## With and Across The Grain

Anne Watson (2000) came across some learners asked to copy and complete a table based on the following structure

7 x 1 = 7 1 x 7 = 7 7 ÷ 1 = 7 7 ÷ 7 = 1

7 x 2 = 14 2 x 7 = 14 14 ÷ 2 = 7 14 ÷ 7 = 2

… … … …

She noted that when learners follow a simple number pattern to anticipate the next and future terms, they are acting in a manner which is similar to going with the grain of a piece of wood: fresh wood splits relatively easily along the grain. This matches my experience of offering people sequences of terms in which everyone (mathematicians and non-mathematicians alike) quickly work out the pattern and can predict the next and future terms. Going with the grain on sequences and grids means following simple patterns such as writing all the 7s in the first column, then all the multiplication signs, then the numbers 1, 2, 3, … and so on. Cutting across the grain reveals the structure of wood, so *going across the grain* can be used to refer to the act of making mathematical sense of relationships, here, between the different entries in a row of the table, which is presumably what the authors intended learners to encounter.

The phrase *with and across the grain* can shift from description to action when it reminds teachers to prompt learners to make mathematical sense and so turn copy-and-complete from a clerical exercise into a significant and relevant mathematical experience. Another way of saying this is that in order for doing a task to influence learning, it is necessary to prompt learners to see the general through (each of) the particulars, and then to see each of the particulars in (as instances of) the general. This two way process was summarised by Alfred Whitehead (1932):

To see what is general in what is particular and what is permanent in what is transitory is the aim of scientific thought. (p4)

I prefer to rephrase it more expansively: ‘to see the general through the particular and the particular in the general’ and ‘to be aware of what is invariant in the midst of change’ is how human beings cope with the sense-impressions which form their experience, often implicitly. The aim of scientific thought is to do this explicitly.

*With and Across the Grain*, when internalised as a description of actions which a teacher can take to direct learner attention, has become a teaching framework which enhances or structures learning. When taken up by learners, it acts as a framework for learning. As with other teaching-learning frameworks, it serves to bring to mind actions which might enrich learning, but which might otherwise have slipped by unnoticed.