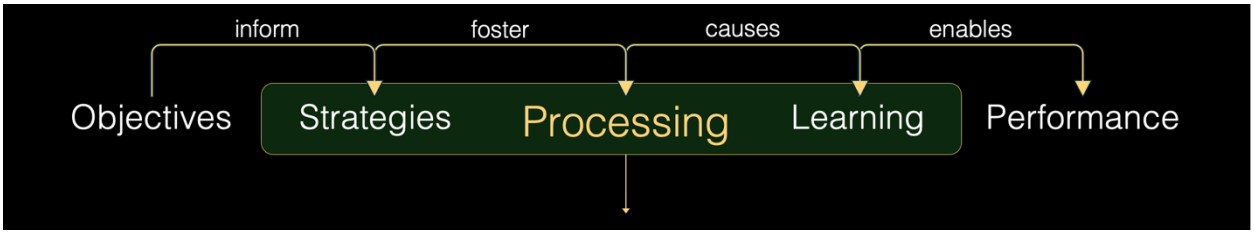
Cognitive Science
concepts, constructs

Neuroscience
systems, synapses, molecules

III. Fundamental Challenges

1. Learning is not visible.
2. The causal mechanisms of learning are vague.
3. Learning is not consistent.

IV. A Model of Teaching and Learning



Learning Principles

Teaching Implications

Activation Prior Knowledge

- ✅ Activate relevant prior knowledge before teaching new knowledge.
- ✅ Use “productive” and meaningful activities: write, talk, draw, solve.
- ✅ Focus on both conceptual and perceptual prior knowledge.

Foster Alignment

- ✅ Select strategies that will motivate appropriate cognitive processing.
- ✅ Align strategies, processing, (desired) learning, and performance.
- ✅ Include cognitive, behavioral, social, and affective processing.

Foster Processing

- ✅ Use “productive” and meaningful activities: write, talk, draw, solve.
- ✅ Align depth of processing activities with students’ prior knowledge.
- ✅ Include cognitive, behavioral, social, and affective processing.

Foster Meaning

- ✅ Actively foster students’ connection of new and prior knowledge.
- ✅ Provide and prompt significance determinations.
- ✅ Emphasize meaning, use, interest, surprise, significance, emotion.

Foster Knowledge Strength

- ✅ Provide retrieval practice with initial learning to strengthen memory.
- ✅ Engage in spaced generative retrieval to strengthen memory.
- ✅ Include cognitive, behavioral, social, and affective processing.

V. What We Process, We Learn

Part I: Sentences 1 to 10.

Please rate the sentences that will be read aloud on **how easily you can pronounce** them. Repeat the sentences silently to yourself. Use the following scale:

1	2	3	4	5
very easy to pronounce				very difficult to pronounce

1. 6.
2. 7.
3. 8.
4. 9.
5. 10.

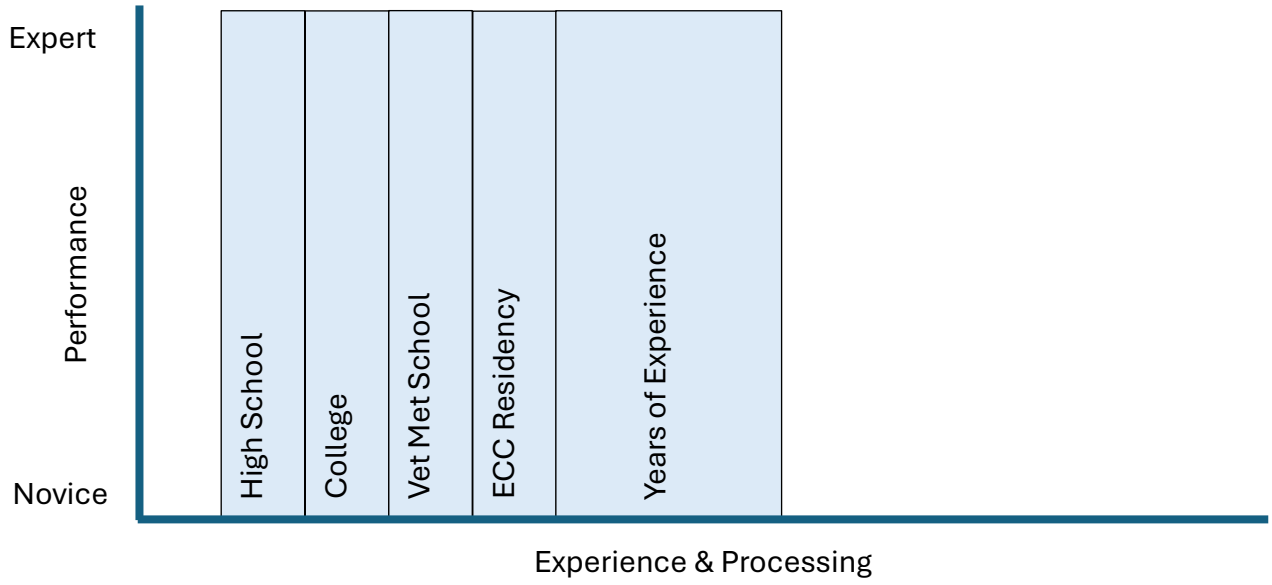
Part II: Sentences 11 to 20.

Please rate the sentences that will be read aloud on how well you can **form a vivid mental picture** or image of the action of the sentence. Use the following scale:

1	2	3	4	5
very easy to imagine				very difficult to imagine

11. 16.
12. 17.
13. 18.
14. 19.
15. 20.

