# UNIT OF MEDICAL EDUCATION FACULTY OF MEDICINE CHULALONGKORN UNIVERSITY

# **Contents**

Preface	хi

### Acknowledgments xv

1	Educational Research: Its Nature and Characteristics 1
	Introduction 1
	The Nature of Educational Research 3
	The Systematic Process of Research 3
	The Validity of Educational Research 4 Internal Validity 5 External Validity 6
	The Reliability of Educational Research 9
	Research Has a Variety of Forms 9
	Classification of Educational Research 10
	Basic and Applied Research 10
	General Methodology: Qualitative and Quantitative Research 12 Experimental Research 14 Quasi-Experimental Research 15
	Survey Research 15
	Historical Research 16
	Ethnographic Research 16
	The Role of Theory 18
	The Activities of the Research Process 20
	Identification of the Research Problem 21
	Data Collection 22
	Analysis 22
	Summarizing Results and Drawing Conclusions 22

	Summary 23
	The Function of Educational Research 24
	Key Concepts 26
	Exercises 26
	Notes 27
	References 27
2	Identification of a Research Problem 29
	Selection of a Research Problem 29
	Statement of the Research Problem 31
	Constants, Variables, and Operational Definition 34
	Independent and Dependent Variables 35 Other Possible Types of Variables 36
	Variables as They Are Measured 38
	Operational Definition 39
	Hypotheses and the Statement of the Problem 40
	Types and Forms of Hypotheses 42
	Examples of Hypotheses Related to Problem Statements 45
	Summary 50
	Key Concepts 52
	Exercises 52
	Notes 53
	References 54
3	The Review of the Literature 55
5	The Activities of the Review of the Literature 56
	Sources of Information 57
	Periodical Literature 58
	Education Index 58
	Education Resources Information Center (ERIC) 58
	An Example Using CIJE and RIE 60
	Other Indexes and Abstracts 64
	Review of Educational Research (RER) 65
	Other Reviews 65
	Reports of Meta-Analysis 66
	Abstracts and Reports in Periodicals 66
	Theses and Dissertations 68
	Selected Books 69
	The Encyclopedia of Educational Research (EER) 69
	Handbook of Research on Teaching 69
	Review of Research in Education 69
	Conducting a Computer Search 70  Identifying the Research Problem and the Extent of Search 71
	140.000 July 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.0
	Selecting a Database 71
	Selecting and Combining Descriptors 72
	Searching the Database for Numbers of References 73

Broadening the Search, if Necessary 75
Use of the CD ROM 75
Selecting Studies for the Review of the Literature 77
Assembling and Summarizing Information 78
Bibliographic Entry 79
Abstract or Summary 80
Organizing Information 83
Interpreting and Using Information 83
Critical Review 84
Writing the Review 85
Referencing 85
Preparing the Bibliography 86
Summary 87
Key Concepts 88
Exercises 88
Notes 89
References 89
Research Design in Quantitative Research 91
The Purposes of Research Design 91
The Concept of Controlling Variance 92
Procedures for Controlling Variance 93
Randomization 94
Building in Factors as Independent Variables 95
Holding Factors Constant 97
Statistical Control 97 Using Procedures for Control in Combination 99
Using Procedures for Control in Combination 99 Characteristics of Good Research Design 101
Freedom from Bias 102
Freedom from Confounding 102 Control of Extraneous Variables 102
Statistical Precision for Testing Hypotheses 103  Summary 103
Key Concepts 104
Exercises 104
Notes 105
References 105
regorences 103
E
Experimental Research 107
The Meaning of Experimental Design 107
Experimental Variables 109
Use of the Term Subject 110
Criteria for a Well-Designed Experiment 111
Experimental Validity 112
Threats to Experimental Validity 113
Posttest-Only Control Group Design 115

