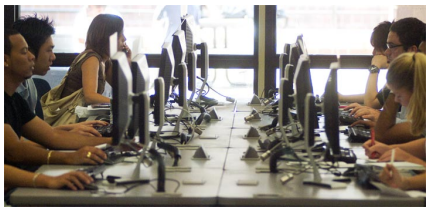
Learning, Memory, & Technology

Working Memory and Learning Effectiveness in a Technology-Rich Environment



Peter E. Doolittle
Assistant Provost for Teaching and Learning
Executive Director, Center for Instructional Development and Educational Research
Professor, Educational Psychology
Virginia Tech

Agenda

1. Introduction
2. Active Learning
3. Working Memory
4. Technology
5. Conclusion

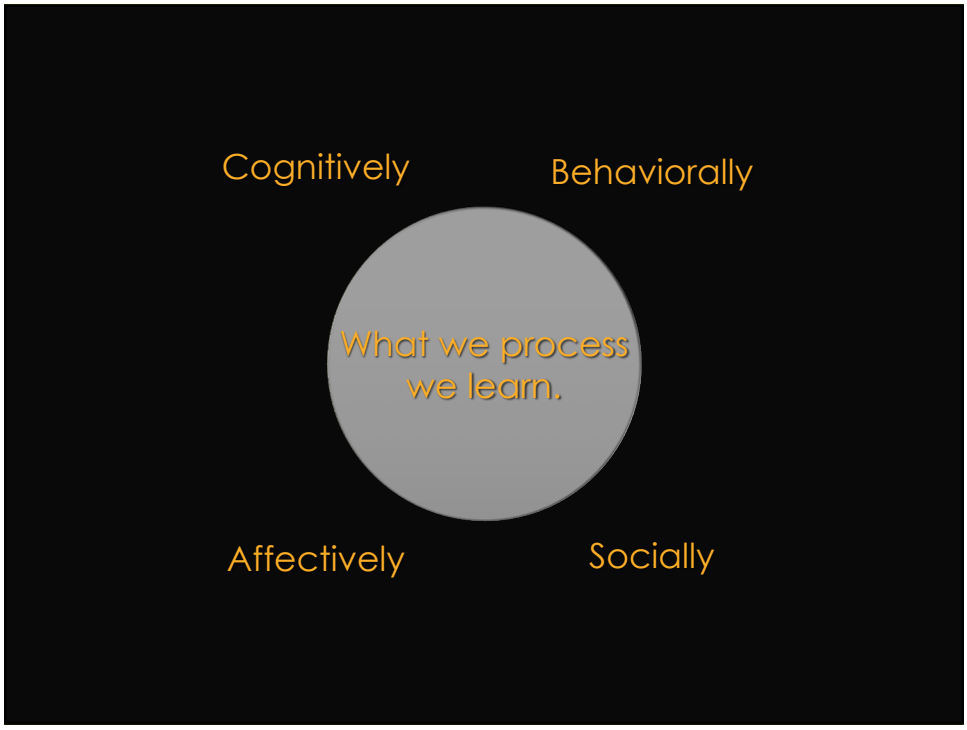
Active Learning

Activity

Learning & Meaning

1. Knowledge/meaning is constructed during experience and reconstructed during recall.
2. Knowledge is organized.
3. When specifics are lost, meaning remains.
4. Cognitive strategies are used to function more effectively.
5. We can assess the effectiveness of our thinking.

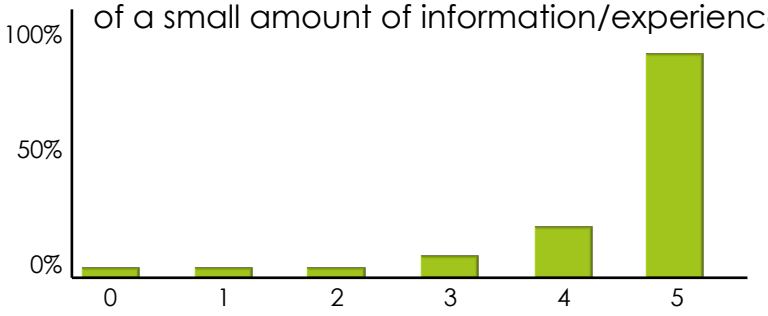
(Engle, 2006; Halpern & Hakel, 2003; Mariano, Doolittle, & Hicks, 2009; Wagner, 2006)



Active Learning & Working Memory

Short-Term Memory

Short term memory = short term retention of a small amount of information/experience



Working Memory Capacity

- Crucible of Thought
  - Attends to Experience
  - Stores Immediate Experiences
  - Access Long-Term Memory
  - Processes Experience and Memory
  - Maintains Current Goal for Processing
  - (especially in the presence of distraction)
- WMC = Storage + Processing = Attentional Control

(Doolittle & Mariano, 2008; Unsworth & Engle, 2007; Vergauwe et al., 2015)

Working Memory Capacity

- Positive impacts (↑WMC) include:
  - Fluid Intelligence
  - LTM Activation
  - Attentional Control
  - Reading/Language Comprehension
  - Reasoning
  - Storytelling
  - Complex Cognition

