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A Guide to Research Methodology for Beginners

By

Ajit Kumar Roy

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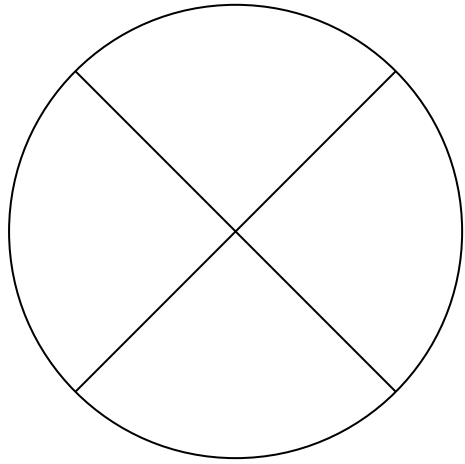
Dedication:

Dedicated to my granddaughter
'ANGANA'



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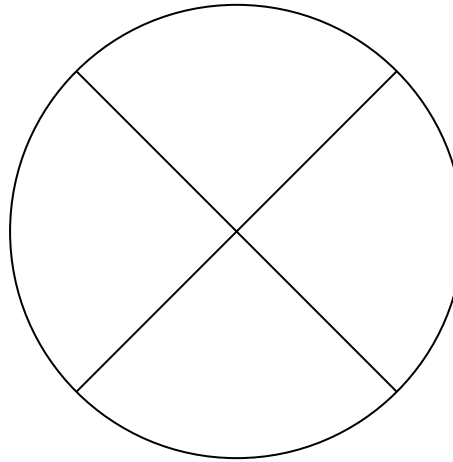


Preface

Research methodology is taught as a supporting subject in several ways in many academic disciplines at various levels by people committed to a variety of research programme. During my research and teaching career, it is observed that most students struggle to generate interesting or useful research questions or build scientific theories. To address this gap, I have devoted on the fundamental topics creating conceptual understanding about research methodology which are essential skills for a researcher. Some parts are intended to prompt one's imagination so that one is able to see an issue from a particular point of view. Planning is the essential step for any work to be done systematically. Without comprehensive planning for the research work no specific outcome would be generated.

The book entitled ***"A guide to Research Methodology for Beginners"*** is succinct and compact by design focusing only on essential concepts rather than burden students with a voluminous text on top of their assigned readings. The book is structured into the following nine chapters.

Chapter-1: What is Scientific Research?
Chapter-2: Literature Review
Chapter-3: How to develop a Research Questions & Hypotheses
Chapter-4: Research Methods and the Research Design
Chapter-5: Concept of Variables, Levels and Scales of Measurements for Data collection
Chapter-6: Data Analysis, Management and Presentation
Chapter-7: Tips for Writing Research Report
Chapter-8: Glossary Related to Research Methodology
Chapter-9: References

Chapter 1 is an introduction to scientific research that covers current knowledge in a succinct form with examples.

Chapter 2 provides a detailed discussion of literature review aiming to provide clear understanding of purpose, importance and procedure of a

good literature review. For considering publishing in a reputed journal, one will have to prepare a good manuscript for publication. Hence accurate bibliographic research, strong experimental design, use of modern analytical techniques, accurate statistical analysis and the results must improve the knowledge on the subject.

Chapter 3 gives the guidelines useful for the identification and selection of a research topic and clarifies how to develop a Research Questions & Hypotheses. The questions relating to whether a research problem is adequately analysed and whether it is clearly stated are addressed. Hypothesis testing with examples are elaborated for clear conception and understanding**.**

Chapter 4 discusses at length on the concept of *Research Design particularly differences between* Research Methods and the Research Design**.** Broadened the discussion to cover issues in research design and, more broadly, how to choose the most Appropriate Design? Most importantly, the concept of validity and reliability and ways to improve these are also elaborated.

Chapter 5 presents guidelines for *Data Collection with emphasis on the* Concept of Variables, Levels and Scales of Measurements for Data collection which is of prime importance while designing experiments and surveys. Finally, one has collected all the data and how to manage and analyse it. For the management of data, a few practical issues are addressed, such as confidentiality, security, translation and recording. The analysis section will give one clues as to how to use thematic or narrative analysis, what validation strategies one need to think of, what good practice guidelines you should follow.

Chapter 6 gives the details of the whole research design and its basis. It includes the details of research method, population, sampling, tools for data collection, data scoring, data analysis and presentation particularly ways to concretely develop qualitative research designs.

Chapter 7 discusses how to w*rite a good Research Report because for a researcher, I think to publish in a good journal must be the big aim.*

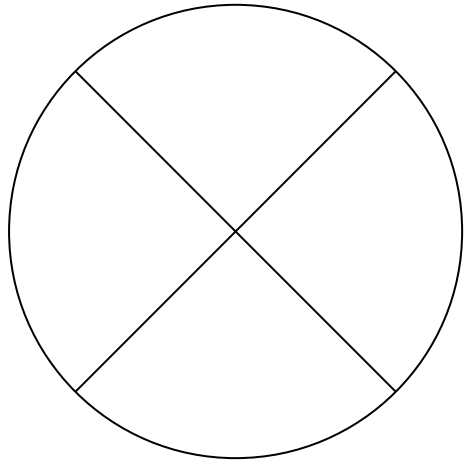
This Chapter presents the format and guidelines that an investigator may follow when writing the final research report.

Chapter 8 is devoted focussing on a brief account of the definitions of common terms applied in research in the form of Glossary.

Chapters 9 is enriched with current r*eferences for further reading*

This book evolved from the experience of teaching research methods course at various levels for more than four decades**.** Many figures, tables, and exhibits are used to illustrate concepts, procedures, and empirical outcomes. This book is also unique in using a measurement framework to examine a variety of issues in research methodology, both quantitative and qualitative. I think the book is in conformity with the function of a research that ensures one to effectively address the research problem logically and as unambiguously as possible. It is expected that the book will be useful for graduate students, researchers, and professors teaching courses on research methods.

