# Learning Difficulties Australia

Learning Difficulties Australia is an association of teachers and other professionals dedicated to assisting students with learning difficulties through effective teaching practices based on scientific research.


www.ldaustralia.org

enquiries@ldaustralia.org

@LearningDifficultiesAustralia

@LD_Australia

# Dr Anne Bellert

Master of Leadership: (with Distinction), Monash University, VIC. 2022

Doctor of Philosophy (PhD), University of New England, NSW. 2012
*The Effects of Improved Automaticity in Basic Academic Skills: A Study of Learning Difficulties in the Middle-School Years.*

Bachelor of Education (Special Education), UNE, NSW. 1998

Bachelor of Teaching (Primary), UNE – Northern Rivers, NSW. 1994

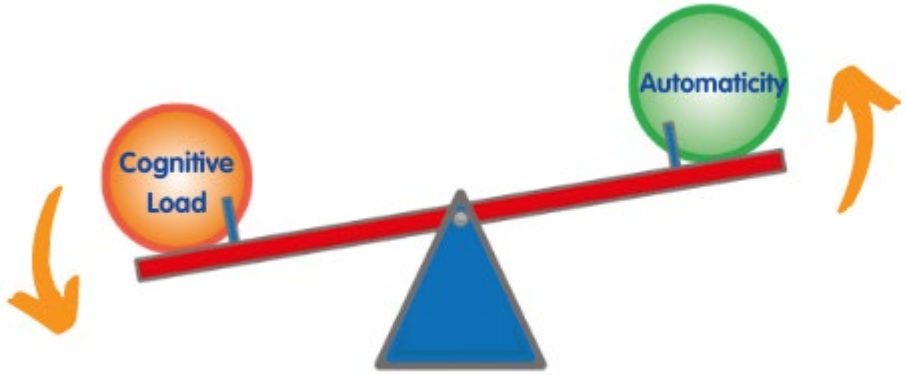
I have worked as a classroom teacher, support teacher and school advisor in schools in regional NSW for 10+ years.

In 2014 I began working in the tertiary sector as a lecturer in inclusive education (Southern Cross University). In 2017 I was promoted to Senior Lecturer.

In August, 2022, I started working at Melbourne Graduate School of Education, in the Learning Intervention team. I am currently the Course Co-Ordinator for the Graduate Certificate in Education - Learning Difficulties

## Now co-convenor of LDA's Consultants Committee

# Automaticity in basic number facts: Freeing up the load.




- automaticity in basic number facts
  - the cognitive advantages it offers
- strategies and approaches to support the development of basic academic skills
  - for students experiencing learning difficulties
- differences between rote learning and developing automaticity
  - out with the old, in with the new

Image source: https://phonicshero.com/wp-content/uploads/seesaw-graphic-e1622554159110.png

# Automaticity

- Memory (encode/decode)
  - Long term memory (LTM)
- Working memory
  - Limited capacity
    - Lower order aspects of the task have priority
- Practice needed for effective retrieval from LTM
  - Spaced practice of the knowledge
  - Practice retrieving the knowledge

# Basic number facts

- Addition and subtraction facts to 10
- Multiplication and division facts to 12+

- Numeracy vocabulary
  - Vocabulary associated with basic facts
  - General mathematics vocabulary, e.g. geometry

