REVIEWS

Key Stage 3 Mathematics: A Guide For Teachers

Annie Gammon

Secondary school maths departments are currently building small mountains of binders and boxes from the KS3 Strategy. So why pay out £50 on another folder to add to the pile? ***Key Stage 3 Mathematics*** is different in that it brings together all of the issues and developments that form the Strategy as well as more general topics that any developing department should spend time on.

The author is a numeracy consultant in London and was involved in piloting the strategy, and the file draws together the best elements of the training but in a much less time-consuming form. The eleven chapters cover topics such as lesson structure, planning, assessment, groups with particular needs, and transition into Y7. Each page is clearly laid out with really useful boxes illustrating the points made; examples of resources in the lesson planning chapter, annotated excerpts from the framework in the planning chapter. There are also clear examples from other schools' policies and points at which to reflect on one's own ideas.

At the end of each chapter, three or four Inset activities are provided for a department to work together on developing use of calculators, for example, or learning from misconceptions.

For a school that is already getting plenty of support from their LEA and has undertaken the training, some of the materials will be unnecessary, eg, auditing the department, cross-curricular numeracy. However a department with little time or support available, with non-specialist teachers or recruits from abroad, will find some sections ideal for going through with staff to make them au fait with what is required in the classroom.

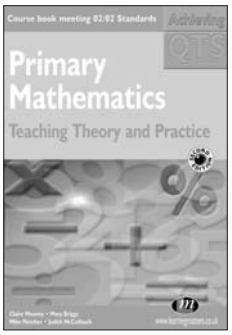
It is most useful as a reference guide for heads of department; and with clear and thought-provoking advice on structuring lessons, recently-qualified and returning teachers will find it a good summary of the issues involved as well.

Adam Creen teaches at Salesian School, Surrey.

Key Stage 3 mathematics: a guide for teachers, Annie Gammon, Beam, 2002, ISBN 1 903142083

Primary Mathematics Teaching Theory and Practice

Claire Mooney, Mary Briggs, Mike Fletcher & Judith McCullouch



Primary mathematics teaching theory and practice, Claire Mooney, Mary Briggs, Mike Fletcher and Judith McCullouch, published by Learning Matters, 2002, second edition.

This book is aimed at trainee primary teachers and addresses the requirements for attaining QTS with respect to the teaching of mathematics.

It is well structured, beginning with a clear overview of the recommended form of the daily mathematics lesson and including a chapter devoted to early years mathematics teaching. The main content analyses progression and misconceptions in each of six areas in turn: *number*; *shape and space*; *measures*; *handling data and probability*; *algebra* and *calculation*. Finally, the authors discuss teaching strategies followed by the management of planning and assessment.

It is difficult to know where to start in describing the qualities of this book. The style in which it is written is perfect for the intended audience, making it easily accessible. Any subject-specific language is clearly defined and no assumptions are made about the reader's mathematical background. Practical tasks are suggested, some of which encourage reflection on contrasting theory and practice in the classroom; others which aim to develop personal mathematical knowledge and skills.

Practical advice is abundant. The book makes an effort to consider issues and scenarios in *real* classrooms, ranging from making the most of available resources to improving furniture arrangements. The chapters which tackle progression and misconception are excellent. Examples of appealing and stimulating activities are

woven into the text and confusions which arise, for example as a result of everyday use/misuse of mathematical words, are highlighted. The pointers for observing practising teachers will be invaluable to trainees on early teaching placements.

Throughout this book research summaries are included which supply a context to the theory and give weight to the content. References to other parts of the book itself and also further reading material, are provided in the margin and each chapter is clearly summarised.

The only disappointing feature of this book is the not infrequent occurrence of typing errors (and the misspelling of NRICH!). However I believe it to be invaluable, not just to those in training, but also for dipping in and out of during the first few years as a qualified teacher. It blends useful, realistic classroom guidance with the reader's own mathematical development, reinforced by relevant and manageable research summaries.

Liz Pumfrey is a Primary Teacher Research Associate with NRICH.

