INFORMATION LITERACY AND COGNITIVE SCIENCE

What can we apply from the science of learning?
LEARNING THEORY...
LEARNING THEORIES

Behaviorism  Constructivism
LEARNING THEORIES (EXPANDED)

- Practice-based Learning
  creates activities
  where learners can
  apply content

- Authentic

- Situated Cognition

- Constructivism

- Behavioral Learning

- Cognitive Information Processing

- Schema/Cognitive Load

Instructional Communication supports learning about content
COGNITION = KNOWLEDGE

Learning

Perception

Reasoning

Cognition

COGNITION = MENTAL PROCESSES

COGNITIVE LEARNING THEORY

RESEARCH IN THE DIGITAL AGE

“Research seems to be far more difficult to conduct in the digital age than it did in previous times.” (p. 2)

“...a large majority of students reported spending three hours on research and another two hours on writing – one or two days before a 5-7 page course-related research paper was due.” (p. 7) (video)

“Wikipedia is my presearch tool.” (p. 12)

MENTAL MODELS: PROJECT IL

1 Big Picture
2 Language
3 Situational
4 Information gathering

Results

WHAT ONE WORD SUMS UP HOW YOU FEEL AT THE MOMENT YOU RECEIVE AN ASSIGNMENT?

- angst
- tired
- dread
- fear
- anxious
- annoyed
- stressed
- disgusted
- intrigued
- excited
- confused
- overwhelmed

# Mental Models: Kuhlthau

![Diagram of mental models]

<table>
<thead>
<tr>
<th>Initiation</th>
<th>Selection</th>
<th>Exploration</th>
<th>Formulation</th>
<th>Collection</th>
<th>Presentation</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feelings (Affective)</td>
<td>Uncertainty</td>
<td>Optimism</td>
<td>Confusion</td>
<td>Frustration</td>
<td>Doubt</td>
<td>Clarity</td>
</tr>
<tr>
<td>Thoughts (Cognitive)</td>
<td>Vague</td>
<td>Focused</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actions (Physical)</td>
<td>Seeking relevant information</td>
<td>Seeking pertinent information</td>
<td>Exploring</td>
<td></td>
<td>Documenting</td>
<td></td>
</tr>
</tbody>
</table>

**Source:** Kuhlthau, C. C. (2008, December 1). Information search process. [http://www.scils.rutgers.edu/~kuhlthau/information_search_process.htm](http://www.scils.rutgers.edu/~kuhlthau/information_search_process.htm)
STRATEGIES FOR HANDOUTS

- Use **boldface** and *italic* print in text to highlight key concepts, terms
- Use boxes and shading to bring out important blocks of text
- Use colour in diagrams to point out important features
- Use graphical diagrams and imagery strategies (concepts maps, Venn diagrams) to help learners make meaningful connections
STRATEGIES FOR HANDOUTS, CONT’D.

- Provide many different kinds of examples or problems in different contexts to aid in application, retention, and transfer.
- Integrate explanations with diagrams to avoid splitting attention between two sources of visual input.
- Leave certain pieces of diagrams and text out so that learner has opportunity to complete it (partially completed problems).
STRATEGIES FOR ONLINE RESOURCES

In addition to the strategies for handouts...

- Use worked examples to demonstrate how experts would do research or solve a problem
  - Example

- Narrate animations or diagrams, rather than using online text (avoid “attention splitting”)

- In animated tutorials, use cues to draw learner’s attention to the next mouse click
STRATEGIES FOR ASSIGNMENTS

- Build in opportunities for students to reflect on their learning or justify their choices
  - How is this source relevant to your topic?
  - Reflect briefly (75-100 words) on your research strategy for this exercise. What did you do that you hadn’t done before? What worked well? What didn’t work well? Would you do anything differently next time? If so, what?
STRATEGIES FOR ASSIGNMENTS, CONT’D.

- Require students to interact with the sources and relate them to prior or new learning
  - Does this article follow scientific method? Why or why not?
  - Why would it be important for researchers to acknowledge their source of funding?
- Provide individual feedback, offering constructive ways for students to expand or revise their strategies
- Provide group feedback, as appropriate (e.g., clarifying misconceptions or additional explanations from in class)
STRATEGIES FOR INSTRUCTION: GAGNÉ

Nine instructional events:
1. Gaining attention
2. Informing the learner of the objective
3. Stimulating recall of prior learning
4. Presenting the stimulus
5. Providing learner guidance
6. Eliciting performance
7. Providing feedback
8. Assessing performance
9. Enhancing retention and transfer
STRATEGIES FOR INSTRUCTION

- Plan lessons/sessions around no more than 5-7 discrete concepts
- Divide lesson into mini-lessons, structured around Gagné’s events (scaffolded)
- Draw diagrams on the whiteboard as you explain concepts (stick people are OK)
- Use analogies and metaphors that students will understand to help them link to prior learning
- Start from where students are, and move them beyond that point … then tell them how to get the support they need
Thank You...
The End