

Teaching for Deep and Flexible Learning

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Peter Doolittle

- Educational Psychologist, Virginia Tech
- Teaching, Learning, and Technology
- Middle and High School CS and Math



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Agenda

Learning



Principles



Applications



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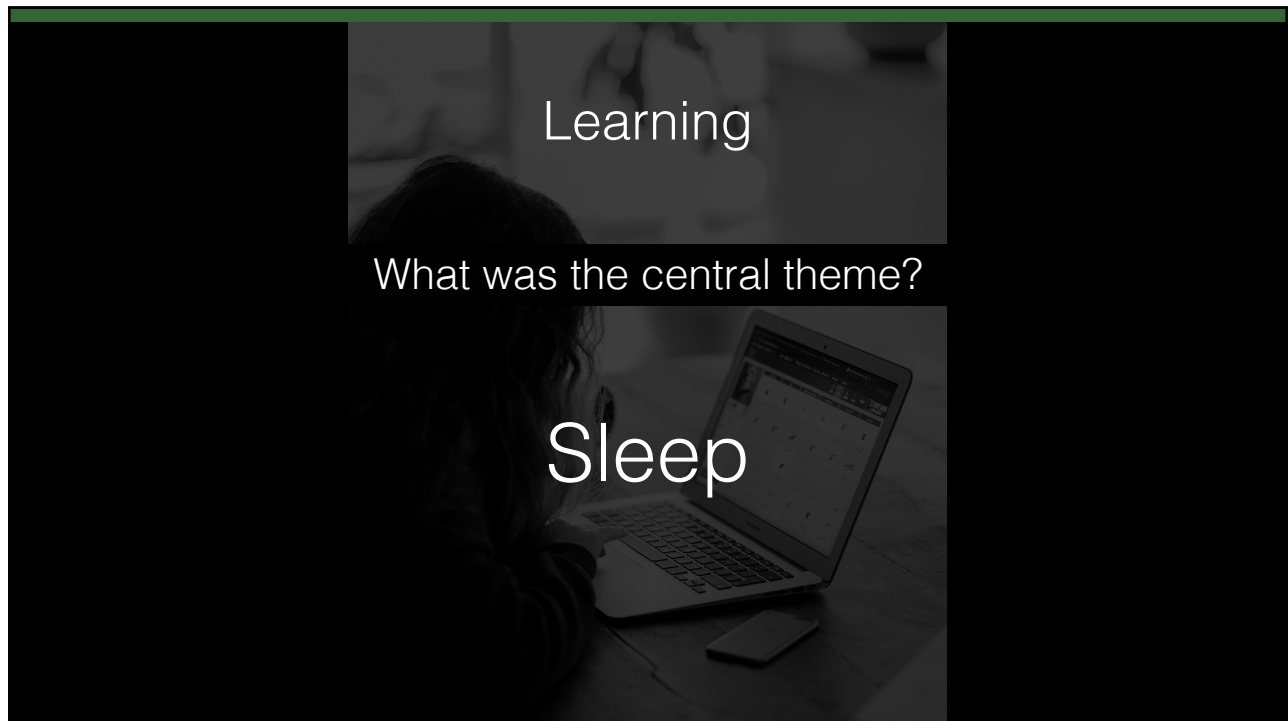
Learning



