How to prepare & present a lecture: A step-by-step guide for clinical faculty

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We're starting a pediatrics residency program!!



Pediatrics Residency of Idaho

Pediatrics Residency of Idaho (PRI) will offer excellent clinical training with high patient volumes in all clinical areas; the first class of residents will start in July 2023. The vision of our program is to produce outstanding pediatrician leaders for their communities and to train outstanding broad spectrum pediatrics physicians to work in any setting. This work includes serving under-served and rural areas as well as our vulnerable populations of Idaho with high quality, affordable care provided in a collaborative work environment. We are the first pediatrics residency to be based out of a Federally Qualified Health Center, rather than a medical school, university, or hospital. This difference allows us to be more completely focused on community-based residency training and development of leadership and advocacy skills to use in your future community and practice.



Photo by St. Luke's Health System in Boise, ID

Regularly scheduled didactic sessions are required by ACGME

Accreditation Council for Graduate Medical Education

BUT . . . there are many common criticisms of lectures



Passive learning





Waning attention

Too much information

1. https://www.istockphoto.com/vector/bored-kid-at-school-gm641659466-116219975

2. https://www.dreamstime.com/illustration/overwhelmed-student.html

3. https://www.gettyimages.com/illustrations/wasting-time

Case: Prepare a lecture on the basic anatomy of the heart



https://health.clevelandclinic.org/why-making-your-heart-work-harder-lowers-your-blood-pressure/



Criticisms can be overcome by intentional learner-centered instructional design.



Faculty development programs should provide educators with information of . . .



(1) how humans learn(science of learning)



(2) how to design lecturesto enhance learning*(science of instruction)*

- 1. <u>https://knowledgeone.ca/from-surface-to-in-depth-learning/</u>
- 2. http://clipart-library.com/clipart/lecture-cliparts_12.htm

"When the goal is to foster learning, it might be useful to understand how learning works." (Mayer)



Consider first principles of learning

- Learning is promoted when . . .
 - (1) solving real-world problems
 - (2) existing knowledge is activated
 - (3) new knowledge is **demonstrated**
 - (4) new knowledge is **applied**
 - (5) new knowledge is **integrated**

Focus what it to be learned

Create an 'instructional objective'



Best Practice Recommendations

1) Didactic lectures should be administered as blocked, weekly sessions.

2) Encourage faculty attendance and participation in conference.

3) The lecture should ensure that their presentation complies with:

- Cognitive load theory,
- Multimedia learning theory, and
- Active learning principles

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Q. What is 'cognitive load theory'?



Figure 1. Aktinson–Shriffin three-stage model of human memory.

Working memory ightarrow Long-term memory

J. Q. Young et al.





Q. What is multimedia learning theory?

Applying the science of learning



Figure 1 A cognitive theory of multimedia learning

So what does this all mean for us as clinical faculty?



• Need to decrease extraneous load

Faculty are in control of extraneous load



Death by PowerPoint!

- - Avoid 'death by PowerPoint' by avoid using in 'default' mode.
- Suggested design rules include:
- changing the default headline from a short phrase headline to a short sentence that states the main assertation of the slide
- replace the bulleted list with visual representation of the evidence.
- - reduce the number of words on a slide
- ending presentations with a conclusion slide



Q. How does 'multimedia learning theory' help us?

Table 3. Mayer's 12 principles of multimedia learning.^{43,44}

- 1. Coherence Principle: Avoid extraneous words, pictures, and sounds. They can detract from learning.
- 2. Signaling Principle: Add cues to highlight the essential materials.
- 3. Redundancy Principle: On-screen text can detract from learning. People learn better from graphics and narration alone as opposed to graphics, narration, and on-screen text.
- 4. Spatial Contiguity Principle: Corresponding words and pictures should be presented near each other rather than far from each other on the screen.
- 5. Temporal Contiguity Principle: Corresponding words and pictures should be presented simultaneously rather than successively.
- 6. Segmenting Principle: Multimedia lessons should be presented in learner-controlled segments rather than as a continuous unit.
- 7. Pre-training Principle: When students already know the names and behaviors of system components, they will learn more from the session.
- 8. Modality Principle: Learning is more effective when words are presented as narration rather than on-screen text.
- 9. Multimedia Principle: Learning is more effective when words are combined with pictures as opposed to include words alone.
- **10. Personalization Principle:** Information delivery is more effective when words are presented in a conversational style rather than formal style.
- 11. Voice Principle: Learning is more effective when narration is spoken in a friendly human voice rather than a machine voice.
- **12.** Image Principle: Learning is not necessarily more effective when the speaker's image is added to the screen