5

117 Pretest-Posttest Control Group Design Solomon Four-Group Design 120 Factorial Designs 125 Repeated Measures Designs Designs Extended in Time 128 129 Time Series Designs Interpreting Results of Experiments 130 134 Randomness and Representativeness Summary 135 Key Concepts 135 136 Exercises 138 Notes References 138 6 Quasi-Experimental Research 139 The Problems of Validity Posttest-Only, Nonequivalent Control Group Design 140 143 Pretest-Posttest, Nonequivalent Control Group Design Time Series Designs 146 Single-Group Time Series Design 146 149 Multiple-Group Time Series Design 151 Variations in Time Series Designs Single Subject Designs A-B Design 153 155 A-B-A Design A-B-A-B Design 157 Multiple-Baseline Design 160 160 Multiple-Baseline Design Across Behaviors 160 Multiple-Baseline Design Across Subjects 161 Multiple-Baseline Design Across Situations 163 Action Research and Quasi-Experimental Research Summary 164 Key Concepts 165 Exercises 165 Notes 167 167 References 7 Survey Research 169 Survey Research: Its Scope and Description 169 Ex post facto Research 170 170 Examples of ex post facto Research Other Survey Research 171 Survey Designs 172 Longitudinal Designs Cross-Sectional Designs 174

The Methodology of Survey Research 176
Questionnaire Surveys 178
Item Construction 179
Item Format 181
Pilot Run of the Items 183
The Cover Letter 183
Questionnaire Format 186
Procedures for Increasing Response Rate 187 Follow-up Procedures 188
Identifying Sources of Nonresponse 189
Incomplete and Possible Dishonest Response 190
Examples 192
Community Surveys 192 Client Surveys 194
Interview Surveys 194
Interview Items 197
Items from the Gallup/Phi Delta Kappa Poll 198
Conducting the Interview 199
Potential Sources of Error 200
Telephone Interviews 201
A Comment About Branching Items 202
Other Surveys 203
Analyzing and Reporting Survey Results 203
Hypothetical Example 1 204
Hypothetical Example 2 204
Hypothetical Example 3 205
Summary 206
Key Concepts 207
Exercises 207
Notes 209
References 209
Research Design in Qualitative Research 211
The Epistemology of Qualitative Research 211
Components of Research Design 213
Working Design 213
Working Hypotheses 214
Data Collection 214
Data Analysis and Interpretation 216 Possible Codes 216
Perspectives for Qualitative Research 219
Example: Funnel Approach 220
Example: Modified Analytic Induction Approach 221
Reliability and Validity of Qualitative Research 222

Use of Computers in Qualitative Research

UNIT OF MEDICAL EDUCATION FACULTY OF MEDICINE CHULALONGKORN UNIVERSITY

223

	Capabilities of Computer Software in  Qualitative Research 224 The ETHNOGRAPH 224 AskSam 225 Sources of Information about Computers in Qualitative Research Summary 226 Key Concepts 227 Exercises 227 Notes 228 References 228	225
9	Historical Research 231  The Value of Historical Research 232  Sources of Information in Historical Research 234  The Methodology of Historical Research 234  Identification of the Research Problem 235  Collection and Evaluation of Source Materials 238  External Criticism 238  Internal Criticism 239  Synthesis of Information 240  Analysis, Interpretation, and Formulating Conclusions 241  Quantitative Methods in Historical Research 243  Comments on the Reporting of Historical Research 243  Reports in Professional Journals 244  Summary 245  Key Concepts 246  Exercises 246  References 247	
10	Ethnographic Research 249  The Nature of Ethnography in Education 249  The Phenomenological Nature 250  The Naturalistic Nature 251  The Holistic and General Perspective 252  A Conceptual Schema for Ethnographic Research 253  The Process of Ethnographic Research 254  Identification of the Phenomenon to Be Studied 258  Identification of Subjects 258  Hypothesis Generation 259  Data Collection 260  Observation 261  Videotaping 262  Interviewing 262  Reviewing Other Sources 263  Triangulation 263	

ix

**Analysis** 265 266 Coding Use of Numbers 267 269 **Drawing Conclusions** Examples of Ethnographic Research in Education The Reliability and Validity of Ethnographic Research 272 Reliability 273 Validity 274 The Role of Ethnographic Research 277 Summary 278 Key Concepts 279 Exercises 280 Notes 281 References 281 11 Sampling Designs 283 The Concept of a Random Sample 283 Random Selection and Random Assignment 284 Use of a Random Number Table Sampling Error and Sampling Bias 287 Criteria for a Sampling Design 288 Stratified Random Sampling Allocation of Sample Size Among Strata 290 Cluster Sampling 292 Systematic Sampling 294 Possible Problem of Periodicity 294 Considerations in Determining Sample Size—Random Sampling 295 Purposeful Sampling Comprehensive Sampling 298 Maximum Variation Sampling 299 Extreme Case Sampling 299 Typical Case Sampling 300 Homogeneous Sampling 300 Other Variations of Purposeful Sampling 300 Sample Size of Purposeful Samples Summary 303

