



Helping Our Kids With Working Memory

South Texas ISD
November, 2023






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Dyslexia




ADHD





Slidebooks

Check out the helpful information in these slidebooks which cover topics like ADHD and executive functioning.




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 **What is Working Memory?**


The cognitive ability to briefly hold, maintain, or store information "in mind" while processing that information or other information.


STORAGE + PROCESSING

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 **What are some things I do that require wm?**


- Converse with others.
- Cook/bake.
- Remember multi-step directions.
- Keep track of subproducts when doing mental math.
- Switch between mental tasks.
- Compare two items at the store.
- Keep track of your place when counting.
- Hold the beginning of a spoken sentence in mind to link it up to the end of a sentence.
- Comprehend what you read.

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 **Let's do some short term and working memory tasks so you can see what using it feels like**


- String of numbers
- Mental arithmetic
- Remember a picture


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 **OK, so why should I care?**

Students with higher WM capacity do better in school than students with lower WM capacity.


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 **Alloway:**

- Tested a group of bright, eager five years olds as they started kindergarten and followed them over a six year period. Tested IQ, working memory, reading, writing, and math skills
- A student's working memory – NOT IQ – at five years of age was the best predictor of reading, spelling, and math outcomes six years later. IQ was not nearly as predictable.

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 **Unfortunately.....**

"In a recent study, the majority of teachers interviewed only picked up early warning signs of working memory failure in their students 25 percent of the time, often thinking that the students were unmotivated or daydreaming instead."


Working Memory and the Classroom
 Why it is important to assess Working Memory in an educational setting
 Published on June 11, 2012 by [Tracy P. Alloway, Ph.D.](#) in [Keep It in Mind](#)

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1st Grade

Models of Working Memory



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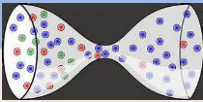
There are different models, but in general:

- Cognitive system
- Responsible for storing and manipulating information
- Flexibly used to support everyday cognitive activities that require both processing and storage
- Limited capacity
- The imposition of either excess storage or processing demands in the course of an on-going cognitive activity will lead to loss of information from this temporary memory system

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1st Grade



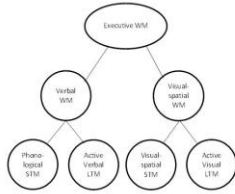
- Effortful
- Error prone
- Very easily influenced by minor distractions or interruptions (fragile)
- Differs from "short term memory" since there are few demands on processing; Short term memory is "storage only"
- Used when information is going into storage AND coming back out of storage

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Dehn's Integrated Model of WM

Integrated Model of Working Memory



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- The Integrated Model proposed by Dehn (2008) draws from several models.
- It does not propose any new constructs or structures but offers a comprehensive, **understandable** model of WM.
- He says STM is the storage part. It is a separate neurological and cognitive system.
- It is only when WM is utilizing specific information held in STM that the two work in an integrated fashion.

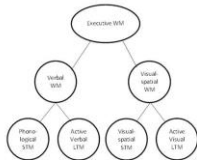
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Dehn's Integrated Model of WM

Integrated Model of Working Memory



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100% CYPHO

- There are two passive short-term memory (STM) storage components (auditory and visual-spatial) that are supervised by executive WM. Thus STM is considered part of WM.
- Processing while retaining verbal content is known as verbal WM, and processing while retaining visual-spatial content is known as visual-spatial WM.
- Executive WM is also involved in dividing attention, switching back and forth between pieces of information, inhibiting the intrusion of irrelevant information, and updating no longer relevant content with newer content.

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- WM development does not occur in isolation. It depends upon, and influences, the advancement of several cognitive abilities.
- Steady developmental improvement until a leveling off around age 15 years.

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difficulties and provide strategies to support these areas.

