

EDUCATIONAL RESEARCH METHODS

A FUNCTIONAL APPROACH

Laban P. Ayiro



KENYA LITERATURE BUREAU
PUBLISHERS AND PRINTERS

Contents

<i>List of Figures</i>	viii
<i>List of Tables</i>	ix
<i>Foreword</i>	xi
<i>Dedication</i>	xiii
<i>Preface</i>	xiv
<i>Acknowledgements</i>	xvii
<i>Acronyms and Abbreviations</i>	xviii
1. Research: Meaning, Purpose, Language and Ethics	1
Introduction	1
1.1 Meaning of research	1
1.2 Purpose of research.....	3
1.3 Importance of research	5
1.4 Other ways of knowing	6
1.5 The language of research.....	7
1.6 Preparation for research.....	9
1.7 The research process	10
1.8 Ethics in research	13
<i>Chapter 1 Summary</i>	15
<i>Practice Questions</i>	15
2. Types of Research in Education	16
Introduction	16
2.1 Characteristics of research	16
2.2 Purposes of educational research	17
2.3 Types of research	18
<i>Chapter 2 Summary</i>	23
<i>Practice Questions</i>	23
3. Research Methods in Education	24
Introduction	24
3.1 Qualitative research methodologies	24
3.2 Quantitative research methodologies.....	31
3.3 Quantitative and qualitative research: Key differences	33

3.4	Mixed methods research	37
3.5	The research continuum	41
	<i>Chapter 3 Summary</i>	41
	<i>Practice Questions</i>	41
4.	The Research Problem	42
	Introduction	42
4.1	Identifying a research problem.....	42
4.2	Sources of research problems	43
4.3	Crafting a problem statement.....	49
	<i>Chapter 4 Summary</i>	53
	<i>Practice Questions</i>	53
5.	Research Questions and Hypotheses	54
	Introduction	54
5.1	Definitions and the relationship between research questions and hypotheses.....	54
5.2	Characteristics of good research questions and hypotheses.....	55
5.3	Types of research questions and hypotheses	55
5.4	Frameworks for developing research questions and hypotheses	62
5.5	Steps in constructing research questions and hypotheses.....	65
5.6	Examples of research questions	67
5.7	Use of research questions and hypotheses in mixed methods research	70
	<i>Chapter 5 Summary</i>	71
	<i>Practice Questions</i>	71
6.	Population and Samples	71
	Introduction	71
6.1	Population.....	73
6.2	Sample	74
6.3	Sampling and demographics.....	84
6.4	Sample size and bias	85
6.5	Sample size in quantitative studies.....	87
6.6	Sample size and diversity in qualitative research.....	88

6.7	Sampling in the modern world.....	90
	<i>Chapter 6 Summary</i>	92
	<i>Practice Questions</i>	92
7.	Reviewing and Citing Literature.....	93
	Introduction	93
7.1	The concept of literature review.....	93
7.2	Why review literature?.....	93
7.3	Purpose and value of literature review.....	96
7.4	Locating literature in electronic databases.....	97
7.5	Citations	100
	7.5.1 Examples.....	100
7.6	Citations in academic work	102
7.7	Structuring the literature review	104
7.8	Linking the literature to your study.....	106
7.9	Preparing to write a critical review.....	109
7.10	Using a style guide.....	110
	<i>Chapter 7 Summary</i>	112
	<i>Practice Questions</i>	112
8.	Research Designs.....	113
	Introduction	113
8.1	The concept of research design	113
8.2	Components of a research design.....	114
8.3	Examples of qualitative research designs	115
8.4	Examples of mixed methods research designs.....	123
8.5	Examples of quantitative research designs.....	127
8.6	Basic considerations in the choice of design.....	134
8.7	Threats to validity.....	136
8.8	Other research designs.....	139
	<i>Chapter 8 Summary</i>	141
	<i>Practice Questions</i>	141
9.	Methods of Data Collection	142
	Introduction	142
9.1	Why accurate data collection is essential.....	142