Hinged dissections: swinging and twisting, Greg N.Frederickson, CUP 2002, ISBN 0 521 81192 9, £35.00 hardback

Hinged Dissections: Swinging & Twisting
Greg N. Frederickson

This book is a sequel to ***Dissections: plain and fancy*** [1]. It is concerned with the same type of problem, cutting a shape (typically a regular polygon) into as few pieces as possible so that they can be rearranged into a different shape, but with the additional condition that the pieces must be hinged together. The rearrangement cannot consist of moving each piece separately, but is more like uncoiling a chain of shapes and re-coiling it the opposite sense.

As in his earlier book, Frederickson has taken great care to credit solutions accurately, and place them in a historical perspective. In particular, the detailed presentation of techniques for solving these problems is interspersed with a series of short chapters reviewing the contribution of Henry Dudeney, assessing his individual contribution against that of his correspondents. He has also included occasional sections on related themes (such as colouring hinged dissections, hinged tessellations, hinged-convertible polyominoes).

Again, like the earlier book, there are some puzzles left for the reader (answers at the back), but I have even stronger reservations about the new book's place in schools, since it is essentially a collection of solutions. Certainly any student who was motivated to work through even a few of the technical sections would begin to develop considerable geometrical insight. It is very well illustrated, and many of the dissections have an immediate visual appeal, but the subject is very specialised, and I cannot imagine many of the pupils I teach spending much time with it. The preface identifies the intended audience as 'anyone who has had a course in high-school geometry and thought that regular hexagons were rather pretty', and it could be an interesting addition to a further education library.

Paul Gailiunas teaches at Gosforth High School, Newcastle.

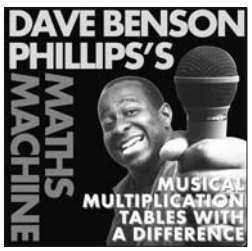
Reference

1 Greg N. Frederickson: ***Dissections: plain and fancy***, CUP, 1998

Dave Benson Phillips's Maths Machine
Hillier-Stevens Music 2001

This CD contains three versions of eleven songs, one for each of the tables between two-times and twelve-times. Each table has a story connected with it, based on a distinctive theme. For example, the eight times table story is called *Elephant Dream*. Each line of the story ends with a rhyme for the answer, and the songs are each sung in three different ways, with more missing each time. For example;

1 'An elephant walked through the door, Three times eight is twenty-four.'



Dave Benson Phillips's Maths Machine, Hillier-Stevens Music 2001, number H501CD

There is a web site; www.mathsmachine.com/

2 'An elephant walked through the door, Three times eight is _____.'
3 'An elephant walked through the door, _____.'

with the intention that the pupil fills in the missing part. My son Simon (8) writes;

It was a bit hard when they didn't say the answers but I did know the units. For example:
'An elephant walked through the door.'
'3×8=_4.'
It did still help me though.

He certainly found the tunes catchy, and even asked if he could listen to it while doing his literacy homework 'to help me concentrate'! A possible danger of using this rhyming method is that it may reinforce a wrong answer; for example, my ten-year-old daughter filled in eleven twelves as one hundred and forty-two, so I made sure she realised this was wrong straight away. The CD format makes it very easy to pick out the table and version you want; it would even be possible for you (or one of your pupils?) to program a certain sequence as required, or to repeat tracks while they were being learned. Used appropriately, this CD could form a popular and effective element of your numeracy teaching.

Paul Strickland teaches at Liverpool John Moores University.

Alan McLean reviews four books on training to teach

I was pleased to have the chance to review these texts with their suitability for PGCE students in mind. Texts designed to support ITE students tend to come in two varieties – the course text and the reader. Course texts tend to be based around the philosophy, course structure and student needs in one particular institution; often they are based on course notes developed over some years and can therefore be well trialled and comprehensive in coverage. However their particular structure, and specific school tasks to support this, can make them a less flexible resource for other courses. Readers provide a collection of essays by experts in the field; if the whole is not suitable as a core text, tutors can pick chapters that support their own course.

