Call for Proposals

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Scholars in many countries are involved in researching effective approaches to the teaching and learning of mathematics. Each book in the series, Research in Mathematics Education, focuses on a theme that is of interest to a broad range of audiences, including researchers, professional development providers, teacher educators, curriculum developers, and classroom teachers.

The editors are currently inviting proposals from a variety of perspectives at all levels of schooling. Any high-quality research that addresses an important issue in mathematics education and is of interest to an international audience will be considered. Some topics for which there is particular interest include (but are not limited to) the following: curriculum, assessment, equity in addressing diverse learners, research on the teaching and learning of particular content strands, teacher education (along the entire continuum, from preparation to induction to professional development of practicing teachers), and models of and research into effectiveness of alternative paths to teacher certification.

The editors also welcome proposals with the purpose of sharing research that has been discussed at conferences in order to make it available to a wide audience. In this way, papers can be presented in more detail or extended further than is often possible at conferences.

Books in this series:
- International Perspectives on Mathematics Curriculum
- Digital Curricula in School Mathematics
- Approaches to Studying the Enacted Mathematics Curriculum
- Variability is the Rule
- Language and Mathematics Education
- A Five-Year Study of the First Edition of the Core-Plus Mathematics Curriculum
- Future Curricular Trends in School Algebra And Geometry
- A Decade of Middle School Mathematics Curriculum Implementation
- Mathematics Curriculum in Pacific Rim Countries - China, Japan, Korea, and Singapore
Curriculum can be defined in a variety of ways. It might be viewed as a body of knowledge, a product, or a process. Curricula can differ as they are conceptualized from various theoretical perspectives to address the needs of teachers, students, and the context of schooling. One reason to study curriculum is “to reveal the expectations, processes and outcomes of students’ school learning experiences that are situated in different cultural and system contexts. ... further studies of curriculum practices and changes are much needed to help ensure the success of educational reforms in the different cultural and system contexts” (Kulm & Li, 2009, p. 709).

This volume highlights international perspectives on curriculum and aims to broaden the wider mathematics education community’s understandings of mathematics curriculum through viewing a variety of ways that curricula are developed, understood, and implemented in different jurisdictions/countries. Within this volume, we define curriculum broadly as the set of mathematics standards or outcomes, the messages inherent in mathematics curriculum documents and resources, how these standards are understood by a variety of stakeholders, and how they are enacted in classrooms. The focus is on the written, implied, and enacted curriculum in various educational settings throughout the world.

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The mathematics curriculum – what mathematics is taught, to whom it is taught, and when it is taught – is the bedrock to understanding what mathematics students can, could, and should learn. Today’s digital technology influences the mathematics curriculum in two quite different ways. One influence is on the delivery of mathematics through hardware such as desktops, laptops, and tablets. Another influence is on the doing of mathematics using software available on this hardware, but also available on the internet, calculators, or smart phones.

These developments, rapidly increasing in their availability and decreasing in their cost, raise fundamental questions regarding a mathematics curriculum that has traditionally been focused on paper-and-pencil work and taught in many places as a set of rules to be practiced and learned.

This volume presents the talks given at a conference held in 2014 at the University of Chicago, sponsored by the Center for the Study of Mathematics Curriculum. The speakers – experts from around the world and inside the USA - were asked to discuss one or more of the following topics:
• changes in the nature and creation of curricular materials available to students
• transformations in how students learn and how they demonstrate their learning
• rethinking the role of the teacher and how students and teachers interact within a classroom and across distances from each other

The result is a set of articles that are interesting and captivating, and challenge us to examine how the learning of mathematics can and should be affected by today’s technology.


