Contents

1

Preface хi 1 Educational Research: Its Nature and Characteristics Introduction The Nature of Research The Validity of Educational Research 4 Internal Validity External Validity The Reliability of Educational Research 6 The Systematic Process of Research The Scientific Method The Activities in the Research Process Identification of the Research Problem 11 Data Collection 11 Analysis 12 Summarizing Results and Drawing Conclusions 12 Classification of Educational Research 12 Basic and Applied Research General Methodology Classification 14 Experimental Research Ex Post Facto Research 15 Survey Research 15 Historical Research Ethnographic Research 16 The Role of Theory Summary 19 **Key Concepts** 21 Exercises 21 Note 22 References 22 2 Identification of a Research Problem 23 Constants, Variables, and Measurement Scales 23 Types of Variables 24 Independent and Dependent Variables 24

Other Possible Types of Variables

Measurement Scales 27
The Operational Definition 28
Selection of a Research Problem 29
Statement of the Research Problem 30
Hypotheses and Statement of the Problem 33
Types and Forms of Hypotheses 35
Examples of Hypotheses Related to Problem Statements 37
The Research Problem in the Research Proposal 43
Summary 44
Key Concepts 44
Exercises 45
Notes 46
References 46
The Review of the Literature 47
The Activities of the Review of the Literature 48
Sources of Information 49
Periodical Literature 49

Education Resources Information Center (ERIC) 50
Other Indexes and Abstracts 55
Review of Educational Research (RER) 56
Abstracts and Reports in Periodicals 57
Theses and Dissertations 58
Selected Books 61
The Encyclopedia of Educational Research (EER) 62
Handbook of Research on Teaching 62
Review of Research in Education 62
Conducting a Computer Search 63
Identifying the Research Problem and the Extent of Search 64
Selecting a Database 64
Selecting and Combining Descriptors 64
Searching the Database for Number of References 66
Obtaining the Desired Abstracts 68
Broadening the Search, If Necessary 68
Assembling and Summarizing Information 69
Bibliographic Entry 69
Abstract or Summary 70
Interpreting and Using Information 74
Critical Review 75
Writing the Review 76
Referencing 77
Preparing the Bibliography 78
Summary 79
Key Concepts 80
Exercises 80
References 81

4	Principles of Research Design 83
	The Purposes of Research Design 83
	The Concept of Controlling Variance 83
	Procedures for Controlling Variance 86
	Randomization 86
	Building in Factors as Independent Variables 87
	Holding Factors Constant 89
	Statistical Control 89
	Using Procedures for Control in Combination 91
	Characteristics of Good Research Design 92
	Freedom from Bias 93
	Freedom from Confounding 93
	Control of Extraneous Variables 94
	Statistical Precision for Testing Hypotheses 94
	Organizing the Research Activities 94
	Summary 96
	Key Concepts 97
	Exercises 97
	Note 99
	Reference 99
_	Experimental Research 101
3	-
	The Meaning of Experimental Design 101
	Experimental Variables 103
	Use of the Term Subject 105
	Criteria for a Well-Designed Experiment 105
	Experimental Validity 106
	Posttest-Only Control Group Design 108
	Pretest-Posttest Control Group Design 110
	Solomon Four-Group Design 113
	Factorial Designs 115
	Repeated Measures Designs 118
	Counterbalanced Designs 120
	Threats to Experimental Validity 123 Designs Extended in Time 125
	— +0
	Interpreting Results of Experiments 127 Randomness and Representativeness 131
	Summary 132 Key Concepts 133
	Exercises 133
	Notes 136
	References 136
6	Quasi-Experimental Research 139
	The Problems of Validity 139
	Posttest-Only, Nonequivalent Control Group Design 140
	Pretest-Posttest, Nonequivalent Control Group Design 143

