EVIDENCE-BASED LECTURING: WHAT DO WE REALLY KNOW?

April 2019

Discussion

- What stood out to you from the recent panel discussions about classroom teaching? (Related to classroom time)

Outline

- General Lecture Effectiveness
- Instructor Enthusiasm?
- Segments and Pauses?
- Powerpoints and Notes?
- Interactive/Active strategies?

Lectures vs. Other methods

When are lectures useful?

When are lectures useful?

- The purpose is to teach information
- The presenter is effective, comfortable and the “expert”
- The learners are able to assimilate from lectures
- Learners have limited prior knowledge
- Group size is moderate to large
- Facilities are adequate

When are lectures useful?

- The purpose is to teach information that is:
  - Not readily available
  - Diverse, scattered
  - Current
  - Limited time available
  - Explain difficult concepts or analysis of issues
  - Demonstrate relationships between information

The Effects of Different Learning Environments on Students' Motivation for Learning and Their Achievement

Baeten, Marlies; Dochy, Filip; Struyven, Katrien

British Journal of Educational Psychology, v83 n3 p484-501 Sep 2013

- Learning in lecture (L) versus case-based learning (CBL) options in a child development course:
  - Motivation and self-direction

    L/CBL > CBL > L
  - Achievement scores

    L > CBL and L/CBL > L/CBL/L

Touvinen and Sweller, 2001

- Worked example versus discovery/PBL task in working with a database
- Worked examples enhanced learning, task efficiency and decreased cognitive load
- Minimal effect in students with prior knowledge

Bottom Line

Lectures play a significant role in most curricula and are a valuable tool for certain content and learners.

So why not do it well?!

Medical Students Impressions of Effective Lectures

Effective

- Enthusiastic
- Models, Demos
- Interactive

Ineffective

- Excess research commentary
- Reading from slides

Nichols et al, IAMSE, 2006

Graduate Students Impressions of Effective Seminars

Effective

- Pitched to general audience
- Linked to big picture
- Conducive to questions; time for questions
- Within appropriate time frame

Ineffective

- No general introduction or link to big picture
- Too much jargon, usually undefined
- Expert level only

Courneya, IAMSE, 2006

Question 1. Does Lecturer Enthusiasm Really Matter?

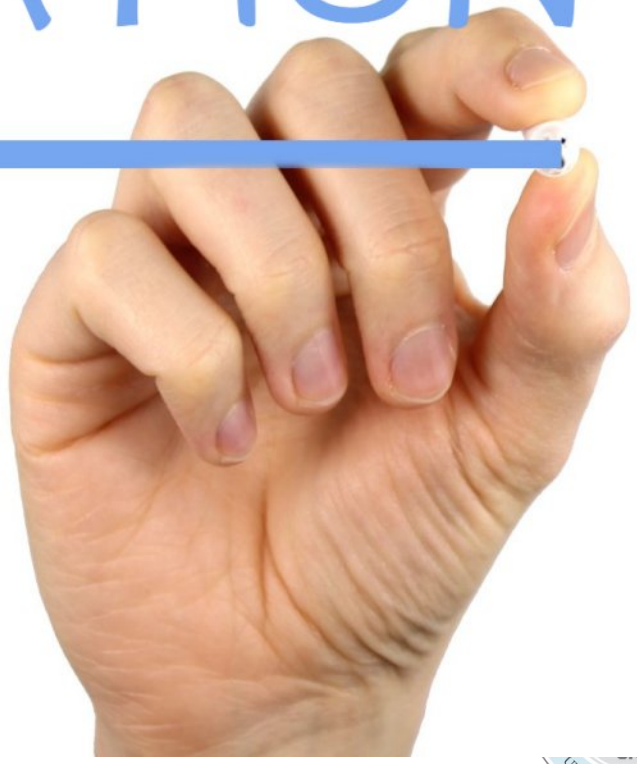
Enthusiasm

- Instructor
  - Better test score with enthusiastic performance (Mastin,1963)
  - Students take more notes and do better on tests (Stewart, 1989)
  - Effect only significant when other motivation low (Marsh, 1984)

