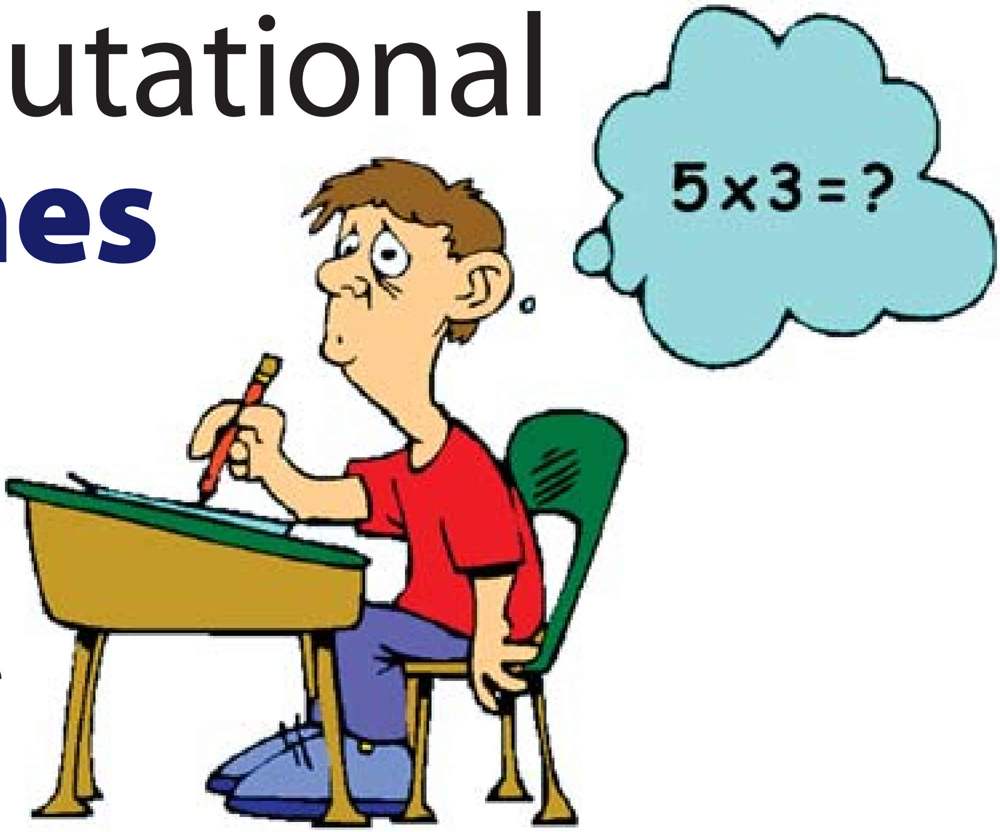
Computational **glitches**



John Taylor offers advice on how to identify and fix the 'numerical' glitches that can hold some of your pupils back.

As part of my 'day job' I have the pleasure of working with 'looked-after' pupils in school, targeting specific age groups during the year. Many of these children are identified by their schools as working below the level expected for their age. Despite the emotional baggage that some carry and the serial sense of rejection caused by successive changes of foster placement and/or school, their performance is compared to that of their peers who are not in public care.

To help these pupils, I work with them on a one-to-one basis, using a laptop computer and some excellent software packages. Amongst our varied aims of the scheme is the raising of attainment levels in Literacy and Numeracy.

Common problems

Through my work with the pupils, I have noticed that some common problems (relating to Numeracy) appear. The pupils frequently demonstrate:

- no working knowledge or understanding of number bonds;
- no recognition that reversing the order of an addition gives the same result (3 + 5 is the same as 5 + 3);
- no understanding of place value;
- not 'seeing' the number of objects when set out in a formal pattern (such as the dots on a dice);
- not understanding what makes an odd number 'odd' or an even number 'even';
- no knowledge or understanding of computational shortcuts (to add 9 add a ten and subtract 1); and
- no working knowledge or understanding of multiplication tables.