Approaches to Studying the Enacted Mathematics Curriculum
Dan Heck, Horizon Research, Inc.; Kathryn Chval, University of Missouri; Iris Weiss, Horizon Research, Inc.; Steven W. Ziebarth, Western Michigan University


Curriculum materials are among the most pervasive and powerful influences on school mathematics. In many mathematics classes, student assignments, the questions the teacher asks, the ways students are grouped, the forms of assessment, and much more originate in curriculum materials. At the same time, teachers have considerable latitude in how they use their curriculum materials. Two classes making use of the same materials may differ markedly in what mathematics content is emphasized and how students are engaged in learning that content. This volume considers a variety of research tools for investigating the enactment of mathematics curriculum materials, describing the conceptualization, development, and uses of seven sets of tools. Mathematics education researchers, curriculum developers, teacher educators, district supervisors, teacher leaders, and math coaches will find insights that can improve their work, and guidance for selecting, adapting, and using tools for understanding the complex relationship between curriculum materials and their enactment in classroom instruction.

Variability is the Rule
A Companion Analysis of K-8 State Mathematics Standards

John P. Smith, Michigan State University


In response to No Child Let Behind, states have developed mathematics curriculum frameworks that outline their intended curriculum for grades K–8. While some have indicated that districts or individual schools may use their framework as a model for specific curricular programs, others have taken a more prescriptive or even mandatory stance. Collectively, these frameworks present a sense of the national mathematics program and what we expect students to learn.

This volume follows The Intended Curriculum as Represented in State Mathematics Curriculum Standards: Consensus or Confusion? (Reys). While the Reys volume focused on number and operations, algebra and reasoning strands, the Smith volume analyzes geometry, measurement, probability, and statistics strands. It also presents an analysis what verbs used tell us about the cognitive demand of grade level expectations. This volume, even more than the Reys volume, emphasizes the theme of variability in the content, expression, and clarity of grade level expectations across the states.

As the nation moves toward implementation of the Common Core Standards, this volume highlights some of the challenges teachers and other school personnel face in interpreting mathematics grade-level standards as goals for classroom teaching. The shift from 50 state standards to one document does not resolve this basic challenge.

CONTENTS:

Language and Mathematics Education
Multiple Perspectives and Directions for Research

Judit N. Moschkovich, University of California at Santa Cruz


Issues of language in mathematics learning and teaching are important for both practical and theoretical reasons. Addressing issues of language is crucial for improving mathematics learning and teaching for students who are bilingual, multilingual, or learning English. These issues are also relevant to theory: studies that make language visible provide a complex perspective of the role of language in reasoning and learning mathematics. What is the relevant knowledge base to consider when designing research studies that address issues of language in the learning and teaching of mathematics? What scholarly literature is relevant and can contribute to research? In order to address issues of language in mathematics education, researchers need to use theoretical perspectives that integrate current views of mathematics learning and teaching with current views on language, discourse, bilingualism, and second language acquisition. This volume contributes to the development of such integrated approaches to research on language issues in mathematics education by describing theoretical perspectives for framing the study of language issues and methodological issues to consider when designing research studies. The volume provides interdisciplinary reviews of the research literature from four very different perspectives: mathematics education (Moschkovich), Cultural-Historical-Activity Theory (Gutiérrez, Sengupta-Irving, & Dieckmann), systemic functional linguistics (Schleppegrell), and assessment (Solano-Flores). This volume offers graduate students and researchers new to the study of language in mathematics education an introduction to resources for conceptualizing, framing, and designing research studies. For those already involved in examining language issues, the
volume provides useful and critical reviews of the literature as well as recommendations for moving forward in designing research. Lastly, the volume provides a basis for dialogue across multiple research communities engaged in collaborative work to address these pressing issues.


A Five-Year Study of the First Edition of the Core-Plus Mathematics Curriculum

Harold Schoen; Steven W. Ziebarth, Western Michigan Univeristy; Christian R. Hirsch, Western Michigan University; Allison BrckaLorenz


The study reported in this volume adds to the growing body of evaluation studies that focus on the use of NSF-funded Standards-based high school mathematics curricula. Most previous evaluations have studied the impact of field-test versions of a curriculum. Since these innovative curricula were so new at the time of many of these studies, students and teachers were relative novices in their use. These earlier studies were mainly one year or less in duration. Students in the comparison groups were typically from schools in which some classes used a Standards-based curriculum and other classes used a conventional curriculum, rather than using the Standards-based curriculum with all students as curriculum developers intended.