Presence

- Builds Focus
- Relationships
- Caring
- Learning

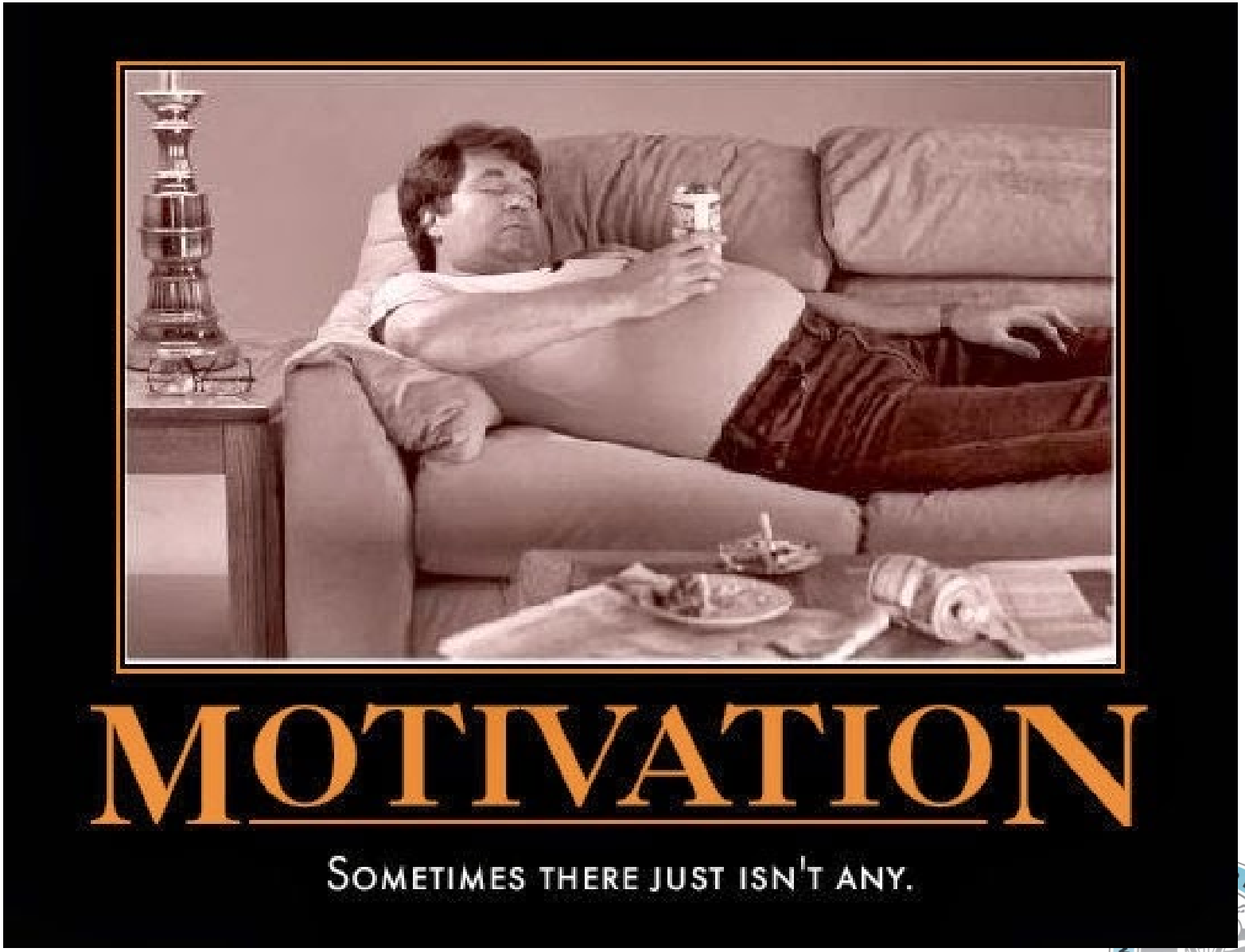
MOTIVATION



Learner motives

- Intrinsic
  - Learning and professional goals
  - Curiosity
  - Social interaction

- Extrinsic
  - Achievement
  - Tests
  - Fear



Question 2. Are Students' Attention Spans Really Getting Shorter?

- Optimal television viewing time for retention was 15 to 20 minutes (1965,1968)
- Students reported 20 to 30 minutes was optimal lecture time (1970)

