Objectives

• Describe the role of working memory in early learning;
• Describe developmentally appropriate assessment of working memory;
• Describe strategies to improve working memory.

What is Working Memory?

The information that is held in mind and is necessary to simultaneously
– perform and
– correctly complete
some type of cognitive task.

(Cowan & Alloway, 2009)
What is Working Memory?

• A limited capacity store for retaining information for a brief period while performing mental operations on that information.
• The information may come from sensory memory, short-term memory, or long-term memory.
• The key component of working memory is active manipulation of the information.

(Miller, 2007)

What is Working Memory?

A system for temporary storage and manipulation of information, necessary for a wide range of cognitive tasks.

The ability to keep information in your mind for a short period of time (seconds) and be able to use the information in your thinking.
The Role of Working Memory in Early Learning
Gloria Maccow, Ph.D., Assessment Training Consultant

**Working Memory**

- **Central Executive**
- **Visuospatial Sketchpad**
- **Episodic Buffer**
- **Phonological Loop**

Baddeley & Hitch, 1974; Baddeley, 2000.

**Working Memory and Early Learning**
Why is Working Memory Important?

Working memory is used for:
- Controlling attention
- Resisting distraction
- Complex thinking
- Organization
- Problem solving
- Remembering tasks

Working memory is key for academic performance

15% of all students have working memory deficits causing them to perform below average in many areas of learning.

Working memory is crucial for areas such as math, reading comprehension, complex problem solving, and test taking.
Written Language Problems Based on a Working Memory Architecture (Berninger, 2007)

Coding Alphanumeric Stimuli in Working Memory (Berninger, 2007)
Developmentally Appropriate Assessment of Working Memory

Assessing Working Memory

- Processing capacity.
- Storing and processing visual and verbal information.
- Proactive interference.
- Examples of working memory tests.
Strategies to Improve Working Memory

Phonological Short-term Memory Interventions

Most interventions to improve short-term memory involve rehearsal training.

Rehearsal Strategies

- Say the material over and over to oneself.
- Engage in serial repetition. This allows information to be maintained in working memory for longer periods of time, thus enhancing short-term recall. Elaborative rehearsal facilitates long-term storage.
Additional Phonological Short-term Memory Interventions

- Naming letters and objects
- Repeating spoken sentences
- Reciting nursery rhymes
  - Highlights the phonological structure of language.
- Rhyming games
  - Enhance phonemic awareness and the ability to store phonological information.

Verbal Working Memory Interventions

- Elaborative Rehearsal
- Semantic Rehearsal
- Chunking
- Paraphrasing
Executive Working Memory Interventions

Dual Encoding

– Strategies utilizing concurrent visual and verbal encoding.
– Some dual encoding occurs naturally (reading).
– In the classroom, visual and verbal materials should be utilized.

Organizational Strategies

– Fitting existing information into an organized structure (semantic category).
– Structuring and organizing information reduces the processing load on working memory, thereby allowing more efficient encoding of material into long-term storage.
– Organizing information involves rehearsal and the processing of information at a deeper level.
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Working Memory Training

An evidence-based intervention for working memory training.

www.cogmed.com

Neuroplasticity makes working memory training possible

The brain can physically change in response to focused repeated intensive activity – training.

Improved working memory generalizes to other cognitive abilities and behavior.
Three products for Cogmed training

- Cogmed JM for preschoolers
- Cogmed RM for school-age children
- Cogmed QM for adults

All the products share the same underlying design - the only difference is in the user interface.

For the student...

- Five weeks of training – five times per week (25 sessions)
- Every session is 30-40 minutes
- Training catered to fit the student’s schedule (3-4 times per week = 8 weeks)
- Weekly rewards recommended
- Supported by a Coach, supervised by training aide or coach
- Goes through the exercises in a quiet space – separated from students and distractions
For the educator…

Cogmed Training Web to monitor progress

Who is a Cogmed candidate?

- Is easily **distracted**
- Has trouble **waiting his/her turn**
- Struggles with **comprehending what he/she reads**
- Struggles with **problem solving** that requires holding information in mind - such as math calculations
- Struggles with **completing tasks**, especially **multiple step tasks**
- Has difficulty **integrating new information** with prior knowledge
- Has **difficulty taking notes** and listening at the same time

Cogmed can be used Pre-K through adulthood by individuals with poor working memory
Success stories

“The student is much more focused. His ability to receive, retain, and recall has increased dramatically - as has his classroom confidence. He is also much more able to initiate an assignment, class work, or a project. Historically, he had no follow through- this is also an area of great improvement for him.”

Teacher, Academy at Manayunk – Philadelphia, PA

More user stories at www.cogmed.com

References

