

# RESEARCH IN EDUCATION

---

## A Conceptual Introduction

James H. McMillan

Virginia Commonwealth University

Sally Schumacher

Virginia Commonwealth University



Little, Brown and Company  
Boston      Toronto

# CONTENTS

---

## PART I

### Basic Principles of Educational Research 1

#### CHAPTER 1 Introduction to the Field of Educational Research 2

##### Research as Scientific Inquiry 3

Sources of Knowledge 3

Definition of Research 4

Nature of Research-Based Knowledge 5

Scientific Inquiry 7

##### The Functions of Research 7

Basic Research 10

Applied Research 12

Evaluation Research 13

##### Education as a Field of Inquiry and Practice 15

Interdisciplinary Field of Inquiry 15

Limitations of Educational Research 16

Importance of Educational Research 17

##### Summary 18

##### Self-Instructional Review Exercises 19

#### CHAPTER 2 Types of Research: Designs, Techniques, and Format 21

##### Research Design 22

Experimental Designs 22

Nonexperimental Designs 25

##### Collecting Information 27

Observational Research 28

Questionnaire Research 29

Test Research 29

Interview Research 30

Documents 30

Ethnographic Research 30

Unobtrusive Research 31

##### Format of Research Articles 31

Abstract 32

Introduction 32

Research Problem 32

|   |           |
|---|-----------|
| Review of Literature  | 33        |
| Research Hypothesis or Question   | 35        |
| Methodology   | 36        |
| Results   | 38        |
| Discussion, Implications, Conclusions                                     | 38        |
| References  | 40        |
| <b>How to Read Research</b>   | <b>40</b> |
| Research Problems   | 43        |
| Review of Literature  | 43        |
| Hypotheses or Questions   | 44        |
| Methodology   | 44        |
| Results   | 44        |
| Discussion, Implications, Conclusions                                     | 44        |
| <b>Summary</b>  | <b>44</b> |
| <b>Self-Instructional Review Exercises</b>                                | <b>45</b> |
| <b>CHAPTER 3 Research Problems: Statements, Questions, and Hypotheses</b> | <b>47</b> |
| <b>Nature of Research Problems</b>  | <b>48</b> |
| Sources of Problems   | 48        |
| Illustrative Topics   | 49        |
| <b>Problem Statements</b>   | <b>51</b> |
| Concepts, Constructs, and Variables                                       | 52        |
| Problem Formulation   | 54        |
| Formal Problem Statements   | 56        |
| <b>Significance of Problem Selection</b>                                  | <b>58</b> |
| Knowledge of an Enduring Practice   | 58        |
| Theory Development  | 59        |
| Generalizability  | 59        |
| Methodological Advancement  | 60        |
| Current Issues  | 60        |
| Evaluation of a Specific Practice at a Given Site                         | 60        |
| <b>The Logic of Research Statements, Questions, and Hypotheses</b>        | <b>61</b> |
| Statements of Research Purposes   | 62        |
| Specific Research Questions   | 63        |
| Research Hypotheses   | 65        |
| Operational Definitions   | 67        |
| <b>Standards of Adequacy for Problem Statements</b>                       | <b>69</b> |
| General Research Problem  | 69        |
| Significance of Problem   | 69        |
| Specific Research Purpose, Question, or Hypothesis                        | 69        |
| Other Criteria for Standards of Adequacy                                  | 70        |
| <b>Summary</b>  | <b>70</b> |
| <b>Self-Instructional Review Exercises</b>                                | <b>71</b> |

|                  |   |           |
|------------------|---|-----------|
| <b>CHAPTER 4</b> | <b>Literature Review</b>                    | <b>74</b> |
|                  | Functions of a Review of Related Literature | 75        |
|                  | Sources for a Literature Review             | 78        |
|                  | Reviewing the Literature                    | 78        |
|                  | Sources for Reviews of Secondary Literature | 80        |
|                  | Sources for Primary Literature Review       | 81        |
|                  | The Search for the Literature               | 86        |
|                  | Selection of Databases and Key Terms        | 86        |
|                  | Manual Search                               | 87        |
|                  | Computer Search                             | 91        |
|                  | Abstracting and Organizing the References   | 96        |
|                  | Presentation of the Literature Review       | 97        |
|                  | Organization of the Literature Review       | 97        |
|                  | Criticism of the Literature                 | 98        |
|                  | Standards of Adequacy                       | 100       |
|                  | Selection of the Literature                 | 100       |
|                  | Criticism of the Literature                 | 100       |
|                  | Summary and Interpretation                  | 101       |
|                  | Summary                                     | 101       |
|                  | Self-Instructional Review Exercises         | 102       |

