
Teaching Mathematics Foundations To Middle Years

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Teaching Mathematics

Foundations to Middle Years

At the forefront of research in mathematics education, this new edition of Teaching Mathematics: Foundations to Middle Years continues to provide knowledge to future teachers of mathematics with the information and resources they need to help them prepare for the classroom. Following an evidence-based approach focused on identifying and reflecting on student reasoning, pre-service teachers are encouraged to develop a deep understanding of the big ideas in mathematics and the connections between them. Now in its third edition, this text has been revised extensively, with a new structure that points more directly to the learning progressions involved in developing a deep understanding of mathematics from the early to middle years of schooling. Interspersed throughout the text are activities and thought-provoking teaching scenarios for pre-service teachers to explore, whether individually, in groups or in the classroom. The authors' detailed knowledge of mathematics and

mathematics teaching combines effectively with the book's teaching and learning features to help pre-service teachers develop the deep understanding of mathematics and the teaching and learning of mathematics needed to become confident, enthusiastic teachers of mathematics.

Teaching Mathematics: Teaching Mathematics

Foundations to Middle Years *OUP Australia & New Zealand*

Teaching Mathematics: Foundations to Middle Years connects teacher education students to the bigger picture of mathematics. It shows them how to communicate mathematically, feel positive about mathematics and their role in teaching it and to enter the classroom confident they are equipped with the practical knowledge, skills, strategies and activities to teach mathematics.

Teaching Mathematics

Foundations to Middle Years

Teaching Mathematics: Foundations to Middle Years connects readers to the bigger picture of mathematics. This comprehensive textbook designed to help pre-service teachers gradually build mathematical knowledge and become confident about teaching the subject to a range of age groups, in diverse learning environments. Spanning Foundations to 9 mathematics curriculum, the book's unique structure explores the different stages of how children learn maths and how to teach maths, before drilling down to specific strands and skills by age group. The second edition is rich with student work examples,

practical activities and a wealth of teaching and learning tools to ensure pre-service and practising educators feel positive about mathematics and their role in teaching it.

Teaching Mathematics

Foundation to Senior Phase

Teaching Mathematics

Providing a Foundation for Teaching Mathematics in the Middle Grades *SUNY Press*

This book provides middle school teachers with a firm pedagogical foundation based on the manner in which students learn the mathematics being taught.

Teaching Mathematics at Secondary Level

Open Book Publishers

Teaching Mathematics is nothing less than a mathematical manifesto. Arising in response to a limited National Curriculum, and engaged with secondary schooling for those aged 11– 14 (Key Stage 3) in particular, this handbook for teachers will help them broaden and enrich their students' mathematical education. It avoids specifying how to teach, and focuses instead on the central principles and concepts that need to be borne in mind by all teachers and textbook authors—but which are little appreciated in the UK at present. This study is aimed at anyone who would like to think more deeply about the discipline of

'elementary mathematics', in England and Wales and anywhere else. By analysing and supplementing the current curriculum, Teaching Mathematics provides food for thought for all those involved in school mathematics, whether as aspiring teachers or as experienced professionals. It challenges us all to reflect upon what it is that makes secondary school mathematics educationally, culturally, and socially important.

Teaching Mathematics in Primary Schools

Principles for effective practice *Routledge*

'This is an outstanding book: it should be high on the list of any primary school teacher's set of references and a required text for pre-service teachers.' Australian Primary Mathematics Classroom
In our technology-rich world, numeracy is just as important as the smartphone in your pocket. Students need to develop mathematical ways of seeing the world and strong problem-solving skills, and those foundations are taught in the primary school classroom. Teaching Mathematics in Primary Schools covers the mathematical content taught in primary and middle years, always emphasising how students can connect what they learn in mathematics with other curriculum areas and with the world beyond the classroom. The authors draw on the latest international research to show how teachers can develop a rich repertoire of classroom teaching techniques, and effective planning, assessment and reporting methods. They outline approaches to creating supportive learning environments for all students, and to building their knowledge and confidence in using mathematics. This third edition has been updated throughout and

includes a new chapter on numeracy. Evidence-based uses of digital technologies to support learning and teaching are included in every chapter. With practical strategies that can be implemented in the classroom, this book is an invaluable resource for pre-service and early career primary and middle years mathematics teachers.