VI. From Novice toward Expert



VII. Meaning: Making Connections

A Word Activity

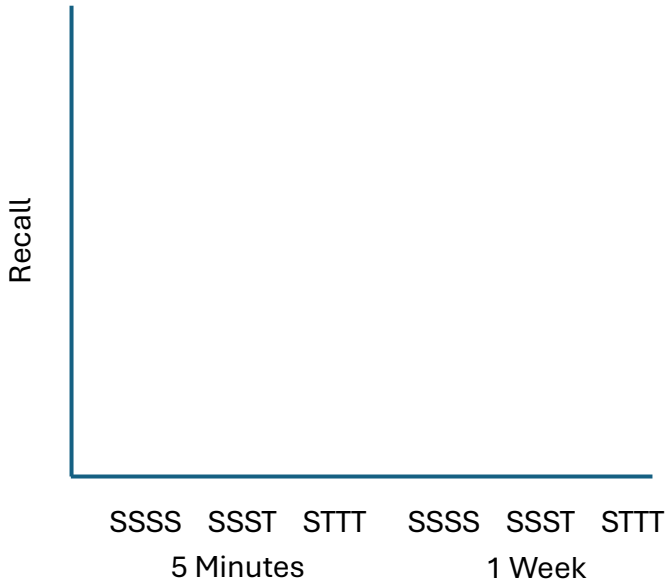
Meaning Modulators

What are 2 ideas that have *resonated* with you thus far??

VIII. Learning Effects

Retrieval Effect

	5 Minutes	1 Week
SSSS		
SSST		
STTT		



Spacing Effect

Generation Effect

Interleaving Effect

Spaced Generative Retrieval

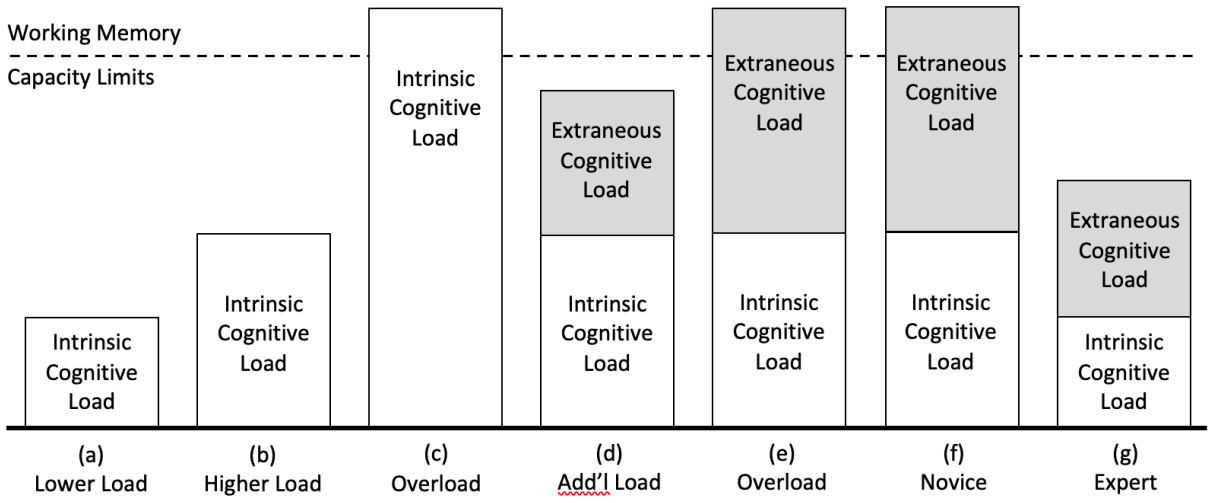
X. Working Memory and Cognitive Load

Working Memory: The crucible of thought.

- Current Goals
- Immediate Experiences
- Relevant Prior Knowledge
- Cognitive Processing
- (Generate Meaning)
- (Connect past and present to future for adaptive behavior)

Cognitive Load: The memory and processing requirements (load) necessary to complete a task.

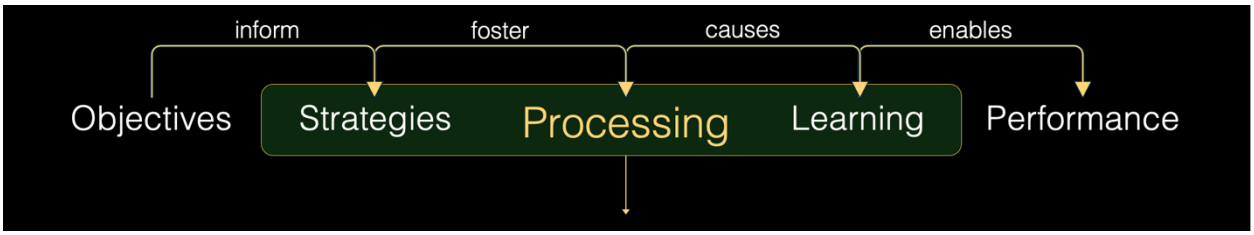
- Intrinsic Load
- Extraneous Load
- ~~Germane Load~~



Managing Cognitive Load

Activate Prior Knowledge
Segment Instruction
Scaffold Instruction
Spaced Generative Retrieval (often)
Concrete Examples
Written and Oral Instructions
Pauses
Practice with Feedback for Skills (often)

A Reflection



Learning Principles:

1. What We Process We Learn.
2. If We're Not Learning, We're Forgetting.
3. We Remember What's Meaningful (what we connect).
4. We Strengthen Knowledge through Spaced Generative Retrieval.
5. Processing requires cognitive resources, too many resources (too much cognitive load) and processing (learning) suffers.

What are two takeaways from today's discussion?

XI. Bonus Activity… if there's time

Image	Recognize?		
	Yes	No	
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			