Classroom Strategies for **Improving Working Memory**

by Mark Katz, PhD



WORKING MEMORY HAS BEEN DESCRIBED as our "mental workspace," a place to hold information "online," so to speak, long enough to manipulate it in order to solve a problem or complete a task. People who pay attention well seem to have a much easier time keeping information in their mental workspace than people with weak attentional skills.

It should come as no great surprise, perhaps, that research shows people with ADHD often experience problems in working memory. But is the reverse also true? Can those with problems in working memory also experience problems in attention? "Yes, they can," says British cognitive psychologist Susan Gathercole, a professor at York University.

According to Gathercole, learning tasks that children are required to carry out in class every day often place significant demands on their working memory. And in any one classroom, children will vary tremendously in their working memory capacity. For some children, working memory demands simply far exceed their working memory capacity. As a result, they lose the information they need to successfully complete the task they're working on. And once the information is lost, it's not likely to be retrieved. The child is then forced to guess at the correct answer, or start over. Eventually, many simply abandon the task. And once they do, they're no longer paying attention.

Of the hundreds of children with poor working memory that Gathercole has studied, not one has ever been described by a teacher as having a memory problem. Instead, they are described as inattentive, as daydreamers, or as poorly focused. And that's exactly how they appear. Poor working memory, in other words, can lead to attention problems.

Constantly forgetting the information needed to successfully complete academic tasks takes its toll over the long run. According to Gathercole, it's among the reasons why children with poor working memory often fall behind academically. "By identifying these children early on," she says, "and then providing them the supports they need to succeed, we can prevent academic problems down the road." Gathercole and her colleagues developed the following seven-step process designed to accomplish this (described in the sidebar on page 7):

1. Recognize working memory failures.
2. Monitor the child.
3. Evaluate the working demands on learning activities.
4. Reduce working memory load.
5. Be prepared to repeat.
6. Encourage the use of memory aids.
7. Develop the child's use of strategies for supporting memory.

Lifespan implications of poor working memory

"Poor working memory, in and of itself, should be considered a significant risk factor for academic problems," says Gathercole, "regardless of whether it co-occurs with other conditions, such as ADHD." Studies by Gathercole and her colleagues show that more than eighty percent of children with poor working memory eventually fall behind their peers academically. And the same is true for students in college. Poor working memory appears to have lifespan implications.

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Seven-Step Process for Improving Working Memory

STEP 1: Recognize Working Memory Failures

Teachers are encouraged to look for four common signs of working memory overload:

- **Incomplete recall,** as when a child begins writing a sentence, then struggles to remember all of the words in the sentence;
- **Failure to follow instructions;**
- **Place-keeping errors,** apparent when a child keeps losing track of either steps completed or steps yet to completed, and either repeats steps needlessly or constantly has to start over; and
- **Task abandonment,** a common consequence of the previous errors.

STEP 2: Monitor the Child

Teachers are encouraged to ask the child to verbalize their steps in completing tasks the child often struggles to complete. This can provide important information about where the breakdown is occurring and what supports are likely to work best.

STEP 3: Evaluate the Working Demands of Learning Activities

Learning tasks likely to exceed a child's working memory capacity are identified and altered so they can be completed successfully. Three features of learning tasks are assessed closely:

- **Length.** In the absence of supports, the longer the task and the more steps necessary for its successful completion, the less likely a child with poor working memory will be able to complete it successfully.
- **Unfamiliar or non-meaningful content.** When having to hold unfamiliar or non-meaningful information in mind, the child can't draw upon previous knowledge as a tool to support working memory. Familiar or meaningful information is much easier to temporarily keep in our mental workspace.
- **A demanding mental processing activity.** Whenever a child is asked to perform a challenging mental activity while simultaneously holding on to information, working memory capacity becomes an issue.

STEP 4: Reduce Working Memory Load

The opportunity to repeat a task several times provides a sense of familiarity with the steps necessary to complete the task successfully. For some children, the task may have to be adapted so that it doesn't exceed working memory capacity. Learning tasks can be adapted several different ways: by reducing the amount of the material, by increasing the meaningfulness of the material, by simplifying the amount of mental processing, and by restructuring complex tasks.

STEP 5: Be Prepared to Repeat

Children with poor working memory benefit from having information repeated to them, and also benefit from visual reminders of the steps needed to complete a task successfully. Sometimes an understanding classmate who sits alongside the struggling student can also help out.

STEP 6: Encourage the Use of Memory Aids

External memory aids can level the academic playing field for children with poor working memory. Memory aids might include visual posters of multiplication tables, visual posters of the correct spelling of commonly used words, and visual posters of academic task directions. Computer software programs can also serve as memory aids, along with a host of other audio and visual technologies.

STEP 7: Develop the Child's Use of Strategies for Supporting Memory

With training and practice children can learn to master memory, organizational, and other strategies that will serve to make them more independent learners and also help to level their academic playing field. Children are also coached on how use their particular strengths to compensate for their weaknesses, as is the case when a child with strong visual spatial skills uses these strengths to recall information not easily retained auditorily, or vice versa. It's also important that children learn to advocate for themselves, which includes asking for help when needed.



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Unfortunately, working memory problems often go undetected in the classroom. "They're confused with poor motivation or failing to pay attention," says Gathercole. Having now observed hundreds of these children in actual classroom situations, she can see the source of the confusion. "These children often start a learning task with the best of intentions. Then they fail to retain important information necessary to complete the task successfully. If help isn't forthcoming, it's at this point that inattention, distractibility, or loss of motivation occurs," she explains.

Gathercole is finding a number of teachers responding positively to her classroom strategies. Many also say they now understand why some of their students have been struggling. Before, when they saw the child as "inattentive," it looked willful, as though the child simply wasn't trying. Understanding that the child's problems may actually stem from poor working memory, they now realize it may be a matter of overload.

Anyone wishing to learn more about Gathercole's work is encouraged to read her publication, *Understanding Working Memory: A Classroom Guide,* coauthored with Tracy Packiam Alloway. The guide can be downloaded free of charge from the website of the Centre for Working Memory and Learning at the University of York, york.ac.uk/res/wml/ (click on the Information for Parents and Teachers icon). A related article by Gathercole, "Working Memory in the Classroom," can also be downloaded from the site. Readers are also referred to the book by Gathercole and Alloway, *Working Memory and Learning: A Practical Guide for Teachers* (Sage, 2008).