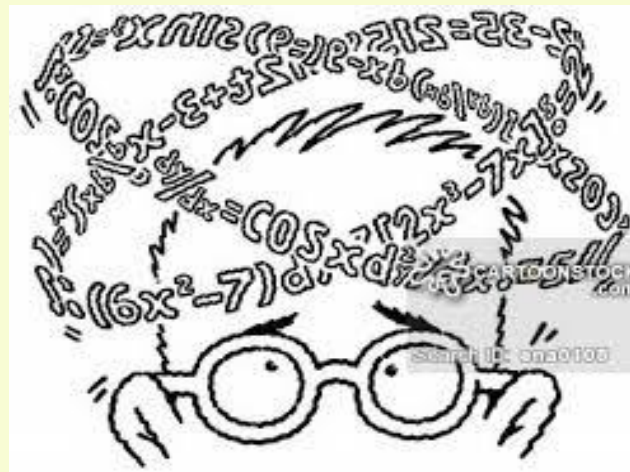


Recognising specific maths difficulties such as dyscalculia



SENCO Conference

25th January 2018

Siân Reading

What are your memories of learning Maths at school?



What did you do when you didn't understand or were stuck? How did you feel?

'It just didn't add up'

Only in Britain: a maths free zone

"I was pleased you didn't ask me any maths questions... Luckily my mother-in-law is a maths teacher so she is the expert [in our family]"

Ed Balls



"I hope I've got the physical skills to fly a helicopter. But mentally, there are the exams and everything. I mean, I can't do maths"

Prince Harry



"I would have liked to have been examined in history, poetry and writing essays. The examiners, on the other hand, were partial to Latin and mathematics. And their will prevailed"

Winston Churchill



"I'm shite at mathematics"

Caitlin Moran (when 19)



"I did maths at school and for one year at university but I don't think I was ever very good at it—and some people would say it shows"

Gordon Brown



Aims

- Support understanding the types of difficulties in maths children may experience
- Provide an overview of current research in the area of maths difficulties



Current definitions

Discuss.....

- Using the handout compare and contrast the definitions of dyscalculia



The Statistics

- Almost half the adults in England only have the maths skills of a primary school child
- Steve Chinn suggests that 25% of pupils have maths difficulties
- Boys and girls are equally affected
- 5-8% of the population have dyscalculia

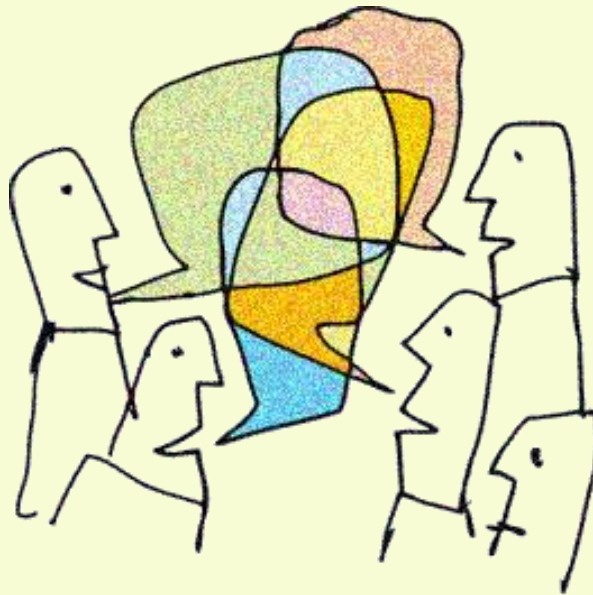
Prof Greg Brooks, Sheffield University:-

- 22% of 16- to 19-year olds are functionally innumerate
- This has remained at the same level for at least 20 years

Common areas of difficulty

Discuss on your table-

From your experience, what are the common areas of difficulty for pupils with specific maths difficulties?



