

Contents

Foreword by <i>Herbert P. Ginsburg</i>	xi
Preface	xiii
Acknowledgments	xv

Part I: General Framework

1. Two Views of Learning	3
The Need for a Psychological Understanding of Learning	3
Two Theoretical Approaches	7
Educational Implications: Planning for Meaningful Learning	15
2. Informal Mathematics: The Key Middle Step	18
The Preschooler's Knowledge of Mathematics	18
A Brief History of Mathematics	20
Children's Mathematical Development	26
Educational Implications: Building on Informal Knowledge	34
3. Two Views of Curriculum and Instruction	37
Educational Effectiveness and Theoretical Perspective	37
Arithmetic or Mathematics?	42
Educational Implications: Planning Balanced and Appropriate Instruction	47
4. Different Approaches to Evaluation and Remediation	50
The Need for Specific Evaluation: The Case of Adam	50
Two Views of Evaluation and Remediation	51
Standard Tests	58
Educational Implications: Components of Effective Testing and Diagnosis	61
5. Beliefs and Math Anxiety	65
The Nature of the Problem	65

Beliefs	68
Math Anxiety	70
Educational Implications: Fostering Constructive Beliefs	74

Part II: Informal Mathematics

6. Counting Skills	81
The Development of Counting Skills	81
Educational Implications: Counting Difficulties and Remedies	88
Educational Implications: Teaching Counting Skills	99
Summary	103
7. Number Development	104
Two Views of Number Development	104
Educational Implications: Number Difficulties and Remedies	116
Educational Implications: The Nature of Basic Instruction	122
Summary	127
8. Informal Arithmetic	128
The Bases for Informal Addition and Subtraction	128
Informal Addition	131
Informal Subtraction	136
Informal Multiplication	139
Educational Implications: Informal Arithmetic Difficulties and Remedies	142
Summary	154

Part III: Formal Mathematics

9. Arithmetic Concepts	157
The Need for Meaningful Learning	157
Informal Knowledge as a Building Block	159
Educational Implications: Designing Meaningful Instruction	163
Educational Implications: Dealing with Blind Spots	169
Summary	176
10. Basic Number-Combination Mastery	177
Number-Combination Difficulties	177
Two Views of Mastering Basic Number Combinations	178

Educational Implications: Developmental Factors and Pitfalls	182
Educational Implications: Meaningful Instruction of Basic Number Combinations	187
Summary	191
11. Reading and Writing Basic Symbols	192
Reading and Writing Difficulties	192
Different Views—Different Instruction	194
Educational Implications: Focused Reading and Writing Training	197
Summary	201
12. Place-Value Numeration Skills and Concepts	204
Reading and Writing Multidigit Numerals	204
Place-Value Knowledge	210
Educational Implications: Meaningful Place-Value Numeration Training	213
Summary	221
13. Written and Mental Multidigit Calculation	223
Adam’s Calculating Difficulties	223
Written Calculation	225
Mental Arithmetic	231
Educational Implications: Providing Meaningful and Well-Rounded Computational Training	239
Summary	245
14. Problem Solving	247
Early Problem-Solving Ability	247
Problem Solving and Word Problems	253
Educational Implications: Instruction That Encourages Problem Solving	260
Summary	264
15. Epilogue	266
Progress Is Possible: The Case of Adam	266
Toward Meaningful and Enjoyable Mathematical Learning	267
References	270
About the Author	285
Index	287