

WORKING MEMORY IN THE CLASSROOM

A summary of recommendations from Working Memory: A Practical Guide for Teachers

caer.org.uk/working-memory-in-the-classroom/

WHAT IS WORKING MEMORY?

Working memory (WM) refers to the ability to hold in mind and manipulate a limited amount of information over short periods of time.

WM can hold up to about four items or 'chunks' of information. Familiarity improves WM capacity because it enables us to create larger 'chunks' of information. For example, the eight-digit string 1 0 6 6 1 9 1 8 can be remembered as two chunks – 1066 and 1918 – if we are familiar with the historical significance of those dates.

Information in WM is likely to be lost after about 30 seconds unless we can actively rehearse or refresh that information. Information in WM can also be lost or stored inaccurately due to distraction or interference.

WM capacity develops across childhood, reaching adult-like levels at about age 15. There are also large individual differences in WM capacity, with some children showing WM ability several years behind their peers.

WM underpins learning, and children have to use their WM to complete almost any task in the classroom. Research has shown that WM ability is strongly associated with academic attainment.

There is very little evidence to show that WM training helps children improve on classroom activities. Evidence suggests that the best way to support children in the classroom is to structure the environment and adapt teaching practices in order to reduce the demands placed on WM.

Almost all information that is stored in long-term memory has to go via WM. Similarly, information in long-term memory that is required to complete the task-at-hand usually has to be brought back into WM. Therefore, although long-term memory has potentially infinite capacity, most classroom activities will still be constrained by WM limits.

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HOW TO RECOGNISE AND IDENTIFY WORKING MEMORY PROBLEMS

Several behaviours tend to be associated with lower WM ability. Whilst these behaviours can also be the product of other difficulties or learning disorders, they can help detect children at risk of WM deficits:

Attention – appearing distracted or losing concentration easily

Forgetting – struggling to hold information in mind or forgetting what to do

Following instructions – struggling to complete multi-step tasks or instructions

Needing extra support – asking to be reminded, or needing to be reminded more often, about the task-at-hand.

Academic progress – behind peers in academic attainment, struggling to learn new material, and taking longer to incorporate it into existing knowledge.

The CAER website has links to materials that will help to identify children with working memory difficulties.

HOW TO SUPPORT WORKING MEMORY IN THE CLASSROOM

Increase Familiarity
When introducing new material, WM demands will be higher if there are no connections to be made with long-term memory. Where possible, find connections to what pupils already know.

Use Routines
Routines that are regularly practised become automatic, freeing up WM capacity. Routines can be about classroom behaviour or about learning, for example, writing routines.

Reduce Complexity
Reduce the amount of information presented at any one time, and/or break multiple steps down into smaller stages. Simplify design by removing unnecessary complex fonts, clip art, and colours.

Time and Space
If too much time elapses between the explanation of a task and the completion of that task, then information will be lost from WM. If children have to move between multiple sources of information, WM demands are increased: try to keep different sources of information in close proximity.

Repeat or model information
The simplest way to respond to a WM failure is to repeat instructions. Alternatively, teachers can use modelling, including explicit processes such as writing a description, or implicit processes such as choosing the best strategy to answer a maths question.

Provide memory aids
Children with WM difficulties will benefit from the ability to offload aspects of task performance on to external memory aids, reducing the demands placed on WM. These aids are generally physical or visual aids, for example, a printed list of French verb endings, or a number line.

Encourage Strategy Use
Children can be taught strategies to support WM performance. However, children with WM difficulties may struggle to use these strategies, partly because they need to remember to use them. Some possible strategies are:

Requesting help
Teachers can also help by giving an explicit reminder before a task that points to sources of help such as memory aids.

Rehearsing material verbally
This works best for a limited amount of information that is needed immediately, and is not appropriate for all situations. Rehearsal can be out loud or internal.

Note taking
This can be as simple as writing down the instructions that the teacher has just given, or a concept map in a graphic organiser. Keep materials close to hand that can be used for this purpose.

Mnemonics
'Chunking' information frees up some of the capacity in WM, e.g., using a mnemonic such as BIDMAS (order of operations in Maths). Pupils can also be encouraged to come up with their own mnemonics.