

## Children being able to interpret word problems

Action research findings – ‘Spring 1’ 2012

During the first half of the spring term, 2012, all seven schools and a maths consultant took part in action research sessions to answer the question: *‘How can we ensure that children are able to interpret word problems accurately?’*

Children from year five and year six who are quite able at pure calculation however struggle with interpreting word problems were looked at. It was noted that the children sampled were less confident with AF3 for reading. It was planned that each of the days were hosted by a different school and representatives from two other schools visited each day this meant that each of the planned seven studies would have three schools involved in them and that each school would take part in three studies despite only having to host one of them. Due to illness and a visit by Ofsted, only five of the studies took part this time. Despite that the information gained from the five studies was interesting and enlightening.

Summary of findings on teaching word problems:

- **Vocabulary and technical maths language need to be modelled by teachers (i.e. ‘teacher thinks aloud’). Teachers should display vocabulary in sentences and possibly separate subtraction into two subsets of ‘taking away’ and ‘finding the difference’ as well as separating division into ‘sharing’ and ‘grouping’ then children need to be given many opportunities to talk and discuss using mathematical language and justifying reasoning i.e. with ‘think, pair, share’.**
- **When listening to children’s explanations do not accept them unless they are accurate then ensure that they are up-levelled (use the same prompt as you would for improving sentences in literacy i.e. ‘Let’s make that a Super Sentence!’)**
- **Level 4 word problems contain a much more sophisticated use of mathematically technical language and children need practise at speaking and writing in this style so that they are more readily able to interpret it.**
- **Focus on word problems with children as if they are a literacy genre (see them as a story that we have to unpick the meaning and content).**
- **Support the children with getting the ‘picture’ by using representational resources (this will develop their ability to visualise the actions determined by the problem). The resources represent the parts of the problem i.e. a tower of 5 cubes can represent a team of 5 children, where each cube means one child – this links to the idea of metaphor.**
- **Drawing can also be used alongside the physical resources if appropriate where diagrams support with deciding on the approach.**

- Put less emphasis on looking at the bold words as they are not the whole story to solving the problem.
- Use resources and pictures to help the children understand the approach and the context of word problems – this develops their ability to visualise the ‘story’ of the problem and improves their ability to infer thus impacting on AF3 for reading.
- Be aware of words and language structures that may hamper children’s ability to understand that are not listed as mathematical vocabulary i.e. ‘each’
- When asking children to write their own word problems use the structure of recognised styles of word problems (again we are treating different types of word problems as a distinct genre as we do in literacy) this helps with the children realising that word problems follow patterns and structures so that as we approach them we can find links with other styles of problems we have encountered before and don’t always feel we have to ‘start at the beginning’ every time with each new problem we come across; thus increasing children’s confidence in this area
- Children need to practise going back to the question to read it again once they think they have reached the answer to check for context and if there are more steps to do, etc. (teaching methodical approaches is something, again, that needs to be done throughout school so it is second nature once the children reach upper KS2)

Summary of findings related to other observations during the study:

- We need to ensure that children are learning how to make choices in maths lessons all through school (lessons and activities where children are asked to justify choices and test if their choice works – remembering that making mistakes is a valuable learning experience).
- Ask teachers to count daily with their children in different ways, looking for patterns, where appropriate, and starting at different points, as this will continually develop the children’s skills necessary for calculating as well as helping with pattern-spotting which is crucial for being able to Reason in maths. Counting in 25s and 15s is good skill for year 6 as many problems in the KS2 SAT paper involve using multiples of these, or related numbers such as 250.
- Venn and Carroll diagrams should be used in maths lessons to facilitate/scaffold a sorting activity of some sort at least every fortnight (therefore the diagrams are being used for what they were designed and it will ensure that teachers are including reasoning about numbers and shapes on a regular basis).
- Children should be encouraged and trained to see divisibility links with numbers/digits, even if the numbers are decimals, i.e. there is a ‘twelve’ in £1.20 so therefore £1.20 is divisible by 3p (and 30p) because 12 is divisible by 3 AND  $99 \div 3$  is easy because both digits are divisible by 3 (Activities where you ask children to

find the links between set of numbers can help here, i.e. 'How are these numbers the same?: £1.20, 120cm, 2.4m, 36%).

- Ensure children recognise numbers as multiples that are not obvious i.e. £1.20 has a twelve in it so it is a multiple of 3 (as well as a multiple of 2, 4 & 6).
- Ensure children are not getting locked into one image or approach i.e. with the halving and halving again – this worked for the problem with 4 oranges but didn't help them with 5 apples!
- Ensure children can write numbers in response to its description (not its name) i.e. 'Write a number that has 4 tenths and 3 tens in it. What is it called?' – 'Thirty point four'
- Focus on word problems with children as if they are a literacy genre and look for similarities of structure and strategies (see them as a story that we have to unpick the meaning and content)

Summary of children's responses at the end of the action research days:

**Children expressed that:**

- concrete resources help them to build a 'picture' of the story of the problem and would like to use these in class
- diagrams help them to build a 'picture' of the story of the problem and would like to use these in class
- the scaffold for the 'I am thinking of a number ...' problem was very helpful (the Leaping Lily Pads scaffold)
- using resources to build a picture of what we do makes it more 'realistic'
- the diagrams help them to build a 'picture' of the story of the problem
- rebuilding word problems with 3 sentences help them to understand how they can be structured
- writing their own problems with the same structure as problems looked at help them to understand how word problems are structured
- working in a small group is helpful