## **PART II**

### **Research Designs and Methods 105**

|                  |   |            |
|------------------|---|------------|
| <b>CHAPTER 5</b> | <b>Research Design</b>                    | <b>106</b> |
|                  | Characteristics of Research Design        | 107        |
|                  | Internal Validity                         | 108        |
|                  | External Validity                         | 114        |
|                  | Choosing Subjects                         | 116        |
|                  | Sample Selection                          | 117        |
|                  | Sample Size                               | 120        |
|                  | Choosing Instruments                      | 123        |
|                  | Test Validity                             | 123        |
|                  | Test Reliability                          | 126        |
|                  | Sources for Locating Existing Instruments | 130        |
|                  | Procedures for Collecting Information     | 132        |
|                  | Ethical and Legal Considerations          | 132        |
|                  | Ethics of Research                        | 132        |
|                  | Legal Constraints                         | 135        |

Summary 135

Self-Instructional Review Exercises 136

## **CHAPTER 6 Data Collection Techniques and Surveys 139**

Questionnaires 140

Justification 140

Defining Objectives 140

Writing Questions and Statements 140

General Format 142

Types of Items 143

Item Format 149

Pretesting 150

Interviews 150

Preparing the Interview 151

During the Interview 153

Observation 156

Justification 156

Defining Observational Units 157

Recording Observations 157

Training Observers 158

Unobtrusive Measures 158

Survey Research 160

Steps in Conducting a Survey 161

Summary 165

Self-Instructional Review Exercises 166

## **CHAPTER 7 Data Analysis of Quantitative Descriptive Research 169**

Introduction to Descriptive Statistics 170

Scales of Measurement 171

Graphic Portrayals of Data 173

Frequency Distribution: A Picture of a Group 173

Histogram 175

Frequency Polygon 175

Measures of Central Tendency 177

The Mean 178

The Median 179

The Mode 180

Relationships Among Measures of Central Tendency 180

Measures of Variability 183

The Range 184

Standard Deviation 184

Standard Scores 188

|                                       |     |
|---------------------------------------|-----|
| Measures of Relationship              | 189 |
| Scatter Plot                          | 189 |
| Correlation Coefficient               | 191 |
| Interpreting Correlation Coefficients | 192 |

Summary 198

Self-Instructional Review Exercises 199

## **CHAPTER 8** Experimental, Single Subject, and *Ex Post Facto* Research 202

Purpose and Characteristics of Experimental Research 203

    Characteristics of Experimental Research 203

    Strengths and Limitations of Experimental Research 205

    Planning Experimental Research 207

Internal Validity of Experiments 208

External Validity of Experiments 209

Pre-Experimental Designs 212

    Notation 212

    One-Group Posttest-Only Design 212

    One-Group Pretest-Posttest Design 213

    Posttest-Only with Nonequivalent Groups 215

True Experimental Designs 217

    Pretest-Posttest Control Group Design 218

    Posttest-Only Control Group Design 221

Quasi-Experimental Designs 224

    Nonequivalent Pretest-Posttest Control Group Design 225

    Time Series Designs 227

Single-Subject Designs 230

    A-B Designs 231

    A-B-A Designs 232

    Multiple-Baseline Designs 233

*Ex Post Facto* Designs 237

    Characteristics 237

    Conducting *Ex Post Facto* Research 238

Standards of Adequacy 239

    True Experimental Designs 240

    Quasi-Experimental Designs 240

    Single Subject Designs 241

*Ex Post Facto* Designs 241

Summary 241

Self-Instructional Review Exercises 242

|                  |   |            |
|------------------|---|------------|
| <b>CHAPTER 9</b> | <b>Inferential Data Analysis</b>                  | <b>245</b> |
|                  | The Logic of Inferential Statistics               | 246        |
|                  | Probability                                       | 246        |
|                  | Error in Sampling                                 | 247        |
|                  | Null Hypothesis                                   | 248        |
|                  | Level of Significance                             | 250        |
|                  | Errors in Hypothesis Testing                      | 252        |
|                  | Interpreting Level of Significance                | 252        |
|                  | Comparing Two Means: The <i>t</i> -Test           | 253        |
|                  | Comparing Two or More Means: Analysis of Variance | 257        |
|                  | One-Way Analysis of Variance                      | 257        |
|                  | Multiple Comparison Procedures                    | 258        |
|                  | Factorial Analysis of Variance                    | 260        |
|                  | Analysis of Covariance                            | 265        |
|                  | Nonparametric Tests                               | 266        |
|                  | Chi-Square  | 268        |
|                  | Multivariate Analyses                             | 269        |
|                  | Summary   | 271        |
|                  | Self-Instructional Review Exercises               | 274        |