AJIT KUMAR ROY



About the Book

This book is the outcome of more than four decades of experience of the author in teaching and research field. Research is a creative process and the topic of research methodology is complex and varied. The basic premise for writing this book is that research methods can be taught and learnt. The emphasis is on developing a research outlook and a frame of mind for carrying out research. The book presents current methodological techniques used in interdisciplinary research along with illustrated and worked out examples. This book is well equipped with fundamentals of research and research designs. All efforts have been made to present Research, its meaning, intention and usefulness. Focussed in designing of research programme, selection of variables, collection of data and their analysis to interpret the data are discussed extensively. Statistical tools are complemented with examples, making the complicated subject like statistics simplest usable form. The importance of software, like MS Excel, SPSS, for statistical analyses is included. Written in a simple language, it covers all aspects of management of data with details of statistical tools required for analysis in a research work. Complete with a glossary of key terms and guides to further reading, this book is an essential text for anyone coming to research for the first time and is widely relevant across the disciplines of sciences. This book is designed to introduce Masters, and doctoral students to the process of conducting scientific research in the life sciences, social sciences, education, public health, and related scientific disciplines. It conforms to the core syllabus of many universities and institutes. The target audience for this book includes those are going to start research as graduate students, junior researchers, and professors teaching courses on research methods.

The book entitled ***"A guide to Research Methodology for Beginners"*** is succinct and compact by design focusing only on essential concepts rather than burden students with a voluminous text on top of their assigned readings. The book is structured into the following nine chapters.

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Chapter-9: References

It is a comprehensive and compact source for basic concepts in research and can serve as a stand-alone text or as a supplement to research readings in any doctoral seminar or research methods class. The target audience for this book includes those are going to start research as graduate students, junior researchers, and professors teaching courses on research methods.

Chapter1: What is Scientific Research?

1.1 Definition of Research

When you say that you are undertaking a research study to find answers to a question, you are implying that the process

1. is being undertaken within a framework of a set of philosophies/approaches;
2. uses procedures, methods and techniques that have been tested for their validity and reliability;
3. is designed to be unbiased and objective.

Philosophies mean approaches e.g. qualitative, quantitative and the academic discipline in which you have been trained.

Validity means that correct procedures have been applied to find answers to a question.

Reliability refers to the quality of a measurement procedure that provides repeatability and accuracy.

Unbiased and objective means that you have taken each step in an unbiased manner and drawn each conclusion to the best of your ability and without introducing your own vested interest. Bias is a deliberate attempt to either conceal or highlight something.

Adherence to the three criteria mentioned above enables the process to be called ***'research'***. However, the degree to which these criteria are expected to be fulfilled varies from discipline to discipline and so the meaning of 'research' differs from one academic discipline to another. The difference between research and non-research activity is, in the way we find answers. The process must meet certain requirements to be called research. We can identify these requirements by examining some definitions of research. The word research is composed of two syllables, re and search; re is a prefix meaning again, anew or over again search is a verb meaning to examine closely and carefully, to test and try, or to probe. Together they form a noun describing a careful, systematic, patient study and investigation in some field of knowledge, undertaken to establish facts or principles. Research is a structured enquiry that utilizes acceptable scientific methodology to solve problems and create new knowledge that is generally applicable. *Scientific methods* consist of systematic observation, classification and interpretation of data. Although we engage in such process in our daily life, the difference between our casual day- to-day generalisation and the conclusions usually recognized as scientific method lies in the degree of formality, rigorousness, verifiability and general validity of latter.

Scientific Research: It can't be termed as "scientific research" unless: (1) it contributes to a body of science, and (2) it follows the scientific method. Science refers to a systematic and

organized body of knowledge in any area of inquiry that is acquired using "the scientific method". Science can be grouped into two broad categories: natural science and social science.

Natural science is the science of naturally occurring objects or phenomena, such as light, objects, matter, earth, celestial bodies, or the human body. Natural sciences can be further classified into physical sciences, earth sciences, life sciences, and others.

Physical sciences consist of disciplines such as physics (the science of physical objects), chemistry (the science of matter), and astronomy (the science of celestial objects).

Earth sciences consist of disciplines such as geology (the science of the earth).

Life sciences include disciplines such as biology, the science of human bodies and botany and the science of plants.

Social science is the science of people or collections of people, such as groups, firms, societies, or economies, and their individual or collective behaviours. Social sciences can be classified into disciplines such as

Psychology is the science of human behaviours

Sociology is the science of social groups and

Economics *is* the science of firms, markets, and economies.

The natural sciences are different from the social sciences in several respects. The natural sciences are very precise, accurate, deterministic, and independent of the person making the scientific observations. For instance, a scientific experiment in physics, such as measuring the speed of sound through a certain media or the refractive index of water, should always yield the exact same results, irrespective of the time or place of the experiment, or the person conducting the experiment. If two students conducting the same physics experiment obtain two different values of these physical properties, then it generally means that one or both of those students must be in error. The same cannot be said for the social sciences, which tend to be less accurate, deterministic, or unambiguous. For instance, if you measure a person's happiness using a hypothetical instrument, you may find that the same person is more happy or less happy or sad on different days and sometimes, at different times on the same day. One's happiness may vary depending on the news that person received that day or on the events that transpired earlier during that day. Furthermore, there is not a single instrument or metric that can accurately measure a person's happiness. Hence, one instrument may calibrate a person as being "more happy" while a second instrument may find that the same person is "less happy" at the same instant in time. In other words, there is a high degree of measurement error in the social sciences and there is considerable uncertainty and little agreement on social science policy decisions. For instance, you will not find many disagreements among natural scientists on the speed of light or the speed of the earth around the sun, but you will find numerous disagreements among social scientists on how to solve a social problem such as reduce global

terrorism or rescue an economy from a recession. Any student studying the social sciences must be cognizant of and comfortable with handling higher levels of ambiguity, uncertainty, and error that come with such sciences, which merely reflects the high variability of social objects.