Isolated “Facts” from Google

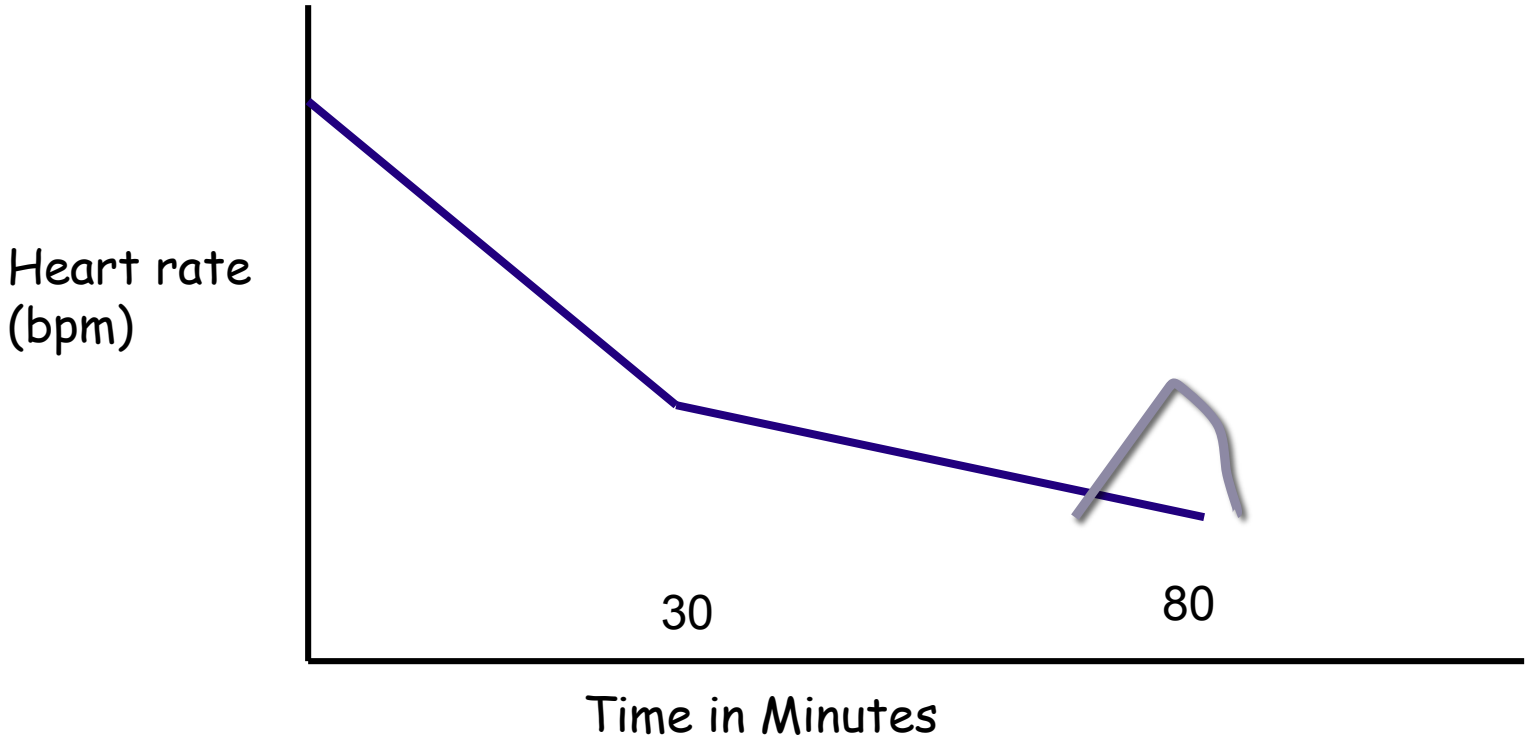
- Relevant to marketers:
  - Attention span to a message is 9 seconds
  - Twitter trending averaged 17.5 hours in 2013 and 11.0 hours in 2016
- Among millennials
  - More likely to shift focus away from speaker than other generations
- Among business professionals
  - More selective in what they pay attention to
  - Stories and animated visuals help

What about in the classroom?

- Multitasking negatively affects learning, including classmates
  - Cell phone ringing (End et al, 2010)
- Non-course use of laptop negatively affected student and nearby classmates (Sana et al 2013)