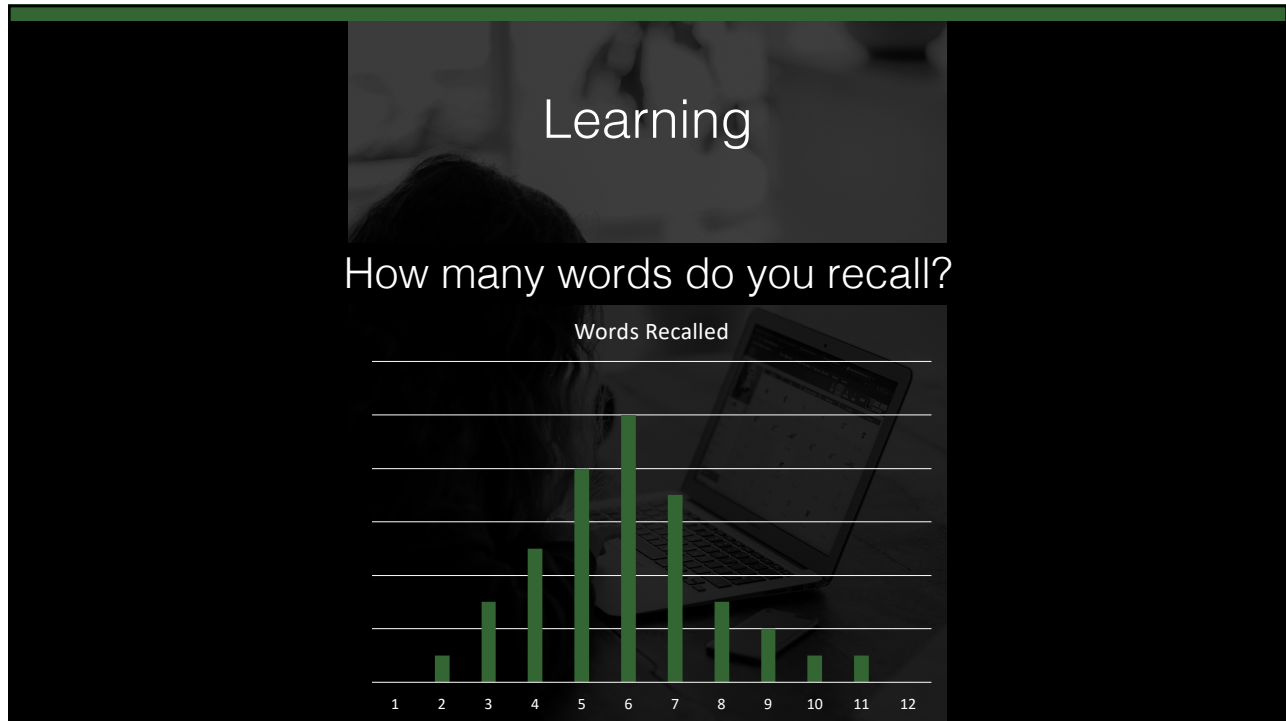
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Rest	Snore	Sound
Tired	Bed	Comfort
Awake	Eat	Stars
Dream	Pillow	Night

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Learning Principles and the Brain