Scientific Knowledge: The purpose of science is to create scientific knowledge. Scientific knowledge refers to a generalized body of laws and theories to explain a phenomenon or behaviour of interest that are acquired using the scientific method. Laws are observed patterns of phenomena or behaviours, while theories are systematic explanations of the underlying phenomenon or behaviour.

Scientific method refers to a standardized set of techniques for building scientific knowledge, such as how to make valid observations, how to interpret results, and how to generalize those results. ***The scientific method must satisfy four characteristics***:

***Replicability*:** Others should be able to independently replicate or repeat a scientific study and obtain similar, if not identical, results.

***Precision*:** Theoretical concepts, which are often hard to measure, must be defined with such precision that others can use those definitions to measure those concepts and test that theory.

Falsifiability: A theory must be stated in a way that it can be disproven. Theories that cannot be tested or falsified are not scientific theories and any such knowledge is not scientific knowledge.

***Parsimony*:** When there are multiple explanations of a phenomenon, scientists must always accept the simplest or logically most economical explanation. This concept is called parsimony or "Occam's razor."

The scientific method, as applied to social sciences, includes a variety of research approaches, tools, and techniques, such as qualitative and quantitative data, statistical analysis, experiments, field surveys, case research etc.

General Definition Research: General definition is "finding answers to questions in an organized and logical and systematic fashion" but that can be diverse.

How Have We Searched for Truth?

1) tradition or custom
2) authority
3) personal experience
4) deductive reasoning
5) scientific inquiry (research)

Nature of Research may be as follows

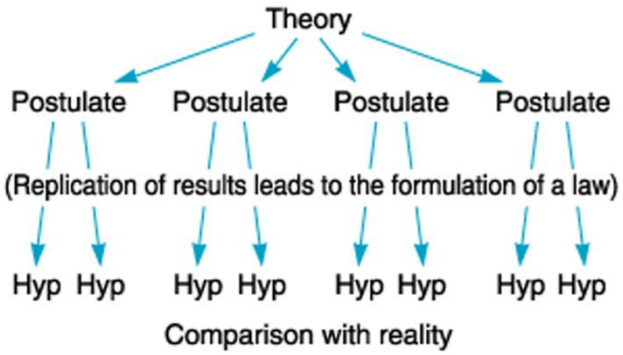
- ✓ Systematic – ordered structure of inquiry
- ✓ Logical – process to evaluate conclusions drawn
- ✓ Empirical -collection of data (facts, experience, etc.) on which to base decisions
- ✓ Reductive – individual events (data) are used to establish general relationships
- ✓ Replicable – process is recorded so findings and procedures can be tested again

1.2 Deduction and Induction:

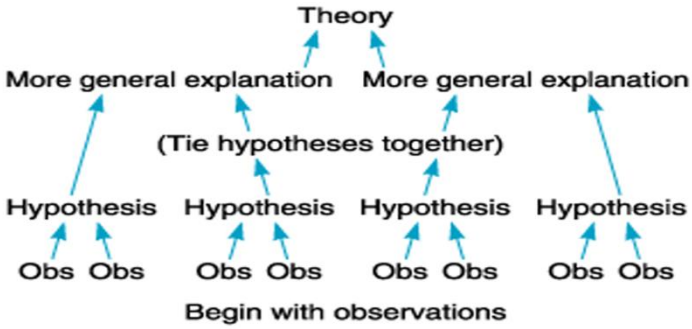
Deductive-using logic from general to specific often used for generating our hypotheses in research.

Inductive–It happens from specific to general. General conclusions based on many specific observations. Integration of these forms the scientific method

Deductive Reasoning



Inductive Reasoning



Basic Scientific Method

- ✓ Identify the problem – central to beginning the method of actually solving the problem
- ✓ Formulate the hypothesis – outcome statement to test
- ✓ Develop the plan of research – what do you need to do to test this hypothesis? (Methodology, participants, data gathering, analysis)
- ✓ Collecting and analyzing the data

✓ Interpreting the results and forming conclusions-does the evidence support the hypothesis

Basic Research Plan

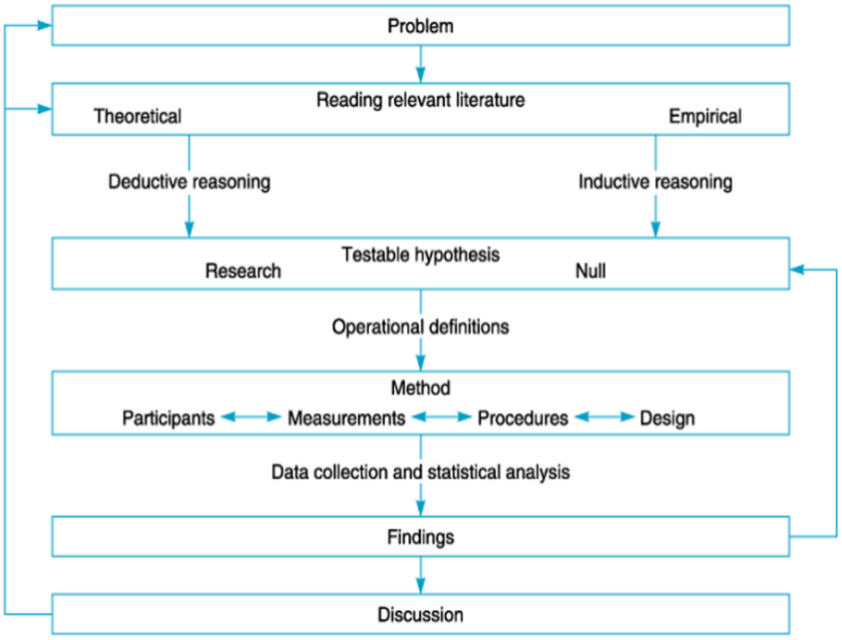


Figure-1: Outline of Basic Research Plan

Types of Research Questions

1) Descriptive

2) Difference questions

3) Relationships

Theory: Theories provide order to facts and a framework of generalization. Theory–belief or assumption about how things relate to each other often used for cause and effect statements. One should often have not relied on theory and instead used empiricism.

