Exploration Versus Calculation

By Bernard Bagnall

The purpose of this article is to share some thoughts about different aspects of helping children with their development of mathematics.

I was involved in looking at the large collection of activities that were under the heading of "area" on NRICH when I noticed a big difference that would divide the activities into two. There was Circle Panes, Numerically Equal, Inside Seven Squares, Sending a Parcel, Framed, Disappearing Square, Appearing Square and Plutarch's Boxes. (You can find these resources by clicking on the links or by typing their title into the keyword search box in the top right-hand corner of the NRICH page, then clicking on "Title search".) All these activities were about 'calculating' areas in different, and sometimes difficult, situations. They involved having knowledge of various formulae and an understanding of when and how to apply them. In a way they are activities which involve arithmetic in a similar way to using arithmetic to work out the cost of shopping.

4 articles @ £1.99 each
4.5 metres of material @ £5.39 a metre
3 bottles @ £2.49 each [special offer 3 for 2]

What change would there be from a £50 note?

The remaining activities were Pebbles, Great Squares, Two Squared, Transformations on a Pegboard, A Square in a Circle, Making Boxes, Tiles on a Patio, My New Patio, Rope Mat, The Big Cheese and Dissect. These problems require no particular knowledge of formulae to do with the calculation of area in different situations. They require pupils to be able to count, and probably, cut paper, draw, use a ruler, look out for patterns and start to observe systems that they use, to question and to feel the freedom to think and be creative.

I call the first group the "Calculation Style" and the second group the "Exploration Style". I believe that at the end of the Calculation ones the pupils may feel more secure about their knowledge of formulae and, be more confident to tackle similar problems in other areas of the subject. Some of the best pupils would feel proud that they managed it all and got them "right". You, the teacher, may have used them for reinforcement and/or assessment reasons. For the Exploration activities I believe that most pupils would have their concepts of area enhanced, would have discovered something new, would have been creative and would have sustained their work for a prolonged period of time. You the teacher, would have used the activities for these kinds of reasons.

I would suggest that you try the two kinds with your pupils and see what results they bring. When I was taught in the 50's it was a matter of "Here's how you do it; Copy it; Repeat it many times; Use it" and then you'll know it for life! How untrue that was unless you had a natural flair for it, in which case you got bored. The Calculation activities are still quite close to the work in those days but have an important role to play in keeping pupils focussed, readily supplying assessment and building up confidence. Whereas the Exploration ones have got much more of the 'Using and Applying' part of the Curriculum at their heart and at the same time help the pupils to develop concepts in that part of Mathematics. The other important aspects of the Exploration activities are that they are accessible to a very wide range of ability. For example The Big Cheese is accessible from

year two pupils and has the potential to excite postgraduate students too.

Thinking and creativity are so very important aspects of learning that it seems to be a huge advantage to working with the explorations. Therefore when starting on some new topics of the Mathematics curriculum I would encourage the exploration approach to enable thinking, creativity, enhanced concept development, enjoyment and motivation. Whereas starting off with the Calculation style is more likely to please only a few and dis-engage many. So we need a mixture of both kinds of activity and a balance that helps the pupils in every area of their learning.

Published February 2011