Age in years	Verbal (Number of average items remembered)	Visual (Number of average items remembered)
5	2.0	1.5
8	3.0	2.5
10	4.0	3.5
13	5.0	4.5
16	6.0	5.5
22	6.0	5.5
35	6.0	5.5
45	5.0	4.5
55	4.0	3.5
65	4.0	3.5

Figure 1.1 Working memory across the lifespan


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100 Essential Words

- Executive working memory is the last WM component to mature – may not peak until late teens or early 20s.
- Substantial degree of variability at each age, so within an average class of 30 children, we would expect to see working memory differences corresponding to 5 years of normal development between the three highest and three lowest scoring individuals


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100 Essential Words

- Approximately 10% of school aged children suffer from deficits in STM or WM
- ANYTHING detrimental to the brain and cognitive functions is likely to have deleterious effects on WM.
- Impairments can be developmental or acquired, and temporary or permanent.
 - Concussion, TBI, Extreme prematurity, Childhood diabetes, Dopamine deficiency, Depression, Stress, Anxiety

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100 Essential Words

How might I know?


- Has trouble remembering information for just a few seconds.
- In the middle of an activity, forgets how to continue or finish it.
- Has difficulty staying focused during cognitively demanding activities.
- Performance is worse during challenging activities.
- Prefers simple tasks over complex tasks.
- Takes a long time to complete assignments.
- Has difficulty retrieving information efficiently.
- Has difficulty relating new information with prior knowledge.
- Makes comments about having memory problems.
- Has difficulty with mental arithmetic.
- Has difficulty memorizing and retaining facts.
- Is very slow at arithmetic computation.
- Seeks assistance from peers.
- Does not appear to use any memory strategies.
- Misses a lot of information during instruction.


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 **What is "cognitive load"?**


- Cognitive Load is the **processing** dimension of WM.
- Emphasizes the limited cognitive capacity of WM and how easily WM can become overloaded during academic learning.
- It is the proportion of time during which a given processing task occupies WM's focus of attention.

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 **What is "cognitive load"?**

- It is not the storage component, BUT
 - As cognitive load increases, there is a corresponding decrease in how much information is retained.
 - The more that a processing task demands attention, the fewer WM resources are available for rehearsing the information in STM storage components
- The processing-storage relationship is bidirectional. Focusing too much on maintaining information through rehearsal can impede processing, slowing it down or causing processing errors.
- Think "limited capacity". Effective time sharing of attention involves rapid, back-and-forth switching of attention from processing to maintenance (rehearsal)

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 **Types of interventions**


- **Remedial:** goal of correcting a brain-based deficit by directly addressing the weakness. Strengthen the affected brain structures (WON'T COVER)
 - Efforts have to be put in because brain does not appear to remediate or compensate by itself.
 - Strengthen WM and/or strengthen related cognitive processes
 - Think "brain planking"
- **Compensatory:** environmental modification or behavioral strategies designed to bypass the persistent impairment.
 - Teaching and application of strategies
 - Not designed to strengthen the WM brain areas

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 **Compensatory**

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 **1) Emphasize memory-based instruction**

- Teach students about WM
- Remind students to use memory strategies
- Model the use of memory strategies
- Reinforce students using strategies
- Structure content in a manner that facilitates strategy use. Chunking, categorizing
- Allow time for WM exercises

Don't have to do them all.....


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 **Metamemory Instruction**

- Teach students about memory, increase their self-awareness , and show them memory practices
- Students with more advanced metamemory development are more strategic in their learning and study habits.
- Key elements to teach (p 200 of Dehn's Essentials)
 - Forgetting is normal
 - Two kinds – visual and verbal
 - Some info is easier to remember than others
 - Three memory systems
 - WM is short and repetition helps keep info in WM
 - WM involves storage and manipulation
 - WM can overload
 - There are things we can do to make WM stronger


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2)

DECREASE COGNITIVE LOAD


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**Rapid Reference 5.8:
Teacher Behaviors That Increase Cognitive Load**

- Long, complex, and inconsistent verbalizations
- Disorganized presentations and lessons
- Not allowing enough time for learners to process information
- Requiring students to multitask
- Not allowing students to use memory aides
- Allowing a noisy learning environment
- Presenting excessively long lessons
- Introducing procedural steps before they are needed
- Not providing visual representations