Basic Research Concepts: Variables -any characteristic that varies i.e., more than one value. Can be Categorical or numerical or Discrete or continuous.

Types of Research Problems

Basic Research: Essential for the development of theory, motivated by intellectual curiosity with no immediate practical utility.

Applied Research: Answer an immediate practical problem and often apply the findings of basic research

Quantitative – The truth is out there

Qualitative – multiple truths

Steps in Conducting Scientific Research

A good scientist practices objectivity to avoid errors and personal biases that may lead to falsified research. The entire scientific research process from defining the research question to drawing conclusions about data requires the researcher to think critically and approach issues in an organized and systematic way. Scientific research can lead to the confirmation or re-evaluation of existing theories or to the development of entirely new theories.

Defining Problem and Research: The first step of the scientific research process involves defining the problem and conducting research. First, a broad topic is selected concerning some topic or a research question is asked. The scientist researches the question to determine if it has been answered or the types of conclusions other researchers have drawn and experiments that have been carried out in relation to the question. Research involves reading scholarly journal articles from other scientists, which can be found on the Internet via research databases and journals that publish academic articles online. During research, the scientist narrows down the broad topic into a specific research question about some issue.

Hypothesis: The hypothesis is a concise, clear statement containing the main idea or purpose of your scientific research. A hypothesis must be testable and falsifiable, meaning there must be a way to test the hypothesis and it can either be supported or rejected based on examining data. Crafting a hypothesis requires you to define the variables you're researching (e.g., who or what you're studying), explain them with clarity and explain your position. When writing the hypothesis, scientists either make a specific cause-and-effect statement about the variables being studied or make a general statement about the relationship between such variables.

Design Experiment: Designing a scientific experiment involves planning how you're going to collect data. Often, the nature of the research question influences how the scientific research will be conducted. For example, researching people's opinions naturally requires conducting surveys. When designing the experiment, the scientists selects from where and how the sample being studied will be obtained, the dates and times for the experiment, the controls being used and the other measures needed to carry out the research.

Collect Data: Data collection involves carrying out the experiment the scientist designed. During this process, the scientists record the data and complete the tasks required to conduct the experiments. In other words, the scientist goes to the research site to perform the experiment, such as a laboratory or some other setting. Tasks involved with conducting the experiment vary depending on the type of research. For example, some experiments require bringing human participants in for a test, conducting observations in the natural environment or experimenting with animal subjects.

Analyse Data: Analysing data for the scientific research process involves bringing the data together and calculating statistics. Statistical tests can help the scientist understand the

data better and tell whether a significant result is found. Calculating the statistics for a scientific research experiment uses both descriptive statistics and inferential statistics measures. Descriptive statistics describe the data and samples collected, such as sample averages or means, as well as the standard deviation that tells the scientists how the data is distributed. Inferential statistics involves conducting tests of significance that have the power to either confirm or reject the original hypothesis.

Draw Conclusions: After the data from an experiment is analysed, the scientist examines the information and makes conclusions based on the findings. The scientist compares the results both to the original hypothesis and the conclusions of previous experiments by other researchers. When drawing conclusions, the scientist explains what the results mean and how to view them in the context of the scientific field or real-world environment, as well as making suggestions for future research.

Various Stages of Scientific Research

Problem Stage:

1. Identify the PROBLEM area.

2. Survey the LITERATURE relating to the problem; in light of the literature, explain the problem for investigation in clear, specific terms.

3. Identify and define relevant CONCEPTS or VARIABLES and relate them to each other in testable HYPOTHESES, answerable research questions and research objectives as appropriate.

Planning Stage:

4. Construct the RESEARCH DESIGN to maximize internal and external validity: (a) select your subjects if required; (b) control and/or manipulate variables if required; (c) establish criteria to evaluate outcomes; (d) engage in instrumentation – select or develop measuring instrument(s), if necessary.

5. Specify the DATA COLLECTION procedures, and

6. Select and specify the DATA ANALYSIS methods.

Execution Stage:

7. Execute research as planned;

8. ANALYSE the data, answering research questions, meeting research objectives and testing hypotheses specified; report findings of tests and any additional information of interest to the research problem.

9. EVALUATE the results and draw CONCLUSIONS relating these to the problem area.

How Scientific Knowledge is produced?

Basically, there are two ways by which scientific knowledge can be produced. These are through the methods of ***induction and deduction***.

Induction is a process of moving from specific observations to a general conclusion. The researcher in this regard takes the following steps:

- First, he or she observes phenomena and records them.
- He/she studies data so recorded for possible patterns and regularities.
- Finally, he/she seeks explanation(s) to such patterns where they exist. It is at this final stage that what is called a theory (more on this later), in the form of a general principle that explains what has been discovered, can emerge.

In the second method of ***deduction***, there is movement from a theory to specific observations. In other words, theory precedes observation. It involves the following steps:

On the basis of a theory, an investigator predicts certain phenomena. Next, the investigator observes and collects data to ascertain whether the phenomena occur as predicted. Typically, however, scientific research involves both deduction and induction. A researcher may start with a theory and deduce certain phenomena that he then sets out to observe. If successive observations do not fit the theory, then the theory can be revised and, ultimately, rejected. Observations then lead to a new theory through induction. Scientific research can be either quantitative or qualitative in method and approach. A quantitative approach relies heavily on quantitative (statistical) data in the form of numbers collected through empirical observation or from statistical digests. Qualitative approaches rely more on data that are in the form of words rather than numbers. While quantitative data are analysed through the use of descriptive and inferential statistical tools with a view to testing hypotheses and offering explanations, qualitative data are categorized into themes and evaluated with a view to describing or discovering phenomena.

Language of Scientific Research: The science or study of methods of research, otherwise called research methodology, has its own language and key words. It is appropriate at this stage to briefly highlight the meaning of words that we will continue to encounter as we study and apply the scientific method. These include population (or universe), sample, subject, parameter, statistic, concept, variable, hypothesis and theory.

Population (or universe) refers to the entire group of people, events, institutions and issues, countries that is the target or subject of investigation. All military coups in Africa constitute the population for a study of military coups on the continent.

