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?
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
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
  \[ L > CBL \text{ and } L/CBL > L/CBL/L \]
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

<table>
<thead>
<tr>
<th>Effective</th>
<th>Ineffective</th>
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</thead>
<tbody>
<tr>
<td>• Enthusiastic</td>
<td>• Excess research commentary</td>
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<tr>
<td>• Models, Demos</td>
<td>• Reading from slides</td>
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<tr>
<td>• Interactive</td>
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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
MOTIVATION
Sometimes there just isn't any.
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

Heart rate (bpm)

Time in Minutes

Lloyd 1968
What are students thinking about?

Body

Time

People

Environment/World

FOCUS

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”
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

- Bacterial Infection
- Uroliths
- Neoplasia
- Obstruction
- Prostatic Disease
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

Select most relevant incoming information

ORGANIZE

Organize information into coherent representation

INTEGRATE

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”

SURPRISE!

SHINY!

ALL THE OTHER ELEPHANTS ARE DOING IT!
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!