These problems affect many pupils, not just the ones I work with. The tragedy is that these 'computational' glitches go unnoticed in the classroom because often pupils eventually get to the 'correct answer' – even if the journey to it has been laboured. The teacher cannot detect these glitches because they are not able to focus solely on one pupil in a busy, structured lesson. They do not see the pupil counting on each time to reach an answer.

Stop reinforcing failure

Somewhere in your school there's bound to be a poster of Dorothy Law Nolte's famous piece *A Child Learns*. This poster offers eleven formulaic, but challenging, sentences built around the basic sentence:

'A child who lives with … learns to ....'

I'd like to add a twelfth line:

'A child who lives with failure learns not to succeed.'

We need to identify and tackle the problems rather than reinforce failure. Pupils, who have difficulty with numerical computations, often also have difficulty with other areas of mathematics, such as measuring and data handling. So, it is fundamentally important to tackle the problem as soon as it is identified.

Identifying the problem

You need to set aside time to give each pupil quiet, one-to-one sessions lasting perhaps ten minutes. Begin with those pupils who cope well with spatial maths, but less well with numbers. Then progress onto the rest of the class.

Prepare a set of small computational tasks (like those to the right for addition). They need to be presented on card or folded paper, so that the task is not seen until you are ready to observe. You need to watch carefully to see HOW the task is carried out.

Future one-to-one sessions can look at the other three operations and perhaps progress up to higher skill levels.

Addition tasks	
4 + 1 = 6 + 2 = 3 + 4 =	Do they **KNOW** these number facts or do they have to work them out by counting on?
7 + 2 = 2 + 7 = 5 + 3 = 3 + 5 =	Do they **KNOW** that the answer to the first pair is the same, as is the answer for the second pair?
4 + 4 = 6 + 6 =	Do they **KNOW** simple doubles without having to work out?
Half of 16 is… Half of 12 is…	Do they **KNOW** halves of numbers up to 20?
6 + … = 10 3 + … = 10 etc.	Do they **KNOW** numbers bond to 10? Have they noticed that 6 + 4 is the same as 4 + 6?
10 + 8 = 25 + 10 =	Can they **INSTANTLY** add a ten to the tens column?
30 + 27 = 24 + 20 =	Can they **INSTANTLY** add a multiple of ten to the tens column?
27 + 9 = 39 + 7 =	Do they use shortcuts such as adding 9 using the (+10, - 1) method?

Getting back to basics

Once the computational 'glitch' has been identified, you might need to return to concrete materials. Find materials that serve the purpose in a simple way. Use equipment that has not been designed for an educational supplier's catalogue. A box full of sticks (the chopped up prunings off an apple tree are ideal!) and rubber bands are much better than some hi-tec gadget designed by someone who has never taught a pupil in a real classroom in their life!

Beating the problems

Here are some suggestions on how to beat the computational glitches:

- Physically lay out and count two sets of sticks before putting them together and counting the total. Record in the conventional way.
- When adding numbers totalling more than ten, bundle them up into 10s and put them to the left of the loose 1s.
- Lay out rows of 10 sticks, then move the last one of the 1st row a few cm away from the rest of the row and count the 9 and the isolated 1. Repeat for the other rows moving away 2, 3, 4, 5, etc. Look at the pattern and record each row.
- Make a number using 10 bundles and loose 1s. Count on and record as you add of extra 10s.

Conclusions

Primary teachers of my age will remember those halcyon days before the rejected 11+ was rebranded as SATs. In those glorious days, it was generally acknowledged that teachers were better qualified than Government ministers to decide the most suitable method of teaching. We focussed on individual pupils and their specific needs. The structured yet informal individual assessments I propose follow the same principle. We need to get back to seeing the pupil's learning as the sole objective; not sorting them out into 'borderline level 3s' and 'safe level 4s'. By fixing the computational glitches that hold them down we release them to achieve higher.

John Taylor has been teaching mathematics for many years and his new book *Jumpstart ICT* is available now from Fulton Publishers.