Strategies for Monitoring & Enhancing How Well You Are Learning

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What We Will Cover

1. Information Processing
   - Perception + processing + retention + recall
2. Metacognition
   - Monitoring processes
   - Tracking successes and failures
   - Learning from each to improve future efforts
3. Along the way…
   - Strategies to improve learning
   - Optimizing online learning and searching
4. WRAP-UP: Conversation and Interaction
   - Time for us to share and discuss

Information-Processing Model

**Input & Selection**

- **Sensory register** constantly stimulated.
- **Primary attention** focuses receptors on stimuli
- **Sensory buffer** holds input short-term.
- **Selective perception** controls what gets through.
Attention & Processing

- **Processing attention**
  - directs and selects particular stimuli for encoding.
- **Depth of processing equals. . .**
  - How much *prolonged* attention we focus on stimuli.
  - Extent to which we use rehearsal & processing strategies to incorporate stimuli into what already know.

Primary Attention versus Processing Attention

Process of moving from

- **primary attention** (perceiving and selecting)
- **processing attention** (analyzing and encoding)

Involves…

- detecting salient characteristics of stimuli.
- distinguishing important stimuli from “background” stimuli.
- focusing on the appropriate stimuli.
- avoiding being distracted by competing stimuli.

But *selective perception* may short-circuit this process.
Selective Perception

Cannot pay attention to everything, so make choices. Choosing not to attend to stimuli = **LOST STIMULI**.

Selective perception functions on basis of...
- Your internal properties
  - Concerns or anxieties
  - Self-concept
  - Prior experiences
  - Expectations
- Properties of way message is delivered (stimuli type)
- Ways in which content of message is designed
  - Organization, illustration, clarity, redundancy

Short-term Memory (STM)

- Holds stimuli to be processed.
- Has limited capacity & limited duration.
- Two types
  - *immediate memory*  
    sensory workspace + pre-processing
  - *working memory*  
    processing workspace & reinforcement ("3Rs")
- Stimuli that are not encoded or rehearsed are lost.
- Maintenance rehearsal can delay loss.
Short-term Memory (STM)

- Novelty-seeking and mental fatigue affect learner persistence.
- Sense & relevance affect processing.
- Depth of processing affects encoding.

Attention Span = Novelty-seeking + Mental Fatigue

- Adults: ~10-20 min. blocks
- How increase persistence?
  - Change way in which working with content to introduce novelty. Change modality?
  - Divide learning/studying into time-length-appropriate blocks that vary in format & style.
  - Distribute exposure over time. (smaller blocks across days?)
Long-term Memory (LTM)

- Holds *encoded* stimuli.
- Strengthen encoded pathways through “3Rs”—
  - R etrieval
  - R ehearsal (elaboration)
  - R estoration (restoration)

Encoding Issues

- *Cognitive load* is key to processing and encoding.
- *Spare capacity* determines how much load you can handle.
- *Automaticity* reduces cognitive load.
- Factors influencing encoding:
  - Distraction
  - Stimulus *salience* (how much key characteristics stand out)
Properties Affecting Processing

- Familiarity versus novelty
- Activity versus passivity
- Involvement versus detachment
- Empowerment versus helplessness (self-efficacy)

Midway through the exam, Allen pulls out a bigger brain.

Applied Info Processing:
Helping Yourself Encode /1

- Eliminate negative assumptions; have faith in your abilities.
  - Anxiety increases cognitive load (reducing spare capacity).
  - Confidence can reduce load (increasing spare capacity).
- Be intentional & active about learning (as opposed to passive).
- Use existing advance organizers and/or create your own.
  - Look for objectives and summaries before reading.
  - Ask yourself:
    - What do I know now?
    - What am I trying to learn and why?
Pay attention to *salience* hints.
- Chapter and section headings
- Highlighting – *bold*, *italics*, *underlined*, CAPS, colored type & *shading*
- Note what gets a table, figure or illustration. (Is there a reason?)
- Consider writing questions as you read.
- Relate what you are learning now to what already know.
- Formulate memory aids – *mnemonics*: words, drawings, images, rhymes, songs
Helping Yourself Recall

In advance of required performance:
- Minimize distractions as you prepare.
- Use 3Rs to enhance memory trace (retrieval pathway).
- Concentrate practice at the beginning to achieve automaticity.
- Distribute practice over time to exercise memory trace.
- Given memory flexibility, consider ways to represent what you know in different ways (enhance novelty while retain familiarity).
  - Music and imagery might offer another retrieval pathway.

For actual performance:
- Take care of physical needs (sleep, food, body temp, anxiety).
- Consider “off-loading” at start of performance to reduce load.

Information Processing: Executive Function

Based on Atkinson-Shiffrin (1968)
Executive Function = Metacognition

Metacognition Defined

Metacognition refers to:

- One’s knowledge concerning one’s own cognitive processes and products or anything related to them
  - For example, learning-relevant properties of information or data
- Active monitoring, consequent regulation, & orchestration of these processes in relation to cognitive objects or data
  - Usually in service of some concrete goal or objective

(Flavell, 1976, p. 232)

What “Better” Learners Know (Secret Knowledge)

How to monitor their learning processes & adjust behavior

- How to make a learning plan and allocate time
- When they “know” versus just think they know
- When to ask questions and what kinds to ask
- How to lighten memory load (using memory aids)
- How often to practice & which techniques work best for them
- When to abandon one approach for another
- How to reflect on current performance & plan for better future performance
6 Classes of Metacognitive Skills

