Designing Case-Based E-Learning

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Let's try to make sense of the terms

- Problem-based learning (PBL):
  - Usually refers to a curriculum style
  - Questions for research based upon ''real life'' problems that may be clinical or nonclinical.
  - Group activities
  - Requires a "facilitator"
- Case-based learning (CBL)
  - Can be an element of curriculum
  - Based on issue(s) that arise in a clinical case
  - Self-directed or structured
  - Structure depends on the level of the learner.

Potential Advantages of CBL in Medical Students

- intrinsic and extrinsic motivation is developed, allowing individualized learning
- encourages self evaluation and critical reflection
- allows scientific inquiry and the development of support provision for their conclusions
- Stimulates individual inquiry into the case problem

From B. Williams Emergency Med J. 2005; ;22:577–581

Potential Advantages of CBL for Residents

- Permits a simulated patient encounter with a problem that they may never have encountered; creates awareness
- Allows for re-evaluation of basic knowledge; filling of knowledge gaps
- Allows a re-evaluation of problem-solving skills.
- integration of knowledge and practice, and development of learning skills

Different learners-different methods

Medical students →	Extended group activities; generally requires support
Graduate med students →	Clinical cases with direction to focused learning points
Faculty and residents →	Case reports of rare or complex situations, not normally encountered. Clinical vignettes to test knowledge and problem solving;

Examples of CBL for the advanced

- For specific case management (searchable)
  - Case reports in journals
  - Published case series
- For professional enrichment/learning:
  - Grand Rounds; clinical conferences
  - Clinical vignettes in journals with discussion (often, Grand Round in print")
  - Photo quizzes
  - Interactive case sessions at large meetings
  - Interactive computer-based case problems

Research in Multimedia Learning

(based on R.E. Mayer, Multimedia Learning, Cambridge Univ. Press, 2nd ed. 2009)

- Experimental lesson: How does a bicycle pump work?
  - Narration alone, or
  - Narration with simultaneous animation
- Transfer testing (essay)
  - Suppose you push down on the handle and no air comes out. What could have gone wrong?
  - Why does air enter a pump? Why does it exit the pump?
  - What can be done to make sure that a pump will not fail?

Measuring and Interpreting Effect Size

(Cohen, J. Statistical Power For Behavioral Sciences, Erlbaum press, Mahwah, NJ, 1988)

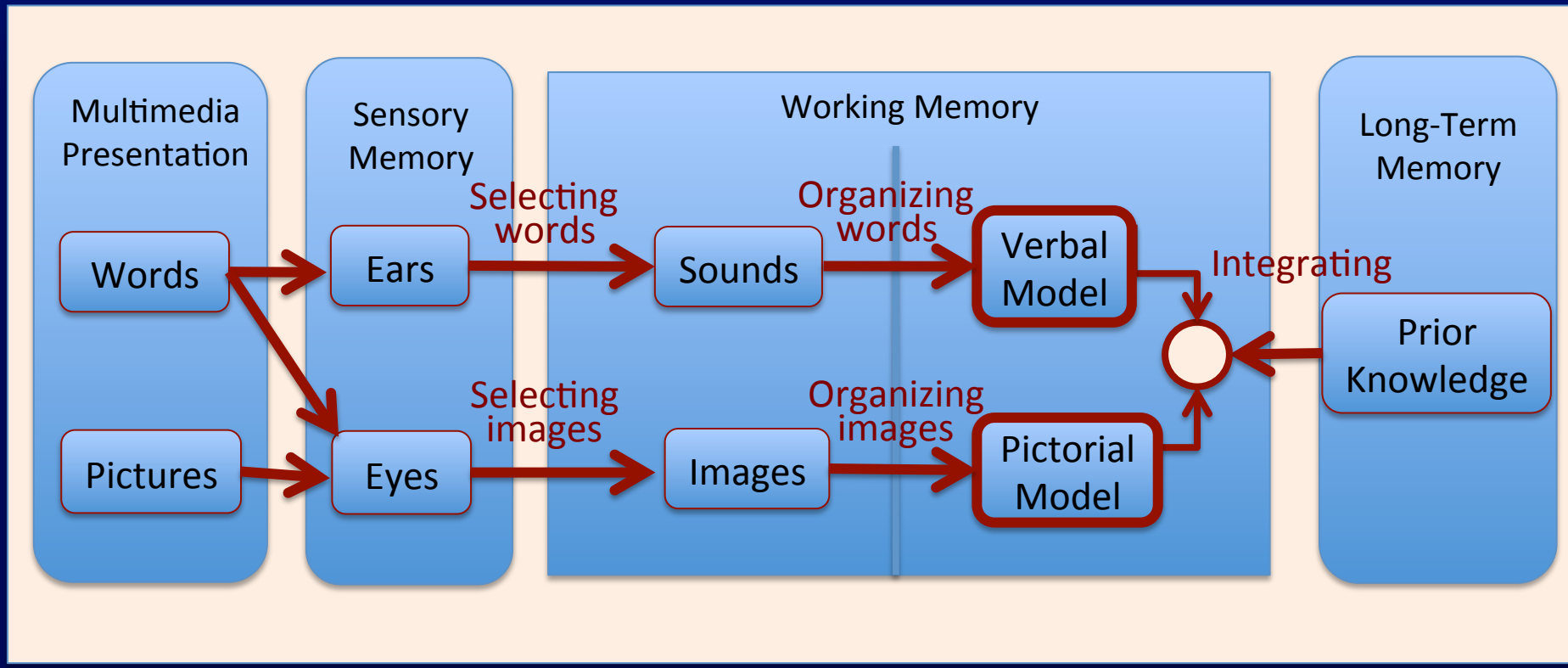
- Subtract the mean of the experimental and control group (Δ)
- Effect size= Δ ÷ pooled standard deviation (SD)
- Effect size ≈ No. of SDs of improvement
- Interpretation:
  - ~0.8 is considered a large effect
  - ~0.5 is considered medium
  - ~0.2 is consider a small

