

Executive Function Skills: Working Memory

Working memory can be described as the ability to store and manage information in one's mind for a short period of time, the manipulation of short-term memory information or the ability to keep one piece of information in mind while working on or with something else (Smyth-Myles, 2016). In fact, most of the "work" in the memory system occurs in "working" memory where information is **managed, manipulated and transformed** (Can Learn, 2013). For many students, struggles with working memory impact their academic and behavioral performance in the classroom.

Struggles:

- Recalling sounds letters make when decoding a word (Smyth/Myles, 2016).
- Recalling the meaning behind (the comprehension) of what you are reading when you are primarily focused on decoding or reading the words (learning to read vs reading to learn)
- Slow retrieval of information (Can Learn, 2016).
- Hold few pieces of information in their mind at a given moment in time:
- "They hear what you said, or see what is presented, but as more information overwhelms their memory system they lose previous information needed to successfully complete the task. Once information is lost it is not likely to be retrieved. It is easy to see how the student can become frustrated and consequently stop paying attention." (Can Learn, 2016).
- Poor attention to detail: missing or skipping portions of what is expected
- In ability to follow instructions; especially when multiple instructions are given
- Filing information, filing information in an effective manner for efficient retrieval
- Integrating various sets of information:
- Sounds (direct and indirect), voices (direct and indirect), sights, touch or other sensory
- Coordinating and integrating old and new information
- Math:
- Mental math
- Estimation
- Remembering numbers is borrowing and carrying
- Take a longer time when writing, especially original compositions:
- Remembering what they want to write, the formatting, the expectation, the details, paying attention to grammar and spelling as well as context
- Some can even lose track of their thoughts mid-sentence
- Taking and keeping up with notes in class

Intervention options:

- Provide written/visual directions for the student to reference so they can focus on the assignment/activity, not focus on "how" to complete the work or trying to remember the specific steps in the exact sequence.
 - Provide examples and sample finished products for the student to reference

- Clarifies expectations, defines/clarifies “complete”, increases meaning and purpose.
- Break larger tasks down into small chunks
 - Visual expectations of the different chunks with examples
 - Reduce the amount of material required by the student
- Teach students to take notes with the [Cornell Notetaking Method](#)
- Teach how to highlight keywords, how to look for words that are in bold
 - You can’t just tell the student to do it, you need to teach HOW to do it.
 - Teach students HOW to highlight with the technology they will use for state/standardized testing
- Teach the student to stop after every paragraph or two to take notes, highlight, or use post its to identify important information. These can then be used for summaries or notes for tests.
- Reduce Processing Demands:
 - Use word prediction to allow emphasis on the content and not the spelling
 - Emphasize content and not mechanics for initial drafts
 - Use editing checklists after initial ideas are on paper
 - Provide a detailed graphic organizer or rubric with the expectations so the student can focus on content, not the process or trying to remember all of the individual requirements
 - Graphic Organizers - help eliminate the need for the student to remember the “how to do the assignment, they can focus on the context of the assignment
 - Rubric – provide the rubric for students BEFORE they begin the assignment so expectations are clear then check for understanding
 - Create a work system with visual supports – this reduces processing demands, can focus more on what they are to do then how they are to do it.
 - Must do - Can do folders – Students complete the **MUST DO** portion of the folder before they are allowed to move on to the **CAN DO** portion containing more preferred activities and choices.
 - Visuals and Mnemonic Devices to assist with Math & Science - struggles to remember the formulas inhibit the ability to demonstrate proficiency
 - Use **visuals** or to do lists to help reduce anxiety (defines expectations, breaks up assignments, helps with sequencing difficulties). The use of **visuals** or to do lists helps students who struggle to visualize themselves completing a task in a different space and time or think through and remember the different steps required to complete a task in a different space and/or time. It is truly a case of out of sight, out of mind.
 - Create calendars **WITH THE STUDENT** for longer projects or assignments, or multi-step projects (color code subjects or even different calendars for different subjects)
- Tests: Most often students are told when tests will occur NOT HOW to study for them!
 - Teach students what and how to study – this test prep sheet can prime students for what they need to do to prepare for a test.
 - Allow re-do for students with parameters and requirements
 - Give students several days to prepare/study for a test.

Resources:

- [Rubistar](#) - website to develop rubrics or pull sample rubrics
- [Rubric template in word](#) -
- [iRubric](#) -
- [Opinion Graphic Organizers](#)
- [Academic essay structure and format](#)
- [Project Write Graphic Organizers](#)
- [1300 Math Formulas PDF](#)
- [Common Math Formulas PDF](#)
- [mathportal.org](#) - online sample problems and free math help
- [Education World](#) - list of math mnemonic devices
- [12 Memory Strategies that Maximize Learning](#)
- [Test Prep Document](#)
- [Re-Test Option 1](#)
- [Re-Test Option 1](#)
- [Reading Comprehension Bookmark in word](#)
- [Reading Comprehension Bookmarks with different strategies](#)
- [Yellow and Green Visual Checklist](#)
- [My Checklist Visual](#)

Apps:

- [Cogmed](#) - Cogmed Working Memory Training is an evidence-based intervention for improved attention. Based on the concept of neuroplasticity and with more published research behind it than any other cognitive training program, Cogmed is trusted by healthcare professionals and educators around the world.
- [Study Blue](#) - With StudyBlue's mobile app, you can make, study, and share mobile flashcards, study guides, and quizzes. It's mobile, it's social, and it's free
- [Fit Brains Trainer](#) - Fit Brains Trainer is a brain training & fitness app with more than 360 games & unique training sessions that are designed to enhance your Memory, Processing Speed, Concentration, Problem Solving and Visual skills. Use the Fit Brains Trainer a few minutes daily to improve the performance of your brain
- [Vismory](#) - Memorize the shape, color, and position of small beautifully crafted 3D objects, then answer challenges by touching the correct case and you win!
Give the correct answer and you progress toward the next level, make an error and lose part of your progression. Faster is your answer, higher is your score!
- [Memory](#) - Memory! is very cute and funny memory matches game with many different colorful and vivid pair cards which your child will definitely love. This game is the best way to engage your kids and in parallel to train their memory and concentration ability. With three levels of difficulty the complexity of the game can be adjusted accordingly to the age and skills of your kid.
- [Elevate](#) - an app that personalizes a training regimen for each user, depending on his or her goals. The user can play 30-plus games that boost memory skills, focus, and processing speed. The games are designed in collaboration with experts in neuroscience and cognitive learning.

- [Dual N-Back](#) - A classic working-memory training app with solid research to back up the benefits. In general, N-Back tasks present an ongoing sequence of stimuli (in this case, pictures), and the player's job is to indicate when the picture he sees matches a picture that was seen "n" steps earlier in the sequence. One study suggests that playing N-Back games can result in long-term working-memory improvement.
- [Flashcards+](#) - an engaging and fast-paced app to bolster the studying process and exercise working memory. Users can choose subjects and categories from a user-curated bank of topics or create their own flashcards. The app also allows you to track your results and your speed.

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