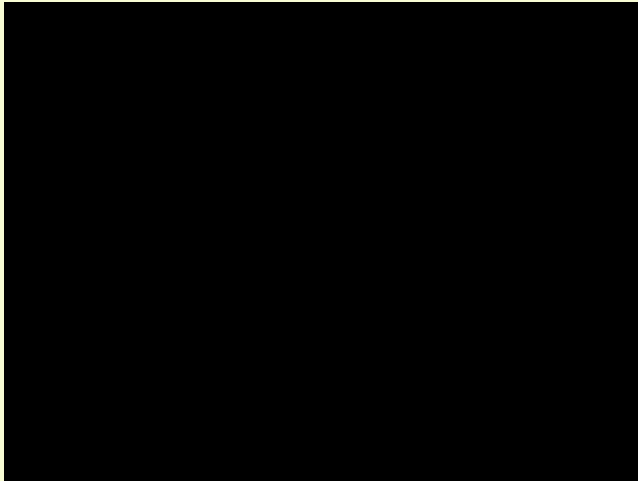
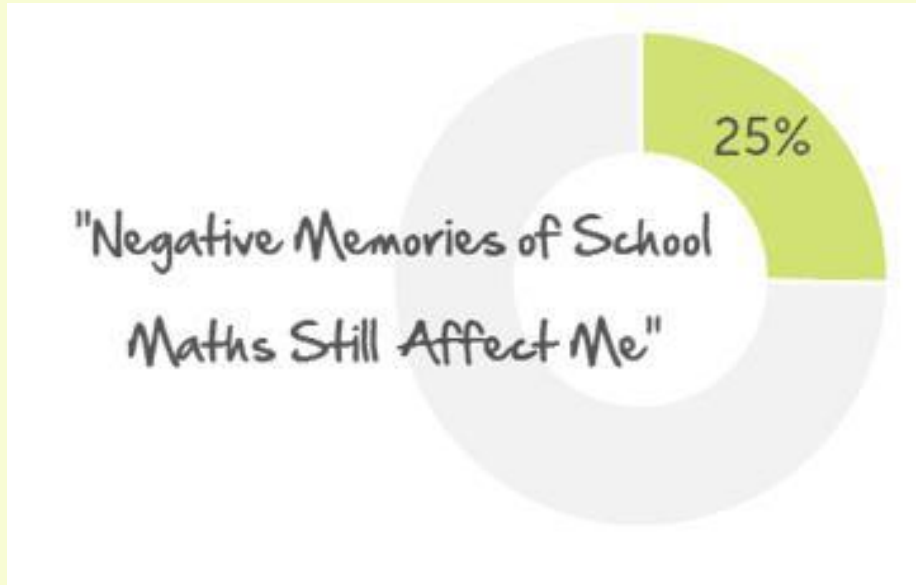
What does this look like in the classroom?

- Has difficulty when counting backwards
- Has a poor sense of number and estimation
- Has difficulty in remembering 'basic' facts, despite many hours of practice/rote learning
- Has no strategies to compensate for lack of recall, other than to use counting
- Has difficulty in understanding place value and the role of zero in the Arabic/Hindu number system
- Has no sense of whether any answers that are obtained are right or nearly right
- Tends to be slower to perform calculations
(Therefore give less examples, rather than more time)

What does this look like in the classroom?

- Forgets mathematical procedures, especially as they become more complex, for example 'long' division
- Addition is often the default operation. The other operations are usually very poorly executed (or avoided altogether)
- Avoids tasks that are perceived as difficult and likely to result in a wrong answer
- Weak mental arithmetic skills
- High levels of mathematics anxiety

Maths Anxiety



Maths anxiety: Maths makes some people feel anxious, leading them to avoid situations where they may have to use mathematics (Chinn, 2012).

A lack of support for adults: Many feel as though it's too late to improve and don't know where to go for support. Furthermore, numeracy often takes a back seat to literacy; it enjoys less attention and less support in adult learning and may seem less of a problem. Literacy is vitally important - but so too is numeracy.

Language

Language and reading ability can affect the ability to complete mathematical tasks. So it is important to know:

- Do they have visual difficulties?
- Is paper/print contrast an issue?
- Can they read the question?
- Do they understand the key words?
- Can they read/understand the non-technical words?
- How successful are their comprehension skills?



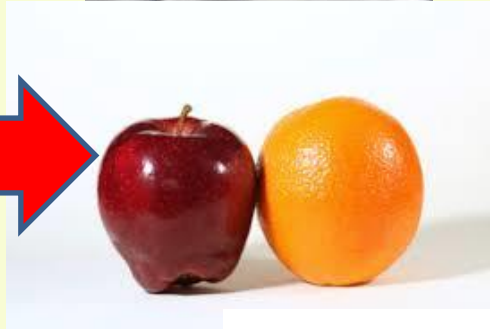
Language

If we consider words used in mathematics we can all think of different meanings!