Aspects of Teaching Secondary Mathematics: Perspectives on Practice

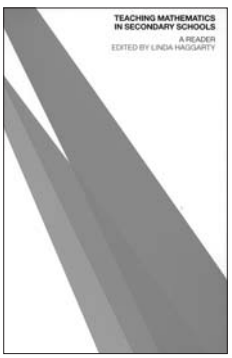
Editor Linda Haggerty

Aspects of teaching secondary mathematics: perspectives on practice, Editor Linda Haggerty, published by Routledge Falmer, 2002, 284 pages, ISBN 0415266416, Price £18.99

Aspects of teaching secondary mathematics and ***Teaching mathematics in secondary schools*** are the set books for the Open University's PGCE course. In ***Aspects***, each of the chapters is by a respected researcher and provides an overview of powerful ideas about teaching and learning mathematics; they also offer practical strategies for work in the classroom. While many chapters would repay close study, I particularly liked John Mason's review of the nature of algebraic generalisation, Keith Jones's analysis of the key ideas in the often muddled world of school geometry and Tim Rowland's thoughtful discussion of mathematical language. This is clearly a text which should be available for reference in any UDE library and in training school departments. So why do I feel dispirited reading much of it? Partly it may be the 'heaviness' of the page layout and of some of the text, but more importantly I found it difficult to imagine many of my students finding suitable practical entry points to begin to engage with the ideas presented.

Teaching Mathematics in Secondary Schools: A Reader

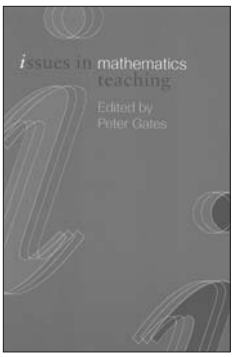
Editor Linda Haggerty



This is the companion volume to ***Aspects***. A wide-ranging collection of articles, it provides background reading on key ideas and contempo-

Teaching mathematics in secondary schools: a reader, Editor Linda Haggerty, published by Routledge Falmer, 2002, 272 pages, ISBN 0415260698, Price £18.99

rary issues in mathematics education; it can be recommended for ITE students and for teachers who wish to develop their thinking and practice. The articles are all by researchers whose names will be familiar to readers of MT. Some articles focus on a specific aspect rather than providing an overview of developments and so more quickly achieve a depth of analysis. In this category I found Dave Hewitt's discussion of the 'arbitrary and necessary' in mathematics and Mary Barnes's description of 'magical moments' in mathematical discovery particularly insightful and valuable. However I could not find enough essential reading to insist all my students buy this as a core text.



Issues in mathematics teaching, Editor Peter Gates, published by Routledge Falmer, 2001, 311 pages, ISBN 041523865X, Price £17.99

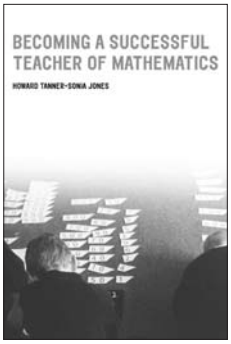
Issues in Mathematics Teaching
Editor Peter Gates

Issues in teaching mathematics is another reader which covers similar ground to the OU text, and has some of the same contributors, but is addressed both to a primary and secondary audience. A good deal of thought has been put into the style and approach and, helpfully, each chapter has a similar format with an introduction, key questions and invitations to reflect on the issues raised; this does help to make the text more accessible even when complex issues are being addressed. 'Issues' in the title is taken seriously and there is an aim to make the politics of mathematics education explicit throughout the book; a central belief is that mathematics teachers can contribute to making the world a fairer place. Some of the most distinctive chapters focus on the wider context of mathematics teaching: there are very helpful suggestions for developing PSMSC in mathematics from Jan Winter; the analyses of ethnic underachievement by Derek Kassem and of 'real-life' assessments by Barry Cooper will be valuable reading for any student or practicing teacher. Again I would find this useful as a source of articles rather than as a core text.