Time Series Designs 146
Single-Group Time Series Design 147
Multiple-Group Time Series Design 149
Variations in Time Series Designs 152
Single-Subject Designs 153
A-B Design 154
A-B-A Design 156
A-B-A-B Design 158
Multiple-Baseline Designs 161
Multiple-Baseline Across Behaviors 162
Multiple-Baseline Across Subjects 162
Multiple-Baseline Across Situations 162
Summary 165
Key Concepts 166
Exercises 166
Note 168
Reference 169
Ex Post Facto and Survey Research 171
Ex Post Facto Research: A Definition 172
Setting and Scope 175
Guidelines for Ex Post Facto Research 175
Survey Research: A Definition 176
Classification of Survey Studies 177
Interview and Questionnaire Studies 178
Conducting an Interview 180
Interview Items 183
Telephone Interviews Versus Face-to-Face Interviews 185
The Use of Mailed Questionnaires 186
Item Construction 187
A Pilot Run of the Items 192
Procedures for Increasing Response Rate 195
The Cover Letter 196
Follow-ups 198
Use of Rewards 199
Other Factors That May Affect Response Rate 200
Identifying Sources of Nonresponse 200
Demographic Information 202
Sequential Activities of a Questionnaire Study 202
Controlled Observation 205
Survey Designs and Methodology 207
Longitudinal Designs 207
Cross-Sectional Designs 210
The Methodology of Survey Research 211 Summary 214
· / ·
Key Concepts 215
Key Concepts 215 Exercises 215
Key Concepts 215

8 Historical Research 219

Sources of Information in Historical Research 220	
The Methodology of Historical Research 220	
Identification of the Research Problem 220	
Collection and Evaluation of Source Materials 223	
External Criticism 223	
Internal Criticism 224	
Synthesis of Information 226	
Analysis Interpretation and Farmal 1.1.	
Analysis, Interpretation, and Formulating Conclusions	226
Comments on the Reporting of Historical Research 227	
Reports in Professional Journals 227	
Why Do Historical Research? 228	
Summary 229	
Key Concepts 229	
Exercises 230	
References 230	
Tribus months Decree 1 200	
Ethnographic Research 233	
The Nature of Ethnography in Education 233	
The Qualitative Nature 234	
The Participant-Observer 235	
The Holistic and General Perspective 235	
A Conceptual Schema for Ethnographic Research 236	
The Process of Ethnographic Research 239	
vi de di calmi	
Identification of Subjects 243	
Hypothesis Generation 244	
Data Collection 244	
Observation 244	
Interviewing 246	
Reviewing Other Sources 246	
Triangulation 246	
Analysis 248	
Drawing Conclusions 248	
Connecting the Example and the Conceptual Schema	249
Examples of Ethnographic Research In Education 250	,
Example from Elementary School Writing Instruction	250
Example from Bilingual Education 252	250
Other Considerations 253	
The Reliability and Validity of Ethnographic Research	253
Reliability 254	433
Validity 255	
Quantitative Methodology 256	
Use of Sampling Procedures 257	
Use of Questionnaires, Observational Inventories,	and Content
Analysis 258	
Summary 258	

Key Concepts 259
Exercises 260
Note 260
References 261
Sampling Designs 263
The Concept of a Random Sample 263
Random Selection and Random Assignment 264
Use of a Random Number Table 265
Criteria for a Sampling Design 267
Stratified Random Sampling 268
Allocation of Sample Size Among Strata 269
Cluster Sampling 272
Sampling Through an Intermediate Unit 274
Selection Procedure 274
Potential Problems and How to Deal with Them 275
Systematic Sampling 278
The Possible Problem of Periodicity 278
Considerations in Determining Sample Size 279
Summary 281
Key Concepts 282
Exercises 282
Notes 284
References 284
Measurement and Data Collection 285
Concepts of Measurement 285
Types of Measurement Scales 286
Reliability of Measurement 287
Empirical Procedures for Estimating Reliability 288
Expected Reliability Coefficients for Various Types of Tests 289
Validity of Measurement 289
Content-Related Evidence 291
Criterion-Related Evidence: Concurrent and Predictive 291
Construct-Related Evidence 292
The Variables Measured in Educational Research 292
Tests and Inventories Used for Measurement 293
Achievement Tests in Academic and Skills Areas 294
Attitude Inventories 296
Likert Scale 297
Semantic Differential 299
Aptitude Tests 301
Personality Measures 302
Rating Scales 303
Observation Systems 305
Where to Find Test Information 309
Data Preparation 310
Coding Data 310

