Introduction to the Third Edition: Getting the Most from This Resource xv

PART I. FOUNDATIONS OF BUILDING EXPERTISE 3

Chapter 1: Expertise in the Global Economy  5
  The Value of Expertise  5
  What Is an Expert?  7
  Seven Lessons Learned About Experts  9

Chapter 2: Four Ingredients of Instruction  17
  Which Media Are Best for Learning?  18
  Four Components of Learning  19
  Three Views of Learning  21
  Four Instructional Architectures  23

Chapter 3: No Yellow Brick Road  33
  Instructional Components and Learning:
    No Yellow Brick Road  33
  Graphics and Learning: A Journey Down
    the Yellow Brick Road  34
  Factors That Influence Learning  40
  Toward an Evidence-Based Training Profession  42
  About the Numbers  43

Chapter 4: The Psychology of Building Expertise  49
  Two Memories for Learning  49
PART II. BASIC LEARNING EVENTS PROVEN TO BUILD EXPERTISE 65

Chapter 5: How Working Memory Works 67
   Working Memory: The Center of Learning 68
   New Content Has a Short Shelf Life in Working Memory 69
   Chess, Chunking, and Capacity Limits of Working Memory 71
   What Happens When Working Memory is Overloaded? 75
   Automaticity: A Working Memory Bypass 77
   Visual and Auditory Components in Working Memory 79
   Why Is Working Memory So Limited? 80
   Working Memory and Performance 81

Chapter 6: Managing Cognitive Load 85
   The Cognitive Load Management Principle 86
   Methods That Bypass Working Memory 89
   Methods That Minimize Content 94
   Methods to Impose Content Gradually 100
   Methods to Minimize Unproductive Mental Work 102
   Methods to Maximize Working Memory Capacity 105

Chapter 7: Managing Attention 111
   The High Price of Attention Failure 111
   The Attention Principle 112
   Instructional Methods to Support Attention 114
   Optimizing Attentional Capacity in the Classroom 115
   Methods to Focus Attention 120
   Methods to Support Selective Attention 121
What Is Divided Attention? 129
Methods to Minimize Divided Attention 131

Chapter 8: Leveraging Prior Knowledge 139
The Prior Knowledge Principle 140
Methods to Activate Prior Knowledge 141
Methods to Compensate for Limited Prior Knowledge 148
Avoid Activating Inappropriate Prior Knowledge 155
When to Use Prior Knowledge Methods 158

Chapter 9: Helping Learners Build Mental Models:
Implicit Methods 163
The Building Mental Models Principle 164
Explicit and Implicit Encoding Methods 167
Implicit Methods to Build Mental Models 169
Use Graphics to Build Mental Models 169
Personalize Your Learning Environment 177
Include Deep-Level Learning Agent Dialogs 183
Provide Examples and Encourage Their Processing 185
Provide Effective Analogies 187
Include Process Content in Your Instruction 189
Offer Cognitive Support for Novice Learners 191

Chapter 10: Helping Learners Build Mental Models:
Explicit Methods 197
Is Active Learning Better? A Tale of Six Lessons 198
Building Mental Models Principle 203
Explicit vs. Implicit Methods for Building Mental Models 204
Maintenance vs. Elaborative Rehearsal 205
Incorporate Frequent Elaborative Practice Exercises 207
The Law of Diminishing Returns 209
Distribute Practice Assignments 212
Provide Explanatory Feedback 214
Use Effective Questioning Techniques in the Classroom 217
Promote Psychological Engagement with Graphics 219
Promote Explicit Self-Explanations of Content 220
Incorporate Collaborative Learning Opportunities 223
Minimize Note-Taking in Instructor-Led Presentations 226
Who Benefits from Practice? 227

Chapter 11: Learning vs. Performance:
The Psychology of Transfer 233
Transfer: The Bridge from Training to Performance 234
Four Tales of Transfer Failure 235
Causes of Transfer Failure 238
The Transfer Challenge 241
Specific Versus General Theories of Transfer 241
The Transfer Continuum 244
Surface Versus Deep Structure and Transfer 247
Transfer and Intelligence 248

Chapter 12: Teaching for Transfer 253
Transfer: It's All About Context 253
Teaching for Near-Transfer Performance 254
Learning Aids for Near-Transfer Learning 257
Teaching for Moderate Transfer 259
Teaching for Far-Transfer Performance 262
Learning Aids for Guided-Discovery Simulations 273

PART III. PROMOTING ADAPTIVE EXPERTISE
AND MOTIVATION 279

Chapter 13: Problem-Centered Instruction 281
The Revival of Problem-Centered Learning 282
The Benefits of Problem-Centered Design 283
Three Problem-Centered Design Models 286
Model 1: Problem-Based Learning (PBL) 286
Model 2: 4C/ID 294
Model 3: Sherlock and Cognitive Apprenticeship 298
Applying Problem-Centered Design 299
Issues in Problem-Centered Instruction 304
Reservations About Problem-Centered Instruction 306

Chapter 14: Metacognition, Self-Regulation, and Adaptive Expertise 313
Cognition, Metacognition, and Adaptive Expertise 314
Metacognition and Self-Regulation 316
Are Learners Self-Regulated? 318
Supporting Self-Regulation During Learning 321
Domain-Specific Metacognitive Skills 327
Building Domain-Specific Metacognitive Skills 329

Chapter 15: Motivation and Expertise 337
Motivation for Learning 337
What Is Motivation? 339
External vs. Internal Views of Motivation 340
Beliefs and Learning Choices 341
Beliefs About Learning Outcomes and Persistence 346
Goal Setting and Motivation 347

Chapter 16: Motivating Your Learners 357
Instructional Environments That Motivate 357
Evidence for Managing Learner Beliefs 358
Promote Self-Confidence by Structuring for Success 359
Encourage Mastery (Progress) Goal Orientations 363
Exploit Personal and Situational Interest 365
Techniques to Promote Cognitive Situational Interest 366
PART IV. BUILDING EXPERTISE IN ACTION 377

Chapter 17: Practical Applications in Building Expertise 379
  Adopting Evidence-Based Practice 380
  What Is an Excellent Lesson? 383
  Sample 1: A Receptive Presentation 388
  Sample 2: A Directive e-Lesson 393
  Sample 3: A Guided-Discovery Classroom Workshop 397
  Exploratory Architectures for Far-Transfer Learning 401
  A Final Word 403

References 405
Glossary 431
Name Index 469
Subject Index 475
About the Author 493
About ISPI 495