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Sooooo..... (203)

- Oral instructions simple and short
- Lessons brief
- Allow time for processing and rehearsal
- One task at a time (not notetaking and listening)
- Quiet environment
- Direct instruction (next slide) with repetition
- Nonessential, irrelevant or confusing info omitted
- Present steps just before they are needed
- Present visually and verbally

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10 Essential Strategies

- Use visually oriented instruction – use visuals presented by teacher and/or visualize themselves
- Repeat info – a lot. Repeat it. Repeat info. A lot. ☺
 - Write instructions down
 - Ask a peer to repeat
 - Teach students rehearsal
 - Engage in periodic review
- Automaticity reduces cognitive load so work toward mastery which will increase automaticity
- Elaboration – conscious, explicit linking of new information with related prior knowledge
- Train rehearsal, chunking, updating, visualization, dual encoding

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10 Essential Strategies

3) Accommodations/modifications for specific academic subjects

Written expression

- Shorten writing assignments
- Allow shorter sentences
- Disregard basic skill errors during initial stages
- Allow revisions after feedback is provided
- Allow abbreviations and symbols in first draft
- Separate planning from writing (do an outline or use graphic organizer)
- Allow a scribe or "external storage" person
- Check work several times, each time looking for only thing only (cap, punct, spacing, case, etc)

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10 Essential Strategies

Taking notes

- Provide a note-taker
- Provide a copy of notes
- Provide a template or partially completed notes
- Teach them to use abbreviations, shorthand for frequently used words
- Allow them to record lessons and listen and take notes again or deeper later

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Mathematics

- Use calculator
- Allow facts tables
- Provide a list of step-by-step procedures
- Allow extended time
- Teach them to use a number line
- Help students identify story problem words that signify the procedure involved
- Use lined notebook paper/graph paper

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Basic reading skills

- Until fluency and decoding are automatic, support for sounding out phonemes and blending are important.
- Say the first phoneme
- Say all the phonemes separately and have the child blend
- Say the word and have the child repeat

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Reading comprehension

- Preview material prior to reading it so related prior knowledge is activated
- During oral reading, allow the reader to substitute words that are consistent with meaning
- Require re-reading if sentences not read fluently
- Read selection to the student
- Have student pause and reflect after each sentence or paragraph

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100 Essential Strategies

General accommodations

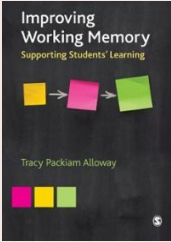
- Extended time on tests
- Present info verbally AND visually
- Repeat info verbatim
- Provide cues and prompts at the point of performance
- Repeat info in a simplified manner
- Provide written checklists to guide task completion
- Provide lists of step by step instruction
- One task at a time
- Slow down instruction
- Preferential seating

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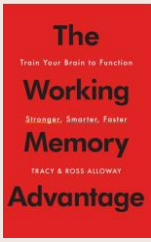


100 Essential Strategies

Great sources




Improving Working Memory
Supporting Students' Learning
Tracy Packiam Alloway

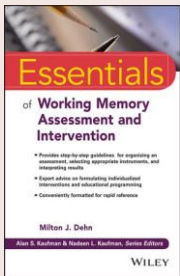


The Working Memory Advantage
Train Your Brain to Function
Stronger, Smarter, Faster
TRACY & ROSS ALLOWAY

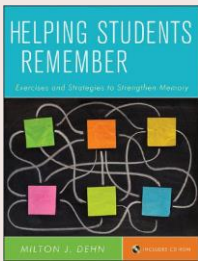
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100 Essential Strategies



Essentials of Working Memory Assessment and Intervention
Milton J. Dellin
Alan E. Kaufman & Nathan L. Kaufman, Series Editors
WILEY



HELPING STUDENTS REMEMBER
Evidence and Strategies to Strengthen Memory
MILTON J. DELLIN
THOMSON CO. USA

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