	References 320
12	The Analysis of Data 323
	Descriptive Statistics 323
	Distributions 324
	Describing a Distribution of Scores 324
	Measures of Central Tendency 325
	Measures of Variability 326
	Shapes of Distribution 327
	Correlation—A Measure of Relationship 328
	Uses of Correlation 331
	Different Correlation Coefficients 332
	Inferential Statistics—Making Inferences from Samples to Populations 33
	Testing Hypotheses and Estimating Parameters 335
	The Concept of Sampling Distribution 336
	Building a Confidence Interval—The Example Continued 340
	Possible Errors in Hypothesis Testing 341
	Inferences from Statistics to Parameters: A Review 343
	Parametric Analyses 344
	The t-Distribution—Another Sampling Distribution 345
	The Difference Between Two Means: An Example Involving the
	t-Distribution 345
	Analysis of Variance (ANOVA) 347
	Nonparametric Analyses 349
	The Chi-Square (χ^2) Test and Distribution 349
	Correlation Analyses 352
	Analysis of Covariance 354
	Choosing the Appropriate Statistical Test 356
	The Role of Statistical Analyses 357
	Using the Computer in Data Analysis 361
	Summary 368
	Key Concepts 369
	Exercises 369
	Notes 372
	References 372
13	Writing Research Proposals and Reports 373
	Major Sections of the Research Proposal 373
	Identification of the Problem 374
	Review of the Literature 376
	Methodology or Procedures 377
	Significance of the Proposed Research 379
	•

An Example of a Data File

Summary

Exercises

Notes

Key Concepts

Ethical Considerations in Conducting Research

Other Sections of the Research Proposal 380
Cover Page 380
Abstract 380
Budget 380
Staff Résumés 381
Appendices 381
The Evaluation of Proposals 381
Major Sections of the Research Report 382
Introduction, Including the Statement of the Problem 383
Review of the Literature 385
Methods or Procedures 388
Results 389
Conclusions, Recommendations, and Implications 391
Other Sections of the Research Report 392
Abstract 392
Bibliography and Reference List 392
Appendix 393