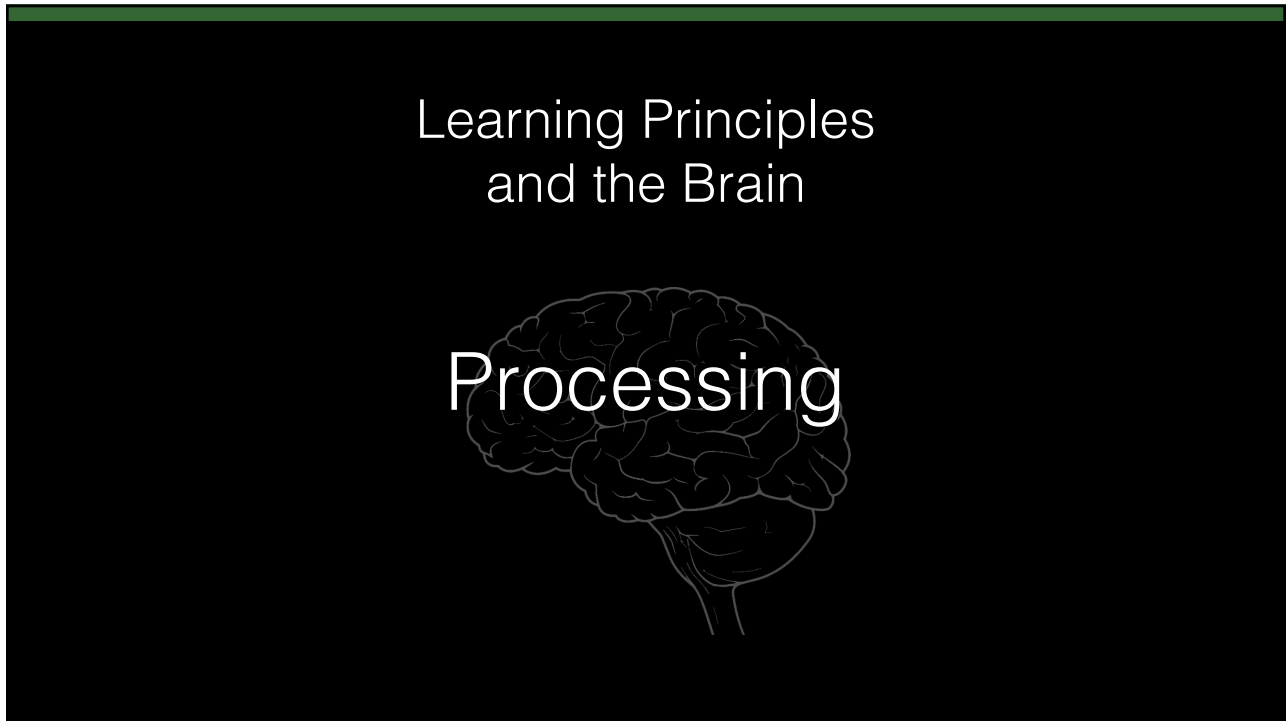


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Learning Principles and the Brain

1. Learning occurs through **experience**
2. Experience creates functional neural **pathways**
3. Pathways are created and activated through **attention**
4. Attention is **intentional** and **incidental**
5. Experience → Attention → Pathways is a **feedback** loop
6. Individual **brains differ** based on experience

