

About This Book

Geometry is grasping space ... that space in which the child lives, breathes and moves. The space that the child must learn to know, explore, conquer, in order to live, breathe, and move better in it.

—Freudenthal, *Mathematics as an Educational Task*

Welcome to *Navigating through Geometry in Grades 3–5*! This book is about the “big ideas” of geometry presented in *Principles and Standards for School Mathematics*, by the National Council of Teachers of Mathematics (NCTM) (2000). These four ideas are shape, location, transformations, and spatial visualization. These quintessential concepts in school geometry are summarized in the introduction to the book and related specifically to grades 3–5 at the start of each chapter. Please take time to read the introductions to both the book and the chapter before you begin the activities in each chapter. Doing so will help you understand the various connections to geometry in grades 3–5 discussed in *Principles and Standards for School Mathematics* and deepen your understanding of the big ideas and the important mathematics that is behind each one.

The activities in this book are designed with you, the teacher, in mind. Although the activities for each big idea are not intended to constitute a complete unit, the activities are sequential, one building on another. Also, many connections among the big ideas have been emphasized throughout. The final activity, Geo City, incorporates the major concepts presented throughout the book. Designed as a project, this activity is effective as an interactive, performance-based assessment.

Each chapter begins with a brief overview of the concepts included in the big idea. The activities, which contribute to the development of those concepts, follow the same format throughout the book: Goals for students’ learning are presented and are connected to the expectations for students in grades 3–5 outlined in the geometry section in *Principles and Standards for School Mathematics*. The prior knowledge expected of students, the materials necessary for conducting the activity, and the learning environment are then discussed, and the important geometric terms emphasized in the activity are listed. Since language development is very important in these grades, definitions for terms that may not be familiar to teachers have been included in some instances. Research has shown that imprecise language is very evident in students’ work in geometry (Burger and Shaughnessy 1986). Correct language is essential for the development of conceptual understanding in geometry. Teachers are encouraged to introduce the important terms to students during the activity and to make sure that the students understand them before moving on. Using the terms frequently throughout the year will reinforce students’ understanding and correct use of the terms.

The “Engage” section of each activity sets the stage for the exploration. This section, which is sometimes a miniexploration, is an important part of the lesson; its success rests on the teacher’s efforts to spark

Key to Icons



Principles and Standards



CD-ROM



Blackline Master

Three different icons appear in the book, as shown in the key.

One alerts readers to material quoted from *Principles and Standards for School Mathematics*, another points them to supplementary materials on the CD-ROM that accompanies the book, and a third signals the blackline masters and indicates their locations in the appendix.

interest, give clear directions, and sometimes provide initial instruction. The key is to engage without overinstructing, which can be difficult. In our desire for our students to succeed, we teachers often “help” them too much. We must remember that learning is much more powerful when it is gleaned through discovery—especially when some struggle is involved—than when it is imparted through telling.

In “Explore,” the activities are described and suggestions are given for guiding the students’ explorations. The blackline masters that accompany some of the activities are intended to help you organize the activities. The masters are signaled by an icon and can be found in the appendix, along with solutions to the problems. They can also be printed from the CD-ROM that accompanies the book. The CD, also signaled by an icon, contains applets for students to manipulate and resources for professional development.

The “Assess” section offers suggestions for ongoing informal and formal assessment. Please be aware that the time requirements for the activities differ. Some will take one class period of about one hour. Others, however, may take several days to complete, with the “Engage” section introduced on the first day, followed by a couple of days for the exploration and a final day for summary and assessment.

The “Extend” section can guide you in providing challenges that require high-level thinking for students who are ready to extend their learning. The tasks suggested in this section can be used in a learning center, in individualized instruction, or in a flexible-grouping program to give students differentiated instruction. “Where to Go Next in Instruction?” will help you see where an activity fits into the curriculum and what might follow logically to further develop the concepts investigated in it.

The authors hope you find that the activities in this book enrich your curriculum and help your students develop a strong sense of geometric concepts and relationships—help them “grasp the space in which they live.” Foremost, we hope that in your explorations, you and your students experience the joy and wonder of geometry and other mathematics.