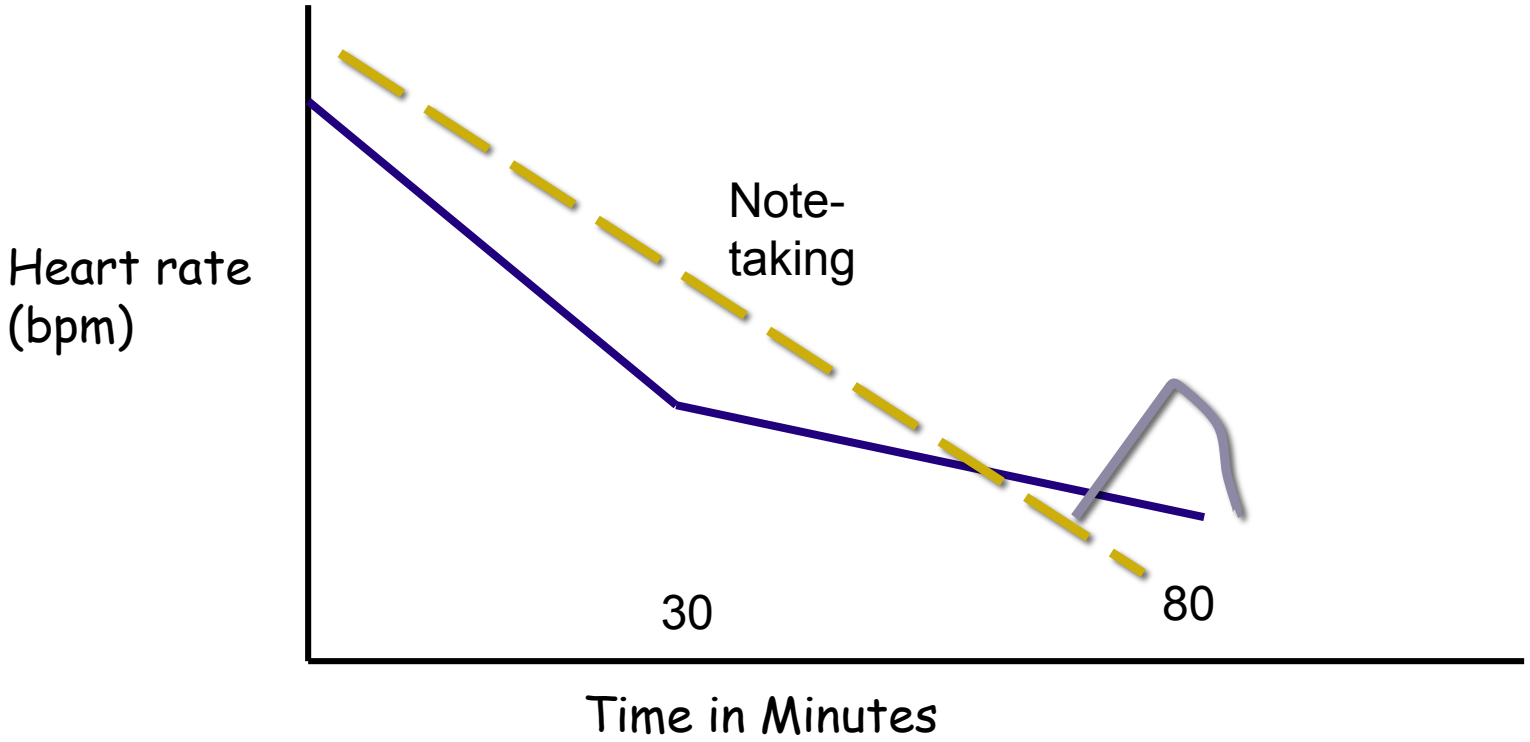
Question 3. Does Segmenting and Pausing Really Work?

Students' Heart Rate Data – Uninterrupted Lecture



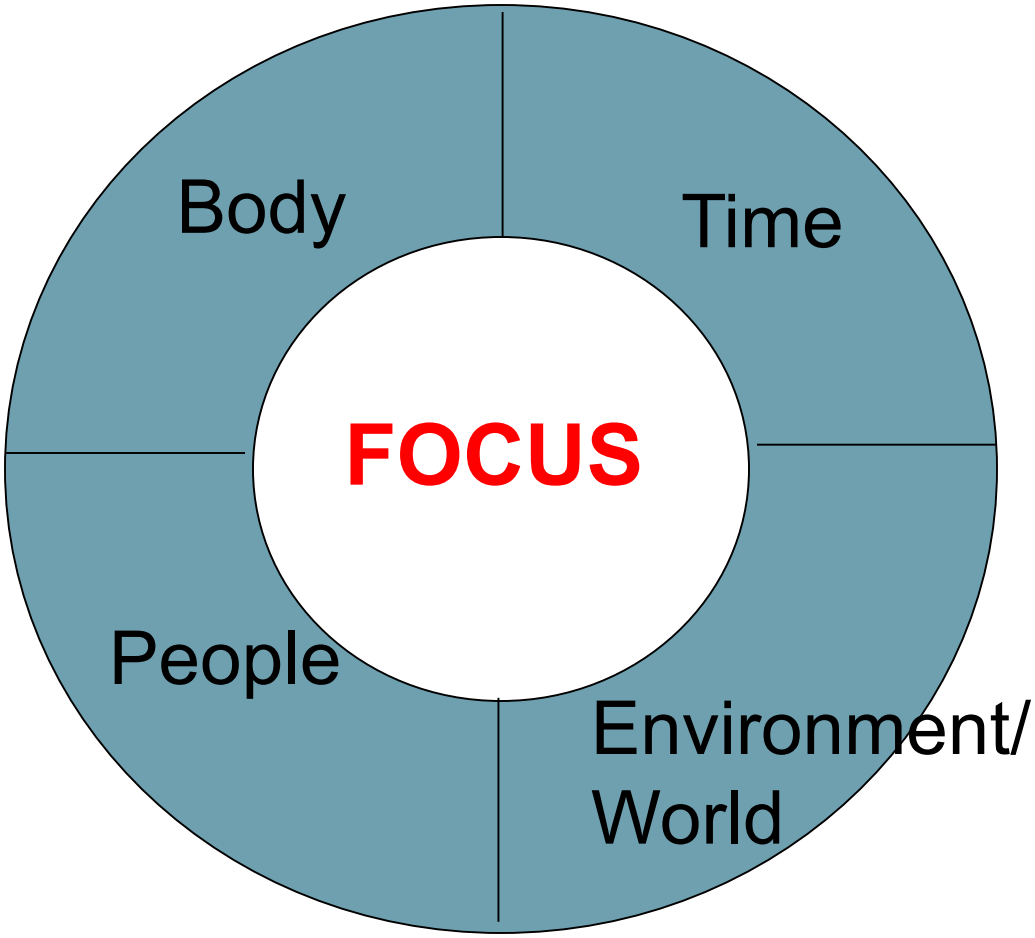
Lloyd 1968

Students' Heart Rate Data – Uninterrupted Lecture



Lloyd 1968

What are students thinking about?