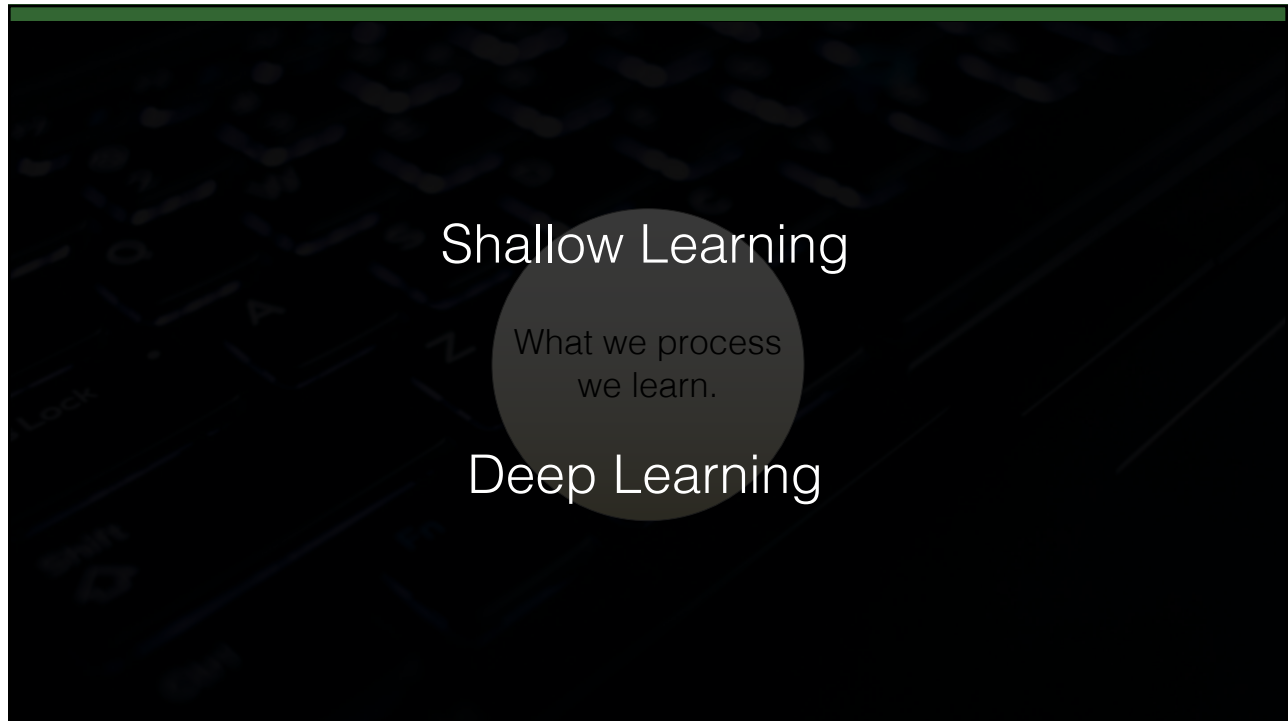
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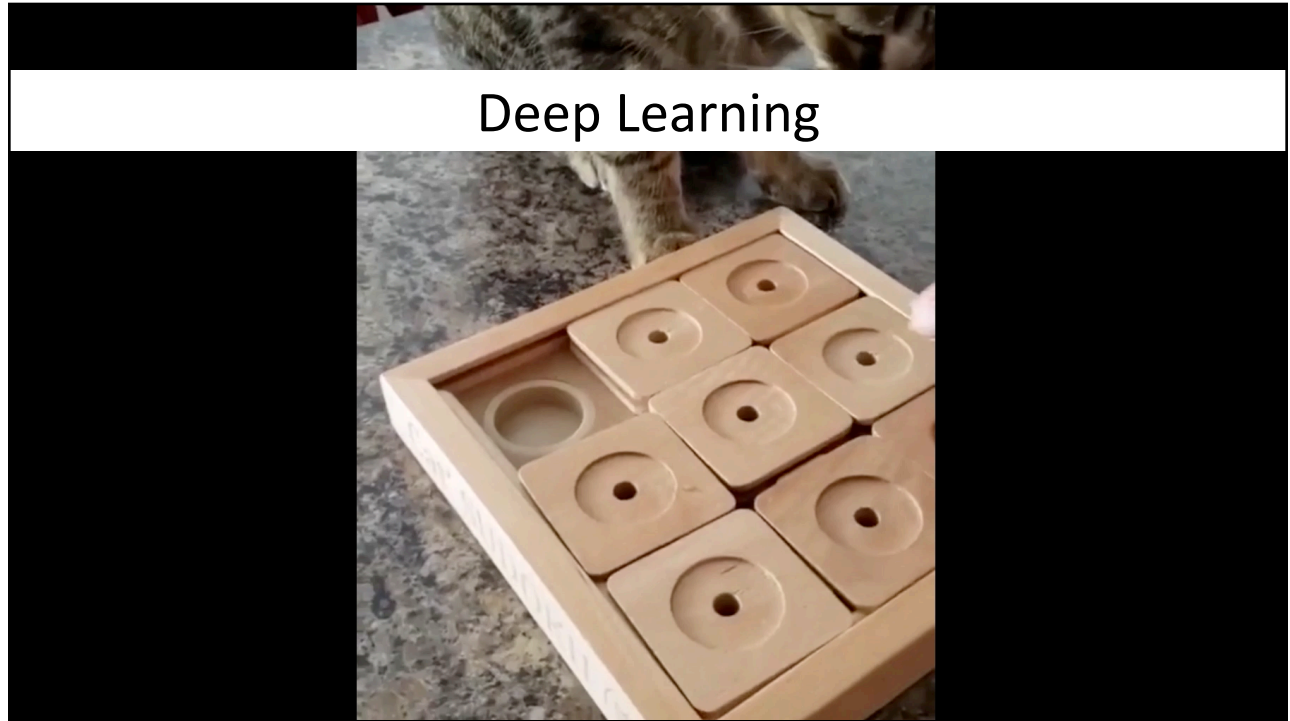


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Deep Learning



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Shallow vs Deep Learning

Shallow Learning

- Abstract
- Independent
- Rigid
- Specific Application

Deep Learning

- Integrated
- Relational
- Flexible
- Generalizable

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Learning Principles and the Brain

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Learning Principles and the Brain