|                   |  |            |
|-------------------|--|------------|
| <b>CHAPTER 10</b> | <b>Analytical Research: Historical, Legal, and Policy Studies</b>            | <b>276</b> |
|                   | General Characteristics of Analytical Research                               | 277        |
|                   | Topics of Analysis   | 277        |
|                   | Types of Sources   | 279        |
|                   | The Search for Facts   | 280        |
|                   | Nature of Analytical Explanations  | 281        |
|                   | Kinds of Analysis  | 282        |
|                   | Analysis of Educational Concepts   | 285        |
|                   | Analysis of Educational Events: Historical, Legal, and Policy-making Studies | 286        |
|                   | The Topic and Problem Statement  | 286        |
|                   | Location and Criticism of Sources  | 288        |
|                   | Facts, Generalizations, and Causal Explanations                              | 294        |
|                   | Analytical Research in Perspective   | 299        |
|                   | Standards of Adequacy for Analytical Research                                | 300        |
|                   | Problem Statement  | 300        |
|                   | Selection and Criticism of Sources   | 300        |
|                   | Facts and Generalizations  | 301        |
|                   | Causal Explanations  | 301        |

Summary 301

Self-Instructional Review Exercises 302

## **CHAPTER 11 Ethnographic Research 305**

Ethnographic Research Traditions and Educational Studies 306

Distinguishing Characteristics of Ethnographic Research 306

Research Orientation 308

Origins of the Problem 310

Foreshadowed Problems 311

A Valid Data Base 313

Qualitative Analysis: Triangulation 319

Case Study Design 321

Presentation of Results: Levels of Abstraction 322

Uses of Ethnographic Methodology in Research 326

Standards of Adequacy for Ethnographic Studies 328

Focus and Purpose of the Study 328

Research Design and Methodology 329

Presentation of Findings and Conclusions 329

Contribution to Knowledge and Further Research 329

Summary 330

Self-Instructional Review Exercises 331

## **CHAPTER 12 Evaluation Research 335**

Definition and Functions of Evaluation Research 336

Definition of Evaluation 336

Formative and Summative Evaluation 337

Basic and Evaluation Research 338

Selected Approaches to Evaluation 339

Objectives-Based Evaluation 341

Systems and Cost Analysis 344

Decision-Oriented Evaluation 347

Responsive Evaluation 349

The Evaluation Proposal 351

The Evaluation Focus: Memorandum of Agreement 352

Evaluation Design 352

Adequacy of Evaluation Proposals 355

Adequacy of Evaluation Reports 356

Conclusion 359

Summary 360

Self-Instructional Review Exercises 360



# PART III

## Communication of Research

365

### CHAPTER 13 Interpreting Research 366

Interpretation Requires Thinking 367

Communication of Research 367

Choice of What to Include 367

Writing Style 369

Interpretations of the Reader 371

Summarizing Results 372

Summary of Descriptive Statistics 373

Summary of Inferential Statistics 373

Summary of Qualitative Research 378

Interpretation of Results 378

Interpretations Based on Research Design 379

Interpretations Based on Previous Research 382

Conclusions and Recommendations 383

Summary 387

Self-Instructional Review Exercises 387

### CHAPTER 14 Educational Research: An Evolving Field 393

Development of Educational Knowledge 394

Research Problems from Changing Educational Practices 394

Empirical Problems from Previous Research 396

Expansion of Research Methodologies 397

Design 397

Methodology 398

Integration of Previous Research Findings 398

Tools of Research 399

Trends in Educational Research 401

Continued Change in Research and Educational Practices 401

Dialogue Among Scientists, Researchers, and Practitioners 402

Synthesis of Theory, Research, and Practice 402

Summary 403

Self-Instructional Review Exercises 403

### Appendices 405

A. Glossary 405

B. Computers in Educational Research 417

C. Calculations for Selected Descriptive and  
Inferential Statistics 423

D. Research-Oriented Journals 442

Answers to Self-Instructional Review Exercises 446

References 455

Index 463