Putting a Report Together 394
Summary 395
Key Concepts 395
Exercises 395
References 396
Appendix 1: Sample Research Proposal 397
Appendix 2: Additional Statistical Procedures for Data Analysis 405
,
Nested Analysis of Variance 405
Nested Analysis of Variance 405 Multiple Regression and Correlation 407
Nested Analysis of Variance 405 Multiple Regression and Correlation 407 Standard Error of Estimate 409
Nested Analysis of Variance 405 Multiple Regression and Correlation 407 Standard Error of Estimate 409 Discriminant Analysis 410
Nested Analysis of Variance 405 Multiple Regression and Correlation 407 Standard Error of Estimate 409 Discriminant Analysis 410 Factor Analysis 412
Nested Analysis of Variance 405 Multiple Regression and Correlation 407 Standard Error of Estimate 409 Discriminant Analysis 410 Factor Analysis 412 Uses of Factor Analysis 413
Nested Analysis of Variance 405 Multiple Regression and Correlation 407 Standard Error of Estimate 409 Discriminant Analysis 410 Factor Analysis 412
Nested Analysis of Variance 405 Multiple Regression and Correlation 407 Standard Error of Estimate 409 Discriminant Analysis 410 Factor Analysis 412 Uses of Factor Analysis 413
Nested Analysis of Variance 405 Multiple Regression and Correlation 407 Standard Error of Estimate 409 Discriminant Analysis 410 Factor Analysis 412 Uses of Factor Analysis 413 Multivariate Analysis of Variance 414
Nested Analysis of Variance 405 Multiple Regression and Correlation 407 Standard Error of Estimate 409 Discriminant Analysis 410 Factor Analysis 412 Uses of Factor Analysis 413 Multivariate Analysis of Variance 414 Summary 418
Nested Analysis of Variance 405 Multiple Regression and Correlation 407 Standard Error of Estimate 409 Discriminant Analysis 410 Factor Analysis 412 Uses of Factor Analysis 413 Multivariate Analysis of Variance 414 Summary 418 Notes 418
Nested Analysis of Variance 405 Multiple Regression and Correlation 407 Standard Error of Estimate 409 Discriminant Analysis 410 Factor Analysis 412 Uses of Factor Analysis 413 Multivariate Analysis of Variance 414 Summary 418 Notes 418
Nested Analysis of Variance 405 Multiple Regression and Correlation 407 Standard Error of Estimate 409 Discriminant Analysis 410 Factor Analysis 412 Uses of Factor Analysis 413 Multivariate Analysis of Variance 414 Summary 418 Notes 418 References 418 Appendix 3: Solutions to Exercises 421
Nested Analysis of Variance 405 Multiple Regression and Correlation 407 Standard Error of Estimate 409 Discriminant Analysis 410 Factor Analysis 412 Uses of Factor Analysis 413 Multivariate Analysis of Variance 414 Summary 418 Notes 418 References 418
Nested Analysis of Variance 405 Multiple Regression and Correlation 407 Standard Error of Estimate 409 Discriminant Analysis 410 Factor Analysis 412 Uses of Factor Analysis 413 Multivariate Analysis of Variance 414 Summary 418 Notes 418 References 418 Appendix 3: Solutions to Exercises 421 Appendix 4: Tables 439
Nested Analysis of Variance 405 Multiple Regression and Correlation 407 Standard Error of Estimate 409 Discriminant Analysis 410 Factor Analysis 412 Uses of Factor Analysis 413 Multivariate Analysis of Variance 414 Summary 418 Notes 418 References 418 Appendix 3: Solutions to Exercises 421 Appendix 4: Tables 439 Table A, Ordinates and Areas of the Normal Curve 440
Nested Analysis of Variance 405 Multiple Regression and Correlation 407 Standard Error of Estimate 409 Discriminant Analysis 410 Factor Analysis 412 Uses of Factor Analysis 413 Multivariate Analysis of Variance 414 Summary 418 Notes 418 References 418 Appendix 3: Solutions to Exercises 421 Appendix 4: Tables 439 Table A, Ordinates and Areas of the Normal Curve 440 Table B, Critical Values of t 442
Nested Analysis of Variance 405 Multiple Regression and Correlation 407 Standard Error of Estimate 409 Discriminant Analysis 410 Factor Analysis 412 Uses of Factor Analysis 413 Multivariate Analysis of Variance 414 Summary 418 Notes 418 References 418 Appendix 3: Solutions to Exercises 421 Appendix 4: Tables 439 Table A, Ordinates and Areas of the Normal Curve 440 Table B, Critical Values of t 442 Table C, Upper Percentage Points of the χ^2 Distribution 443
Nested Analysis of Variance 405 Multiple Regression and Correlation 407 Standard Error of Estimate 409 Discriminant Analysis 410 Factor Analysis 412 Uses of Factor Analysis 413 Multivariate Analysis of Variance 414 Summary 418 Notes 418 References 418 Appendix 3: Solutions to Exercises 421 Appendix 4: Tables 439 Table A, Ordinates and Areas of the Normal Curve 440 Table B, Critical Values of t 442 Table C, Upper Percentage Points of the χ² Distribution 443 Table D, Upper Percentage Points of the F-Distribution 444
Nested Analysis of Variance 405 Multiple Regression and Correlation 407 Standard Error of Estimate 409 Discriminant Analysis 410 Factor Analysis 412 Uses of Factor Analysis 413 Multivariate Analysis of Variance 414 Summary 418 Notes 418 References 418 Appendix 3: Solutions to Exercises 421 Appendix 4: Tables 439 Table A, Ordinates and Areas of the Normal Curve 440 Table B, Critical Values of t 442 Table C, Upper Percentage Points of the χ^2 Distribution 443
Nested Analysis of Variance 405 Multiple Regression and Correlation 407 Standard Error of Estimate 409 Discriminant Analysis 410 Factor Analysis 412 Uses of Factor Analysis 413 Multivariate Analysis of Variance 414 Summary 418 Notes 418 References 418 Appendix 3: Solutions to Exercises 421 Appendix 4: Tables 439 Table A, Ordinates and Areas of the Normal Curve 440 Table B, Critical Values of t 442 Table C, Upper Percentage Points of the χ² Distribution 443 Table D, Upper Percentage Points of the F-Distribution 444

459

Author and Subject Indexes