Oral Storytelling and Teaching Mathematics

Pedagogical and Multicultural Perspectives *SAGE*

"The accompanying CD-ROM contains the full text of two epic stories plus additional worksheets, handouts, and art."--Page 4 of cover.

Elementary and Middle School Mathematics: Pearson New International Edition

Teaching Developmentally

For Elementary Mathematics Methods or Middle School Mathematics Methods Covers preK-8 Written by leaders in the field, this best-selling book will guide teachers as they help all PreK-8 learners make sense of math by supporting their own mathematical understanding and cultivating effective planning and instruction. Elementary and Middle School Mathematics: Teaching Developmentally provides an unparalleled depth of ideas and discussion to help teachers develop a real understanding of the mathematics they will teach and the most effective methods of teaching the various mathematics topics. This text reflects the NCTM and Common Core State Standards

and the benefits of problem-based mathematics instruction.

Helping Children Learn Mathematics *National Academies Press*

Results from national and international assessments indicate that school children in the United States are not learning mathematics well enough. Many students cannot correctly apply computational algorithms to solve problems. Their understanding and use of decimals and fractions are especially weak. Indeed, helping all children succeed in mathematics is an imperative national goal. However, for our youth to succeed, we need to change how we're teaching this discipline. Helping Children Learn Mathematics provides comprehensive and reliable information that will guide efforts to improve school mathematics from pre-kindergarten through eighth grade. The authors explain the five strands of mathematical proficiency and discuss the major changes that need to be made in mathematics instruction, instructional materials, assessments, teacher education, and the broader educational system and answers some of the frequently asked questions when it comes to mathematics instruction. The book concludes by providing recommended actions for parents and caregivers, teachers, administrators, and policy makers, stressing the importance that everyone work together to ensure a mathematically literate society.

Strengths-Based Teaching and Learning in Mathematics

Five Teaching Turnarounds for Grades K-6 *Corwin*

Your game plan for unlocking mathematics by focusing on

students' strengths. What if instead of focusing on what students haven't mastered, we identify their mathematical strengths and build on students' points of power? Beth McCord Kobett and Karen S. Karp highlight five key teaching turnarounds are presented: identify teaching strengths, leverage students' strengths, design instruction from a strengths-based perspective, help students identify their points of power, and promote strengths in the school community. Each chapter provides opportunities to reflect and transfer practice while also sharing · Downloadable resources, activities, and tools · Examples of student work within Grades K-6 · Real teachers' notes and reflections for discussion

Principles to Actions

Ensuring Mathematical Success for All *National Council of Teachers of Mathematics, Incorporated*

This text offers guidance to teachers, mathematics coaches, administrators, parents, and policymakers. This book: provides a research-based description of eight essential mathematics teaching practices ; describes the conditions, structures, and policies that must support the teaching practices ; builds on NCTM's Principles and Standards for School Mathematics and supports implementation of the Common Core State Standards for Mathematics to attain much higher levels of mathematics achievement for all students ; identifies obstacles, unproductive and productive beliefs, and key actions that must be understood, acknowledged, and addressed by all stakeholders ; encourages teachers of mathematics to engage students in mathematical

thinking, reasoning, and sense making to significantly strengthen teaching and learning.

Mathematics Learning in Early Childhood

Paths Toward Excellence and Equity *National Academies Press*

Early childhood mathematics is vitally important for young children's present and future educational success. Research demonstrates that virtually all young children have the capability to learn and become competent in mathematics. Furthermore, young children enjoy their early informal experiences with mathematics. Unfortunately, many children's potential in mathematics is not fully realized, especially those children who are economically disadvantaged. This is due, in part, to a lack of opportunities to learn mathematics in early childhood settings or through everyday experiences in the home and in their communities. Improvements in early childhood mathematics education can provide young children with the foundation for school success. Relying on a comprehensive review of the research, *Mathematics Learning in Early Childhood* lays out the critical areas that should be the focus of young children's early mathematics education, explores the extent to which they are currently being incorporated in early childhood settings, and identifies the changes needed to improve the quality of mathematics experiences for young children. This book serves as a call to action to improve the state of early childhood mathematics. It will be especially useful for policy makers and practitioners—those who work directly with children and their

families in shaping the policies that affect the education of young children.