1. Task Analysis
2. Goal Setting
3. Strategic Action
4. Handling Load
5. Persistence and Responsibility
6. Growth

Metacognitive Skills: Task Analysis

Recognize the size and scope of a task.
- Identify components of task.
  - Divide task into appropriate steps/stages.
- Estimate time to complete it.
- Schedule time to complete it.
- Prepare for the task...
  - Emotionally.
  - Intellectually (warm-up).
  - Get the environment ready.
Metacognitive Skills:

**Goal Setting**

<table>
<thead>
<tr>
<th>Set appropriate goals &amp; subgoals.</th>
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<tbody>
<tr>
<td>- Identify/clarify what to be accomplished.</td>
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<tr>
<td>- Identify/clarify why doing what you are to do (relevance).</td>
</tr>
<tr>
<td>- Sequence subgoals to support meeting goals.</td>
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</table>

<table>
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<tr>
<th>Revise goals &amp; subgoals as necessary.</th>
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<tbody>
<tr>
<td>- Assess ongoing suitability of goals and subgoals.</td>
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<tr>
<td>- Modify <em>inappropriate</em> goal or subgoals.</td>
</tr>
<tr>
<td>- May match less well than expected or conditions may have changed.</td>
</tr>
<tr>
<td>- Change subgoal sequence (if needed).</td>
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</tbody>
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Metacognitive Skills:

**Strategic Action**

<table>
<thead>
<tr>
<th>Select appropriate learning strategies.</th>
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<tbody>
<tr>
<td>- Match strategies to goals/subgoals.</td>
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<tr>
<td>- Align strategies with steps &amp; stages.</td>
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<tr>
<th>Determine effectiveness of a learning strategy or set of strategies.</th>
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<tr>
<td>- Track ongoing effectiveness of strategies.</td>
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<tr>
<td>- Identify ineffective strategies. (&amp; why?)</td>
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<th>Revise a learning strategy or set of strategies, as necessary.</th>
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<tr>
<td>- Replace ineffective strategies (match goals/ subgoals).</td>
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<tr>
<td>- Realign with steps and stages.</td>
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Metacognitive Skills:

Handling Load

Minimize cognitive load (particularly memory load).

- Handle anxiety. (positive outlook/self-talk?)
- Reduce environmental distractions.
- Identify and select appropriate memory aids.
- Induce automaticity where possible.

Persistence & Responsibility

Recognize scope of mental effort required.

- Reflect on task and consider task demands.

Distribute mental effort across task (as needed).

- Devote time & energy to task.
- Plan to persist until done.
- Schedule so can persist.

Take personal control & responsibility for learning.

- Evince self-efficacy: “I made this happen.”
- “I can do it again” or “I can do better.”
- What happens to me is within my control (or not?)

Metacognitive Skills: Growth

Analyze success of a learning outcome.
- Identify…
  - What went well
  - What could be better next time
  - Why the outcome was what it was

Generalize from one learning episode to others.
- Identify…
  - What is unique about this learning situation
  - What is common to other learning situations
  - What made you feel good or bad (and why)

Applied Metacognition
Enhancing Web Searching /1

Task Analysis: Organize before you start searching.
- Identify related search terms
- Estimate time and block out enough time (but recognize boredom and novelty time factors).

Goal Setting: Decide what you want to accomplish.
- Make (written?) note of what you are looking for.
- As new leads or sources appear, add them to your note.

Strategic Action: Monitor progress & modify accordingly.
- Check your note from time to time. Check the time.
- What is working & why? What isn’t working and why?
- Learn/know when to ask for help (human or online).

Applied Metacognition

Enhancing Web Searching /2

HANDLING LOAD: Reduce distractions.
- Choose “right” environment (for you and for task).
- Recognize blinking captures attention (attentional demand).
- Monitor your load (“forehead wrinkling”); adjust as needed.

PERSISTENCE: Work to completion (if possible).
- Monitor mental fatigue (boredom) and novelty seeking.
- If helps, track completion proportion to use drive for closure to help.

GROWTH: Learn from your successes and failures.
- When learn a new technique, write it down (particularly for search terms).

Online Learning & Information Processing /1

Some online activities offer too many distractions.
- Web searching/surfing
- Online classes (no one watching you; easy to multi-task)

Some online learning designs are weak attentionally.
- Long videos
  - Analogy: Non-interactive lecture.
- Poor attentional design
  - Issue: Too little novelty/too much familiarity (voice/layout?)
  - Issue: Too little gaining/regaining attention
  - Issue: Too little relevance/insufficient rationale
Some online learning designs increase cognitive load.

- Poorly composed PowerPoints
- Analogy: Crowded small writing on the board
- Complex/poorly designed interfaces
- Issue: Split attention/processing
- Unreliable connectivity
  - Issue: Anxiety uses capacity.
  - Issue: Lower quality demands more attention (reducing spare capacity).

Some online learning designs are isolating.

- Asynchronous sessions without social interaction
Info Processing & Tech
Special PowerPoint Tips

- Use good **title** on each page = advanced organizer.
- Number multiple pages or use **subtitles** = schema.
- Use consistent layout, fonts, operations, sounds = familiarity.
- Don’t use same layout for every slide = novelty.
- Provide note page **handouts** = cognitive support.
- Recognize that too much text = high cognitive load.
- Other cognitive load offenses:
  - Using type that is too small
  - Putting too much on screen
  - Using distracting noises.
  - Employing garish colors.

Useful References


Interaction and Sharing

CONVERSATION