Take away



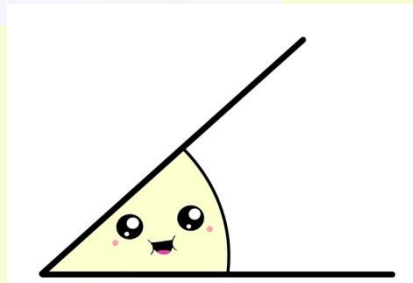
difference



product



acute



Language

Which is the 'bigger' number?

23

543

Write a long
number

2

Language

If we teach them to underline the key words, this has value as a strategy, but can cause mistakes. It is important that they understand the context and can 'see' the problem.

Jay deletes some photos from his camera and has 34 **left**. He takes 6 **more** photos and then deletes 15 **more**. How many photos does he have now?



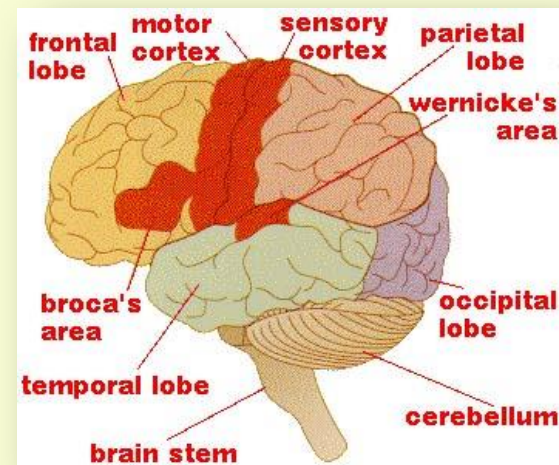
What do we mean by number sense/numerosity?

- The ability to determine the number of objects in a small collection
- To count, and to perform simple addition and subtraction, without direct instruction



What do we mean by number sense/numerosity?

- The brain processes number symbols and number words in different areas of the brain
- Number symbols are in the parietal lobe
- Number words are in the broca's area
- Butterworth (1999) has found that some people who can barely read or write can do complex maths provided it is presented in purely numerical form



What do we mean by number sense/numerosity?



Animals can count in the sense that they can recognise the difference between one animal and a group- this is vital for survival.

What do we mean by number sense/numerosity?



1, 2, 3, ...

Subitising

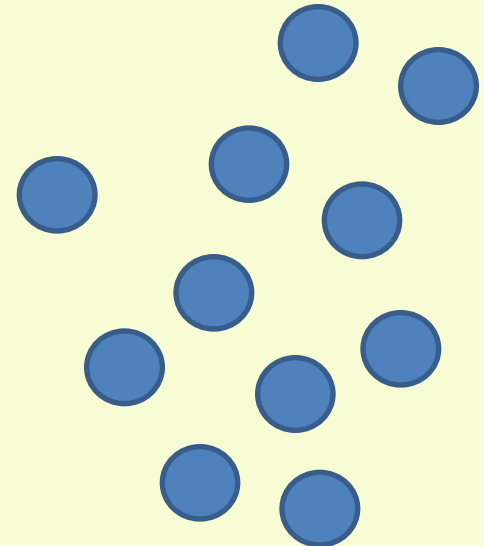
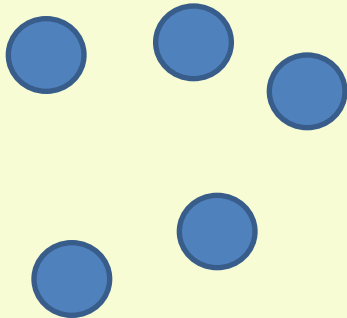
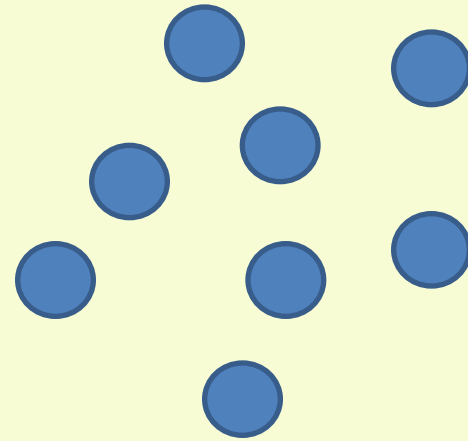
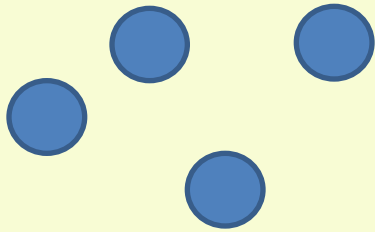


- Subitising comes from Latin- 'sudden'
- The ability to give the amount of objects in a set without counting

- Most people can subitise up to five or six objects
- Dyscalculic people do not have this ability
- Is this innate? Are we born with the ability to assess quantity?