Courtesy Howard Pollio, UT

But.. What impact about learning?

- No difference in learning among lecture segments or time (Bligh and others)
- Recall and note taking enhanced with two minute pauses (Ruhl and Siritsky 1995)
- Students who checked/revised notes with a partner or alone during lecture pauses outperformed those taking other approaches (Luo et al, 2016)

Impacts on Attention

- Instructor
- Student fatigue, interest
- Classroom
- Time of day, length of class
- Difficulty of task or vocabulary

Bottom Line

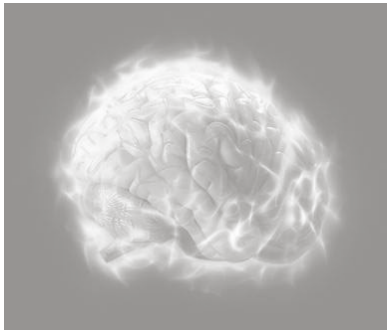
There are many factors that impact attention during a lecture.

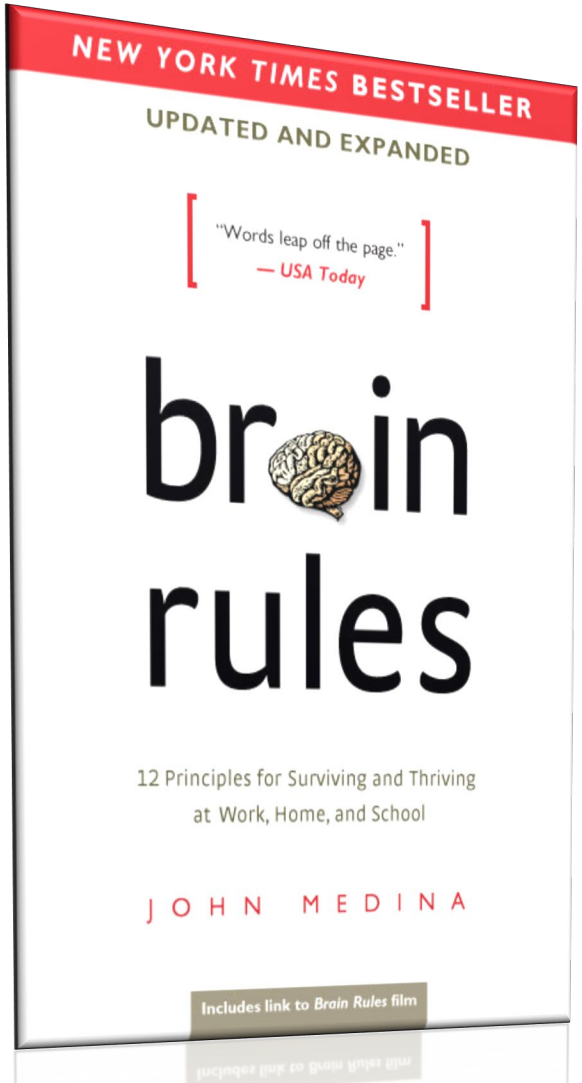
So why not do our best to help students focus and learn?

Question 4. Which is Most Useful for Learning: PowerPoints, Notes, or Detailed Study Guides?

Use and Abuse of PowerPoint

Brain Rule #6





- "We don't pay attention to boring things"

MASTER TEACHER PROGRAM
Dedicated to Teaching Excellence
UTCVM
UNIVERSITY OF TENNESSEE

What helps us remember?

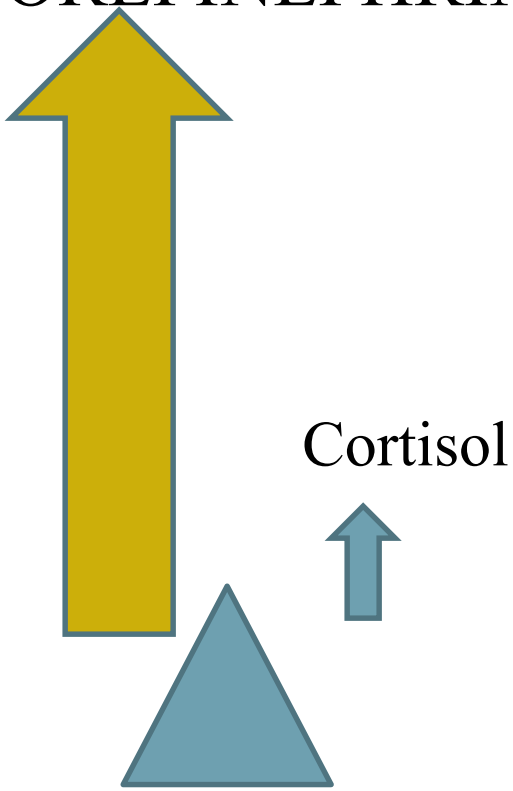
- Emotion
- Novelty
- Senses
- Repetition

Brain Rules,
Jon Medina

What helps us remember?