Sample refers to any sub-set or sub-group of the population. Thus, military coups in the 1960s (or in Sierra Leone or Eastern Africa), in so far as these are sub-sets, constitute a sample of military coups in Africa. The critical point here is the target population, which varies from study to study. A subject is a single member of a sample. Thus, the January 1966 coup

in Nigeria is a subject in the sample of African coups that occurred in the 1960s drawn from the population of all military coups in Africa.

A **parameter** is an attribute of a population. An example would be the success rate of all coups in Africa.

A **statistic** is an attribute of a sample. An example is the success rate of a sample of military coups in Africa.

A **Concept** is an abstraction based on characteristics of perceived reality. It is a word or general notion that expresses generalizations from particulars. For instance, "weight" is a concept that expresses numerous observations of the extent to which things are more or less heavy, just as security expresses observations about the extent of safety and freedom from danger or anxiety. Now, it is clear that one way of defining a concept is through the use of other concepts. Thus, I define weight above by referring to heaviness. I also see security in relation to safety, danger and anxiety. This is what is called conceptual definition – defining a concept (word) with the help of other concepts (words). Another way of defining concepts, especially in certain types of research involving quantitative data, is through what is called operational definition. This definition specifies the process by which a concept is to be measured. Operational definition of weight will specify specific measurement procedure (in pounds, kilograms, etc). Security can be operationally defined as zero strikes, zero conflicts, etc within a specified period.

A **variable** is a concept (symbol or characteristic) whose values can vary. In other words, it is a concept that can take more than one value, a quality or characteristic that varies among the subjects of investigation. There are different types of variables. A continuous variable is one that is capable of taking on an ordered and theoretically infinite set of values. Examples are the variables of age, income, casualty, height and weight. A categorical (or discrete) variable on the other hand is one capable of taking on only a specific set of values of a discontinuous nature, with each value being individually distinct from the others. Examples are: sex, religion and marital status. An independent variable is the presumed cause/influence/explanation of the dependent variable, whose values are presumed to be dependent on or affected by the independent variable. In other words, the dependent variable is the presumed effect or function of the independent variable. Other types of variables are competently explained in relevant texts.

A **hypothesis** is a conjectural statement linking two or more variables (at least one independent and one dependent) in a hypothesized relationship. Much of scientific research involves the collection and analysis of data to uphold or falsify such hypotheses.

Concepts and variables constitute the building blocks of scientific research. While certain types of research (especially those involving non-quantitative data) can be conducted

without hypotheses, which essentially link concepts and variables together, no research of a scientific nature can be conducted in the absence of concepts and variables.

Finally, as indicated earlier, the ultimate goal of scientific research is to discover powerful theories that provide explanation for observed phenomena. Simply put, a theory is a set of interrelated concepts, definitions and propositions that present a systematic view of phenomena by specifying relations among variables with the purpose of explaining, predicting and controlling the phenomena.

The natural and physical sciences have been more successful in theory-building than the social sciences and the humanities for obvious reasons. One reason is that human beings are definitely more complex and more unpredictable than such inanimate objects as rocks. *Discovering theories that help to explain, predict and control such erratic entities becomes a very difficult task indeed.*

A second major reason has to do with measurement problems, which are more acute in the social sciences than in the physical sciences. How do we, for instance accurately measure such things as unemployment, instability, extent of freedom, corruption and impact of public policy? This is a major problem in social science research program.

More than a set of skills, it is a way of thinking: examining critically the various aspects of your professional work. It is a habit of questioning what you do, and a systematic examination of the observed information to find answers with a view to instituting appropriate changes for a more effective professional service.

1.3 Types of Research and Research Problems

The chapter aims to acquaint students with basic concepts of various types' research methods and process that will help develop Research Skill for Planning, designing, and conduct of research.

Research Method and Methodology: Methodology and Method are often incorrectly used interchangeably. ***Methodology*** is the study of the general approach to inquiry in a given field. ***Method*** is the specific techniques, tools or procedures applied to achieve a given objective. For example, Research methods in economics include regression analysis, mathematical analysis, operations research, surveys, data gathering, etc.

***Pure Research*:** Known as the fundamental or the theoretical research is basic and original. This can lead to the discovery of a new theory. Can result in the development or refinement of a theory that already exists, helps in getting knowledge without thinking formally or implementing it in practice, based on the honesty, love and integrity of the researcher for discovering the truth?

Types of Research Problems

- ***Basic Research***
- essential for the development of theory
- motivated by intellectual curiosity
- no immediate practical utility
- ***Applied Research***
- answer an immediate practical problem
- often apply the findings of basic research

Applied Research

- Applied research is based on the concept of the pure research.
- Is problem oriented?
- Helps in finding results or solutions for real life problems.
- Provides evidence of usefulness to society.
- Helps in testing empirical content of a theory.
- Utilizes and helps in developing the techniques that can be used for basic research.
- Helps in testing the validity of a theory but under some conditions.
- Provides data that can lead to the acceleration of the process of generalization.

Utility of pure or applied research

Fundamental difference is that Pure research is sometimes lab-based, lacking naturalness whereas applied is sometimes field-based, lacking control. In pure, basic, theoretical or academic projects, the aim is to understand the cause or mechanism of a phenomenon. Applied or practical projects impact directly on health, wealth, or culture, art, recreation etc. or on development of a method.

Descriptive Research:

a. It is the **s**implest form of research.
b. More specific in nature and working than exploratory research.
c. It involves a mutual effort.
d. Helps in identifying various features of a problem.
e. Restricted to the problems that are describable and not arguable and the problems in which valid standards can be developed for standards.
f. Existing theories can be easily put under test by empirical observations.
g. Underlines factors that may lead to experimental research.
h. It consumes a lot of time.
i. It is not directed by hypothesis.