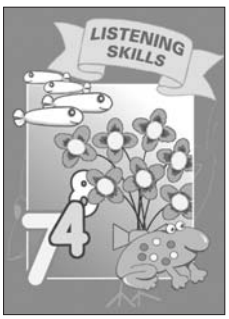
Becoming a Successful Teacher of Mathematics
Howard Tanner & Sonia Jones

Becoming a successful teacher of mathematics is a course text, clearly derived from the authors' experience of teaching the Secondary PGCE course at the University of Wales. As such, I approached it with some misgivings: the structure of chapters and school tasks do not really fit with our own course and there are references to particular Welsh circumstances which are not always helpful. However, the more I have read this book, the more positive I have become about it. This is a very practical guide to teaching mathematics but one which wears its considerable erudition lightly. This may be because evidence from national and international research is integrated with the authors' own research, much of it conducted collaboratively with local teachers. The result is a description of the nature of teaching mathematics, the issues arising and of available research evidence which is explicitly grounded in practice. Another key feature is that the text draws on the best aspects of mathematical education from the last 20 years (yes, Cockcroft is mentioned!) rather than concentrating on only the most recent developments and therefore gives a view of current practice which would be easily recognisable by practitioners. The text is accessible to a new trainee teacher and this is helped by each chapter having a similar format with objectives, short tasks within the text and a summary of the main points. Overall this book can be highly recommended. Certainly I have now found a core text for our PGCE students.

Alan Mclean teaches at Rolle School of Education, University of Plymouth.



Becoming a successful teacher of mathematics, Howard Tanner & Sonia Jones, published by Routledge Falmer, 2002, 233 pages, ISBN 0415230691, Price £15.99



Listening skills – maths early years, Sandi Rickerby and Sue Lambert, published by The Questions Publishing Company Ltd, £12.99, ISBN 1-84190-082-6

Listening Skills – Maths Early Years

Sandi Rickerby and Sue Lambert

"Children don't listen nowadays." How often we hear this complaint from teachers?

If children listened to everything around them, they would go mad – tv, radio, music of all kinds, as well as all the chattering and clattering of school. They have to learn to listen selectively. In fact, they need listening skills.

When I saw the title ***Listening skills – maths early years*** I thought, 'if that's good, it could be very useful'.

Each child in the class or group has a sheet. The teacher reads the instructions, once and once only. The children respond by colouring in accordingly. For example, on one page there is a large picture of a clock face. One of the fourteen instructions reads, 'Use green to colour the number which comes between 7 and 9'.

I used two sheets with a group of Y2 children. They listened, even the real chatter-boxes were attentive. They had to think, but it was not too hard for them.

I went into another school to work with the Y3/4 teacher. "They are the worst lot I have ever had for not listening," she complained. We tried a couple of sheets despite the fact that they were really too easy for the class. During the first one several children were not attending, and this was obvious when they leant over to copy from their neighbours. The second time all of them listened.

I asked the class if they would like to do a similar one sometime. Every hand shot up, none looking to see how others were responding.

We discussed the work. The word 'enjoyed' was much used. Rebecca said, "It was easy, but if you don't listen you don't know what to do. It's hard if you don't listen!"

I have only two reservations that could prove to be a problem. The whole group need access to about eight different coloured pencils, all using the same colour at once. Also some children colour in much faster than others, although this can be rectified by allowing some finishing time at the end.

Listening skills – maths early years is a spiral bound photo-copiable book with fifty A4 worksheets plus instructions. The worksheets are well designed and varied both mathematically and pictorially. The difficulty ranges from simple number recognition to the addition of several numbers under ten.

Each school into which I have taken the book, has ordered it. What better recommendation could there be!

Jenny Murray is an independent maths consultant.

101 Red Hot Starters

Kathryn Stahl

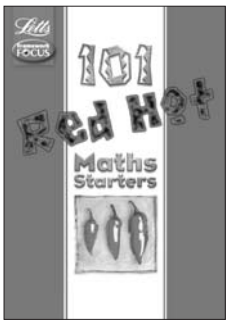
This book is what is says it is!

Everything about it is simple and effective. The contents grid links each starter to a specific year group and an objective. However all the activities are extremely flexible and can be adapted to fit any ability and many address more than one objective.

The starters are grouped into different topics. For example there are seventeen starters related to integers, powers and roots. They are arranged in a progressive fashion, with some more suitable to Y7, then Y8 and Y9.