Results of testing the multimedia principle in several independent studies

Source	Content	Format	Effect size
Mayer, 1989, exp 1	Car Brakes	Paper	1.50
Mayer, 1989, exp 2	Car Brakes	Paper	1.71
Mayer & Gallini, 1990, exp 1	Car Brakes	Paper	1.19
Mayer & Gallini, 1990, exp 2	Pumps	Paper	1.00
Mayer & Gallini, 1990, exp 3	Generators	Paper	1.35
Mayer et al., 1996, exp 2	Lightning	Paper	1.39
Mayer & Anderson, 1991, exp 2a	Pumps	Computer	2.43
Mayer & Anderson, 1992, exp 1	Pumps	Computer	1.90
Mayer & Anderson, 1992, exp 2	Car Brakes	Computer	1.67
Moreno & Mayer, 2002, exp 1	Lightning	Computer	0.45
Moreno & Mayer, 1999, exp 1	Arithmetic	Game	0.47
Median			1.39

Cognitive Theory of Multimedia Learning

(R.E. Mayer, Multimedia Learning, Cambridge Univ. Press, 2nd ed. 2009)



This is why no one gives a lecture without slides anymore!!!

Episiotomy and Repair

Index of Videos

Click here for instructions

Dr. Adanu

Introduction to episiotomy

Dr. Balkachew

Videos (video size can be adjusted by enlarging the window)

1. Infiltration anaesthesia at the time of crowning (1:10)
2. Episiotomy and delivery of the baby (2:15)
3. Delivery and examination of the placenta (1:26)
4. Placement of a swab and infiltration of local anaesthetic for the repair (1:03)
5. Animation of the closure procedure (1:03)
6. Suturing of the vaginal mucosa (4:03)
7. Suturing of the muscle layer (1:12)
8. Suturing of the skin (2:47)
9. Inpection of the repair (0:17)

Self-assessment quiz (note: the new window may open behind this one in some browsers)