Math Fact Fluency

60+ Games and Assessment Tools to Support Learning and Retention *ASCD*

Mastering the basic facts for addition, subtraction, multiplication, and division is an essential goal for all students. Most educators also agree that success at higher levels of math hinges on this fundamental skill. But what's the best way to get there? Are flash cards, drills, and timed tests the answer? If so, then why do students go into the upper elementary grades (and beyond) still counting on their fingers or experiencing math anxiety? What does research say about teaching basic math facts so they will stick? In *Math Fact Fluency*, experts Jennifer Bay-Williams and Gina Kling provide the answers to these questions—and so much more. This book offers everything a teacher needs to teach, assess, and communicate with parents about basic math fact instruction, including The five fundamentals of fact fluency, which provide a research-based framework for effective instruction in the basic facts. Strategies students can use to find facts that are not yet committed to memory. More than 40 easy-to-make, easy-to-use games that provide engaging fact practice. More than 20 assessment tools that provide useful data on fact fluency and mastery. Suggestions and strategies for collaborating with families to help their children master the basic math facts. *Math Fact Fluency* is an indispensable guide for any educator who needs to teach basic facts. This approach to facts instruction,

grounded in years of research, will transform students' learning of basic facts and help them become more confident, adept, and successful at math.

Teaching Mathematics Meaningfully

Solutions for Reaching Struggling Learners *Paul H Brookes Publishing*

In the new edition of *Teaching Mathematics Meaningfully*, the authors have incorporated current research, aligned concepts and practices with the Common Core State Standards and NCTM teaching practices, explained learning trajectories in mathematics, and discussed how to use their instructional process within RTI/MTSS. Based on a foundation of identifying and understanding the Mathematics, the authors' conceptual framework integrates continuous assessment and two perspectives, math learning needs and the learning needs of struggling learners, to plan and implement responsive instruction.

Online Learning in Mathematics Education *Springer Nature*

Visible Learning for Mathematics, Grades K-12

What Works Best to Optimize Student Learning *Corwin Press*

Rich tasks, collaborative work, number talks, problem-based learning, direct instruction...with so many possible approaches, how do we know which ones work the best? In *Visible Learning for Mathematics*, six acclaimed educators assert it's not about which

one—it's about when—and show you how to design high-impact instruction so all students demonstrate more than a year's worth of mathematics learning for a year spent in school. That's a high bar, but with the amazing K-12 framework here, you choose the right approach at the right time, depending upon where learners are within three phases of learning: surface, deep, and transfer. This results in "visible" learning because the effect is tangible. The framework is forged out of current research in mathematics combined with John Hattie's synthesis of more than 15 years of education research involving 300 million students. Chapter by chapter, and equipped with video clips, planning tools, rubrics, and templates, you get the inside track on which instructional strategies to use at each phase of the learning cycle: Surface learning phase: When—through carefully constructed experiences—students explore new concepts and make connections to procedural skills and vocabulary that give shape to developing conceptual understandings. Deep learning phase: When—through the solving of rich high-cognitive tasks and rigorous discussion—students make connections among conceptual ideas, form mathematical generalizations, and apply and practice procedural skills with fluency. Transfer phase: When students can independently think through more complex mathematics, and can plan, investigate, and elaborate as they apply what they know to new mathematical situations. To equip students for higher-level mathematics learning, we have to be clear about where students are, where they need to go, and what it looks like when they get there. Visible Learning for Math brings about powerful, precision teaching for K-12 through intentionally designed guided, collaborative, and independent learning.

Principles and Standards for School Mathematics

An Overview

This easy-to-read summary is an excellent tool for introducing others to the messages contained in Principles and Standards.

Teaching Mathematics to Culturally and Linguistically Diverse Learners *Prentice Hall*

Resource added for the Mathematics 108041 courses.

Mathematics for Machine Learning *Cambridge University Press*

The fundamental mathematical tools needed to understand machine learning include linear algebra, analytic geometry, matrix decompositions, vector calculus, optimization, probability and statistics. These topics are traditionally taught in disparate courses, making it hard for data science or computer science students, or professionals, to efficiently learn the mathematics. This self-contained textbook bridges the gap between mathematical and machine learning texts, introducing the mathematical concepts with a minimum of prerequisites. It uses these concepts to derive four central machine learning methods: linear regression, principal component analysis, Gaussian mixture models and support vector machines. For students and others with a mathematical background, these derivations provide a starting point to machine learning texts. For those learning the mathematics for the first time, the methods help build intuition and practical experience with applying mathematical concepts. Every chapter includes worked examples and exercises to test

understanding. Programming tutorials are offered on the book's web site.