- Problem-solving is the ultimate goal

# The Multi-Store Model of Memory

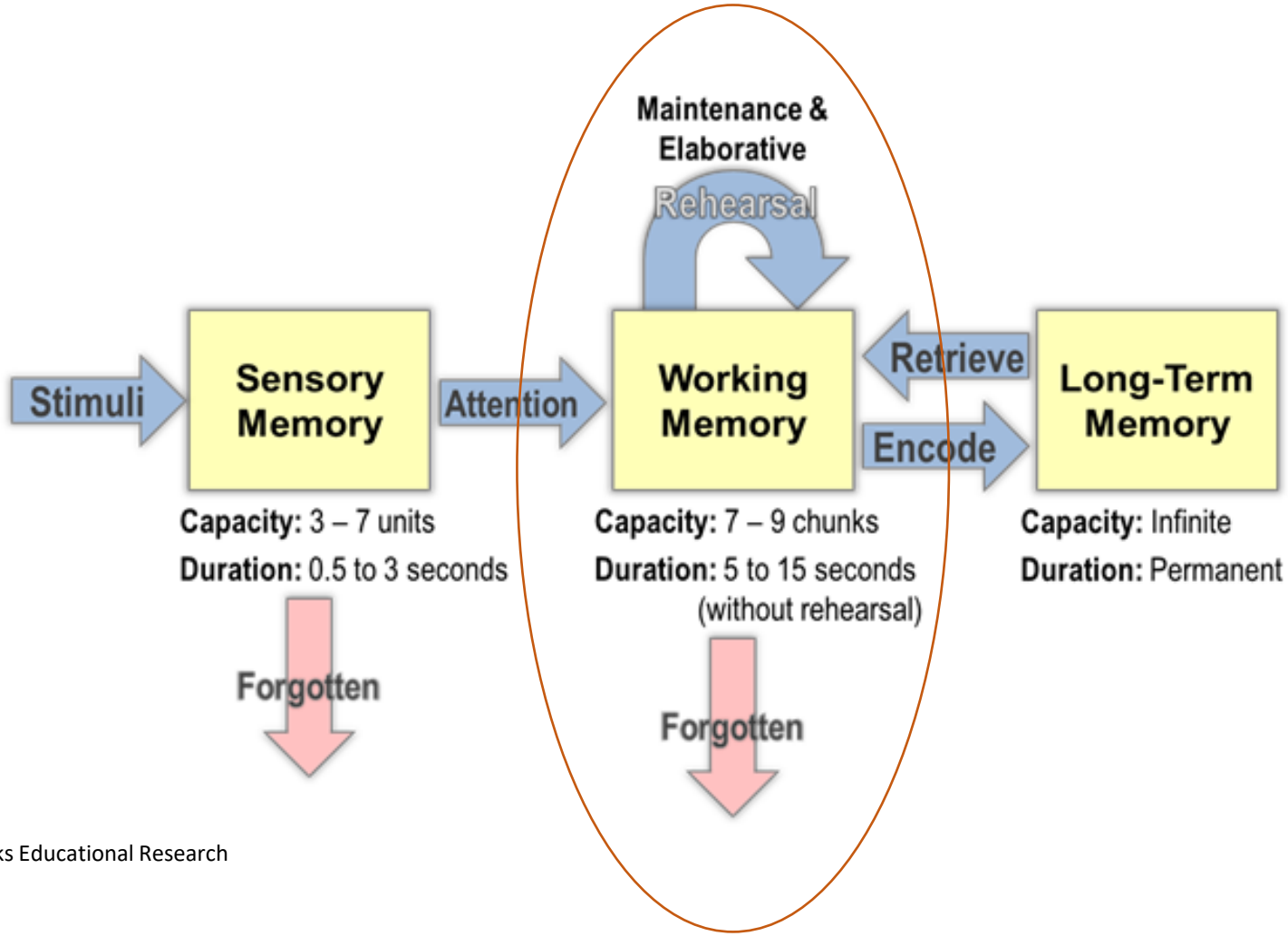



Image source: Dataworks Educational Research

# Working Memory (WM)

- Working memory has been described as a theoretical construct used in cognitive psychology to characterise the system or mechanism underlying the maintenance of task-relevant information during the performance of a cognitive task (Miyake & Shah, 1999).

- Other definitions in the literature similarly describe working memory as a temporary, simultaneous storage mechanism in memory for incoming information required in the performance of a complex task (Baddeley, 1992; Hulme & McKenzie, 1992; Siegel & Ryan, 1989; Swanson & Keogh, 1990).

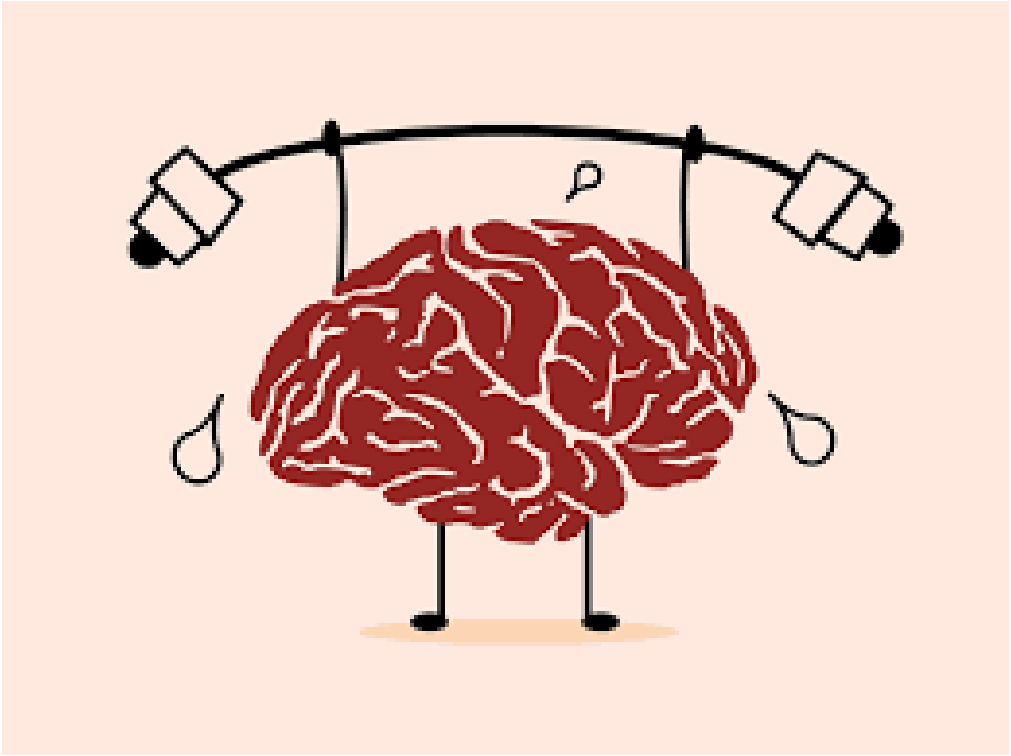


Image source: https://cogbites.org/2019/02/18/what-is-working-memory-training-and-what-makes-it-work/

