Efficiency in Learning Presentation Summary

Efficiency in Learning
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Session Objectives
- Identify sources of cognitive load in instructional materials
- Distinguish among three forms of cognitive load:
  - Intrinsic
  - Extraneous
  - Germane
- Apply evidence-based methods to optimize cognitive load in your training materials

What is Cognitive Load Theory
A comprehensive set of evidence-based guidelines for the design and development of instructional materials that exploit the strengths and accommodate the limitations of human working memory.

Three Types of Cognitive Load

<table>
<thead>
<tr>
<th>Type</th>
<th>Definition</th>
<th>Example</th>
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| Intrinsic| Cognitive load caused by the complexity of the instructional goals and content. Complexity called element interactivity. | Low element interactivity = *learning vocabulary*  
High element interactivity = *speaking in foreign language* |
| Extraneous| Cognitive load that originates from the design and layout of instructional materials in ways that do not lead to learning. Also called irrelevant load. | Explaining a complex visual with text placed in a distant location from the visual requiring the learner to integrate the two sources of information. |
| Germane  | Cognitive load that originates from design of instructional materials in ways that contribute to learning. Also called relevant load. | Providing examples and practice exercises that use varied surface contexts to promote transfer of learning. |
Cognitive Load Theory and Working Memory

Working Memory Features:
- Limited capacity
- Brief duration of information
- Center of cognitive processing (thinking and learning)
- Processing bogs down when overloaded

Interactions and Cognitive Load

Complexity of Content

Expertise of Learner

Load Management in Instructional Materials

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Some Cognitive Load Instructional Principles

I. Manage Intrinsic Cognitive Load

<table>
<thead>
<tr>
<th>Principle</th>
<th>Notes</th>
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<tbody>
<tr>
<td>Segment supporting knowledge from major lesson content by teaching related concepts prior to associated process stages or procedure steps</td>
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<td>Design learning environments that give learners control over pacing and that manage load when pacing must be instructionally controlled</td>
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II. Minimize Extraneous Cognitive Load

<table>
<thead>
<tr>
<th>Principle</th>
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<tbody>
<tr>
<td>Use audio to explain visuals when appropriate</td>
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<tr>
<td>Avoid using redundant modalities</td>
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<tr>
<td>Manage attention:</td>
<td></td>
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<td>- Focus attention</td>
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<td>- Avoid split attention</td>
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<td>Replace some practice with worked examples</td>
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III. Maximize Germane Cognitive Load

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<th>Principle</th>
<th>Notes</th>
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<tbody>
<tr>
<td>Use diverse worked examples to promote learning and transfer</td>
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<tr>
<td>Help learners exploit examples with self-explanations</td>
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References:


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