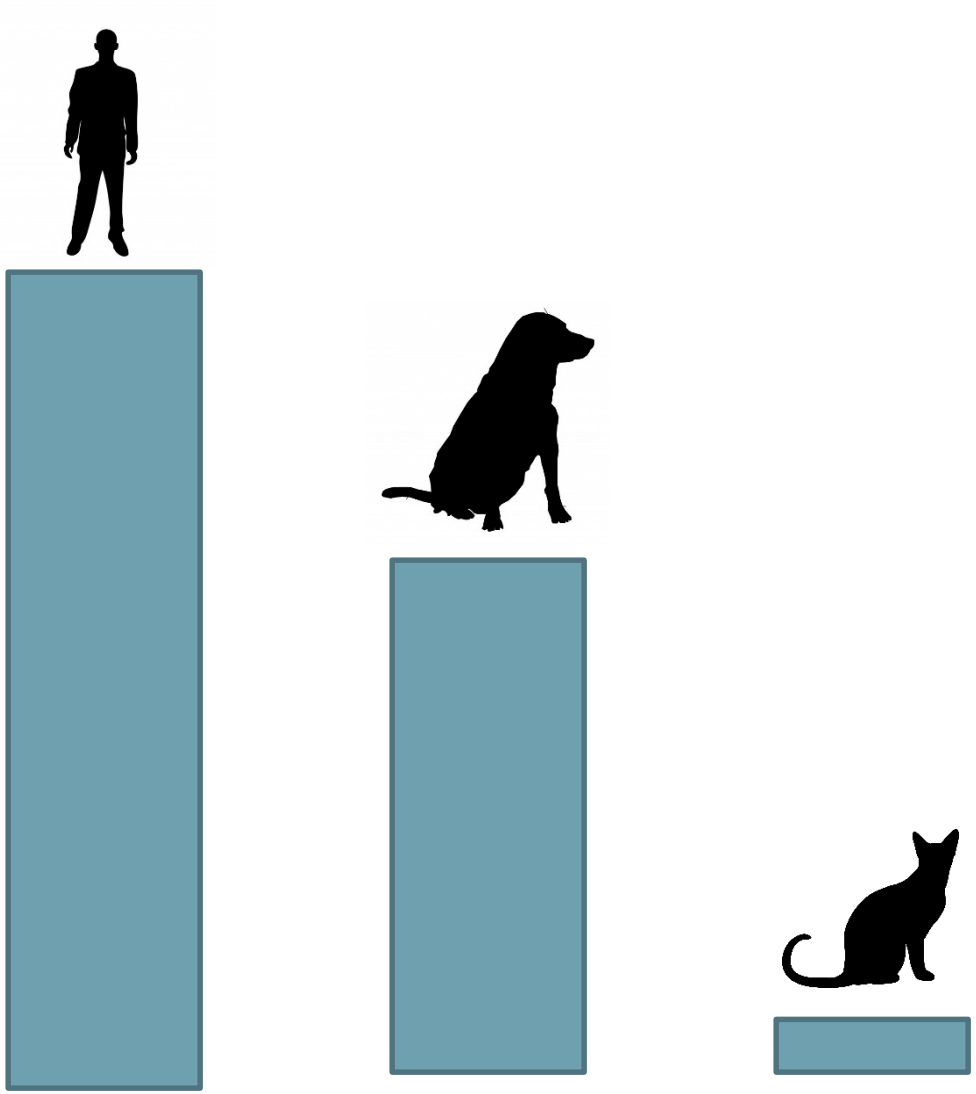
Autonomic neural imbalance

EPINEPHRINE
NOREPINEPHRINE



Cortisol

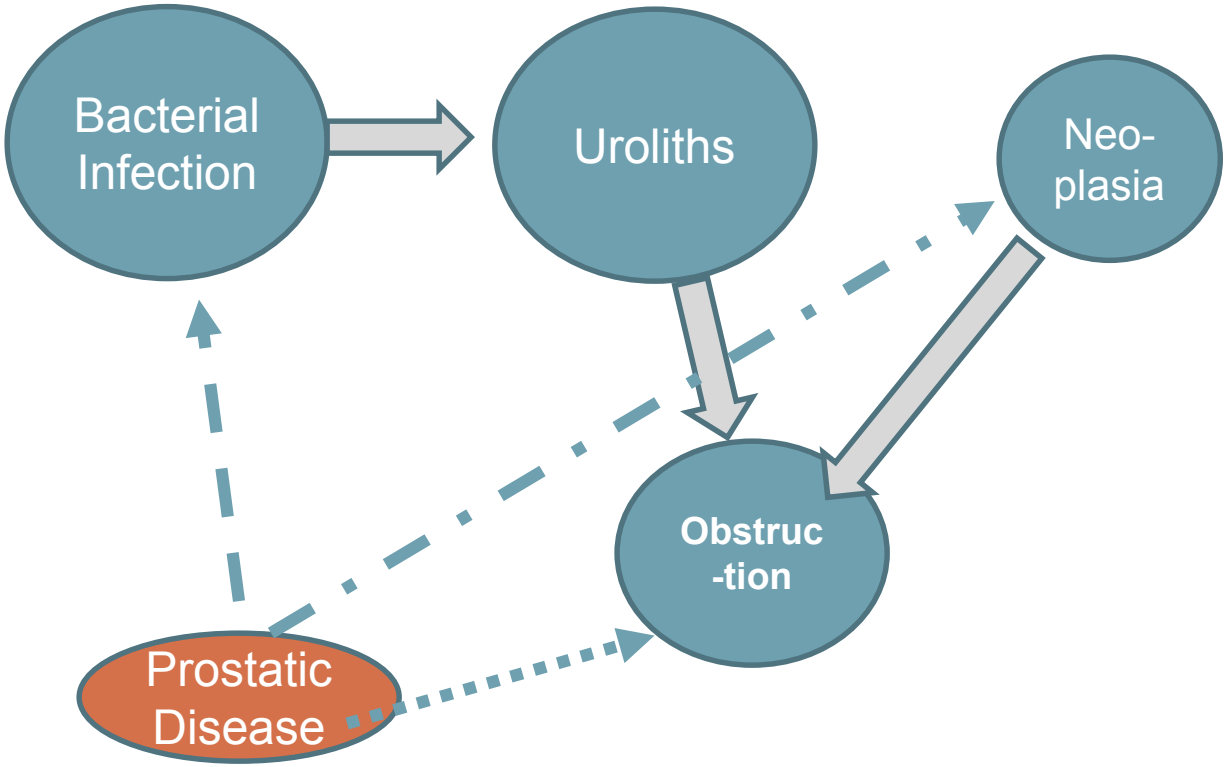
Infographics



Prostatic Disease
Signalment

- Primarily a disease of older dogs and men
- Very rarely reported in cats
- In dogs: 8 – 9 year old intact males

Lower Urinary Tract Disease: Hematuria/Pollakiuria/Dysuria in Dogs



What's the Evidence?

- Meaningful images enhance learning
- We remember images better than words, both immediately and long term
- Students in psychology class using just image slides performed better than students seeing text slides (Holstead, 2015)
- Even better, students finding their own images or drawings perform better

What's the Evidence?

- Students in psychology class using just image slides performed better than students seeing text slides *(Holstead, 2015)*
- Medical students exposed to research-based slide format outperformed students seeing traditional text heavy slides *(Issa et al, 2011)*

What about notes?

- In general, outline notes are useful
- Definitions and diagrams for students are particularly helpful
- Writing something down has cognitive benefits

- More another day…

Question 5. Does Engaging Students and Interaction Really Help Learning?

What do we know about learning?

- Must acknowledge prior knowledge and preconceptions
- Must develop deep foundational knowledge within reasonable cognitive load
- Must fit into conceptual framework
- Must be organized within framework
  - Retrieval
  - Transfer

How People Learn,
2000 and 2018

Simpler…

- Mayer

SELECT

ORGANIZE

INTEGRATE

Simpler…

- Mayer's SOI framework for multimedia learning

SELECT	ORGANIZE	INTEGRATE
Select most relevant incoming information	Organize information into coherent representation	Integrate with relevant knowledge into long term memory

Ways to Facilitate Learning

- Provide a “big picture framework”
- Show linkages to previous and future material
- Highlight the most important new concepts
- Help organize content into conceptual schema

What do we know about engaging presentations?

Engaging Presentations

- Have an intriguing and relevant “hook”
- Are organized and segmented into meaningful 10-15 minute segments
- Emphasize a few key points
- Engage multiple senses
- Have clear transitions and reminders of the overall organization
- Are delivered with enthusiasm and vocal cues
- Have a powerful ending

Where does active learning come in?

