Putting Cognitive Learning Theories to Work to Make Learning Stick

Lisa A. DelSignore, MD
Pediatric Intensivist
Tufts Floating Hospital for Children
Tufts Medical School

Workshop Facilitators: Ariel Winn MD; Lori Newman MEd; Diane Stafford MD; Carolyn Marcus MD; Eli Freiman MD; Laura Chiel MD
Learning is HARD WORK!

“Learning is deeper and more durable when it is effortful.”

Examples of Least Productive Learning Strategies
Active Learning for Mastery
Learning for Mastery: 6 Key Activities

- Retrieval Practice
- Elaboration
- Interleaving
- Generation
- Reflection
- Calibration

Desirable Difficulties

• Use of cognitive learning strategies can be uncomfortable and difficult

• Avoid evolution to undesirable difficulties if learners lack underlying knowledge

• Feedback: Praise learner’s efforts over knowledge

Small Group Activities

• 5 small groups practicing interactive examples of each cognitive learning theory

• Facilitators will rotate to each table with a new activity
  – Brief discussion of theory
  – Interactive example to practice using theory
  – Brainstorm application use in own teaching practice
Retrieval Practice

• Learning or studying information more than once, but leaving considerable time between intervals (e.g. days, weeks, months)

• Embedding new learning requires long term memory
  – Cognitive pathways are strengthened via consolidation, which requires mental rehearsal to “retrieve learning” after a little forgetting

• Example: Flashcards
Retrieval Practice

Without speaking to anyone, write out what these acronyms stand for:

<table>
<thead>
<tr>
<th>DOB</th>
<th>SSN</th>
</tr>
</thead>
<tbody>
<tr>
<td>OTC</td>
<td>SUV</td>
</tr>
<tr>
<td>RAM</td>
<td>RACE</td>
</tr>
<tr>
<td>EST</td>
<td>AARP</td>
</tr>
</tbody>
</table>
Interleaving

• **Mass Practice:**
  – repeatedly studying the same skill
  – AAABBBCC

• **Interleaving:**
  – mixing skills in studying to enhance memory
  – ABCBACACB

• Varying the content as we learn improves our ability to remember and also our ability to learn larger concepts and make associations
Interleaving in Art

Group 1: studied multiple examples of one painter’s works before moving on to study examples of another painter’s works, learning the style of each. Focuses on commonalities among one painter’s work.

Group 2: studied the works of multiple painters at the same time, learning the styles of each by reviewing the differences between the works.

Discerning contextual and functional differences allows a higher level of comprehension.
African Elephant

Asian Elephant
Forest Elephant
Elaboration

Giving new material meaning by expressing it in your own words and connecting it with what you already know

Conduction  Convection  Radiation

Putting new knowledge into a larger context helps learning
Successful learners extract key ideas from new material and organize them into mental models
Generation

• Act of trying to answer a question or solve a problem before being presented any cues, information, or solutions.

• Why does it work:
  – By puzzling through a problem, trainees are far more likely to learn and remember the solution than if somebody simply supplied it to them.
Generation

• Act of trying to answer a question or solve a problem before being presented any cues, information, or solutions.

• Why does it work:
  – By puzzling through a problem, trainees are far more likely to learn and remember the solution than if somebody simply supplied it to them.
What is this Object and What is it Used For?
• Design a therapy for tumor lysis syndrome

Purine Catabolism

Hypoxanthine

Xanthine

Uric Acid

Allantoin

XO

XO

BAD

UO

Allopurinol

Rasburicase
Reflection

1. Identify 1-2 important concept, research finding, theory, or idea that you learned while at this Spring Meeting so far. (analyzing)

2. Why do you believe that this concept, research finding, theory, or idea is important? (reflecting)

3. Apply what you have learned from this activity to some aspect of your life. (relating)

4. What question(s) has the activity raised for you? What are you still wondering about? (questioning)