Book review

by Colin Foster.

Colin Foster reviews *Practising mathematics: Developing the mathematician as well as the mathematics*. ATM. ISBN 978-1-912185009. Price £16.00.

Many ATM publications provide an abundance of rich tasks for introducing new mathematical ideas and developing learners' conceptual understanding and mathematical reasoning. But what about when you just need your learners to practise a specific important technique? I have often heard creative mathematics teachers say things like, "Well, every now and then you have to have a boring lesson where they just practise things". If you have ever wondered whether there could be better ways to generate useful practice than subjecting learners to tedious, repetitive exercises, then this new book has the answer.

In the book, Tom Francome and Dave Hewitt outline what they call "practice through progress" (p.5) in which "[it] is possible to shift the focus of attention so that the mathematics you would like learners to practise and develop their fluency with is subordinated to some other purpose" (p.6). The big idea here is to have what Dick Tahta called an "outer task", which is what the learners are overtly asked to do and is where their attention is likely to be, while at the same time there is an "inner task", which is the mathematics that the teacher *really* wants the learners to be working on. In this way, learners are practising an essential technique while at the same time progressing with a different but connected area of mathematics.

One way to do this is to design a scheme of work so that practice of one topic is systematically embedded into future work in later topics. For example, if learners have worked on multiplying fractions and the next topic is calculating areas of rectangles, then we could ensure that some of those rectangles have fractional dimensions. We might hope that gradually the multiplication of fractions becomes increasingly automatic, so that learners' attention shifts onto the new topic area. If the next topic after that were, say, straight-line graphs of the form $y = mx + c$, fractions could be incorporated as m and c, and rectangles might also be brought in by constructing them from four straight lines, with learners calculating their areas. This approach allows learners to make rich connections between different topics and offers powerful opportunities for deep mathematical thinking.

In the first section of the book, the authors lay out what they mean by "practice through progress", explaining how this enables teachers "to support learners in asking questions, making conjectures, being organised and systematic, looking for patterns, noticing things and communicating what they have noticed and in explaining and justifying their ideas" (p.3). The approach they advocate makes perfect sense by capitalising on the learners' accumulating knowledge and skills to enable them to tackle subsequent topics, while systematically embedding practice and revision of these skills as they go.

The second half of the book shows how this approach can be implemented. The authors present a vast number of rich mathematical tasks, organised by the skill which might be practised through them. So, if you look up "angles", for example, you find tasks which would generate plentiful practice of drawing and measuring angles. However, rather than having learners do this in a pointless context, there is real purpose. Learners' measurement of angles inside shapes constructed on circular geoboards enables them to form and test conjectures, leading to circle theorems. Not only is this of far greater mathematical interest, it indicates how measurement of angles can be purposeful for worthwhile mathematics. And by leading learners' attention away from the nitty-gritty of measuring an angle and onto higher aspects of the task, we increase the chances of them automating the angle-measuring process and developing greater fluency.

The rationale of this book is in perfect harmony with the guiding principles of ATM and, if taken up in classrooms, has the potential to rescue learners from the tedium of endless exercises. The authors have done a fantastic job of collecting and arranging these tasks so as to make them easy to find and use. The next time you are about to shrug your shoulders and use a set of uninteresting exercises, take a look in this book. You may find a task that will achieve the same goal but in a far superior way.

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