
Working memory in practice: Identifying and helping children with working memory problems

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Structure of the workshop

- Different kinds of memory
- Identifying children with working memory problems
- Classroom solutions for children with working memory problems
- Q & A session

Different kinds of memory: An introduction

Different kinds of memory

Procedural memory

- Learned skills
- Lasts: lifetime, once skill is established
- Examples: writing, riding a bike

Different kinds of memory

Semantic memory

- Facts, knowledge
- Lasts: a lifetime, if used sufficiently frequently
- Example: knowing that Paris is the capital of France

Different kinds of memory

Autobiographical memory

- Stored facts and significant events from your life
- Lasts: a lifetime
- Examples: first day at school, your wedding day

Different kinds of memory

Episodic memory

- Records details of particular experiences
- Lasts: up to several days
- Examples: Remembering breakfast this morning, or where you parked the car

Different kinds of memory

Working memory

- Lasts seconds only
- Example: following instructions such as
- “When you pass the church on the left, turn immediately right and take the second left”

Working memory: key features

- Capacity to hold material in mind and manipulate as necessary for brief period
- Mental workspace
- Limited in capacity
- Catastrophic loss

Activity 1: What kind of memory?

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- Procedural memory (skills)
 - Semantic memory (facts)
 - Autobiographical memory (life knowledge)
 - Episodic memory (specific events)
 - Working memory (temporary)

Different situations that involve memory are described below. In each case, try to identify which kind of memory is involved, and how long you would expect the memory to last.

1. You are given an unfamiliar 7-digit telephone over the phone, but have to find a pen from another room in order to write it down.
2. In completing a form, you have to supply your home telephone number.
3. Weigh and combine accurately the ingredients ('50g butter, 150g of flour, 75g of sugar, 25g ground almonds') from a recipe that you have just read that is no longer in view.
4. Calculate the running total of the cost of items in your shopping trolley, as you add each item.
5. Remember a quotation from a Shakespeare play that you studied at school.
6. Learn to ride a unicycle.
7. Complete the multiplication calculation $12 \times 9 = ?$
8. Attempt the calculation $124 \times 45 = ?$ without using a pen and paper,
9. Remember to attend a doctor's appointment you had booked several days previously.
10. Remember where you left your house keys the last time you used them.
11. Your friend and you disagree about whether another friend was there at a party a couple of years ago.
12. Whistle a tune.
13. Amazing luck – there was a question that corresponded directly to some last-minute revision on the morning of the exam.
14. Even better – there was also a question on your favourite topic, on which you had done a coursework essay and a short presentation.
15. Complete this crossword clue: Tree yielding acorn (3).
16. Key your PIN number into an ATM bank machine.
17. Re-type a new password that you have just created.

Identifying children with working memory problems

Characteristics of children with poor working memory

- Poor academic progress
- Difficulties in following instructions
- Problems combining processing with storage
- Place-keeping difficulties
- Teachers say: short attention span and highly distractible

Working memory deficits in other developmental disorders

- Dyslexia
- Language impairment
- ADHD
- Developmental Coordination Disorder
- Genetic disorders, e.g., Down syndrome
- Hypertension

Activity 2:

Identifying children with working memory problems

For each child, decide:

- what (if any) do you consider to be the possible major underlying problems faced by this child?
- whether this child show any of the warning signs associated with working memory impairments? If so, which ones?

Adam

Adam is a 10-year old boy. He is viewed by his teacher as experiencing many problems within the classroom, and on occasions can be a disruptive influence due to his high level of distractibility. He often appears restless and fidgety, and on several occasions has broken classroom equipment. His work is of a low average standard, with its quality varying considerably from day to day. His teacher is as yet unsure whether he will attain Level 4 in Key Stage 2 National Curriculum assessments in English, maths and science, although she feels sure that he has the abilities to do so.

Andrew

Andrew is a 6-year old boy with a pleasant and cheery personality. He is well-behaved and popular in his class. Andrew's IQ is within the normal range, with a higher Performance IQ (105) than Verbal IQ (95). His academic performance is poor in both numeracy and literacy, and is in the lowest ability group in literacy. He frequently becomes frustrated by the difficulties that he experiences, particularly in writing. Andrew does not often participate in class discussions, and often seems to be unable to respond even after he has raised his hand in response to a question by the teacher at 'carpet time'.

