

# Contents

1	Introduction	1
	<i>M. Suzanne Donovan and John D. Bransford</i>	
	A Fish Story, 2	
	Learning Environments and the Design of Instruction, 12	
	Putting the Principles to Work in the Classroom, 20	
	Intent and Organization of This Volume, 21	
	Notes, 25	
	References, 26	
<b>Part I:</b>		
<b>History</b>		
2	Putting Principles into Practice: Understanding History	31
	<i>Peter J. Lee</i>	
	History and Everyday Ideas, 33	
	Substantive Concepts, 61	
	History That Works, 65	
	Notes, 73	
	References, 74	
3	Putting Principles into Practice: Teaching and Planning	79
	<i>Rosalyn Ashby, Peter J. Lee, and Denis Shemilt</i>	
	The Reality Test, 80	
	Working with Evidence: Pilgrim Fathers and Native Americans, 84	
	Working with Evidence: The St. Brendan's Voyage Task, 119	

- Appendix 3A: Implications for Planning, 164  
 Notes, 177  
 References, 177
- 4 “They Thought the World Was Flat?": Applying the Principles of  
*How People Learn* in Teaching High School History 179  
*Robert B. Bain*  
 Where to Begin? Transforming Topics and Objectives into  
 Historical Problems, 181  
 Designing a “History-Considerate” Learning Environment:  
 Tools for Historical Thinking, 199  
 Conclusion, 209  
 Acknowledgments, 210  
 Notes, 211  
 References, 212

## Part II: Mathematics

- 5 Mathematical Understanding: An Introduction 217  
*Karen C. Fuson, Mindy Kalchman, and John D. Bransford*  
 Principle #1: Teachers Must Engage Students’ Preconceptions, 219  
 Principle #2: Understanding Requires Factual Knowledge and  
 Conceptual Frameworks, 231  
 Principle #3: A Metacognitive Approach Enables Student  
 Self-Monitoring, 236  
 Next Steps, 243  
 Notes, 246  
 References, 246  
 Suggested Reading List for Teachers, 256
- 6 Fostering the Development of Whole-Number Sense:  
 Teaching Mathematics in the Primary Grades 257  
*Sharon Griffin*  
 Deciding What Knowledge to Teach, 259  
 Building on Children’s Current Understandings, 267  
 Acknowledging Teachers’ Conceptions and Partial  
 Understandings, 279  
 Revisiting Question 2: Defining the Knowledge That  
 Should Be Taught, 281  
 How Can This Knowledge Be Taught?:  
 The Case of Number Worlds, 282  
 What Sorts of Learning Does This Approach Make Possible?, 302

- Summary and Conclusion, 305  
 Acknowledgments, 306  
 Notes, 306  
 References, 306
- 7 Pipes, Tubes, and Beakers: New Approaches to Teaching the Rational-Number System 309  
*Joan Moss*  
 Rational-Number Learning and the Principles of *How People Learn*, 312  
 Instruction in Rational Number, 319  
 Conclusion: How Students Learn Rational Number, 341  
 Notes, 343  
 References, 345
- 8 Teaching and Learning Functions 351  
*Mindy Kalchman and Kenneth R. Koedinger*  
 Addressing the Three Principles, 359  
 Teaching Functions for Understanding, 373  
 Summary, 389  
 Acknowledgments, 391  
 Notes, 392  
 References, 392  
 Other Relevant Readings, 393

## Part III: Science

- 9 Scientific Inquiry and *How People Learn* 397  
*John D. Bransford and M. Suzanne Donovan*  
 Principle #1: Addressing Preconceptions, 399  
 Principle #2: Knowledge of What It Means to “Do Science,” 403  
 Principle #3: Metacognition, 407  
 The *How People Learn* Framework, 411  
 Conclusion, 415  
 Notes, 416  
 References, 416
- 10 Teaching to Promote the Development of Scientific Knowledge and Reasoning About Light at the Elementary School Level 421  
*Shirley J. Magnusson and Annemarie Sullivan Palinscar*  
 The Study of Light, 422  
 The Study of Light Through Inquiry, 426

Supporting Learning Through Cycles of Investigation, 460	
The Role of Subject-Specific Knowledge in Effective Science Instruction, 467	
Conclusion, 469	
Notes, 470	
References, 472	
11 Guided Inquiry in the Science Classroom	475
<i>James Minstrell and Pamela Kraus</i>	
The Unit: The Nature of Gravity and Its Effects, 477	
Summary, 511	
Notes, 512	
12 Developing Understanding Through Model-Based Inquiry	515
<i>James Stewart, Jennifer L. Cartier, and Cynthia M. Passmore</i>	
Genetics, 516	
Developing Darwin's Model of Natural Selection in High School Evolution, 540	
Classroom Environments That Support Learning with Understanding, 555	
Summary, 561	
Notes, 562	
References, 563	
<b>A Final Synthesis: Revisiting the Three Learning Principles</b>	
13 Pulling Threads	569
<i>M. Suzanne Donovan and John D. Bransford</i>	
Engaging Resilient Preconceptions, 569	
Organizing Knowledge Around Core Concepts, 575	
Supporting Metacognition, 577	
Principles of Learning and Classroom Environments, 586	
Notes, 588	
References, 589	
Other Resources, 590	
Biographical Sketches of Committee Members and Contributors	591
Index	597