

Contents

1. Introduction: Effective Mathematics Instruction	1
Some Strategies for Improving Mathematics Instruction	4

Part I: Teaching Elements

2. Assessment: Measuring Student Learning	9
Alignment	10
Purpose and Timing	11
Assessment Types	17
Evidence of Learning: Assessment Data	19
3. Setting and Communicating Explicit Criteria	31
Verbal Criteria	32
Models and Exemplars	32
Checklists	33
Rubrics	34
Involving Students in Developing Explicit Criteria	38
Using Criteria to Support Classroom Assessment	39
4. Using Questions Effectively	41
Questions to Support Different Forms of Thinking	44
Encouraging Student Questions	50
5. Quality Learning Problems: Skills in Context	53
5.1: <i>My Birthday Chart</i>	56
5.2: <i>Patterns and Their Rules</i>	65
5.3: <i>How Much Money Do I Need?</i>	68
5.4: <i>Design a Game Board</i>	72
5.5: <i>Allowance Planning</i>	76
Writing in Math	78
Conclusion	81

Part II: Lessons and Activities

6. Patterns	85
Patterns – Grades K/1: Teacher-Directed Lesson	86
Teaching Guide	87
6.1: <i>What’s the Pattern?</i>	89
6.2: <i>Patterns with Partners</i>	90
6.3: <i>My Very Own Pattern</i>	91
Patterns – Grades K/1: Student-Centered Lesson	92
Teaching Guide	93
6.4: <i>Patterns with Color (Center 1)</i>	98
6.5: <i>Patterns with Sound (Center 2)</i>	99
6.6: <i>Working with Shapes (Center 3)</i>	100
6.7: <i>Creating a Joint Pattern (Center 4)</i>	101
6.8: <i>My Special Pattern</i>	102
Patterns – Grades 2/3: Teacher-Directed Lesson	104
Teaching Guide	105
6.9: <i>What Do I Know About Patterns?</i>	107
6.10: <i>Growing and Repeating Patterns</i>	109
6.11: <i>Patterns Everywhere</i>	110
6.12: <i>What Have I Learned About Patterns?</i>	111
Patterns – Grades 2/3: Student-Centered Lesson	113
Teaching Guide	114
6.13: <i>What Do I Know About Patterns?</i>	119
6.14: <i>Growing and Repeating Patterns</i>	121
6.15: <i>Noticing Patterns</i>	122
6.16: <i>What Have I Learned About Patterns?</i>	123
Patterns – Grades 4/5: Teacher-Directed Lesson	125
Teaching Guide	125
6.17: <i>Patterns in Many Places</i>	128
6.18: <i>Patterns in Problems</i>	130
6.19: <i>The Disappearing Dog Dilemma</i>	132
Patterns – Grade 4/5: Student-Centered Lesson	134
Teaching Guide	135
Introducing Learning Centers	135
6.20: <i>What Do I Already Know About Patterns? (Center 1)</i>	140
6.21: <i>Patterns in Games (Center 2)</i>	142
6.22: <i>Patterns in Rhythm and Rhyme (Center 3)</i>	144

6.23: <i>Patterns in Art (Center 4)</i>	146
6.24: <i>Patterns in Problems</i>	147
6.25: <i>The Disappearing Dog Dilemma</i>	149
6.26: <i>Reflecting on Patterns</i>	151
7. Measurement	153
Measurement – Grades K/1: Teacher-Directed Lesson	154
Teaching Guide	154
Measurement – Grades K/1: Student-Centered Lesson	156
Teaching Guide	157
Measurement – Grades 2/3: Teacher-Directed Lesson	161
Teaching Guide	161
7.1: <i>How Big Is It?</i>	164
7.2: <i>A Different Way to Measure</i>	165
7.3: <i>Measuring with a Ruler</i>	166
Measurement – Grades 2/3: Student-Centered Lesson	167
Teaching Guide	168
7.4: <i>How Can We Measure Well?</i>	170
7.5: <i>Measuring</i>	171
7.6: <i>Measuring Length</i>	172
7.7: <i>Measuring Capacity</i>	173
7.8: <i>Measuring Time</i>	174
7.9: <i>Measuring Weight</i>	175
7.10: <i>Combined Group Responses</i>	176
Measurement – Grades 4/5: Teacher-Directed Lesson	177
Teaching Guide	177
Measurement – Grades 4/5: Student-Centered Lesson	179
Teaching Guide	180
7.11: <i>How Accurately Do I Measure?</i>	182
8. Money	183
Money – Grades K/1: Teacher-Directed Lesson	184
Teaching Guide	185
8.1: <i>Penny</i>	187
8.2: <i>Nickel</i>	188
8.3: <i>How Much Do I Have?</i>	189
8.4: <i>Do I Have Enough?</i>	191
Money – Grades K/1: Student-Centered Lesson	192
Teaching Guide	193
8.5: <i>Which Coin Is Which? (Exploration 1)</i>	196

8.6: <i>How Many? (Exploration 2)</i>	197
8.7: <i>What Are They Worth? (Exploration 3)</i>	198
8.7A: <i>Change Form (Exploration 3)</i>	199
8.8: <i>Student Reflection</i>	200
Money – Grades 2/3: Teacher-Directed Lesson	202
Teaching Guide	203
8.9: <i>Reviewing Where We Are and What We Have</i>	205
8.10: <i>You Can't Buy a Dinosaur with a Dime</i>	206
Money – Grades 2/3: Student-Centered Lesson	208
Teaching Guide	209
8.11: <i>Money Grab Bag</i>	213
8.12: <i>How Much Is That Dinosaur?</i>	215
8.13: <i>Money Earned, Money Spent</i>	218
Money – Grades 4/5: Teacher-Directed Lesson	220
Teaching Guide	220
8.14: <i>Independent Practice</i>	223
8.15: <i>Word Problems</i>	224
Money – Grades 4/5: Student-Centered Lesson	225
Teaching Guide	226
8.16: <i>What Do I Know?</i>	229
8.17: <i>Shopping List</i>	230
8.18: <i>Toys“R”Us Shopping Trip</i>	231
8.19: <i>Shopping-Trip Checklist</i>	232
9. Fractions	233
Fractions – Grades K/1: Teacher-Directed Lesson	234
Teaching Guide	234
9.1: <i>How Many?</i>	237
Fractions – Grades K/1: Student-Centered Lesson	239
Teaching Guide	240
9.2: <i>Testing Our Hunches</i>	245
9.3: <i>What Is Half?</i>	246
Fractions – Grades 2/3: Teacher-Directed Lesson	248
Teaching Guide	248
9.4: <i>Understanding Fractions</i>	251
Fractions – Grades 2/3: Student-Centered Lesson	252
Teaching Guide	253
9.5: <i>And the Survey Says . . .</i>	257
9.6: <i>Telling a Data Story</i>	258

Fractions – Grades 4/5: Teacher-Directed Lesson	260
Teaching Guide	260
<i>9.7: Which Is Greater?</i>	262
Fractions – Grades 4/5: Student-Centered Lesson	264
Teaching Guide	265
<i>9.8: What Do I Already Know About the Size of Fractions?</i>	268
<i>9.9: Discovering and Testing Rules</i>	272
<i>9.10: Reflecting on What I Have Learned</i>	276
Resources and Web Links	277
References	280
Index	281