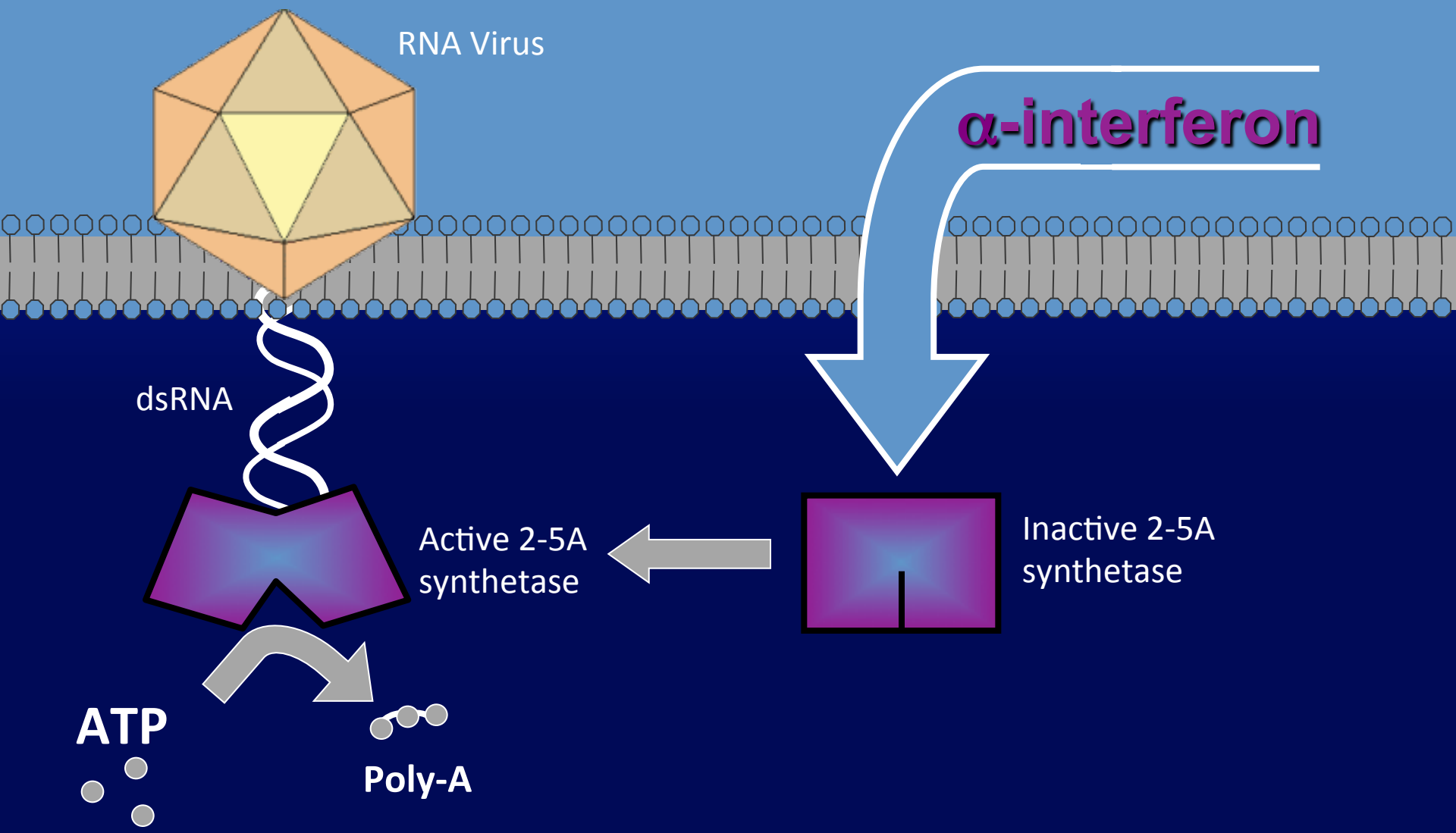
DISCLAIMER: Any medical information in this material is intended to inform and to educate and is not a tool for self-diagnosis or a replacement for medical evaluation, advice, diagnosis or treatment by a healthcare professional. You should speak to your physician or make an appointment to be seen if you have questions or concerns about this information or your medical condition.