Descriptive studies do not test specific relationships between factors. They provide information about behaviors and attributes with the goal of reaching a better understanding of a given topic. Descriptive research is a useful method of gathering information about rare phenomena that could not be reproduced in a laboratory or about subjects that are not well understood. *Descriptive research is an example of "basic" research*

Exploratory Research

a. Involves exploring a general aspect.
b. Includes studying of a problem, about which nothing or a very little is known.
c. Follows a very formal approach of research.
d. Helps in exploring new ideas.
e. Helps in gathering information to study a specific problem very minutely.
f. Helps in knowing the feasibility in attempting a study.

Quantitative Research

Quantitative research is inquiry into an identified problem, based on testing a theory, measured with numbers, and analysed using statistical techniques. The goal of quantitative methods is to determine whether the predictive generalizations of a theory hold true. There are ***three general types of quantitative methods***

Experiments: True experiments are characterized by random assignment of subjects to experimental conditions with the use of experimental controls.

Quasi-Experiments: Quasi-experimental studies share almost all the features of experimental designs except that they involve non-randomized assignment of subjects to experimental conditions.

Surveys: Surveys include **cross-sectional and longitudinal studies** using questionnaires or interviews for data collection with the intent of estimating the characteristics of a large population of interest based on a smaller sample from that population.

Qualitative Research

A study based upon a qualitative process of inquiry has the goal of understanding a social or human problem from multiple perspectives. Qualitative research is conducted in a natural setting and involves a process of building a complex and holistic picture of the phenomenon of interest. Qualitative methods applied to a sample often result in a small sample size because subjects are hard to get, or the interviews are too time consuming, or the researchersdislike the idea of large samples. But a study with a small sample can adequately characterize only strong associations (large effects) in a population. So, these small-scale qualitative studies are not definitive for a small or trivial effect. Furthermore, open-ended inquiry is equivalent to assaying many variables, so there is a high risk of finding a spurious

association. If the sample is small, the spurious association will be strong. Therefore, small-scale qualitative studies are not definitive even for a moderate or large effect. Bottom line: when using qualitative methods to generalize to a population, you need a large sample to characterize small effects.

Historical Research

The idea is to gather, validate and synthesize evidence to establish facts which defend or oppose your hypothesis. It makes use of primary sources, secondary sources, and a lot of qualitative data sources for example logs, diaries, official data, reports, and so on. The issue is that the sources need to be both authentic and valid.

Descriptive Research

- With a descriptive research we are generally aiming to describe some group of people or other entities.

For example, the characteristics of consumer preferences of fish species; the degree to which preference varies with income, age group, sex or other characteristics.

- Descriptive research enables you to achieve a multitude of research objectives.
- Descriptive data become helpful for solving problems only if the process is guided by one or more specific research problems, much thought and effort, and quite often exploratory research to clarify the situation and create hypotheses.

Experimental Research

I. Experimenting refers to the process of research where one or more variables are altered under conditions that allow the collection of data which show the effects.

II. Experiments create artificial situation so the researcher can get the particular data required and can study the data precisely.

III. In experiments the situations are generally made for testing purposes.

IV. This artificiality is the essence of the experimental technique, because it provides researchers additional control over the factors they are exploring.

V. If they can control the factors that are found in a provided situation, they can obtain more definitive proof of cause and effect relationships between any two of them.

VI. Thus, the capability to create a situation for the objective of observing and recording accurately the effect on one factor when another is intentionally modified makes it possible for researchers to accept or reject hypothesis beyond reasonable doubt.

VII. In case the objective is to validate in a resounding way the cause and effect relationship between variables, then definitely experiments are far better than descriptive techniques

VIII. Experiments are generally the most precise studies and have the most conclusive power.

IX. They are particularly effective in supporting hypotheses about cause and effect relationships.

X. However, since the conditions in an experiment are somewhat artificial, they may not apply to everyday situations.

XI. A well-designed experiment has features that control random variables to make sure that the effect measured is caused by the independent variable being manipulated.

XII. These features include random assignment, use of a control group. An experimenter decides how to manipulate the independent variable while measuring the dependent variable.

XIII. In a good experiment, only the independent variable will affect the dependent variable.

XIV. Confounding variables (other Independent variables) ideally get ruled out OR their effects are reduced by the manipulated IV

Experimental Design

It allows us to determine cause and effect. The defining characteristics are

1. Manipulation of Independent variables
2. Experimental control of other variables
3. Random assignment to groups

Strengths

4. Can tease out cause and effect
5. Allows for strict control of variables

Weaknesses

6. Many questions may not be able to be answered using this method – i.e. cannot be varied (e.g. sex, age, birth order, effects of child abuse)
7. May be artificial and limited
8. Causal effects may not hold when the complexity of actual human behavior is considered
9. Involves brief exposures and may miss important processes that occur over time

Survey Research: *Survey research* a research method involving the use of standardized questionnaires or interviews to collect data about people and their preferences, thoughts, and behaviours in a systematic manner. This method has become a very popular method for quantitative research in the social sciences. The survey method can be used for descriptive, exploratory, or explanatory research. This method is best suited for studies that have individual people as the unit of analysis. Survey research has several inherent strengths compared to other research methods.

Strength of Survey Research

- **First**, surveys are an excellent vehicle for measuring a wide variety of unobservable data, such as people's preferences (e.g., political orientation), traits (e.g., self-esteem), attitudes (e.g., toward immigrants), beliefs (e.g., about a new law), behaviours (e.g., smoking or drinking behaviour), or factual information (e.g., income).

- **Second**, survey research is also ideally suited for remotely collecting data about a population that is too large to observe directly. A large area, such as an entire country, can be covered using mail-in, electronic mail, or telephone surveys using meticulous sampling to ensure that the population is adequately represented in a small sample.

- **Third**, due to their unobtrusive nature and the ability to respond at one's convenience, questionnaire surveys are preferred by some respondents.

- **Fourth**, interviews may be the only way of reaching certain population groups such as the homeless or illegal immigrants for which there is no sampling frame available.

- **Fifth**, large sample surveys may allow detection of small effects even while analysing multiple variables, and depending on the survey design, may also allow comparative analysis of population subgroups (i.e., within-group and between-group analysis).