Each starter is organised so that you can see exactly what resources are needed. On occasions you need to prepare an overhead transparency. The activities are all explained in simple English and are incredibly easy to follow. Answers are provided and there are suggestions for making the challenges harder or less challenging.

Students enjoyed doing the starters. A particular favourite and an activity that had a 'wow' factor was the *Asian Square Roots*. In this activity, students practised consecutively subtracting odd numbers from a given square



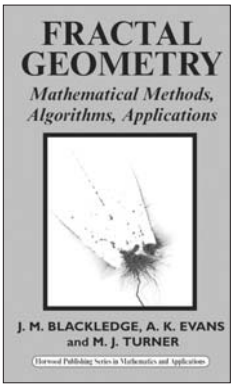
101 red hot starters, Kathryn Stahl, published by Letts, ISBN 184085 6963, Price £4.00

number to find the square root. For those of you that don't know this activity, see page 27! Many found the activity quite challenging as they discovered they very rarely subtract in their heads, tending to add on.

All areas of the curriculum were covered.

This is a really good little book to have in your box of tricks as it could be used at any moment to provide an activity that would capture the students' attention and get them engaged in the opening of a lesson.

Kersten Watkins teaches at Jersey College for Girls, Channel Islands.



Fractal geometry: mathematical methods, algorithms and applications, edited by Jonathan M. Blackledge, Allan K. Evans and Martin J. Turner, published by Ellis Horwood, 2002, ISBN 1-904275-00-1

Fractal Geometry: Mathematical Methods, Algorithms and Applications

Editors Jonathan M. Blackledge, Allan K. Evans and Martin J. Turner

Ever since Mandelbrot published his seminal work, ***The fractal geometry of nature***, in the 1980s, [1] interest in possible applications of fractal geometry have grown. Whereas classical geometry deals with objects of integer dimensions (such as zero dimensional points, one dimensional lines and curves, two dimensional plane figures like squares and circles, and three dimensional solids such as cubes and spheres), fractal geometry covers non-integer dimensions, including mathematical structures like the Sierpinski triangle, Koch snowflake and Peano curve. Applications of this mathematics, and it links to other aspects of the mathematics of dynamical systems, include ways of describing many real-world objects, such as clouds, mountains, turbulence, and coastlines, that do not correspond to simple, integer-dimension geometric shapes. More recently, important applications of fractal geometry have been developed in a number of areas from geology (such as modelling soil erosion and analysing seismic patterns) to economics (such as analysing financial time series).

This edited collection is a result of a conference organised by the Institute of Mathematics and its Applications, its first on fractal geometry (held in September 2000). The book contains 11 chapters, most of which were written by members of, or visitors to, the Institute of Simulation Sciences at De Montfort University (where the conference was held), an interdisciplinary research centre concerned with mathematical and computer simulation, image and signal processing, and optics. The collection is wide-ranging, covering applications of fractal geometry in aircraft design, finance, geology, digital image compression, and cryptography. As a book aimed at researchers in fractal geometry, this is a useful book for those with some expertise in the subject. It is also something to be consulted for anyone wishing to move beyond the popular misconception that fractal geometry is nothing more than pretty pictures. For ideas on how fractal geometry is influencing school and undergraduate mathematics education, it would be worth consulting Frame and Mandelbrot (2002) [2].

Keith Jones works at the Centre for Research in Mathematics Education, University of Southampton.

References

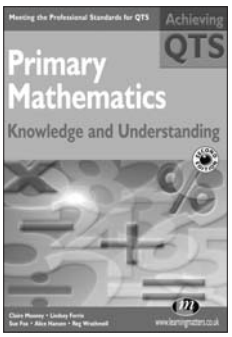
1 B.B. Mandelbrot: ***The fractal geometry of nature***. New York: W. H Freeman, 1982.

2 M.L. Frame and B.B. Mandelbrot: ***Fractals, graphics, and mathematics education***. Washington, D.C., Mathematical Association of America, (MAA Notes 58) 2002.