# Working Memory & Learning Difficulties

- Students who experience learning difficulties (LD) may
  - have reduced WM capacity
    - for all of us, our WM capacity is limited
    - Capacity can be predictive of future achievement
  - Use their limited WM resources inefficiently
    - Shifting focus
    - Emotions take up WM space
  - Over-rely on WM
    - 'work it' constantly instead of retrieving from LTM

- Caution: WM training has limited evidence base for having an impact on learning outcomes
  - methodological issues
  - future prospects
    - (Nutley& Söderqvist, 2017)

# WM & Mathematics

- Mathematics, arithmetic, numeracy
- WMC predicts measures of current and future mathematical abilities, dependent on
  - Developmental stage
  - Exposure to mathematics training (effective teaching)
- Different components of WM are related to mathematics performance at different ages, and between aspects of mathematics within the same age
- During early stages of learning arithmetic most children use counting strategies, before developing verbal counting and finally, the counting will gradually be replaced by forming categorical representations in long-term memory
- For the same task, the strategies used to solve it might differ between students
  - Students experiencing LD tend to over-rely on inefficient strategies

# Automaticity and arithmetic facts

- https://youtu.be/l8JlTqJYKUQ?t=8

# Reducing the Load

- **Increasing the use of efficient strategies**
  - Developmentally appropriate
- **Using the limited capacity of working memory effectively to solve a task**
  - Not ‘using it all up’ on the lower order aspects of a task
    - Instead, retrieve the key information from LTM, and
    - use the available resources (WM) to focus on higher order aspects of a task
- **Clara’s story – fast fingers**
- **Rosemary’s story – not enough practice**

# QuickSmart Numeracy

## Yrs 3-8

- **SiMERR Centre**
- **Professor John Pegg**
- **(Professor Lorraine Graham)**
- **Anne Parnell**
- **Dr Maree Lake**
- **QuickSmart team**

- Average effect-size results for thousands of *QuickSmart* students (of 0.60 to 0.94)
- translates into growth of two- to three-years in one year compared to the gains made by average-achieving students.



quicksmart

University of New England
https://simerr.une.edu.au › quicksmart › numeracy-pr...

[Numeracy Program – QuickSmart - SiMERR - UNE]

Overview: The **QuickSmart Numeracy** intervention program focuses on understanding and recall of basic number facts, performance of elementary calculations, ...

*QuickSmart* is an evidence-based basic skills intervention program designed for middle-school students who experience persistent difficulties in literacy and/or numeracy. The **award-winning programs** provide a framework with short and targeted lesson components for educators to work through with their students.

The aim of *QuickSmart* is to enable students to become automatic (quick) in their basic skills in order to move onto more complex problem-solving skills (smart). Over **67,000 students** have benefitted from the programs since 2001.

# How to achieve automaticity in basic maths facts

- Start with the known
  - Explore current understandings
- Needs more than a singular focus on recall
  - Not rote learning
- Spaced (distributed) practice
- Enough practice opportunity
- Confidence ….
- ‘Trust your head’ (replace old cognitive habits)
- The relationship between number facts
  - If you know one number fact, you know 4 number facts

# How to achieve automaticity in basic maths facts

- Your suggestions .....

# Automaticity Activities 1 (Yr 3-8 & beyond)

- **Always start with review – tap into prior knowledge**
  - Establish that conceptual understanding exists
- **Speed sheets**
  - NOT maths mentals
  - Retrieval practice of known facts, with a limited range (e.g. number facts to 10, +3, '3 times tables')
  - Teach strategies for doing the task
    - jump down the page, do like 'sums' at the same time
- **Flash cards**
  - Limited range in a known domain

# Automaticity Activities 2

- **Games**
  - Memory, 3-in-a-row,
  - Online games BUT carefully selected
- **Self-record progress**
  - Graph rates each time
  - Expect/ explain variance
- **Embedded knowledge activities**
  - Problem solving
  - Include geometry, algebra, measurement etc.
  - TRANSFER AND GENERALISATION

# How is teaching for automaticity in basic number facts different from rote learning?

- Discussion

# Implications for your practice

- **Discussion**

# References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# Dr Anne Bellert

Senior Lecturer
Melbourne Graduate School of Education at the University of Melbourne

Email:
anne.bellert@unimelb.edu.au

abellert@ldaustralia.org