The volume reports one of the first studies of the efficacy of Standards-based mathematics curricula with all of the following characteristics:

- The study focused on fairly stable implementations of a first-edition Standards-based high school mathematics curriculum that was used by all students in each of three schools.

- It involved students who experienced up to seven years of Standards-based mathematics curricula and instruction in middle school and high school.

- It monitored students' mathematical achievement, beliefs, and attitudes for four years of high school and one year after graduation.

- Prior to the study, many of the teachers had one or more years of experience teaching the Standards-based curriculum and/or professional development focusing on how to implement the curriculum well.

- In the study, variations in levels of implementation of the curriculum are described and related to student outcomes and teacher behavior variables.

Item data and all unpublished testing instruments from this study are available at www.wmich.edu/cpmp/ for use as a baseline of instruments and data for future curriculum evaluators or Core-Plus Mathematics users who may wish to compare results of new groups of students to those in the present study on common tests or surveys. Taken together, this volume, the supplement at the CPMP Web site, and the first edition Core-Plus Mathematics curriculum materials (samples of which are also available at the Web site) serve as a fairly complete description of the nature and impact of an exemplar of first edition NSF-funded Standards-based high school mathematics curricula as it existed and was implemented with all students in three schools around the turn of the 21st century.

Future Curricular Trends in School Algebra And Geometry
Proceedings of A Conference

Zalman Usiskin, The University of Chicago; Kathleen Andersen; Nicole Zotto


This volume contains papers from the Second International Curriculum Conference sponsored by the Center for the Study of Mathematics Curriculum (CSMC). The intended audience includes policy makers, curriculum developers, researchers, teachers, teacher trainers, and anyone else interested in school mathematics curricula.


A Decade of Middle School Mathematics Curriculum Implementation
Lessons Learned from the Show-Me Project

Margaret R. Meyer, University of Wisconsin-Madison; Cynthia W. Langrall, Illinois State University


Associate Editors Fran Arbaugh, University of Missouri-Columbia, David C. Webb, University of Colorado at Boulder and Murrel Brewer Hoover, WVSTEM Center @ Marshall University

The purpose of this book is to document the work of the Show-Me Project (1997–2007) and to highlight lessons learned about curriculum implementation. Although the Show-Me Project was charged with promoting the dissemination and implementation of four distinct comprehensive curriculum programs (Connected Mathematics, Mathematics in Context, MathScape, and MathThematics), most of the lessons learned from this work are not curriculum specific. Rather, they cut across the four programs and share commonalities with standards-based curriculum reform at any level. We believe that documenting these lessons learned will be one of the legacies of the Show-Me Project.

We anticipate that the comprehensive nature of this work will attract readers from multiple audiences that include state
and district mathematics supervisors, middle grades mathematics teachers and administrators involved in curriculum reform, as well as mathematics teacher educators. Those about to embark on the review of curriculum materials will appreciate reading about the processes employed by other districts. Readers with interests in a particular curriculum program will be able to trace the curriculum-specific chapters to gain insights into how the design of the curricula relate to professional development, adoption and implementation issues, and teachers’ personal experience using the curriculum materials. Individuals who provide professional development at the middle grades level will find chapters that they can use for both general and focused discussions. Teachers at all stages of implementation will recognize their own experiences in reading and reflecting on the stories of teacher change. Mathematics educators will find ideas on how these curricula can be used in the preparation of preservice middle grades teachers.


Mathematics Curriculum in Pacific Rim Countries - China, Japan, Korea, and Singapore
Proceedings of a Conference
Zalman Usiskin, The University of Chicago; Edwin Willmore, The University of Chicago


This volume contains the proceedings of the First International Curriculum Conference sponsored by the Center for the Study of Mathematics Curriculum (CSMC). The CSMC is one of the National Science Foundation Centers for Learning and Teaching (Award No. ESI-0333879). The countries—China, Japan, Korea, and Singapore (in alphabetical order, which also happens to be the order of their populations)—have each been in the news because of their performance on international tests and/or their economic performance and potential. They also have centralized education ministries that create a single mathematics curriculum framework followed in the entire country. In all these countries, curricula are differentiated for students with different interests, usually around Grade 10 or 11. We think the reader will agree that the papers are of very high quality, befitting the standing of the individuals who were invited, but particularly notable for our international speakers because in three of these countries, English is not the speaker’s first language. Following each paper, we have included a short biography of the author(s), so that the reader can understand the perspective of the paper’s author.