- **Sixth,** survey research is economical in terms of researcher time, effort and cost than most other methods such as experimental research and case research.

Disadvantages of Survey Research

At the same time, survey research also has some unique disadvantages. It is subject to a large number of biases such as non-response bias, sampling bias, social desirability bias, and recall bias. Depending on how the data is collected, survey research can be divided into **two broad categories**:

i) Questionnaire surveys which may be mail-in, group-administered, or online surveys. *Questionnaires are instruments* that are completed in writing by **respondents**

II) Interview surveys which may be personal, telephone, or focus group interviews. In this case, **interviews** are completed by the **interviewer** based on verbal responses provided by respondents

Case Research: Case research, also called case study, is a method of intensively studying a phenomenon over time within its natural setting in one or a few sites. Multiple methods of data collection, such as interviews, observations, pre-recorded documents, and secondary data, may be employed and inferences about the phenomenon of interest tend to be rich, detailed, and contextualized. Case research can be employed in a positivist manner for the purpose of *theory testing* or in an interpretive manner for theory building. Case research has several unique strengths over competing research methods such as experiments and survey research.

Strengths and weakness of Case Study

I. ***First***, case research can be used for either **theory building or theory testing**, while positivist methods can be used for theory testing only.

II. ***Second***, the research questions can be modified during the research process if the original questions are found to be less relevant or salient. This is not possible in any positivist method after the data is collected.

III. ***Third***, case research can help derive richer, more contextualized, and more authentic interpretation of the phenomenon of interest than most other research methods by virtue of its ability to capture a rich array of contextual data.

IV. ***Fourth***, the phenomenon of interest can be studied from the perspectives of multiple participants and using multiple levels of analysis (e.g., individual and organizational).

V. Case research also has some inherent weaknesses. Because it involves no experimental control, internal validity of inferences remains weak.

Action Research

- Action research is a qualitative but positivist research design aimed at theory testing rather than theory building.
- This is an interactive design that assumes that complex social phenomena are best understood by introducing changes, interventions, or "actions" into those phenomena and observing the outcomes of such actions on the phenomena of interest.
- In this method, the researcher is usually a consultant or an organizational member embedded into a social context (such as an organization), who initiates an action in response to a social problem and examines how her action influences the phenomenon while also learning and generating insights about the relationship between the action and the phenomenon.
- Examples of actions may include organizational change programs, such as the *introduction of new organizational processes, procedures, people, or technology or replacement of old ones*, initiated with the goal of improving an organization's performance or profitability in its business environment.
- Hence, action research is an excellent method for bridging research and practice.

Participatory Action Research

The most popular of this method is the participatory action research. This method follows an *action research cycle* consisting of five phases:

(1) diagnosing,
(2) action planning,
(3) action taking,
(4) evaluating and
(5) learning

Diagnosing involves identifying and defining a problem in its social context.

Action planning involves identifying and evaluating alternative solutions to the problem and deciding on a future course of action based on theoretical rationale.

Action taking is the implementation of the planned course of action.

The evaluation stage examines the extent to which the initiated action is successful in resolving the original problem, i.e., whether theorized effects are indeed realized in practice.

In the ***learning phase***, the experiences and feedback from action evaluation are used to generate insights about the problem and suggest future modifications or improvements to the action.

The primary mode of **data collection** is participant observation, although other techniques such as interviews and documentary evidence may be used to corroborate the researcher's observations. Action research is a subjective intervention with a case or sample. Dealing with the *problems of everyday life* is an informal kind of action research. Some researchers identify the extreme subjects in a quantitative survey, and then interview them subjectively/qualitatively as cases. Others do a qualitative pilot study of a few cases to identify a problem and the appropriate measures for a larger quantitative study of a sample. A project based in an unusual region may give new insights but you may struggle to publish in journals devoted to more popular regions. Researchers who mix qualitative methods such as intensive interviews with studying a sample for generalizing to a population can run into a sample-size problem.

Correlation Method

No manipulation: just observe 2+ variables, and then measure relationship. Also called Descriptive, Non-experimental, Naturalistic, Observational, Survey design

Advantages & Disadvantages of Correlation Methods

Advantage: i) Efficient for collecting lots of data in a short time ii) Can study problems you cannot study experimentally

Disadvantage: i) Leaves Cause-Effect Relationship Ambiguous ii) No control over extraneous variables

Experimental Method

True experiments: Manipulate one variable (independent) and Measure effects on another (dependent). Evaluate the relationship between independent (*Levels*, *conditions* & *treatments)* and dependent variables *(outcome/observed level).* Values of DV (presumed to be) "dependent" on the level of the IV

Experimental Validity:

Internal Validity: Is the experiment free from *confounding*?

External Validity: How well can the results be generalized to other situations?

Quasi-experimental designs

Still study effects of IV on DV, *but* IV not manipulated groups/conditions/levels are different

--natural groups (sex, race)

--ethical reasons (child abuse, drug use)

Participants "select" themselves into groups

∴ IV not manipulated

∴No random assignment

Research Settings

Laboratory Studies:

Advantages:

- Control over situation (over IV, random assignment, etc.)
- Provides sensitive measurement of DV

Disadvantages:

- Subjects know they are being studied, leading to *demand*
- Limitations on manipulations
- Questions of reality & generalize ability

Field Studies:

Advantages:

- ***Minimizes suspicion***
- ***Access to different subject populations***
- ***Can study more powerful variables***

Disadvantages:

- ***Lack of control over situation***
- ***Random Assignment may not be possible***
- ***May be difficult to get pure measures of the DV***
- ***Can be more costly and awkward***

1.4 What is Research Skill?

Research Skills:

- A skill is the learned capacity or talent to carry out pre-determined results often with the minimum outlay of time, energy, or both.
- Talent or learned capacity?
- Most of the skills can be learnt or improved over time, if one wants

- Some talent is needed, but alone it is not enough
- People with great talent and no skills obtain much less than what they could do
- Not only technical skills