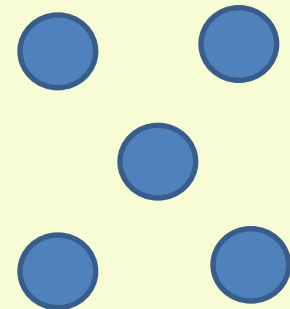
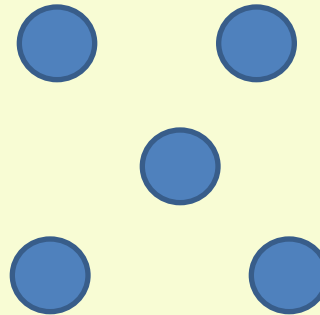
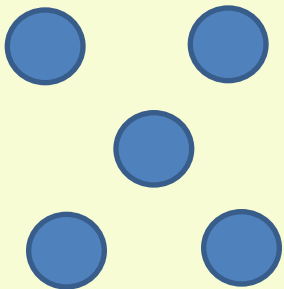
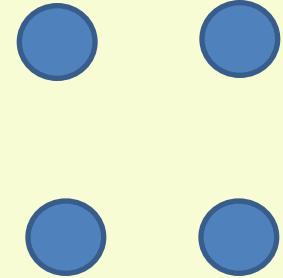
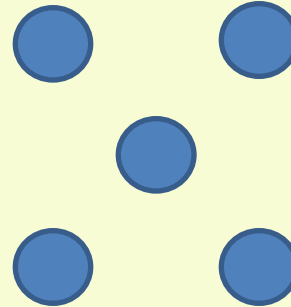
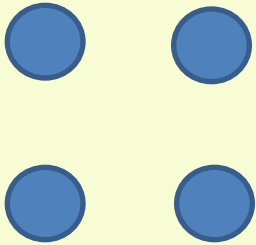
Subitising Activity

Random array



Subitising Activity

Pattern



Memory

- In a typical class of thirty 7/8 year old pupils, 3 would have a working memory capacity of the average 4 year old and 3 would have working memory capacity of an average 11 year old (which is near adult capacity)
- It is not known what causes a person to have reduced WM capacity but it is not thought to be environmental factors
- Those with poor working memory in childhood do not catch up with their peers. Instead the learning gap gets wider
- Learning difficulties arise because the memory loads of learning activities are often too high, leading to task failure and lost learning opportunities



Co-occurrence

- Developmental Dyscalculia often occurs in association with other specific learning difficulties such as dyslexia, dyspraxia or ADHD/ADD
- Co-occurrence is generally assumed to be a consequence of risk factors that are shared between disorders, for example, poor working memory.
However, it should not be assumed that all dyslexics have problems with mathematics, although the percentage may be very high, or that all dyscalculics have problems with reading and writing

Impact of the areas of difficulty

Card sort activity

- Match the area of difficulty to how this may look in the classroom



Impact of the areas of difficulty

- Difficulty reading analogue clocks
- Difficulty stating which of two numbers is larger
- Inability to comprehend financial planning or budgeting, sometimes even at a basic level; for example, estimating the cost of the items in a shopping basket
- Difficulty with multiplication-tables, and subtraction-tables, addition tables, division tables, mental arithmetic, etc.
- Difficulty with conceptualizing time and judging the passing of time. May be chronically late or early

Impact of the areas of difficulty

- Problems with differentiating between left and right
- Inability to visualize mentally
- Difficulty reading musical notation
- Difficulty with choreographed dance steps
- Difficulty working backwards in time, (e.g. What time to leave if needing to be somewhere at 'X' time)
- Difficulty comprehending things relating to occurrences in different time zones

