

Book Reviews

Sowder, Judith T.; Schappelle, Bonnie P.:

Providing a Foundation for Teaching Mathematics in the Middle Grades

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Providing a Foundation for Teaching Mathematics in the Middle Grades edited by Judith T. Sowder and Bonnie P. Schappelle is a welcomed addition in the SUNY Series, Reform in Mathematics Education. The stated purpose of this paperback is to provide a foundation for the mathematics taught in middle grades, (11-14 year-olds), particularly the mathematics that grows out of concepts of number, quantity, and arithmetic operations.

Sowder states that this text is intended primarily for those practicing middle-grade teachers who have come to the realization that they need a better understanding of the mathematics they are teaching before they can make fundamental changes in their teaching behaviors. The second audience is formed from those mathematics educators charged with the preparation and professional development of middle-grade teachers. Further, the text will serve as a valuable resource for researchers in curriculum development and for textbook authors. Supervisors of mathematics programs at the state and district levels will find relevant information for examining curriculum programs for middle-grade classrooms.

The book is divided into two parts. Part I contains thoughts of many researchers who want to help teachers better understand and teach the mathematical topics relevant to middle grades. Part II is made up of results of case-study research with middle-grade teachers and will assist readers in promoting change in teaching methods.

The book is an outcome of a research project associated with the National Center for Research on Mathematical Sciences Education (NCRMSE), the primary funding organization for this project. Nine volunteer teachers and researchers at San Diego State University collaborated in seminar-type settings in the discussions. Relationships be-

tween middle-grade teachers' understanding of the mathematics they teach and their instructional behaviors formed the pivotal point for discussions in the seminars and hence, the focal point of this book. The issues reported herein reflect the first two years of funding and make up only a part of the topics being discussed for middle-grade mathematics.

In the opening chapter, Editor Sowder defines what is meant by the preparation of middle-grade teachers. Mathematical preparation is three pronged: Mathematics content, epistemology, and pedagogy. Mathematics content refers to depth and breadth of mathematical knowledge; epistemology refers to teachers' understanding of how students learn mathematics, and pedagogy is the ability to teach in accordance with the nature of how students learn mathematics. From research studies, Sowder reports that few middle-grade teachers have this basic knowledge primarily due to the fact that they had little opportunities to explore the mathematics appropriate for middle-grade learners in any depth.

In achieving the goals of the project, small groups of volunteer teachers, four the first year and six the second, meeting in seminar groups, came up with case studies in order to focus on outcomes of the project. These teachers felt a need to strengthen their understanding of mathematics.

During the first half of the academic year knowledgeable *outside* speakers (Kieren, Philipp, Harel, Flores, et al.) presented topics on number-sense, operations on fractions, story problems, and ratio and proportional reasoning. The guiding motif "Mathematics must make Sense" prevailed throughout the presentations and discussions.

The ten chapters of Part I are the presentations made by the invited speakers. These chapters form the majority of content in mathematical texts currently being used in the United States. Seminar presenters developed topics with sensitivity to the problems middle-grade students show in studying mathematics. Specifically, these chapters include a section on supportive research findings about "what teachers must know" about the topic under consideration. This is followed by appropriate content information which will aid in teacher understanding of the mathematics they will teach.

It is often thought that the middle-school years are crucial times for students to integrate mathematical concepts they have *learned* in isolation in previous years. In doing so, a majority of students come from these early grades

into middle-school with the erroneous belief that mastery of mathematics is synonymous with the mastery of algorithms. Middle school thinking is a transition into a completely different world where one looks at understanding in many diverse ways. Most notable of these are the change from arithmetic methods to multiplicative ones, ratio and proportional reasoning, and developing pre-algebra concepts. This book, at least in part, provides more than ample discussions in answer to these dilemmas.

The presenters look very carefully at *how* teachers can foster a non-algorithmic approach in the understanding of concepts - often in ways constructionists develop concepts. Extensive bibliographies include a wealth of important supportive articles from reputable international mathematics educators. This alone is a valuable addition to the literature in mathematics education.

Part II is composed of multi-authored chapters which are the results of case studies from the middle-school classroom. Sub-titled, *Catalysts for change*. These three chapters are much of the same information one has become accustomed to reading elsewhere where the same characteristics of exemplary teachers and ways to effect changes in curriculums are named. Three uses for these conjectures are: as instructional tools to help novice teachers connect theory to practice and develop problem solving skills, as raw data for research on teacher cognition (catalysts that promote change in teachers' pedagogical beliefs), and practices. Real instructional change results when teachers have the mathematical foundations coupled with the *passion* to undertake change. The writers of the last three chapters describe eloquently elements that will effect change in teachers' knowledge of content, knowledge of how children learn mathematics, and ability to teach.

Personally, I enjoyed reading these 336 pages. This book considers only a part of mathematical content in the middle school, i.e., number-sense, rational numbers, story-problems, issues in learning mathematics, etc., yet, the book is a valuable source of information for mathematics educators especially those who want a close look at middle-grades mathematics. The issues are clearly stated. The book is very readable and interesting. I look forward to the next volume when, I suspect, the topics of geometry, statistics, and probability will be discussed.

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