[1] The multimedia principle: present words and pictures rather than words alone BEFORE AFTER

Inadequate tissue perfusion leads to

- 1. Hypoxia leads to decreased energy production which leads to metabolic failure and cellular death
- 2. Likewise, decreased perfusion leads to accumulation of waste products and lactic acidosis causing metabolic acidosis and cellular death

Inadequate tissue perfusion leads to anaerobic metabolism and cell death



[2] The signaling principle: highlight essential material BEFORE AFTER

[IV] Obstructive Shock

- Tension Pneumothorax: results in hyperinflation of the hemithorax resulting in kinking of IVS and decreased preload
- Pulmonary Embolism: results in obstruction of the R ventricular outflow and decrease in L ventricular stroke volume resulting in cardiac failure



[IV] Obstructive Shock

- Tension Pneumothorax
- Pulmonary Embolism
- Cardiac Tamponade

[3] The coherence principle: exclude unnecessary words, pictures and sounds and also The signaling principle: highlight essential material:





BEFORE

Oxygen Delivery vs. Consumption

- You can increase your delivery but you can not control your consumption as it is a function of tissue physiology
- You have to meet your tissue's requirements or else you will accelerate lactic acid production and tissue ischemia
- Critical DO2 is that point were DO2 meets VO2 and tissues are utilizing aerobic metabolism
- Up till that point there is an inverse relation between DO2 and VO2 a state we call flow dependent



Relation between DO_2 , VO_2 and O_2 extraction by tissues





Abnormal S_vO₂ Values What is SvO2? □ Normal: 60 - 75% $\Box < 60\%$ It is the Sum of global O2 utilization Decrease in O₂ delivery (MI, ARDS, Px, tamponade..) SVO2 = SaO2 - VO2 / CO * 1.306 * Hb. Increase in O_2 consumption (infection, fever, shivering..) (This modified Fick equation does not allow □ > 75% for the presence of dissolved oxygen). AV shunting ■ Irreversible tissue death 2



Evidence

Applying multimedia design principles enhances learning in medical education

Nabil Issa,¹ Mary Schuller,¹ Susan Santacaterina,¹ Michael Shapiro,¹ Edward Wang,¹ Richard E Mayer² & Debra A DaRosa¹

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CONTEXT The Association of American Medical Colleges' Institute for Improving Medical Education's report entitled 'Effective Use of Educational Technology' called on researchers to study the effectiveness of multimedia design principles. These principles were empirically shown to result in superior

Teaching for understanding in medical classrooms using multimedia design principles

Nabil Issa,¹ Richard E. Mayer,² Mary Schuller,¹ Edward Wang,¹ Michael B. Shapiro¹ & Debra A. DaRosa¹

OBJECTIVES In line with a recent report entitled *Effective Use of Educational Technology in Medical Education* from the Association of American Medical Colleges Institute for Improving Medical Education (AAMC-IME),

of multimedia design (the modified condition group).

RESULTS Findings showed that the modified condition group significantly outscored the traditional condition group on delayed tests of

Q. What are 'active learning principles'?



So, what next? How do I apply all of this?



Step 1 – Refer to first principles of learning

Consider first principles of learning

- Learning is promoted when . . .
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 - (3) new knowledge is **demonstrated**
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First Principles of Learning

Case:



How do you approach this case?

1. Learning is promoted when learners are engaged i

https://health



2. Learning is promoted when existing knowledge is activated as a foundation for new knowledge.

Faculty development programs should provide educators with information of . . .



how humans learn
 (science of learning)



(2) how to design lecturesto enhance learning(science of instruction)

3. Learning is promoted when new knowledge is demonstrated to the learner.

Case:



1. Learning is promoted when learners are engaged in solving real-world problems.

https://health.clevelandclinic.org/why-making-your-heart-work-harder-lowers-your-blood-pressure/



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Your turn!

4. Learning is promoted when new knowledge is applied by the learner.

Next few months . . .

5. Learning is promoted when new knowledge is integrated into the learner's world.

Step 2 – Create an 'instructional objective'

Create an 'instructional objective'



Step 3 – Remember cognitive load theory

Decrease the 'noise'



Need to decrease <u>extraneous load</u>

Step 4 – Use multimedia learning theory

Avoid 'death by PowerPoint'



Step 5 – Add active learning principles

Make it engaging!



Your turn!

4. Learning is promoted when new knowledge is applied by the learner.

Conclusion

When preparing a lecture, you should consider:

- First learning principles
- Instructional objective
- Cognitive load theory
- Multimedia learning theory
- Active learning principles

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