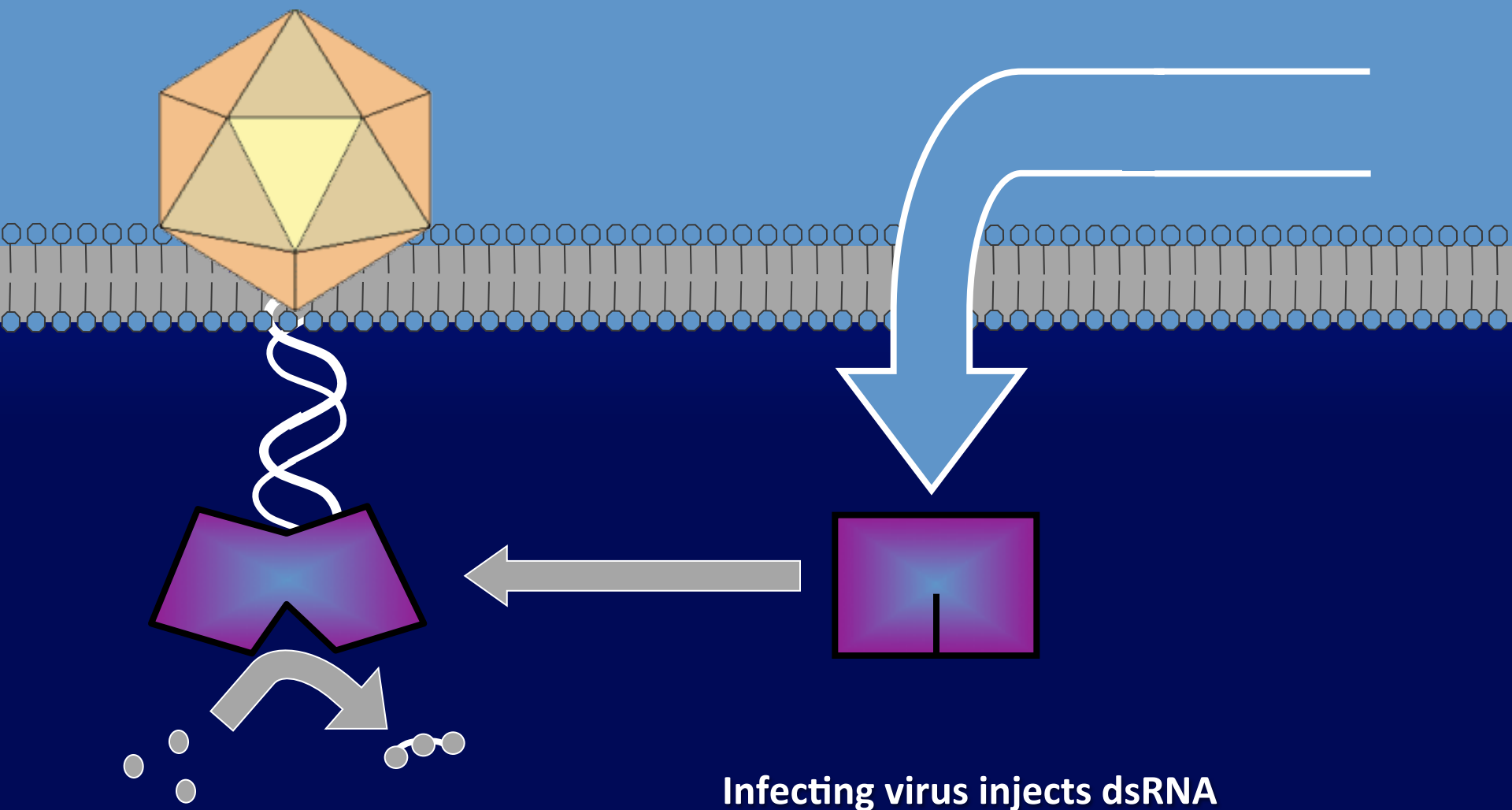
Viewer discretion is advised: The educational material contained herein may contain medical images that non-professional viewers may find disturbing.

The patients who appear in this programme freely gave their consent for the authors to use their images for educational purposes. Where real patients were filmed or photographed, we have not shown their faces or other identifiable features.

Proven Principles of Multimedia Design

- Segmenting
  - Breaking up complex presentations into learner-controlled segments improves learning
  - Median effect size of 3 studies =0.98
- Pre-training
  - Making learners aware of terms and definitions prior to explaining a process improves learning
  - Median effect size of 5 studies=0.85
- Modality
  - Pictures and voice are better assimilated than pictures and printed words
  - Median effect size of 17 studies=1.02


RNA Virus
α-interferon
dsRNA
Active 2-5A synthetase
Inactive 2-5A synthetase
ATP
Poly-A



Infecting virus injects dsRNA

α-interferon induces production of inactive 2-5A synthetase

Free ds RNA activates 2-5A synthetase

The active enzyme converts ATP to 2-5 poly A

Proven Principles of Multimedia Design

- Personalization
  - Narration should be directed personally at the learner, using the pronouns “you” and “I” rather than a passive voice.
  - Median effect size of 11 studies =1.11
- Voice principle
  - A human, familiar voice in narrations enhances learning
  - Median effect size of 3 studies=0.78

Boundary Conditions

- Principles apply most directly to learners with little or no prior knowledge of the subject being taught
- Principles are *more* important in the following situations:
  - Subject-matter is complex
  - Presentation is fast-paced

Main Points

- Case histories are used in multiple ways for different purposes
- Learning method (not just content) should be different for professionals at different levels of expertise
- Learning can be enhanced

unnecessary, gratuitous image