As an NQT I am aware I am writing this with a degree of inexperience. I may merely be reproducing thoughts and views espoused many times before by more experienced practitioners. Having said that, I believe I have much to offer in the way of my enthusiasm for teaching mathematics, being creative in my teaching and most importantly engaging the children I teach. This article sets out how I believe mathematics might be taught in creative ways. It is about my developing thoughts on how I teach mathematics, how my class responds to my teaching, and how I adjust my teaching through assessment of children’s learning.

I will start with an anecdote from a lesson as a trainee teacher. On my second PGCE placement I was asked to teach a lesson to a mixed year 3/4 class on place value. I decided, by putting out a selection of number cards on a main table, to give free choice to my class to multiply numbers of their choice by 10, 100, and 1000. They were to choose the level of difficulty they wanted, and I wrote in the lesson plan box ‘differentiation by outcome’. My lead mentor wasn’t happy. Her advice was that the children would simply go for the easiest numbers and the lesson would not challenge the more gifted mathematicians in the class. I was, therefore, instructed to change the lesson and give the class individual questions based upon the ability groups they were in. Up to that point I had not seen them do any mathematics, so I had no idea of the children’s abilities. I decided to teach my lesson as I had originally planned. The children loved it. They were up on their feet constantly going for the numbers they wanted to use. They proudly brought their calculations to show me. A huge number in the class went for the biggest numbers, and worked successfully with them.

That lesson gave me the confidence and knowledge that, with the right activity, resource and planning, a lesson can work with a whole class on multiple levels without the need to pigeon-hole pupils into differentiated groups with associated activities.

My PGCE was a period of intense, quality learning, where I encountered some inspiring lecturers and mentors. However, the pressure and formality of lesson planning creates an interesting contradiction for me. On the PGCE we constantly re-visited the idea of a variety of learning styles amongst individuals and the subsequent need to vary teaching to cater for so-called different learning groups – if we believe such groups exist and can easily be identified. We were then, however, required to produce lesson plans which differentiated for ability. When we plan, perhaps a consideration for different learning types may be as valid as consideration for varying abilities. During teaching practices I observed several lessons where pupils spent, in my opinion, far too much time listening to, and observing, teachers explain and attempt to model mathematical concepts and ideas. Pupils were then often shown two or three different activities or worksheets to cater for these differentiated groups, again detracting from time that could be spent actively learning.

Good fortune has led me to a one-year contract in the supportive environment of Staveley CE Primary School in South Cumbria. I have a headteacher and mentor who enable me to express myself in the classroom and develop my teaching style with good, professional guiding hands. I have been given the opportunity to utilize my ideas within a flexible framework. I spend significant time planning lessons which enable self-differentiation.
This results in pupils becoming actively involved following a minimum of ‘teacher talk’.

An early lesson I taught to my Year 4/5 Class was a problem using playing cards from 1 to 8. Pupils had to choose any four different cards and make all the combinations that summed to twenty. I had thought I could try lower or higher totals, or more or fewer cards to differentiate. It wasn’t necessary. The more able pupils pushed on and produced a few of the seven possible combinations really quickly. I then asked if they could find a strategy to get them all. The lower ability children used the ‘20’ they were clearly practising number bonds. If pupils had ‘over-guessed’, then they just had to subtract. Children were learning all the time; the more able mathematicians realising how they could structure their answers.

In my plenary we looked at the set of four cards it couldn’t be, by making the highest total that couldn’t reach 20 – for example, 3+4+5+6. So, the class knew that once they had exhausted all the combinations with 7s and 8s in, they were finished. The key to the success of the lesson was minimal talking by me, and maximum challenge for the pupils. The children were encouraged to share their work, and this has become a standard aspect of my practice.

Here is a similarly effective dice game. I explained to the class they were going to practise their addition, multiplication, subtraction and place value – all in one game. The game involved rolling a dice four times to make a score of 100. The key rule of the game is that any of the dice scores rolled can be multiplied by 10. For example, you could roll 4, 2, 5, 1 – and convert that to 40 + 2 x 50 + 1 to make 93. However, pupils must decide at the time the dice is rolled whether to multiply it by 10, or not, before the next dice is rolled. After modelling and playing against another pupil the class split into groups to play against each other. At this point I could easily have left the classroom for the rest of the lesson; so engrossed were the children in the game they would not have noticed my absence. We finished with a ‘beat the teacher’ game and the lesson was complete. The key to differentiation here was that by arranging the learners in mixed groups, some taught others without realising. A challenge for some children could be to work out the difference from 100 each of their scores reached, and to tally the different results.

I must stress that the germ of the idea of both these activities are not mine. One of the skills of teaching is surely to use and adapt existing examples of good practice. I have had the class use 9-pin geoboards to create all the non-congruent triangles and quadrilaterals possible. The Year 4/5 class were all able to engage with these tasks in mixed groups. For the quadrilateral task I started a master sheet of answers on the interactive whiteboard, allowing group members to take turns updating the sheet with more and more answers. This created a crescendo of excitement as we neared the last possible permutations, to the extent that the class refused to leave until we got all 16 possible quadrilaterals. We had a late lunch that day.

Anything I do with measurement, shape and data handling involves hands-on mathematics where pupils usually work in groups of their choice. I simply set clear boundaries, and levels of expectations, when it comes to behaviour and a desired outcome of the lesson. The class seems to respond to this perceived generosity, in allowing them to work with their friends, by working hard.

I also like children to make their own resources. We have made our own multiplication table charts, personalised and decorated by the learners. When we hit a hurdle, and struggled on division, I got the class to revert back to concrete learning and make resources like number beads to help out with our calculations. We also spent some lessons making scale drawings of ourselves. The class had immense fun doing this; measuring each other then scaling the measurements down to create their drawings. The mathematics here was in-depth where pupils:

- Used much mathematical vocabulary.
- Practised using units of measurement.
- Rounded measurements to the nearest centimeter.
- Compared decimals to fractions when dealing with a remainder after simple division.

Learners were not just then dividing, but going from the concrete to abstract in dividing and creating scale drawings. This was an introduction to ratio without them knowing it.

I have a great deal of evidence to suggest that the pupils I teach are all progressing well in their mathematics. More importantly, they all appear to enjoy our lessons, are enthusiastic about mathematics, and are keen to learn. If this enthusiasm for the subject can be fostered now it will surely pay dividends in the future.

Through observations and assessment of learning following my teaching I firmly believe learning in mathematics should be through shared, active, problem-solving experiences.

Phil Cooper teaches at Staveley CE Primary School in South Cumbria.
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