The History of the Geometry Curriculum in the United States

Nathalie Sinclair, Michigan State University


This volume investigates the evolution of the geometry curriculum in the United States over the past 150 years. A primary goal is to increase awareness of the shape and nature of the current geometry curriculum by explaining how things have come to be as they are.

Given the limited access to first-hand accounts of the enacted geometry curriculum during the past 150 years, the monograph relies on textbooks to provide a record of the implemented curriculum at any given point in time. Policy documents can provide insight into the choices made in textbooks by hinting at the issues considered and the recommendations made.

The monograph is organized in a chronological sequence of “notable events” leading to discernable changes in thinking about the geometry curriculum over the past century and a half—roughly the extent of time during which geometry has been taught in American schools. Notable events include important reports or commissions, influential texts, new schools of thought, and developments in learning technologies. These events affected, among other things: content and aims of the geometry curriculum; the nature of mathematical activity as construed by both mathematicians and mathematics educators; and, the resources students are given for engaging in mathematical activity. Before embarking through the notable events, it is necessary to consider the “big bang” of geometry, namely the moment in time that shaped the future life of the geometry curriculum. This corresponds to the emergence of Euclidean geometry. Given its influence on the shape of the geometry curriculum, familiarity with the nature of the geometry articulated in Euclid’s Elements is essential to understanding the many tensions that surround the school geometry curriculum.

Several themes emerge over the course of the monograph, and include: the aims and means of the geometry curriculum, the importance of proof in geometry, the role of visualization and tactile experiences, the fusion between solid and plane geometry, the curricular connections between geometry and algebra, and the use of motion and continuity.

The intended audience would include curriculum developers, researchers, teachers, and curriculum supervisors.
This monograph reports on an analysis of a small part of the mathematics curriculum, the definitions given to quadrilaterals. This kind of research, which we call micro-curricular analysis, is often undertaken by those who create curriculum, but it is not usually done systematically and it is rarely published.

Many terms in mathematics education can be found to have different definitions in mathematics books. Among these are “natural number,” “parallel lines” and “congruent triangles,” “trapezoid” and “isosceles trapezoid,” the formal definitions of the trigonometric functions and absolute value, and implicit definitions of the arithmetic operations addition, subtraction, multiplication, and division.

Yet many teachers and students do not realize there is a choice of definitions for mathematical terms. And even those who realize there is a choice may not know who decides which definition of any mathematical term is better, and under what criteria. Finally, rarely are the mathematical implications of various choices discussed. As a result, many students misuse and otherwise do not understand the role of definition in mathematics.

We have chosen in this monograph to examine a bit of mathematics for its definitions: the quadrilaterals. We do so because there is some disagreement in the definitions and, consequently, in the ways in which quadrilaterals are classified and relate to each other. The issues underlying these differences have engaged students, teachers, mathematics educators, and mathematicians. There have been several articles and a number of essays on the definitions and classification of quadrilaterals. But primarily we chose this specific area of definition in mathematics because it demonstrates how broad mathematical issues revolving around definitions become reflected in curricular materials. While we were undertaking this research, we found that the area of quadrilaterals supplied grist for broader and richer discussions than we had first anticipated.

The intended audience includes curriculum developers, researchers, teachers, teacher trainers, and anyone interested in language and its use.

This volume represents a detailed analysis of the grade placement of mathematics learning goals across all state-level curriculum standards published as of May 2005.

The volume documents the varied grade-level mathematics curriculum expectations in the U.S. and highlights a general lack of consensus across states. As states continue to work to improve learning opportunities for all students this report can serve as a useful summary to inform future curriculum decisions. The report is also intended to stimulate discussion at the national level regarding roles and responsibilities of national agencies and professional organizations with regard to curriculum leadership. Serious and collaborative work that results from such discussions can contribute to a more coherent, focused mathematics curriculum for US students.

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