Getting confused

Colin Foster

There are many examples of mathematical concepts that learners have a tendency to muddle up: area and perimeter, the meanings of negative and fractional indices, gradient and intercept, expressions like $2x$ and x^2; not to mention terms like equation and expression, circumference and diameter and so on.

I have been thinking recently about how to tackle such confusions with pupils and found myself considering how I deal with the many muddles I face! My new Y7 class arrived this year containing two similar-looking girls called Ria and Riarn, who are friends and sit next to each other. How am I to learn their names?

One option would be to split them up and make them sit at opposite ends of the room and perhaps try to associate 'left' with one and 'right' with the other, always speaking to them separately so as to try to keep them distinct in my mind. Perhaps that will enable me to know who's who? Somehow this doesn't appeal.

Instead I tried to get to know them *together* at the same time. I discovered that Riarn plays the violin whereas Ria doesn't and as 'Riar*n*' and 'violi*n*' both end in an '*n*' maybe that will help me? As Riarn talked about her music I imagined her playing her violin and noticed that she has long arms – helpful for a violinist, perhaps. These girls no longer look quite the same – I can't see Ria as a violinist, and I found out that her interests are quite different. So these two 'objects' have now become individuals and are now distinguishable in my mind. But this only happened because I spoke to them *together*. If I'd found that they were *both* violinists I would have moved on to ask about some other feature in my search for differences.

I am coming round to the idea that to tackle confusions in mathematics pupils need to examine the objects *alongside* one another rather than have them presented separately in water-tight compartments. This feels rather obvious, but I find a temptation in my teaching to avoid, say, dealing with factorising and expanding in the same lesson for fear of creating confusion, but I now suggest that that is exactly what's needed to *avoid* confusion. Let the potentially muddling ideas stand next to each other so we can examine them together. As we ponder $2x$ and x^2 for different values of x we find two values of x for which they're equal and an endless number for which they're not and this clarifies the difference between the meaning of the two expressions. Keeping the ideas separate fails to make explicit what is the same and what is different about each and although it may give the appearance of success with each individual concept, I suspect in fact it merely conceals the confusion.

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A tease with Ts

Geoff Dunn

Some pupils in my school are exploring the well-known 'T on a grid' for GCSE coursework. Some of them are currently absorbed by the following investigation that arose naturally as part of their work.

Here are some T's on a five grid.

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25

Let us call the grey T $^6T_5$

This blue T is called $^3T_5$

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

This blue T is labelled $^9T_7$

The value of a T is the sum of the numbers in it.

So $^6T_5 = 6+7+8+12+17=50$

$^7T_5 = 7+8+9+13+18=55$ (of course it goes up by 5)

$^2T_5$ is directly above $^7T_5$ and so is 55 minus 25. (Check $2+3+4+8+13=30$)

$^9T_7 = 9+10+11+17+24=71$

Teachers will recognise one of those time stopping moments in class (an excellent and inspirational atmosphere?) when someone said "Is there a T that sounds like itself?"

There is something very engaging about the question.

Yes. $^3T_5 = 3+4+5+9+14=35$

That's interesting, three-T-five is thirty-five!

Are there any more like this?

On a five grid?

On other grids?

With different sized T's?

What about other letters?

We didn't get far with $^0B_1$ but is there a $^5O_6$ that makes 506? Or a $^7I_8$ that makes 718? Or . . .

Geoff Dunn teaches at Penrice Community College, Cornwall.

Surprise

Helen Williams

I was recently working in a nursery. I had most of the 24 children join me on the floor where I had laid out a tablecloth, a large pile of butter beans sprayed gold on one side and some empty film canisters. They were all busy running their hands through the pile of beans ('What can you feel?' 'What can you see?'), sorting out some to collect ('What can you find?', 'What do you notice?') and filling the film canisters with beans ('What can we do?'). It wasn't long before someone found a lid to fit and began to shake their pot of beans. This caught on (it makes a good noise).

My neighbour was shaking vigorously and smiling broadly at me, "NOISY!" After a while, he opened the lid and tipped them out. He was surprised that there were only four inside. He paused for a moment and then filled his pot as full as he could, having some trouble squeezing the lid shut and began to shake again. There wasn't a sound from his pot. Surprise. He tipped them out to check what was inside.

Jamming the lid shut again he turned to his other neighbour, shaking his full – and silent – pot vigorously in her ear. "Look . . . look . . . look what I got in here . . . !" He tips them all out – to her surprise and his pleasure.

I could sense his fascination at the contradiction – if only four beans make this loud noise, how much noise will all these beans make? (None?!) And his pleasure at trying to surprise (trick?) his neighbour.

I really believe that an element of surprise is a good hook for a learner . . . and a teacher. I hadn't 'planned' for this to happen – I hadn't foreseen it. But now I wait for it to happen and it usually does.

Helen Williams edits MT and teaches in early years' classrooms.

Time

Tony Cotton

We had been exploring a Y2 group's understanding of time. The 'objective' for the lesson was for children to understand half past and the hour. I was talking to Darren at the back of the classroom whilst his friends moved hands on toy clocks to show they could reproduce given times efficiently. This was the conversation:

Tony: What time do you get up?
Darren: Really early, to make sure I can get to school.
Tony: Does your mum get you up?
Darren: No – I get myself up so I have time for breakfast.
Tony: What time do you leave for school?
Darren: I don't know – I'm always very early for school though.

We then had to stop the conversation as one of Darren's friends wanted to know 'how you did half past seven?'.

I was left wondering; how does Darren 'tell' the time? He obviously has cues which signal to him it is time to get up. Maybe post arriving, or milk, maybe a television programme, but I couldn't find out, the pace of the lesson didn't allow for this. Given time I may also be able to persuade him that using a clock may be more efficient – he may not have to arrive at school so early!

Maybe on this occasion too much pace, too clear an objective had stopped me persuading Darren that telling the time was both something he could do and something worth him doing. Too much pace for us both to learn.

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Doug Averis took this on a trip to Tsarkoye Selo (St Petersburg). The palace and park became the summer residence of Peter the Great in 1708.