Design Your Slides with Cognitively-supported Multimedia Principles

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Resources

Cognitive Load Theory

- An instructional theory founded by John Sweller in the early 1980s

- The theory is based on a “cognitive architecture” within which we take in and process information (the cognitive processing load) in the limited capacity of our working memory
Cognitive Load

**Extraneous Cognitive Load**
- Does not serve the instructional goal
- Poor instructional design

**Essential Cognitive Load**
- Represents essential material in working memory
- Load depends on Complexity of material

**Generative Cognitive Processing**
- Required for deep understanding of material (e.g., construction of schemas)
- Good instructional design—increases student motivation to learn
Goals of Multimedia Instruction  
Mayer, 2009; 2014

- **Minimize Extraneous Cognitive Load**
  - Information that does not serve the instructional goal

- **Manage Essential Cognitive Load**
  - Essential material in working memory

- **Foster Generative Cognitive Processing**
  - Aimed at making sense of essential material
Designing Your Slides

Choose a learning objective around something you want students to learn

Consider how you might present that material that meets the objective in a manner that bears in mind the Cognitive Load Theory of Multimedia Learning
Minimize Extraneous Load

**Extraneous Cognitive Load**

- Does not serve the instructional goal
- Poor instructional design

<table>
<thead>
<tr>
<th>Principle</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coherence</td>
<td>Delete extraneous material</td>
</tr>
<tr>
<td>Signaling</td>
<td>Highlight essential material</td>
</tr>
<tr>
<td>Redundancy</td>
<td>Don’t add onscreen captions to narrated graphics</td>
</tr>
<tr>
<td>Spatial contiguity</td>
<td>Place printed words near corresponding part of graphic</td>
</tr>
<tr>
<td>Temporal contiguity</td>
<td>Present spoken words at same time as corresponding graphics</td>
</tr>
</tbody>
</table>

Table 2, Mayer, 2014 (page 62)
Manage Essential Load

**Essential Cognitive Load**
- Represents essential material in working memory
- Load depends on Complexity of material

<table>
<thead>
<tr>
<th>Principle</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Segmenting</td>
<td>Break lesson into learner-paced parts</td>
</tr>
<tr>
<td>Pre-training</td>
<td>Present characteristics of key concepts before lesson</td>
</tr>
<tr>
<td>Modality</td>
<td>Use spoken words rather than printed words</td>
</tr>
</tbody>
</table>
### Foster Generative Processing

**Generative Cognitive Processing**

- Required for deep understanding of material (e.g., construction of schemas)
- Good instructional design—increases student motivation to learn

### Mayer, 2010

<table>
<thead>
<tr>
<th>Principle</th>
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</thead>
<tbody>
<tr>
<td>Multimedia</td>
<td>Use both words and pictures to present key concepts</td>
</tr>
<tr>
<td>Personalization</td>
<td>Put words into conversational style rather than formal style</td>
</tr>
<tr>
<td>Image</td>
<td>Do not necessarily put an image of agent on the screen</td>
</tr>
<tr>
<td>Embodiment</td>
<td>Have onscreen agent use human-like gestures and movements</td>
</tr>
</tbody>
</table>
Personalization Principle

“People learn better from multimedia presentations when words are in conversational style rather than formal style.”

Mayer, page 242
Learning Objective

Students will be able to describe how behavior can affect attitudes.
Attitude Change Can Follow Behavior

• **People** hold many cognitions (for example: beliefs, feelings, behavior) about **themselves** and the world around.

• **People** expect cognitions to be in harmony with one another – that is, that attitudes and behaviors are consistent/compatible.

• Sometimes **people** behave in ways that are inconsistent with **their** attitudes. These conflicting cognitions produce an unpleasant psychological state – cognitive dissonance – that **people** strive to reduce.

• Because **people** cannot change past behavior, one way to reduce the dissonance is by changing **their** attitudes so that **they** are more in line with **their** behavior.
MODIFIED MULTIMEDIA PRINCIPLE
Attitude Change by Our Own Behavior

- We hold many cognitions (for example: beliefs, feelings, and our behavior) about ourselves and the world around us.

- We expect our cognitions to be in harmony with one another – that is, we expect that our attitudes and our behaviors are consistent/compatible.

- Sometimes we behave in ways that are inconsistent with our attitudes. These conflicting cognitions produce an unpleasant psychological state – cognitive dissonance – that we strive to reduce.

- Because we cannot change our past behavior, one way to reduce the dissonance is by changing our attitudes so that they are more in line with our behavior.
Pulling the Principles Together

- Coherence
- Signaling
- Redundancy
- Spatial/Temporal Contiguity
- Segmenting
- Pre-training
- Modality
- Multimedia
- Personalization
Attitude Change
Can Follow Behavior

*People* hold many cognitions (for example: beliefs, feelings, behavior) about *themselves* and the world around them.

*People* expect cognitions to be in harmony with one another – that is, that attitudes and behaviors are consistent/compatible.

Sometimes *people* behave in ways that are inconsistent with *their* attitudes. These conflicting cognitions produce an unpleasant psychological state – cognitive dissonance – that *people* strive to reduce.

Because *people* cannot change past behavior, one way to reduce the dissonance is by changing *their* attitudes so that *they* are more in line with *their* behavior.
Attitude Change by Our Own Behavior
Attitude Change by Our Own Behavior

Beliefs

Feelings

Behavior

Cognitive dissonance
Attitude Change by Our Own Behavior

1. Attitude
2. Discrepant Behavior
3. Cognitive Dissonance
4. Strive for Dissonance Reduction

Attitude change
Educational Implications

• Boundary Conditions
  ➢ Background knowledge
  ➢ Novice learners
  ➢ Second language learners
  ➢ Complex
  ➢ Fast Paced

• Individual Difference
  ➢ Ability
  ➢ Need to belong (personalization)