THIRD EDITION

TEACHING MATHEMATICS IN THE SECONDARY SCHOOL

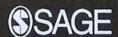
PAUL CHAMBERS AND ROBERT TIMLIN



THIRD EDITION

TEACHING MATHESECONDARY SCHOOL

PAUL CHAMBERS AND ROBERT TIMLIN



Los Angeles I London I New Delhi Singapore I Washington DC I Melbourne



Lite Angeles: | London | Now Delhi Singapore: | Washington DC | Meboure

SAGE Publications Ltd 1 Oliver's Yard 55 City Road London ECTY 1SP

SAGE Publications Inc. 2455 Teller Road Thousand Oaks, California 91320

SAGE Publications India Pvt Ltd B 1/I 1 Mohan Cooperative Industrial Area Mathura Road New Delhi 110 044

SAGE Publications Asia - Pacific Pte Ltd 3 Church Street #10-04 Samsung Hub Singapore 049483

Editor: James Clark

Assistant Editor: Diana Alves

Production editor: Tanya Szwarnowska

Copyeditor: Jane Fricker Proofreader: William Baginsky Indexer: David Rudeforth Marketing manager: Lorna Patr

Marketing manager: Lorna Patkai Cover design: Naomi Robinson

Typeset by: C&M Digitals (P) Ltd, Chennai, India

Printed in the UK

© Paul Chambers and Robert Timlin 2019

First edition published 2008, reprinted twice in 2009, in 2010, 2011 & 2012
Second edition published 2013, reprinted in 2013, twice in 2016 & twice in 2017.

Apart from any fair dealing for the purposes of research or private study, or criticism or review, as permitted under the Copyright, Designs and Patents Act, 1988, this publication may be reproduced, stored or transmitted in any form, or by any means, only with the prior permission in writing of the publishers, or in the case of reprographic reproduction, in accordance with the terms of licences issued by the Copyright Licensing Agency. Enquiries concerning reproduction outside those terms should be sent to the publishers.

Library of Congress Control Number: 2018953889

British Library Cataloguing in Publication data

A catalogue record for this book is available from the British Library

ISBN 978-1-4739-7427-2 ISBN 978-1-4739-7428-9 (pbk)

At SAGE we take sustainability seriously. Most of our products are printed in the UK using responsibly sourced papers and boards. When we print overseas we ensure sustainable papers are used as measured by the PREPS grading system. We undertake an annual audit to monitor our sustainability.

CONTENTS

4	bout the Authors		
	cknowledgements		i
	ublisher's Acknowledgements ew to this Edition		х
			Xi
11	ow to Use this Book		xii
1	Teaching Mathematics		1
	Your early days as a trainee teacher		
	Professionalism		-
	Motivations		2
	What is mathematics?		e
	Why should mathematics be taught?		10
	Numeracy and mathematics		11
	Evidence from the research		13
2	Fundamentals of Teaching Mathematics		19
	School policies		20
	Departmental policies		21
	Spiritual, moral, social and cultural education		21
	The development of the National Curriculum in	n mathematics	24
	The structure of the National Curriculum		27
	Progression in mathematics		28
	Proof in the school curriculum		32
	Proof and justification		34
	Proof and fallacy		37
	Evidence from the research		39

3	Planning to Teach a Mathematics Lesson	45
	Long-term planning	46
	Medium-term planning	48
	Short-term planning	54
	Planning mathematically	57
	Issues in planning	65
	Using resources	67
	Homework	68
	Evidence from the research	70
4	The Elements of a Mathematics Lesson	75
	An introductory activity	77
	The main teaching activity	79
	Summing up	83
	Evidence from the research	88
		GO
_		
5	Learning Mathematics	93
	Early ideas	94
	Constructivism	94
	Social constructivism	96
	The role of the teacher	96
	Effective teaching and learning	97
	Pupils' active involvement	98
	Working in pairs	99
	Group work	100
	Deep learning and mastery	101
	Misconceptions	104
	Cognitive conflict	107
	Metacognition Mindsets	109
	Evidence from the research	110
	Evidence from the research	111
6	Assessment	119
	The purposes of assessment	
	The nature of assessment	120
	Involving pupils in assessment	122
	Use of data	126
	Questioning	129
		130

		CONTENTS
	Record-keeping	133
	Writing reports	134
	National testing	135
	Evidence from the research	138
7	Inclusive Teaching	145
	Inclusion	146
	Culture	147
	Gender	147
	Ethnicity	149
	Differentiation	150
	Special educational needs	152
	Very able pupils	154
	Language in mathematics education	155
	Teaching pupils for whom English is an ad	
	Evidence from the research	162
8	Teaching Different Topics	171
	Number	172
	Mental methods	172
	Written methods	173
	Ratio, proportion and rates of change	181
	Algebra	181
	Geometry and measures	186
	Probability	190
	Statistics	191
	Evidence from the research	192
9	ICT in Mathematics Teaching	197
	Background	198
	Pedagogical issues	199
	Styles of using ICT	200
	Use as a presentational tool	203
	Use of the interactive board	204
	Internet resources	208

Evidence from the research

vii

210

	217
10 Continuing Professional Development	218
Evaluating your lessons	225
Evaluating lessons later in your career	226
Ofsted inspections	229
The induction year	220
Professional development within the school/de	epartment 233
Professional associations	-33
Master's level credits	234
Conclusion	236
Index	239

This is a comprehensive guide covering everything about learning to teach maths. Suitable for anyone considering teaching as a profession, those already in training and new teachers, it provides excellent coverage of the theoretical and practical aspects of teaching maths in an accessible style.'

EMMA MCCREA, ITE LECTURER AND AUTHOR OF MAKING EVERY MATHS LESSON COUNT

This fully updated third edition is the perfect companion to help you succeed in training to teach mathematics in secondary schools. It looks at the fundamentals of mathematics teaching, how to plan lessons and assess learning and how to promote an inclusive approach in your classroom.

Key new features include:

- Updated content reflecting: the National Curriculum in England, the Teachers' Standards and revised requirements for GCSE and A level mathematics
- · Updated 'Evidence from research' features, highlighting developments in the field
- An expanded section on mathematical researceptions
- New coverage of teaching for mastery

2.VDD.

This is essential reading for anyone undertaking mulal teacher education courses in secondary mathematics, including university-based (PGCE, PGDE) and school-based (School Direct, SCITT, Teach First) routes into the profession.

PAUL CHAMBERS was formerly course leader for PGCE mathematics at Edge Hill University.

ROBERT TIMLIN was formerly principal lecturer in mathematics education at Manchester Metropolitan University.