Teaching Elementary Mathematics to Struggling Learners *Guilford Publications*

Packed with effective instructional strategies, this book explores why certain K-5 students struggle with math and provides a framework for helping these learners succeed. The authors present empirically validated practices for supporting students with disabilities and others experiencing difficulties in specific areas of math, including problem solving, early numeracy, whole-number operations, fractions, geometry, and algebra. Concrete examples, easy-to-implement lesson-planning ideas, and connections to state standards, in particular the Common Core standards, enhance the book's utility. Also provided is invaluable guidance on planning and delivering multi-tiered instruction and intervention.

Maths Enrichment

Number *R.I.C. Publications*

The book contains blackline masters of stimulating activities in mathematics.._

About Teaching Mathematics

A K-8 Resource *Math Solutions*

A compendium of more than 240 classroom-tested lessons, this essential resource helps teachers build student understanding

and skills and understand how children best learn math. In this third edition, Marilyn Burns has completely revised the first section to reflect what she has learned over the years from her classroom experience with students and her professional development experience with teachers. This section has also been expanded to address these important topics: teaching math vocabulary, incorporating writing into math instruction, linking assessment and instruction, and using children's literature to teach key math concepts. In an entirely new section, Marilyn addresses a wide range of questions she has received over the years from elementary and middle school teachers regarding classroom management and instructional issues.

Mathematics Education in the Middle Grades

Teaching to Meet the Needs of Middle Grades Learners and to Maintain High Expectations: Proceedings of a National Convocation and Action Conferences *National Academies Press*

Mathematics Education in the Middle Grades: Teaching to Meet the Needs of Middle Grades Learners and to Maintain High Expectations In September 1998, the Math Science Education Board National held a Convocation on Middle Grades Mathematics that was co-sponsored by the National Council of Teachers of Mathematics, the National Middle School Association, and the American Educational Research Association. The Convocation was structured to present the teaching of middle school mathematics from two points of view: teaching mathematics with a focus on the subject matter content or teaching mathematics

with a focus on the whole child and whole curriculum. This book discusses the challenges before the nation's mathematical sciences community to focus its energy on the improvement of middle grades mathematics education and to begin an ongoing national dialogue on middle grades mathematics education.

How Students Learn

Science in the Classroom *National Academies Press*

How Students Learn: Science in the Classroom builds on the discoveries detailed in the best-selling How People Learn. Now these findings are presented in a way that teachers can use immediately, to revitalize their work in the classroom for even greater effectiveness. Organized for utility, the book explores how the principles of learning can be applied in science at three levels: elementary, middle, and high school. Leading educators explain in detail how they developed successful curricula and teaching approaches, presenting strategies that serve as models for curriculum development and classroom instruction. Their recounting of personal teaching experiences lends strength and warmth to this volume. This book discusses how to build straightforward science experiments into true understanding of scientific principles. It also features illustrated suggestions for classroom activities.

The Great Mental Models: General Thinking Concepts

The old saying goes, "To the man with a hammer, everything looks like a nail." But anyone who has done any kind of project knows a hammer often isn't enough. The more tools you have at

your disposal, the more likely you'll use the right tool for the job - and get it done right. The same is true when it comes to your thinking. The quality of your outcomes depends on the mental models in your head. And most people are going through life with little more than a hammer. Until now. The Great Mental Models: General Thinking Concepts is the first book in The Great Mental Models series designed to upgrade your thinking with the best, most useful and powerful tools so you always have the right one on hand. This volume details nine of the most versatile, all-purpose mental models you can use right away to improve your decision making, productivity, and how clearly you see the world. You will discover what forces govern the universe and how to focus your efforts so you can harness them to your advantage, rather than fight with them or worse yet- ignore them. Upgrade your mental toolbox and get the first volume today. AUTHOR BIOGRAPHY Farnam Street (FS) is one of the world's fastest growing websites, dedicated to helping our readers master the best of what other people have already figured out. We curate, examine and explore the timeless ideas and mental models that history's brightest minds have used to live lives of purpose. Our readers include students, teachers, CEOs, coaches, athletes, artists, leaders, followers, politicians and more. They're not defined by gender, age, income, or politics but rather by a shared passion for avoiding problems, making better decisions, and lifelong learning. AUTHOR HOME Ottawa, Ontario, Canada

