A PRACTICAL APPROACH TO USING LEARNING STYLES IN MATH INSTRUCTION

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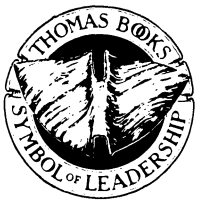

CHARLES C THOMAS • PUBLISHER
Springfield • Illinois • U.S.A.

Published and Distributed Throughout the World by

CHARLES C THOMAS • PUBLISHER
2600 South First Street
Springfield, Illinois 62794-9265

ISBN 0-398-05888-1 (cloth)
ISBN 0-398-06289-7 (paper)
Library of Congress Catalog Card Number: 93-5643

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Printed in the United States of America
SC-R-3

Library of Congress Cataloging-in-Publication Data

Midkiff, Ruby Bostick, 1954–
A practical approach to using learning styles in math instruction / by Ruby Bostick Midkiff, Rebecca Davis Thomasson.
p. cm.
Includes bibliographical references and index.
ISBN 0-398-05888-1 — ISBN 0-398-06289-7 (pbk.)
1. Mathematics—Study and teaching. 2. Cognitive styles. 3. Learning, Psychology of. I. Thomasson, Rebecca Davis. II. Title.
QA11.M4965 1994
370.15'651—dc20 93-5643
CIP

To my parents, W. L. Roach and Doris Young Roach,
my husband, Louis Midkiff, and my son, Martin John Bostick,
with love and pride for their continued support and cooperation.
Ruby Bostick Midkiff

To my husband, Bob Thomasson; my children, Ann Marie Crawford and Davis Kelly; and my parents, Opheila Barbee Davis and the late Van Davis because they have always expressed sincere support for my educational endeavors.
Rebecca Davis Thomasson

and

To all of the teachers who strive to make a difference in lives of children through the use of learning styles.

ACKNOWLEDGMENTS

Without the love, support, patience, and understanding of our families, this work would not have been completed. Our thanks also go to the many people who made this project a reality, especially the teachers from Blytheville, Arkansas, who participated in the Techniques for Teaching Students Through Their Learning Styles Seminar during the spring of 1990. Their willingness to try new and different techniques and their permission to include some of their activities are greatly appreciated.

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Chapter One

INTRODUCTION

The need for improvement in mathematics has received increased attention during recent years. If students are to be prepared to meet the needs of the 21st century, mathematics instruction must shift from mastery of abstract facts to a more thorough understanding of mathematical concepts and skills. Decision making, problem solving, and use of technology will be prerequisites for success in almost any career. Furthermore, much attention has been given to the use of learning styles in the general curriculum and in teaching students to read. However, the use of learning styles based instruction in the mathematics classroom has received limited attention by educational authorities. Therefore, the purpose of this book is to address the improvement of mathematics instruction through the use of learning styles based instruction.

The authors of this text advocate implementation of the National Council of Teachers of Mathematics (NCTM) *Curriculum and Evaluation Standards For School Mathematics* (1989) and recommend that mathematics teachers of all levels of instruction read this document and implement use of the described techniques and strategies. Furthermore, consideration of learning styles based instruction as the *NCTM Standards* are studied and implemented in mathematics classrooms is recommended to increase student achievement in mathematics, as well as improve attitudes towards mathematics and students' self-esteem regarding mathematics.

Chapter Two of the text documents the need for improvement in mathematics and addresses how both the curriculum and instruction must change to prepare our students to live successful lives in the 21st century. Chapter Three provides a comprehensive overview of learning styles and is the most substantial chapter of the book since understanding learning styles is necessary for implementation of the strategies described throughout this writing. Effective use of manipulatives is discussed in Chapter Four and a sample lesson plan which can be used as a model for future use has been included. The use of spatial reasoning as a way to reduce gender differences in mathematics achievement is

addressed in Chapter Five. For easy reference by the reader, references for additional activities to foster visual thinking and spatial reasoning skills have been included in this chapter in addition to their inclusion in the references section of the book. In order to show how a variety of learning styles can be accommodated while providing appropriate drill-and-practice for students, activities which aid retention of mathematical concepts and skills through a variety of learning styles are presented in Chapter Six. The need for changes in assessment in mathematics and ways to implement authentic assessment through the use of portfolios are presented in Chapter Seven. The final chapter summarizes the key ideas presented in detail throughout the book. References for all of the chapters are included in the last segment of this book. All of the chapters have been divided by subheadings including a conclusion which summarizes the key concepts of each section. These subheadings are listed in the table of contents for easy reference by the reader. Specific strategies and activities have been indented throughout the book so that they can be easily identified by the reader. Further explanations of these strategies and activities often follow the indentations in regular format.

The goals of this book, therefore, are to give the reader an understanding of learning styles based instruction in mathematics, of effective use of manipulatives in teaching various concepts at all grade levels, of ways to develop spatial reasoning skills in students, of different activities which accommodate a variety of learning styles, and of authentic assessment in mathematics. The authors contend that use of learning styles based instruction is a powerful strategy which teachers can and should utilize. When the methodology discussed in this book is utilized, teaching will be more effective, less remediation will be necessary, and the overall mathematics curriculum will be enhanced.

The authors, as experienced teachers, have used the suggested activities and approaches described within and can attest to their utility, versatility, and overall effectiveness. Readers are encouraged to modify the suggestions as appropriate and to be creative and flexible in their conceptualization and adaptations of this book's content. Teaching and learning are both complex processes that will become increasingly better understood over time and which continue to require judgement, energy, motivation, and hard work.

Chapter Two

IMPROVING MATHEMATICS INSTRUCTION

NEED FOR INCREASED ACHIEVEMENT IN MATHEMATICS

In recent years, basic skills tests, including a mathematics component, have been implemented in many states and, as a result, a great deal of emphasis has been placed on accountability in teaching. In the same realm, teachers are showing increasing concern about student academic achievement in mathematics. There is a growing number of students entering colleges and universities in need of remedial mathematics. In fact, *Everybody Counts: A Report to the Nation on the Future of Mathematics Education* (National Research Council, 1989) discusses the serious situation that our country faces and the need for high-quality instruction in mathematics. This report also states that the first high school graduates of the 21st century "will leave school without sufficient preparation in mathematics to cope with either on-the-job demands for problem solving or college expectations for mathematical literacy" (p. 2). The National Education Goals for the year 2000 (1989) also state, "Goal 4 Science and Mathematics. U.S. Students will be first in the world in science and mathematics achievement." Furthermore, the *National Council of Teachers of Mathematics Curriculum and Evaluation Standards for School Mathematics* (1989) were created "as one means to help improve the quality of school mathematics" (p. v).

Several approaches can be used to remedy the problem of low student performance in mathematics. All students must receive mathematics instruction and preparation appropriate for the 21st century. Teachers must understand and emphasize that knowledge about and high academic performance in mathematics is the best way "up" for students from disadvantaged backgrounds (National Research Council, 1989). The employees of the next century must be "problem solvers, decision makers, adept negotiators, and thinkers who are at home with open-endedness, flexibility, and resourcefulness" (Caine & Caine, 1991, p. 14). Furthermore, problem-solving skills, use of the calculator and manipula-