Impact of the areas of difficulty

- Difficulty navigating or mentally "turning" the map to face the current direction rather than the common North=Top usage
- Having particular difficulty mentally estimating the measurement of an object or distance (e.g., whether something is 3 or 6 metres away)
- Inability to grasp and remember mathematical concepts, rules, formulae, and sequences
- Inability to concentrate on mentally intensive tasks

Subtypes of dyscalculia

Number sense

- All areas affected except counting and fact retrieval
- May have difficulty with non-symbolic tasks

Verbal memory

- Difficulty with counting, fact retrieval and word problems
- Likely to co-occur with dyslexia



Subtypes of dyscalculia

Executive

- Difficulty with counting, fact retrieval and use of strategy or procedure
- Likely to co-occur with ADHD

Visuo-spatial

- Difficulty with subitizing
- Apprehension of non-symbolic quantities/mental number line



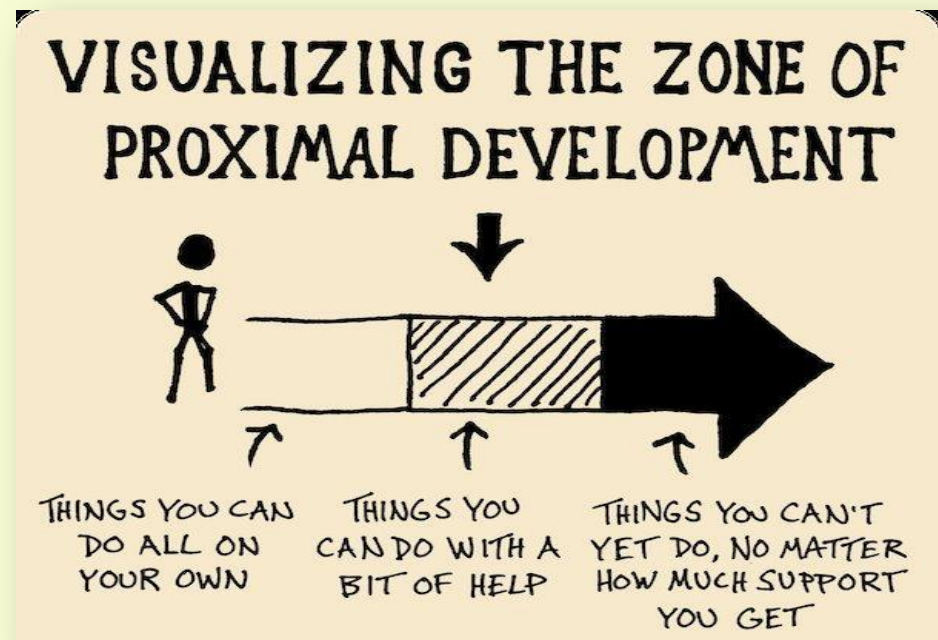
Your role in helping the child

- assessing the child's skills and areas of difficulty
- setting maths work at the right level
- scaffolding learning in the 'zone of proximal development'

Wood et al (1976)

based on

Vygotski's theories



Research

Steve Chinn – various publications including:

- The Trouble with Maths, 2nd Edition, (2012) Abingdon, Routledge
- More Trouble with maths, (2012) Abingdon, Routledge
- Video link:

<https://www.mathsexplained.co.uk/dyscalculia.php>

Brian Butterworth – various publications including:

- The Mathematical Brain (1999), London: Macmillan

Ann Dowker– various publications including:

- What Works for Children with Mathematical Difficulties?

Key documents

- *Mathematics: made to measure* (110159), Ofsted, May 2012;
www.ofsted.gov.uk/resources/110159
- *Mathematics: understanding the score* (070063), Ofsted, Sept 2008;
www.ofsted.gov.uk/resources/070063
- *Good practice in primary mathematics: evidence from 20 successful schools* (110140), Ofsted, Nov 2011;
www.ofsted.gov.uk/resources/110140
- Mathematics subject grade criteria (20100015), Ofsted, Dec 2013;
www.ofsted.gov.uk/resources/20100015
- Ofsted's mathematics web page www.ofsted.gov.uk/inspection-reports/our-expert-knowledge/mathematics
- NC programmes of study, DfE, 2013;
www.gov.uk/government/consultations/national-curriculum-review-new-programmes-of-study-and-attainment-targets-from-september-2014



Siân Reading
sian.reading@birmingham.gov.uk