9.2	Issues related to maintaining integrity of data collection.....	142
9.3	Gaining access	144
9.4	Types of data collection methods.....	145
9.5	Methods used for quantitative data collection	175
	<i>Chapter 9 Summary</i>	176
	<i>Practice Questions</i>	176
10.	Data Analysis and Statistics	178
	Introduction	178
	Part I: Data analysis	178
10.1	Definition of concepts.....	178
10.2	Why study statistics?	180
10.3	Opportunities for statisticians	180
10.4	Variables and constants.....	181
10.5	Levels of measurement and measurement scales.....	184
10.6	Validity and reliability of measurement.....	185
10.7	Computers and statistical analysis.....	189
	Part II: Statistics	190
10.8	Descriptive and inferential statistics.....	190
10.9	Scales of measurement and statistical tests	193
10.10	Description of nominal data.....	195
10.11	Shapes of distributions	197
10.12	The mean, median and mode	200
10.13	The mean and standard deviation	202
10.14	The median and interquartile range.....	203
10.15	Understanding probability in inferential statistics.....	205
10.16	Introduction to the null hypothesis	208
10.17	The Pearson Correlation Coefficient (r)	210
10.18	The t-test.....	214
10.19	One-way analysis of variance (F)	216
10.20	Two-way analysis of variance	218
10.21	Chi-square Test (χ^2).....	219
	<i>Chapter 10 Summary</i>	221
	<i>Practice Questions</i>	221

11. Preparing Research Reports	230
Introduction	230
11.1 Writing an abstract.....	230
11.2 Introduction and literature review	232
11.3 Describing participants.....	235
11.4 Describing measures.....	237
11.5 Reporting research results.....	239
11.6 Writing the discussion	241
11.7 Preparing theses and dissertations.....	243
<i>Chapter 11 Summary</i>	246
<i>Practice Questions</i>	246
12. Philosophical Paradigms in Research.....	247
Introduction	247
12.1 Assumptions in research	247
12.2 Association and causation.....	248
12.3 Deduction and induction	248
12.4 Philosophical worldviews.....	251
12.5 The post-positivist worldview	251
12.6 The interpretivism worldview	253
12.7 Realism	254
12.8 Meaning and meaning making.....	255
<i>Chapter 12 Summary</i>	256
<i>Practice Question</i>	257
Glossary.....	258
Appendices	264
References.....	269
Index	281

Preface

With the enormous growth in recent years of a research culture in all aspects of life, or perhaps more specifically an evidence-based and evaluation culture, more and more people are called upon to undertake social science research in the field of education. Educational research can appear bewildering for first-time researchers, whether they are students, or those who must undertake research as part of their jobs. A researcher has to decide: *When is a survey appropriate? When is an in-depth interview better? How big should a sample be? When is a finding "significant,"* among other questions.

The aim of *Educational Research Methods: A functional Approach* is to help students undertaking research in education research, willingly or perhaps reluctantly, make sense of the subject. Through research in education, educationists understand, explain and predict the social science world. This book is designed for students planning to undertake courses in *research methods*, students writing theses or carrying out extensive research projects in education as well as practitioners. It is essentially a comprehensive introduction to research methods in education, integrating both quantitative and qualitative approaches to research, and also providing basic and functional content on statistics.

The book brings the theory, philosophy and techniques of research to life and enables students to understand the practical relevance of the research methods. The hallmark of this book is that it is written in a highly accessible style and logical structure. It makes educational research exciting. This book arose from my conviction that teaching and learning educational research methods should not be dull or difficult. If you consider research methodology and statistics as too difficult, you will be your own worst enemy. Even those who have carefully avoided mathematics and research methods as a subject will find this book easy to understand.

Two features separate this book from other similar books. First, it has been developed specifically for researchers in education. All examples of the research concepts discussed relate directly to the education sector. It is advantageous to learn research in the context of one's professional frame of reference. It also has a deliberate African orientation, an approach I believe will enthuse the researcher in Africa to feel part of the project in a special way. Other research students globally will also find its content reasonably universal and applicable to their situations.

The other unique feature of this book is the infusion of a chapter on Statistics and Data Analysis (Chapter 10). The purpose of doing research is to collect and analyse data on a phenomenon under investigation. This requires a basic understanding of statistics. Often courses in *research methods* are divorced from the value and application of statistics.

Students learn research methods in one or more courses and then often must learn statistics as a separate entity. This separation presents a disconnect that only increases the chasm between *research methods* as a course and *statistics* as a tool for data collection and analysis.