#### 12 Measurement and Data Collection 307

304

305

306

306

Key Concepts

Exercises Notes

References

Concepts of Measurement 308
Types of Measurement Scales 308

	Reliability of Measurement 309	
	Empirical Procedures for Estimating Reliability 310	
	Expected Reliability Coefficients for Various Types of Tests 31	. 1
	Validity of Measurement 311	
	Content-Related Evidence 313	
	Criterion-Related Evidence: Concurrent and Predictive 313 Construct-Related Evidence 313	
	The Variables Measured in Educational Research 315	
	Tests and Inventories Used for Measurement 315	
	Achievement Tests in Academic and Skills Areas 316	
	Attitude Inventories 317	
	Likert Scale 318	
	Semantic Differential 319	
	Aptitude Tests 321	
	Personality Measures 323	
	Rating Scales 323	
	Observation Systems 325	
	Measures Involving Holistic Scoring 326	
	Where to Find Test Information 327	
	Quantitative Data Preparation 328	
	Coding Data 329	
	An Example of a Data File 330	
	Summary 331	
	Key Concepts 334	
	Exercises 334	
	Notes 335	
	References 336	
10	D. A. J. D. C.	
13	•	
	The Multiple Meanings of Statistics 337 Distributions 338	
	Describing a Distribution of Scores 339	
	Measures of Central Tendency 340	
	Measures of Variability 340	
	Shapes of Distributions 341	
	Standard Scores 342	
	Properties of Standard Scores 343 Determining Standard Scores 343	
	Determining Standard Scores 343  Correlation—A Measure of Relationship 345	
	Uses of Correlation 348	
	Different Correlation Coefficients 349	
	Using the Computer for Data Analysis 352	
	General Procedure for Computer Use 354	
	Summary 359	
	Key Concepts 360	

413

Exercises 360 Notes 361 Reference 361

#### 363 14 Data Analysis: Inferential Statistics Testing Hypotheses and Estimating Parameters 364 Concept of Sampling Distribution 365 Building a Confidence Interval—The Example Continued 368 Possible Errors in Hypothesis Testing Inferences from Statistics to Parameters: A Review 371 Parametric Analyses 372 The *t*-Distribution—Another Sampling Distribution 373 Analysis of Variance (ANOVA) 376 Nonparametric Analyses The Chi-Square ( $\chi^2$ ) Test and Distribution 378 Correlational Analyses 381 Analysis of Covariance 384 The Role of Statistical Analysis 386 Selecting an Appropriate Statistical Analysis 389 Comments About Statistical Analysis Meta-Analysis 394 Summary Key Concepts 395 Exercises 396 Notes 398

#### 15 Communicating About Research 401

398

References

Major Sections of the Research Proposal 402 Identification of the Problem 403 Review of the Literature 405 Methods or Procedures 406 Significance of the Proposed Research 409 Other Sections of the Research Proposal 410 Cover Page 410 Abstract 410 Budget 410 Staff Resumes 411 Appendices 411 The Evaluation of Proposals 411 Major Sections of the Research Report 412 Introduction, Including the Statement of the Problem Review of the Literature 414 Methods or Procedures 415

Results 416 Use of Tables 417 Conclusions, Recommendations, and Implications 418 Other Sections of the Research Report 419 Abstract 420 Bibliography and Reference List 420 Appendix 421 Putting a Report Together 421 Software for Word Processing Guidelines for Presenting Papers at Meetings 424 Presentations to Dissertation and Thesis Committees 426 Summary 427 Key Concepts 428 **Exercises** 429 Notes 429 References 430

## Appendix 1. Ethical and Legal Considerations in Conducting Research 431

#### Appendix 2. Solutions to Exercises 437

## Appendix 3. Tables 451

Table A. Ordinates and Areas of the Normal Curve 452
Table B. Critical Values of t 454
Table C. Upper Percentage Points of the  $\chi^2$  Distribution 455
Table D. Upper Percentage Points of the F-Distribution 456
Table E. Critical Values of the Correlation Coefficient 462

#### Glossary of Research Methods Terms 463

Name Index 471

Subject Index 473