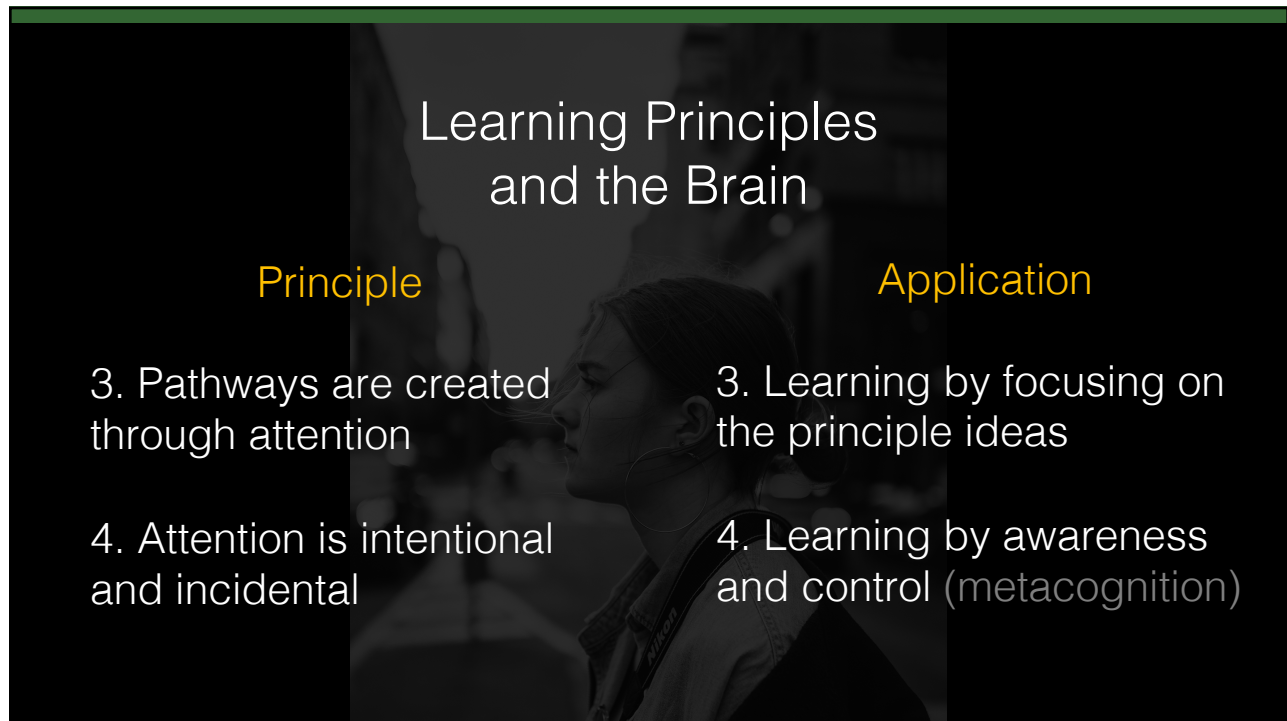
Principle

1. Learning through experience
2. Experience creates pathways

Application

1. Learning through practice at retrieval
2. Learning through varied tasks and purposes

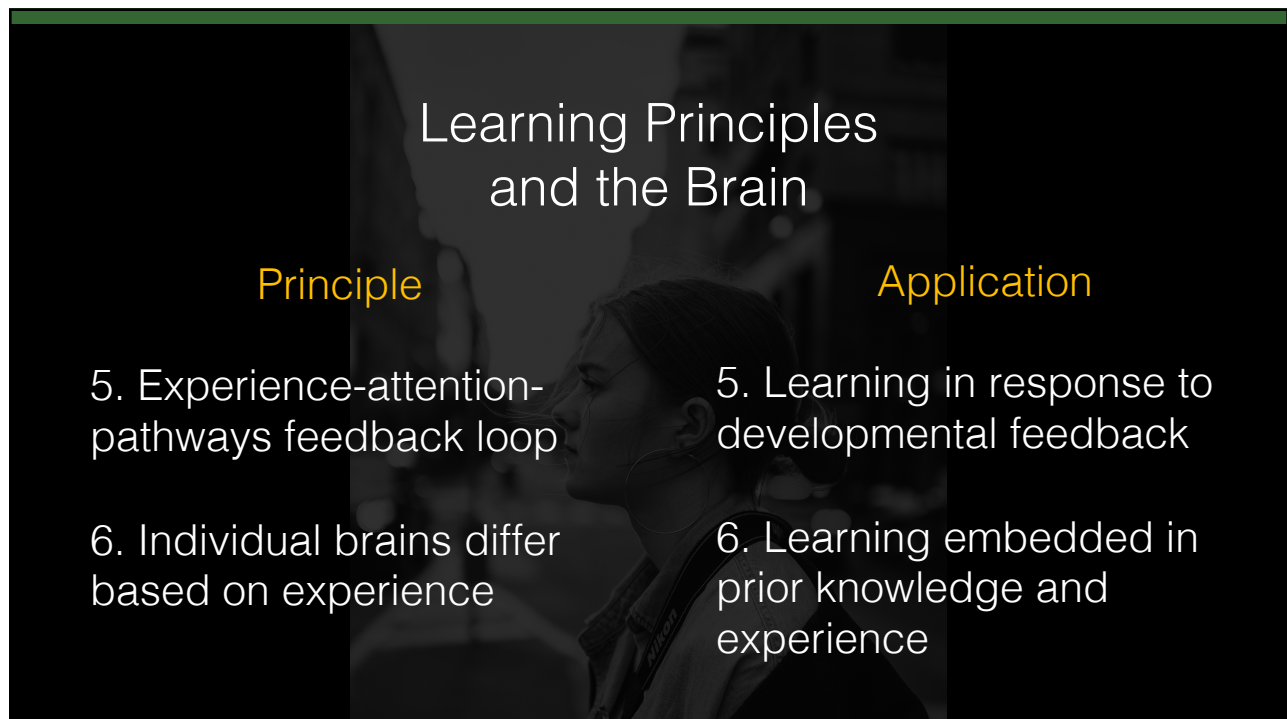
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Learning Principles and the Brain

Principle	Application
3. Pathways are created through attention	3. Learning by focusing on the principle ideas
4. Attention is intentional and incidental	4. Learning by awareness and control (metacognition)

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Learning Principles and the Brain

Principle	Application
5. Experience-attention-pathways feedback loop	5. Learning in response to developmental feedback
6. Individual brains differ based on experience	6. Learning embedded in prior knowledge and experience

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Learning Principles and the Brain

1. Learning through **practice at retrieval**
2. Learning through **varied tasks** and **purposes**
3. Learning by focusing on the **principle** ideas
4. Learning **awareness** and **control** (metacognition)
5. Learning in response to **developmental feedback**
6. Learning embedded in **prior knowledge** and **experience**

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Instructional Strategies



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Summarizing

What is a summary?

long text → short text
main ideas, essence, gist

1. identify important ideas
2. discard unimportant ideas
3. integrate main ideas
4. construct summary sentence