(Doolittle & Mariano, 2008; Unsworth & Engle, 2007; Vergauwe et al., 2015)

Working Memory Capacity

- WMC = Storage + Processing = Attentional Control
- High WMC = Competent Complex Cognition
- Low WMC = Challenging Attentional

Working Memory Capacity

Working Memory Training ≠ ↑ WMC

Learn & Use Strategies

(Redick, Shipstead, Wiemers, Melby-Lervag, &Hulme, 2015)

Working Memory Capacity

- WMC Strategies
  1. Segmenting Instruction
  2. Scaffolding Instruction
  3. Lower Cognitive Load/Lower Information Density
  4. Examples, Examples, Examples
  5. Practice with Feedback

When Hype & Research Collide

Multitasking

Multitasking: The Myth

- Tapscott, 1998
  - multitasking
- Frand, 2000
  - "multitasking way of life"
- Prensky , 2001
  - "digital natives accustomed to the twitch-speed, multitasking "

Watson, C. E., Terry, K.,& Doolittle, P. (2012). Please read while texting and driving. In J. Groccia (Ed.), *To improve the academy* (vol. 31) (pp. 295-310). Bolton, MA: Anchor.

Was Any Research Available?

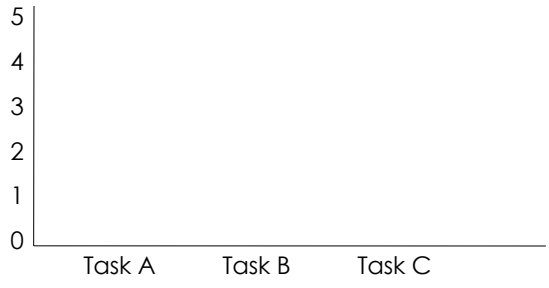
"The greater the number of objects to which our consciousness is simultaneously extended, the smaller is the intensity with which it is able to consider each."

Hamilton, Mansel, & Veitch 1861

Processing and WMC

2 to 60 by 2s

Results



Multitasking and Research

"The truth to multitasking is evident in the empirical studies… humans lack the cognitive, behavioral, and cortical structures necessary to multitask effectively."

-- Watson, Terry, & Doolittle (2012)

Multitasking and Research

"fMRI technology found that multitasking is not actually a concurrent process, but a sequential one that involves task-switching."

-- Charron & Koechlin, 2010

Multitasking and Research

"There is no evidence that multitasking is a new phenomenon exclusive to digital natives … there is a clear mismatch between the confidence with which [digital native] claims are made and the evidence for such claims."

-- Bennett, Maton & Kervin, 2008

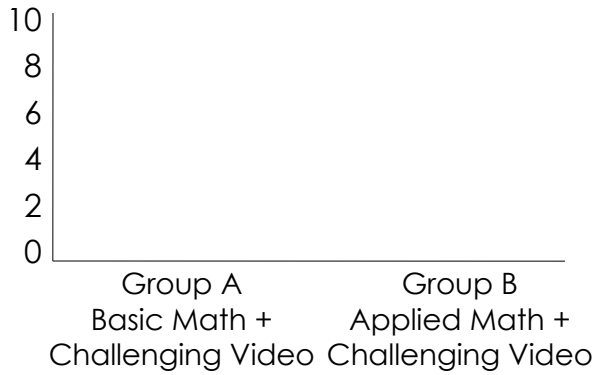
A Few Multitasking Results

- ↑ MT with a laptop in class → ↓ retention & class performance
- ↑ MT while studying → ↓ class performance
- ↑ laptop multitasking → ↓ performance by multitasker (11 %)
- ↑ laptop multitasking → ↓ performance by nearby peers (17 %)
- ↑ MT associated with ↓ self-regulatory behaviors
- ↑ FB associated with ↑ MT associated with ↓ class performance

(Judd, 2013; Junco & Cotton, 2011; Sana, Weston, & Cepeda, 2012; Zhang, 2015)

Accounting Students & Professionals

24 years old 50 years old



Negangard, Ozlanski, Pyzoha, & Doolittle (2015)

Students & Faculty

19 years old 41 years old

Doolittle (2015)

Multitasking, Learning, & Technology

1. Students need to be conscious of multitasking - multitasking decreases learning and performance.
2. Students need to create non-multitasking environments in which to read, plan, & think – be self-regulated.
3. Students should foster automaticity and expertise though practice and feedback to reduce the effects of multitasking.

Multitasking, Learning, & Technology

1. Faculty need to be conscious of multitasking - multitasking decreases learning and performance.
2. Faculty need to scaffold students' learning when multitasking is likely to be necessary.
3. Faculty should foster automaticity and expertise though practice and feedback to reduce the effects of multitasking.

Where We've Been

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4. Technology
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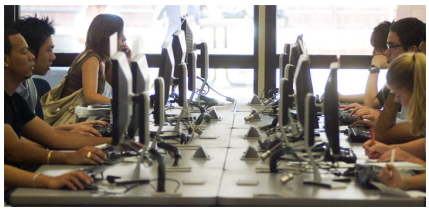

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