Developing Mathematical Proficiency for Elementary Instruction *Springer Nature*

The need to improve the mathematical proficiency of elementary

teachers is well recognized, and it has long been of interest to educators and researchers in the U.S. and many other countries. But the specific proficiencies that elementary teachers need and the process of developing and improving them remain only partially conceptualized and not well validated empirically. To improve this situation, national workshops were organized at Texas A&M University to generate focused discussions about this important topic, with participation of mathematicians, mathematics educators and teachers. Developing Mathematical Proficiency for Elementary Instruction is a collection of articles that grew out of those exciting cross-disciplinary exchanges. Developing Mathematical Proficiency for Elementary Instruction is organized to probe the specifics of mathematical proficiency that are important to elementary teachers during two separate but inter-connected professional stages: as pre-service teachers in a preparation program, and as in-service teachers teaching mathematics in elementary classrooms. From this rich and inspiring collection, readers may better understand, and possibly rethink, their own practices and research in empowering elementary teachers mathematically and pedagogically, as educators or researchers.

Second Handbook of Research on Mathematics Teaching and Learning

A Project of the National Council of Teachers of Mathematics IAP

The audience remains much the same as for the 1992 Handbook, namely, mathematics education researchers and other scholars

conducting work in mathematics education. This group includes college and university faculty, graduate students, investigators in research and development centers, and staff members at federal, state, and local agencies that conduct and use research within the discipline of mathematics. The intent of the authors of this volume is to provide useful perspectives as well as pertinent information for conducting investigations that are informed by previous work. The Handbook should also be a useful textbook for graduate research seminars. In addition to the audience mentioned above, the present Handbook contains chapters that should be relevant to four other groups: teacher educators, curriculum developers, state and national policy makers, and test developers and others involved with assessment. Taken as a whole, the chapters reflects the mathematics education research community's willingness to accept the challenge of helping the public understand what mathematics education research is all about and what the relevance of their research findings might be for those outside their immediate community.

Open-Ended Maths Activities

Using 'Good' Questions to Enhance Learning in Mathematics

Open-ended Maths Activities Second Edition is the revised and expanded edition of the best-selling title by Peter Sullivan and Pat Lilburn. It discusses a type of open-ended, problem-solving question called a 'good' question. These questions enhance learning, teaching and assessment and are a useful addition to a teacher's strategies. It includes: practical advice on how to create

your own 'good' questions to use within the classroom organised by subject area and levels (upper, middle and junior) the sixteen topics covered are included within Number, Measurement, Space and Chance and Data.

Preparing Teachers

Building Evidence for Sound Policy *National Academies Press*
Teachers make a difference. The success of any plan for improving educational outcomes depends on the teachers who carry it out and thus on the abilities of those attracted to the field and their preparation. Yet there are many questions about how teachers are being prepared and how they ought to be prepared. Yet, teacher preparation is often treated as an afterthought in discussions of improving the public education system. *Preparing Teachers* addresses the issue of teacher preparation with specific attention to reading, mathematics, and science. The book evaluates the characteristics of the candidates who enter teacher preparation programs, the sorts of instruction and experiences teacher candidates receive in preparation programs, and the extent that the required instruction and experiences are consistent with converging scientific evidence. *Preparing Teachers* also identifies a need for a data collection model to provide valid and reliable information about the content knowledge, pedagogical competence, and effectiveness of graduates from the various kinds of teacher preparation programs. Federal and state policy makers need reliable, outcomes-based information to make sound decisions, and teacher educators need to know how best to contribute to the

development of effective teachers. Clearer understanding of the content and character of effective teacher preparation is critical to improving it and to ensuring that the same critiques and questions are not being repeated 10 years from now.