Olivia

Olivia is a 7-year old child with an outgoing personality who is well-liked by her classmates. Her IQ is in the high average range (113). She has a mature and responsible attitude and is often chosen by her teacher to run errands. She has been placed in high-ability groups in both literacy and numeracy, and often helps out less able children within the group, occasionally misguiding them. At times she is forgetful, and can appear to be distracted from work by her own thoughts. The teacher often enlists her help in organizing classroom activities such as putting out art materials.

Alice

Alice is aged 9 years. She is a timid girl with a close friendship with one other child. She was identified by her school as having special educational needs (School Action stage) one year ago due to her difficulties in developing literacy skills. Despite good comprehension of language, her word recognition skills are very poor and she struggles to extract meaning from text. Her hand-writing is messy, and her spelling is very inaccurate. Alice has made reasonable progress in maths where she copes with the demands of a mid-range ability group.

Jonathon

At 8 years, Jonathon struggles to meet the language demands of the classroom despite appearing to be a bright and focused child. His spoken language is not markedly impaired, but is characterized by some degree of phonological immaturity. His progress in reading is very poor and he has struggled with many aspects of maths. In both areas, he receives twice-weekly support from a special needs assistant in school. The severity of his learning difficulties is reflected by his School Action Plus special needs status.

Charlotte

Charlotte is a 6-year old girl who has established a small and supportive group of friends in her two years at school. In class activities, however, she often appears withdrawn, and frequently drifts away from activities without completing them. Her teacher says that she often seems to be in a world of her own. She is working in low ability groups in the classroom.

Supporting children with working memory problems

Classroom support

Learning difficulties arise because memory loads of learning activities are often too high, leading to task failures and lost learning opportunities.

Developed a classroom-based intervention designed to minimise learning difficulties by preventing working memory overload.

Activity 3: Classroom solutions

The following classroom situations may place excess working memory loads on a child with poor working memory. Imagine that you have such a child in a class that you are teaching. Discuss how to avoid exceeding the child's working memory capacity to the point that activity failure results.

It's close to the end of the lesson and many of the children still have not completed a maths worksheet activity that has involved manipulating coloured counters. The materials have to be collected together and put away and the worksheets must be returned to each child's maths folder (in their drawer). How would you organise the class (including the child with a working memory problem) in such a way as to achieve this?

The purpose of today's literacy lesson is to develop the children's skills in writing sentences that they have generated for themselves. The sentences should be related to the child's family. What sort of guidance would you offer the child with an impairment of working memory?

As part of the phonics programme in Year 1, the class are engaged in an activity that involves clapping to each syllable in a nursery rhyme and counting the number of claps. Each child takes a turn in clapping along to one rhyme. How would you support the child with a working memory problem when her turn comes?

Another part of the phonics programme involves listening to new rhymes, and remembering the words that rhyme. What sort of rhyme would you choose for a child with a working memory problem?

You are a teacher of a Year 5 class. Some shared classroom materials held currently by Mrs Taylor, a teacher in an adjoining building, are needed urgently in your own classroom. How would you go about giving the responsibility for this errand to a child with a working memory problem?

Q & A session

To find out more

Gathercole SE & Alloway TP (2008). *Working memory and learning: A practical guide for teachers*. Sage.

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Working Memory & Learning

A Practical Guide for Teachers

Susan E. Gathercole & Tracy Packiam Alloway



Assessing working memory

Automated Working Memory Assessment (AWMA)

Alloway (2008)

- Taps verbal and visuo-spatial STM and WM
- PC-based test with automated scoring and standardisation
- 3 tests each of:
 - **verbal STM** (word recall, nonword recall, digit recall)
 - **visuo-spatial STM** (block recall, dot matrix, mazes memory)
 - **verbal WM** (listening recall, counting recall, backward digit recall)
 - **visuo-spatial WM** (Mr X, odd one out, spatial span)

Pearson Publishing

Working Memory Rating Scale

20 item behavioural checklist with items such as:

Needs regular reminders of each step....

Requires regular repetition of instructions ...

Ratings 0 (not typical) to 3 (typical) for each item.

Alloway, Gathercole et al. 2008. Pearson Publishing.

Assessing working memory using the WISC-IV

Working Memory Index:

- Forwards digit span
- Backward digit span
- Letter-number sequencing

Good cross-validation with AWMA

Potential problems:

- All tests verbal and number-based
- Combines STM and WM