Primary Mathematics Knowledge and Understanding

Claire Mooney, Lindsey Ferrie, Sue Fox, Alice Hansen, Reg Wrathmell

This is the second edition of one of the many books that have been published in response to government requirements for beginning primary teachers to have subject knowledge up to (roughly) level 7/8 in areas of mathematics appropriate to the KS2 mathematics curriculum. These requirements were enshrined in the DfEE circular 4/98 Annex D 'The initial teacher training national



Primary mathematics knowledge and understanding, Claire Mooney, Lindsey Ferrie, Sue Fox, Alice Hansen, Reg Wrathmell, published by Learning Matters, Achieving QTS series, ISBN 1 90330055X

curriculum for primary mathematics'. However the revised standards for initial teacher training Qualifying to Teach which came into force on 1 September 2002 do not have the same level of prescription.

The book has seven chapters most cover mathematical content (*Number*; *Algebra*, *equations*, *functions and graphs*; *Measures*; *Shape and space*; *Statistics and probability*), there is an introduction and an interesting chapter on mathematical language, reasoning and proof. Useful links are made between chapters though notes in the margin. The structure of the chapters makes it slightly different to other books that are available. At the start of each chapter clear brief links are made with the *Curriculum Guidance for the Foundation Stage*, the *National Curriculum programmes of study for Key Stages 1 and 2* and the *National Numeracy Strategy's Framework for Mathematics*. There is also a useful summary of current research in the area.

The summaries of content knowledge and understanding under the heading *Professional standards for QTS* do not distinguish between content that primary children will meet and 'desirable background knowledge'. For example in Chapter 5 on Shape and Space (p. 75) the list includes '*using Pythagoras' theorem; calculation of the area of circles and sectors, the length of circumferences and arcs; . . .use formulae for the surface area and volume of prisms*'. At the end of each chapter there are suggestions for further reading and a short self-assessment. Answers are provided at the back of the book.

A strength of the book is the way that pieces of content are related to an example of a child's error. For example (p. 20)

> *Lotti is asked to add the following fractions:* $\frac{1}{4} + \frac{1}{4} + \frac{1}{2}$
> *She tackles the problem as follows:*
> $\frac{-}{4} + \frac{-}{4} + \frac{-}{2} - \frac{-}{8} + \frac{-}{2} - \frac{-}{10}$
> *What does this tell you about her understanding of fractions . . .?*

Whilst this is generally a good strategy, I question whether using algebra to represent the relationship '*multiply a number by itself, add two then halve*' (p. 43) is appropriate at KS2. In the example on plotting co-ordinates (p.93) it would seem to me that Sam's problem is he hasn't labelled the axes, and this isn't mentioned at all. Indeed in all the examples in the text (p.56-8, p.94-5) the axes are not labelled.

The first piece of content in the book is about precedence of operations and the acronym BODMAS (p.8) is introduced. Like many others I have a problem with BODMAS – it implies that division has precedence over multiplication, and that addition has precedence over subtraction – neither of which are true. I always have to ask 'What does O stand for?' Order is probably the best answer, meaning *powers* – but as order is rarely used when discussing powers it may be preferable to use I for indices (the superscript numbers that denote powers) or E for exponent (again referring to the superscript number). I have seen both BIDMAS and BEDMAS used, although I know that BODMAS is popular with published schemes and the national numeracy strategy.

In this book the common error that O is for 'of' is made. This is not explained but in the self assessment (p. 39) the following calculation is presented:
$10 \div 2 + 8 \times 3 - \frac{1}{2}$ *of* $6 + (4-2)$
Firstly the brackets are not necessary, and more importantly 'since when was *of* a mathematical operation?' Surely the calculation should read:
$10 \div 2 + 8 \times 3 - \frac{1}{2} \times 6 + 4 - 2$
There is no ambiguity, which is the reason for using brackets. Brackets could be used in various places to make answers of -4, 2, 22, 103 and…

Unfortunately this is not the only place in the book where mathematical errors are made. Whilst errors in books of this type are not uncommon, partly because mathematics teachers do not necessarily agree on conventions and practices, I am concerned about the number of errors in this particular book. Should you choose to use it, do take care.

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The Association of Teachers of Mathematics
for mathematics educators
primary, secondary and higher

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