Knowing and Teaching Elementary Mathematics

Teachers' Understanding of Fundamental Mathematics in China and the United States *Routledge*

Studies of teachers in the U.S. often document insufficient subject matter knowledge in mathematics. Yet, these studies give few examples of the knowledge teachers need to support teaching, particularly the kind of teaching demanded by recent reforms in mathematics education. *Knowing and Teaching Elementary Mathematics* describes the nature and development of the knowledge that elementary teachers need to become accomplished mathematics teachers, and suggests why such knowledge seems more common in China than in the United States, despite the fact that Chinese teachers have less formal education than their U.S. counterparts. The anniversary edition of this bestselling volume includes the original studies that compare U.S and Chinese elementary school teachers' mathematical understanding and offers a powerful framework for grasping the mathematical content necessary to understand and develop the thinking of school children. Highlighting notable changes in the field and the author's work, this new edition includes an updated preface, introduction, and key journal articles that frame and contextualize this seminal work.

Providing a Foundation for Teaching Mathematics in the Middle Grades *SUNY Press*

This book provides middle school teachers with a firm pedagogical foundation based on the manner in which students learn the mathematics being taught.

Curriculum and Evaluation Standards for School Mathematics *National Council of Teachers of*

Curriculum standards for mathematics for grades K-4, 5-8, and 9-12 are presented which suggest areas of instructional emphasis for specific student outcomes. Also discusses evaluation standards for both the curriculum and student achievement. K-12.

Designing and Implementing Mathematics Instruction for Students with Diverse Learning Needs *Pearson*

Integrates the explicit teaching practices that have proven effective for students with disabilities with the NCTM math standards that dominant current mathematics practices in the United States Part 1 of the book covers the fundamentals of mathematics assessment and instructional design. In Part 2, the detailed scope and sequence charts, along with instructional guidelines keyed to the objectives, provide teachers with specific guidelines for assessment and design. Future or current teachers who will be educating students with diverse abilities in mathematics.

Understanding by Design *ASCD*

Presents a multifaceted model of understanding, which is based

on the premise that people can demonstrate understanding in a variety of ways.

Curriculum Focal Points for Prekindergarten Through Grade 8 Mathematics

A Quest for Coherence *National*

Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics: A Quest for Coherence provides a rationale for focal points for each grade level, prekindergarten - 8.

Teaching Mathematics in the Visible Learning Classroom, Grades 6-8 *Corwin Press*

Select the right task, at the right time, for the right phase of learning It could happen in the morning during homework review. Or perhaps it happens when listening to students as they struggle through a challenging problem. Or maybe even after class, when planning a lesson. At some point, the question arises: How do I influence students' learning—what's going to generate that light bulb "aha" moment of understanding? In this sequel to the megawatt best seller Visible Learning for Mathematics, John Almarode, Douglas Fisher, Nancy Frey, John Hattie, and Kateri Thunder help you answer that question by showing how Visible Learning strategies look in action in the mathematics classroom. Walk in the shoes of middle school teachers as they engage in the 200 micro-decisions-per-minute needed to balance the strategies, tasks, and assessments seminal to high-impact mathematics instruction. Using grade-leveled examples and a decision-making matrix, you'll learn to Articulate clear learning

intentions and success criteria at surface, deep, and transfer levels Employ evidence to guide students along the path of becoming metacognitive and self-directed mathematics achievers Use formative assessments to track what students understand, what they don't, and why Select the right task for the conceptual, procedural, or application emphasis you want, ensuring the task is for the right phase of learning Adjust the difficulty and complexity of any task to meet the needs of all learners It's not only what works, but when. Exemplary lessons, video clips, and online resources help you leverage the most effective teaching practices at the most effective time to meet the surface, deep, and transfer learning needs of every student.

Maths is all Around You *Bloomsbury Publishing*

We encounter mathematics on a regular basis in one form or another. For some people, maths is 'scary' and not something they feel confident about. Even though many educators and

parents attempt to provide good mathematics experiences, there is still a high level of anxiety about the teaching and learning of mathematics. This book presents a broad range of concepts and aims to widen the narrow view that maths for young children is just about numbers and shapes. The content includes pattern (early algebra), counting, number, early operations, measurement, shape and spatial awareness (geometry), matching, sorting, data analysis and the introduction of chance (statistics and probability). This book is intended for educators and parents who would like to explore and investigate maths concepts to enrich children's experiences and extend their current thinking and learning.

Handbook of International Research in Mathematics Education *Routledge*

This book brings together mathematics education research that makes a difference in both theory and practice - research that anticipates problems and needed knowledge before they become impediments to progress.