(Bean & Steenwyk, 1984; Britt & Sommer, 2004; Jitendra et al., 2000; Westby et al., 2010)

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Summarizing

Summarizing is learned:

↑ time
↑ practice
↑ processing

Impact of summarizing:

↑ comprehension
↑ retention
↑ application

(Bean & Steenwyk, 1984; Britt & Sommer, 2004; Jitendra et al., 2000; Westby et al., 2010)

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Summarizing

Summarizing is learned: ↑ time
 ↑ ~~practice~~ →
 ↑ processing

Impact of summarizing: ↑ comprehension
 ↑ retention
 ↑ application

(Bean & Steenwyk, 1984; Britt & Sommer, 2004; Jitendra et al., 2000; Westby et al., 2010)

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Summarizing

Grading summarizing: length
 content
 expression

Improving summarizing: feedback on
 length
 content
 expression

(Bean & Steenwyk, 1984; Britt & Sommer, 2004; Jitendra et al., 2000; Westby et al., 2010)

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Summarizing

- ✓ 1. Learning through **practice at retrieval**
- ✓ 2. Learning through **varied tasks** and **purposes**
- ✓ 3. Learning at the **principle** level
- ✓ 4. Learning **awareness** and **control** (metacognition)
- ✓ 5. Learning in response to **developmental feedback**
- ✓ 6. Learning embedded in **prior knowledge** and **experience**

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Questions?



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Fundación Educativa Seminario
Neuroscience, Cognition, and Technology Seminar

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