Some textbooks on statistics often contain technical information that can be intimidating to non-statisticians. Although this information is important, sometimes, *it is useful to have a short and simple description of a statistic, when it should be used, and how to make sense of it.* This is particularly true for students taking only their first or second statistics' courses. Students who do not consider themselves "mathematically inclined", and those who may have studied statistics years back and now find themselves in need of a little refresher. My purpose in writing this book is to provide short, simple descriptions and explanations of a number of statistics that are used to analyse and present data. Many of them are easy to read and understand.

The book is divided into 12 chapters, arranged in a coherent manner. *Chapter 1* is an introduction, presenting an overview of what research is; meaning, purpose, language and ethics. *Chapter 2* outlines the types of research while *Chapter 3* discusses the research methods in education. *Chapter 4* tackles the problem statement in research, a discussion that is unique because it gives extensive treatment to the understanding of what a research problem is, using examples, and specifies the components of the research problem.

Chapter 5 provides an overview of the purpose of the study, the research questions, and the importance of a hypothesis. It also covers extensively the limitations, delimitations, assumptions, and defining the key words or aspects (operational definitions). *Chapter 6* discusses in detail the concept of population, sample and sampling designs, while *Chapter 7* focuses on reviewing and citing literature. It will help you understand how to use information resources and write a convincing literature review that is adequately amplified.

Chapter 8 discusses the various research designs, highlighting their main characteristics and use, while *Chapter 9* presents a comparative study of the different methods of data collection to help you choose an appropriate method for your study. It also provides clear guidelines for constructing questionnaire and interview schedules, and carrying out successful interviews, in the process of research.

Chapter 10 provides a brief and simple overview of Statistics to help you gain a better understanding of how statistics work and how to interpret them correctly. Each section describes a different statistical technique, ranging from basic concepts like measures of central tendency and describing distributions to more advanced concepts such as t-tests, regression, ANOVA, and factor analysis.

Foreword

I read some special significance in Prof. Laban P. Ayiro's decision to accord me the privilege of introducing the reader to this engaging and informative textbook on research methods in education and statistics. My having been his Vice Chancellor cannot justify his decision. I suspect that he accorded me this privilege precisely because of my documented and globally acclaimed efforts in research and the use of research outcomes for the benefit of humanity. One of the remarkable things about Prof. Ayiro is that, apart from a rich imagination, pragmatic judgement, and immense energy, he has a deep intuitive sense of social, cultural, and cognitive structures. All these are latent in the practice of research and science in general, and are required to develop and produce a useful book such as this. I, therefore, accept the inferred assignment with pleasure.

The goal of *Educational Research Methods: A Functional Approach* is to avail research material to educators so as to equip them with the necessary skills to understand, undertake, implement and evaluate research findings. The book examines how educational research is conducted across the major traditions of qualitative, quantitative and mixed methods. Often in educational research, studies are not entirely either quantitative or qualitative but contain some elements of both approaches. As educators, we can no longer only rely on experiments or surveys to solve our research problems. Mixed methods and action research reinforce this emerging trend in educational research. The book takes the researcher on a walk in education on this continuum.

The audience of this book will include individuals learning about research for the first time (pre-university and undergraduates) as well as graduate students (Masters and PhD) who although have some research experience will find this book invaluable when writing their theses. The book is also a commendable reference for the researcher-practitioner in education, considering its "thinking-skills" approach in the treatment of major ideas.

The book, in my view, is long overdue. Its most immediate value is to help potential researchers to understand the concepts and workings of the research process as a tool used to further the search for solutions to problems in education and further scholarship. It fulfils an obvious need for a systematic account of the research concept and use of statistics. It does so with the clarity and informed assurance that one would expect of the man who wrote the book.

Prof. Ayiro has skilfully written a book that provides a clear and distinct discussion of research methods particularly relevant to education. The book brings to the fore the fact that research involves a process of interrelated activities rather than the application of isolated, unrelated concepts and ideas as is wrongly conceptualised.

Educators practice research following a general sequence of procedures – from initial identification of a research problem to the final report writing of the research case. Inevitably, understanding the sequence or flow of events becomes critical to inquiry. The book, therefore, is divided into 12 chapters that reflect each step in the process of research and the inclusion of concepts and constructs critical to research.

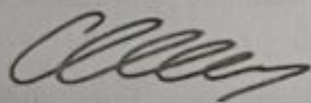
That research methods and statistics are rolled into one, makes this book indeed remarkable. The author appreciates the pivotal role of statistics in research and hence its extensive treatment. The author deliberately takes cognizance of the apprehension most students have for statistical analysis. This is a major factor that distinguishes this book from similar research books. It is a single, bright sword that cuts across the murky waters of teaching a *Research Methods* course as well as engaging in research at university and college levels. It is my belief that this book is a significant resource to anyone interested in conducting research in education and other fields of endeavour.