Learning for Long-term Retention or Transfer

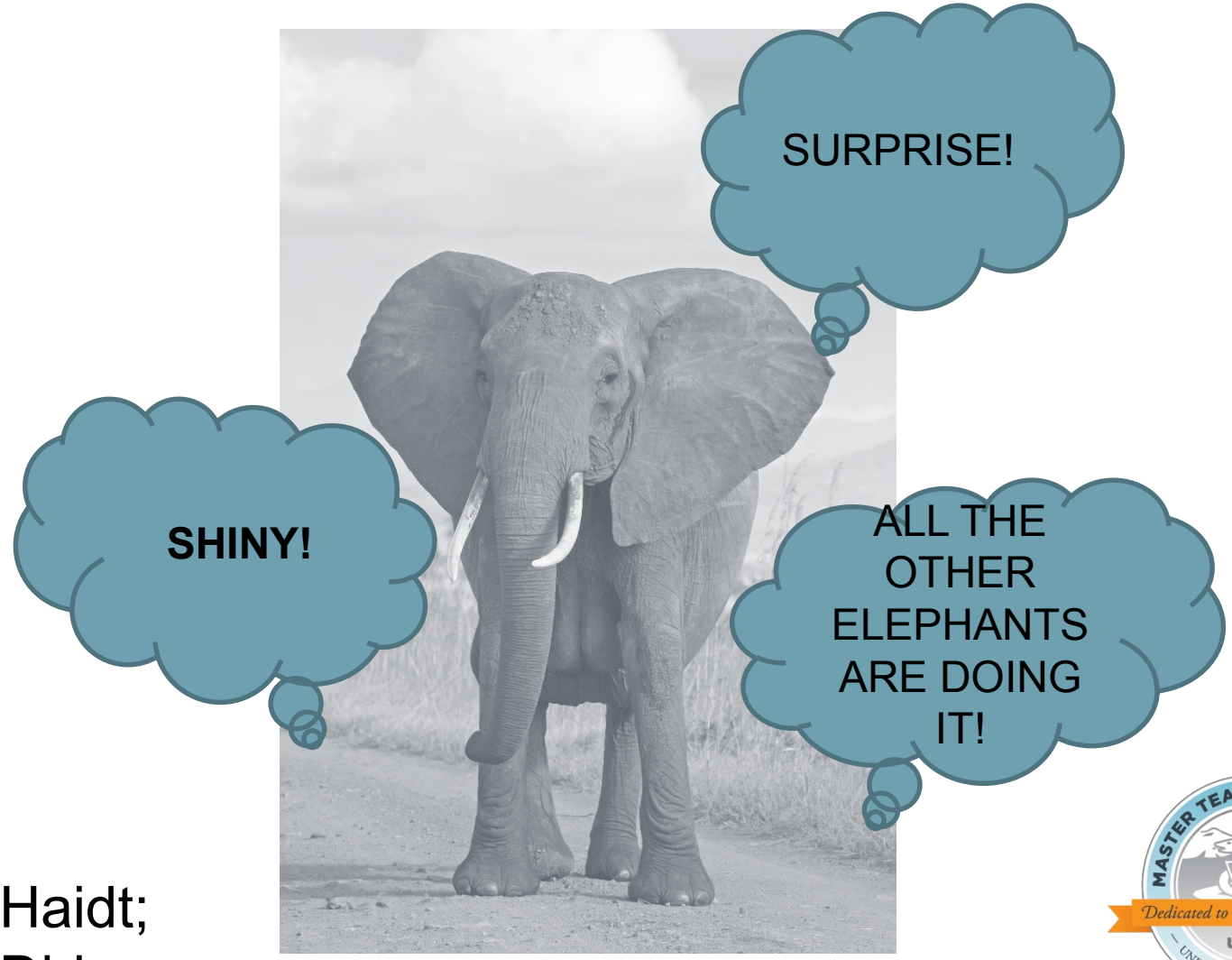
- Solid initial learning
- Deep understanding
- Meaningful chunks or patterns
- Incorporating new elements into existing framework
- Time on task
- Practice
  - Retrieval
  - In context
  - Different applications

Generative Learning (Integrating and Reorganizing)

- Summarizing
- Mapping
- Drawing
- Imagining
- Self-testing
- Self-explaining
- Teaching
- Enacting

Fiorella & Mayer, 2016

“Engage the Elephant”



Haidt;
Dirksen

Evidence

- Neuroscience evidence supporting multisensory approaches
- Experiments with visual material enhance learning
- Demonstration more effective than lecture-only communication content in psychology (Balch, 2014)
- Test achievement higher with interactive approaches in introductory physics (Hake, 1998)

Bottom Line

Including active learning strategies enhances learning, especially in science disciplines. (Freeman et al meta-analysis, 2014)

So…why not use a little bit of it with our lectures?

Back to you: What will you remember most from today's discussion?

Summary

- Evidence is growing to help inform better lectures
- A few small changes in organization, presentation and engagement can make a difference in learning
- Adding some opportunities for students to work with material can make an even bigger impact. Stay tuned!

And don’t forget…

Every brain is wired differently!