

Inventory of Investigations & Activities

xv

I	<i>How to Teach Elementary School Science</i>	1
----------	---	----------

I	<i>Science in Elementary Education</i>	3
----------	--	----------

- Science Imperatives 4
- Society Imperatives 12
- Childhood Imperatives 15
- How Science Contributes to Whole Learning 16
- Summary 18
- Suggested Readings 18

2	<i>How Children Learn Science</i>	19
----------	-----------------------------------	-----------

- Contributions of Piaget 20
- Applying Piaget's Theory to Classroom Science 35
- Children's Concepts, Misconceptions, and Schema Theory 39
- Assessing Children's Knowledge of Concepts and Causes of Events 43
- Summary 46
- Suggested Readings 46

3 *How to Use Closed-Ended and Open-Ended Activities*

48

Closed-Ended Activities	49
Open-Ended Activities	50
How Well Can You Identify and Develop Open-Ended and Closed-Ended Activities?	60
How to Practice	64
Summary	64
Suggested Readings	65

4 *How to Improve Children's Thinking*

66

Observing	67
Classifying	68
Measuring	69
Communicating	74
Inferring	77
Experimenting	78
Textbook Experiments	82
Narrow and Broad Questions for Process Skills	84
Summary of the Process Skills	84
How Well Do You Know the Process Skills?	87
Scientific Attitudes	91
Summary	96
Suggested Readings	97

5 *How to Use Different Resources to Teach Science*

98

Getting Equipment and Supplies	99
Reading Materials	100
Nonreading Materials	108
School and Community Resources	112

Resources for Mainstreamed Handicapped Pupils	113
Resources for Mainstreamed Gifted Pupils	117
Hands-On Activities with Few Materials	118
Summary	123
Suggested Readings	124

6 *How to Arrange and Manage Complementary Experiences* **125**

How to Make Science Learning Centers	126
Managing the Science Learning Center	134
How Well Can You Construct and Manage Science Learning Centers?	136
Microcomputer Centers	138
Science Projects	144
Summary	146
Suggested Readings	147

7 *How to Organize and Evaluate Science Teaching* **148**

Activity-Centered Programs	149
Textbook-Centered Programs	150
School District Curriculum Guides	151
How to Supplement Textbook Units	154
How to Make Your Own Textbook-Based Units	154
Objectives and the Evaluation of Science Learning	164
Lessons and Block Plans	167
How Well Can You Construct and Teach Science Units?	170
Summary	171
Suggested Readings	171

III *Subject Matter, Investigations, and Activities* 173

How Part II Can Help You

174

Investigations 174
Activities 175

8 *Light Energy and Color* 177

1. The Pathways of Light 178
2. Light Refraction 180
3. Color 183
4. Perception and the Eye 185

Investigations and Activities 187
Selected Trade Books: Light Energy and Color 222

9 *Heat Energy* 223

1. Expansion and Contraction 224
2. Changing States of Matter 226
3. Temperature and Heat Energy 228
4. Conduction, Convection, and Radiation 229

Investigations and Activities 233
Selected Trade Books: Heat Energy 257

10 *Sound Energy* 258

1. Sound Vibrations 259
2. How Sounds Travel 262
3. Reflected and Absorbed Sounds 263
4. How Pitch Changes 265

- 5. Hearing and Locating Sounds 267
- Investigations and Activities 268
- Selected Trade Books: Sound Energy 296

11***Magnetic Interactions* 297**

- 1. Magnets and What They Attract 298
- 2. Making Magnets 299
- 3. Fields of Force 300
- 4. Magnetic Poles 300
- 5. Magnetic Theory and Care of Magnets 301

Investigations and Activities 303

Selected Trade Books: Magnetic Interactions 321

12***Electrical Energy* 322**

- 1. Closed and Open Circuits 323
- 2. Series and Parallel Circuits 325
- 3. Conditions Affecting Electrical Flow 328
- 4. Electromagnets 330
- 5. Generating Electricity 332

Investigations and Activities 334

Selected Trade Books: Electrical Energy 364

13***Simple Machines and How They Work* 365**

- 1. Inclined Planes and Screws 366
- 2. Levers 368
- 3. Wheel and Axle 369
- 4. Pulleys 371
- 5. Motion and Friction 372

Investigations and Activities 373

Selected Trade Books: Simple Machines and How They Work 402

14 *Plant Life and Environment* **403**

1. Seeds 404
2. Vegetative Reproduction 407
3. Environmental Conditions 409
4. Plant Parts and Functions 410
5. Responses to Environment 413
6. Molds 414

Investigations and Activities 415
Selected Trade Books: Plant Life and Environment 443

15 *Animal Life and Environment* **444**

Classifying Animals 445

1. Animals with Backbones 446
2. Some Animals Without Backbones 458
3. Ecology 464

Investigations and Activities 467
Selected Trade Books: Animal Life and Environment 496

16 *Human Body and Nutrition* **497**

1. Skeletal and Muscle Systems 498
2. The Nervous System 500
3. The Circulatory and Respiratory Systems 502
4. The Digestive System 504
5. Foods and Nutrition 505

Investigations and Activities 509
Selected Trade Books: Human Body and Nutrition 541

17***The Earth's Changing Surface*****542**

1. Weathering and Erosion 543
2. Soil and Its Makeup 545
3. Building Up of the Land 546
4. How Rocks Are Formed 550

Investigations and Activities 556

Selected Trade Books: The Earth's Changing Surface 580

18***Water, Air, and Weather*****582**

1. Water 583
2. Air and Its Properties 586
3. Weather 589

Investigations and Activities 596

Selected Trade Books: Water, Air, and Weather 631

19***The Earth in Space*****633**

1. Time and Seasons 634
2. Interactions of the Moon, Earth, and Sun 637
3. The Solar System and Beyond 641
4. Gravity and the Laws of Motion 643

Investigations and Activities 647

Selected Trade Books: The Earth in Space 674