

COGNITIVE-INSPIRED INSTRUCTIONAL DESIGN THEORIES

IDE621_Fall 2025_Zhen Li

- Cognitive-inspired instructional design focuses on how people process, organize, and retrieve information.
- Instruction is designed to support attention, reduce cognitive load, strengthen schema formation, and promote meaningful learning.
- Designers create learning environments that guide learners' mental processes rather than simply delivering content.



KEY PRINCIPLES

1. Instruction must align with cognitive processes such as attention, encoding, and retrieval.
2. Prior knowledge determines how learners interpret new information.
3. Clear structure, sequencing, and scaffolding reduce cognitive load.
4. Learners build knowledge by connecting ideas into organized schemas.
5. Practice should include feedback, retrieval, and transfer opportunities.
6. Motivation increases when tasks are meaningful and appropriately challenging.
7. Metacognitive prompts help learners monitor and regulate their own learning.

Characteristics of Schema



Organization of Knowledge



Adaption and Understanding



Shapes Perception and Memory



Development and Change



Role in Cognitive Process

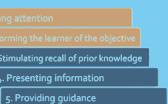
EXAMPLE

DESIGNING A SCIENCE MODULE ON PHOTOSYNTHESIS

1. Teacher begins with an advance organizer linking prior knowledge about plants.
2. New content is sequenced from simple → complex, minimizing extraneous load.
3. Visual models and step-by-step explanations guide schema construction.
4. Students use worked examples, graphic organizers, and short practice cycles.
5. Scaffolds are faded gradually, encouraging independent problem-solving.
6. Retrieval activities strengthen long-term retention and transfer.

TERMINOLOGY

Advance Organizer – Introductory structure that prepares and activates prior knowledge



Advance Organiser

Scaffolding – Temporary support that is gradually removed

Cognitive Load – Mental effort required for processing information

Worked Example – Stepwise demonstration of a problem solution

Elaboration – Expanding new content with connections and explanations

Chunking – Grouping information into meaningful units

Spiral Curriculum – Revisiting core ideas at increasing levels of complexity

Gagné's Nine Events – Framework guiding attention, encoding, practice, feedback, and transfer.

First Principles of Instruction – Merrill's model emphasizing problem-centered learning

Meaningful Learning – Learning that connects new information to existing schemas



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Events



INSTRUCTIONAL STRATEGIES

1. Use advance organizers to build readiness for new content.
2. Design materials to minimize extraneous load and highlight essential relationships.
3. Provide **scaffolded practice** using models, prompts, and guided examples.
4. Sequence instruction from simple → complex with clear conceptual structure.
5. Integrate retrieval practice and frequent low-stakes checks for understanding.
6. Encourage metacognitive reflection through prompts like "How do you know?"
7. Facilitate transfer with real-world tasks and varied practice contexts.

"EDUCATION IS NOT THE LEARNING OF FACTS, BUT THE TRAINING OF THE MIND TO THINK."

— ALBERT EINSTEIN