To the casual reader, this book might be impressive because of its sheer size or perhaps the dazzling formulae. For those who are practitioners of research methods and statistics, the depth of this book and the easily readable nature will no doubt enhance esteem for *Research Methods and Statistics*!

Prof. Ayiro's humour twinkles throughout the book, particularly when he ventures off on side-trips through common life experiences. His most obvious deviation is the story of curiosity amidst the thickness of the plot that defines research and statistics. At other times he carefully traces a concept, such as *hypothesis* back to its origins, showing how "If a certain story is repeated often enough, it becomes the 'truth.'" At times when you might expect Prof. Ayiro to apply Solomonic wisdom and give us his opinion, like *which is the best research design for one to adopt in their study*, he slips quietly away letting us weigh the evidence for ourselves.

Finally, perhaps the most daunting challenge which faced Prof. Ayiro while writing this book was the breadth and depth of the subject of *research methods and statistics*. Normally this would constitute two books. But his philosophical guide is that, he needed to bring out a book that reinforced the logic that, for research to be done well and conclusively, one must understand the statistical tools used to analyse data. The apprehension statistics cause in research methods needs proper treatment and demystification. A gentle approach perhaps or a simplified view of statistics, or just sheer ingenuity, could have been what was needed. That is what this book has delicately done. This book will probably end this apprehension and enhance the teaching and understanding of *research methods and statistics*.

As Prof. Ayiro wades into the academic imperatives of publication with this, his first published book, I am sure he will, in the process, shepherd and umpire his students, fellow researchers and interested life-long learners into winners in the field of research. Summarizing as we continue to flog away at the teaching and practice of research, I take this opportunity to thank Prof. Ayiro. I have never doubted that you could do this. Not for a minute.



Professor R. K. Mibei, FWIF, EBS

Former Vice Chancellor, Moi University

B.A. Biology (Warren Wilson College), M.Sc. Biology (Appalachian State University), M. Plant Pathology (Oklahoma State University), D.Ed. Agricultural Education and Extension (Oklahoma State University), Ph.D. in Mycology (University of Nairobi).

Each section begins with a short description of the statistical tool, and when it should be used. The chapter also focuses on the basics of statistics such as data analysis – analysing both quantitative and qualitative research data, types and procedures. It also covers diverse measurement and scaling techniques, along with multi-dimensional *scaling*. *Chapter 11* has been devoted to the task of interpretation and the art of writing research reports while *Chapter 12* discusses philosophical paradigms in research.

I sincerely hope that you enjoy reading this book and find that it meets your needs and expectations. I welcome any feedback from readers, positive or negative. Through your continuous input, we can improve subsequent editions of this book.

Laban P. Ayiro (PhD)

September 2023

Educational Research Methods: A Functional Approach covers the whole range of methods used in educational research at all stages. These include: the context of educational research; research design; methodologies for educational research; methods of data collection; and data analysis and reporting. It is the go-to text for students, academics and researchers who are undertaking, understanding, or engaged in the application of educational research. It offers useful and practical advice, underpinned by clear theoretical foundations, research evidence and up-to-date references. In addition, it raises key issues and questions for researchers about planning, conducting, reporting and evaluating research.

This book is an essential read for both the multi-disciplinary researcher, and those involved in specifically educational research. It provides a succinct guide to the research methods used to study human subjects; measuring their attributes, attitudes, behaviours, personality traits, reactions, or decisions.

The book also gives students an overview of essential concepts that span most types of research across the social and behavioural sciences. Besides education, it covers research aspects in applied disciplines such as health, social work and business. Each discipline has its own lens on the human experience.

Prof. Laban P. Ayiro's book covers principles of educational research and statistical tools used to analyse and interpret data. It is a welcome addition to the literature on educational research. It is helpful to students embedded in the functional aspects of research methods. Prof. Ayiro is a respected and experienced scholar and academic. With such an engaging writing style, I am confident that the book will be received well in Africa and beyond.

*James Matis, Prof. Emeritus of Statistics,
Texas A&M University*



KENYA LITERATURE BUREAU
PUBLISHERS AND PRINTERS



9 789966 658739 >