Skill 1: Curiosity

- Intellectual curiosity
- How does it work? What if you change this? Why did you do this? …
- Ask questions to everybody (and to yourself) and in all circumstances
- Look at what others do
- Can be very helpful in learning how to recognize the interesting questions

Skill 2: Patience

- Good research needs time
- Don't expect great results immediately
- Theorems may be hard to prove
- Coding may take more time that initially thought to be bug-free
- Experiments need to be tuned to show interesting results and lessons
- Allow ample time to do either theoretical or empirical research

Skill 3: Enjoyment

- Research has to be something you like to do
- Don't do it for some other reason (money, recognition, fame, jobs, etc.)
- If you enjoy it, more chances that the results will be interesting, and all the other things will come
- Just relax and have fun
- Think carefully if this is what you like
- If you can imagine a better life, you should go and take that life

Skill 4: Problem formulation

- A problem should be formulated in a simple and crisp way
- Everybody, even non-expert people, should be able to understand it
- An unnecessary complex formulation may hide the essence of the problem and also its solution
- Talk to others, define your problem to them, get feedback

Skill 5: Look for important problems

- Working only on the details of your latest propagator or theorem can be useful for the next paper
- But devote some time also to think about the larger picture
- What are the important problems in my field?
- Read what others work on
- Discuss with other students, your supervisor, anybody you meet at the conferences

Skill 6: Review existing work

- Being able to find and evaluate previous work
- Look for what others have done **before** starting your research project
- It helps defining and tuning your problem
- May give your ideas on how to solve it
- Avoids reinventing the wheel and wasting time

Skill 7: Problem solving and adaptability

- Find suitable tools to answer a question or to solve a well-posed problem
- Be able to **adapt** yourself to the context
- Turn a problematic situation into an interesting research problem
- Read, read, read
- Don't get discouraged, a solution can always be found

Skill 8: Self-critical eye

- If you are too sure of your research results, you will never notice the flaws
- If you are too unsure, you will never start
- Flaws should be considered and noted, they may be useful later to modify the theory to make space for them
- This can be a source of great results
- Have your work read by others and listen to the comments and suggestions
- Humbleness: there is always something you can learn from others

Skill 9: Being able to learn lessons

- A system or a tool may be a useful object, and experiments may be good, but what is most important is the general lesson learnt by developing it
- Others can use this lesson to build different tools or to define other experiments
- Same also for a theorem, but less crucial since a theorem is already a way to abstract and generalize what has been seen in a specific case
- Learn also from failures (or from rejected papers)
- Work locally, think globally
- Work hard on your specific propagator, but think about the general consequences of your results

Skill 10: Independence and courage

- Independent thoughts
- Not just following others' ideas
- Courage to pursue your ideas
- Self-confidence
- Also, courage to know when to stop

- Don’t worry to state your ideas and ***to be criticized***
- Better to be criticized than to be ignored
- No need for people who follow others

Skill 11: Communicating your results

- A paper
- A talk
- A Ph.D. thesis
- General advice:

The idea and motivation are important, not just the technical details. The simpler your way to present your idea, the more chances people will pay attention.

1.5 Steps of the Research Process

Scientific research involves a systematic process that focuses on being objective and gathering a multitude of information for analysis so that the researcher can come to a conclusion. This process is used in all research and evaluation projects, regardless of the research method (scientific method of inquiry, evaluation research, or action research). The process focuses on testing hunches or ideas in a park and recreation setting through a systematic process. In this process, the study is documented in such a way that another individual can conduct the same study again. This is referred to as replicating the study. Any research done without documenting the study so that others can review the process and results is not an investigation using the scientific research process. The scientific research process is a multiple-step process where the steps are interlinked with the other steps in the process. If changes are made in one step of the process, the researcher must review all the other steps to ensure that the changes are reflected throughout the process. Parks and recreation professionals are often involved in conducting research or evaluation projects within the agency. These professionals need to understand the eight steps of the research process as they apply to conducting a study. Steps of the research process and provides an example of each step for a sample research study.

Step 1: Identify the Problem

The first step in the process is to identify a problem or develop a research question. The research problem may be something the agency identifies as a problem, some knowledge or information that is needed by the agency, or the desire to identify a recreation trend nationally. In the example in table 2.4, the problem that the agency has identified is childhood obesity, which is a local problem and concern within the community. This serves as the focus of the study.

Step 2: Review the Literature

Now that the problem has been identified, the researcher must learn more about the topic under investigation. To do this, the researcher must review the literature related to the research problem. This step provides foundational knowledge about the problem area. The

review of literature also educates the researcher about what studies have been conducted in the past, how these studies were conducted, and the conclusions in the problem area. In the obesity study, the review of literature enables the programmer to discover horrifying statistics related to the long-term effects of childhood obesity in terms of health issues, death rates, and projected medical costs. In addition, the programmer finds several articles and information from the Centres for Disease Control and Prevention that describe the benefits of walking 10,000 steps a day. The information discovered during this step helps the programmer fully understand the magnitude of the problem, recognize the future consequences of obesity, and identify a strategy to combat obesity (i.e., walking).

Step 3: Clarify the Problem

Many times, the initial problem identified in the first step of the process is too large or broad in scope. In step 3 of the process, the researcher clarifies the problem and narrows the scope of the study. This can only be done after the literature has been reviewed. The knowledge gained through the review of literature guides the researcher in clarifying and narrowing the research project. In the example, the programmer has identified childhood obesity as the problem and the purpose of the study. This topic is very broad and could be studied based on genetics, family environment, diet, exercise, self-confidence, leisure activities, or health issues. All of these areas cannot be investigated in a single study; therefore, the problem and purpose of the study must be more clearly defined. The programmer has decided that the purpose of the study is to determine if walking 10,000 steps a day for three days a week will improve the individual's health. This purpose is more narrowly focused and researchable than the original problem.

Step 4: Clearly Define Terms and Concepts

Terms and concepts are words or phrases used in the purpose statement of the study or the description of the study. These items need to be specifically defined as they apply to the study. Terms or concepts often have different definitions depending on who is reading the study. To minimize confusion about what the terms and phrases mean, the researcher must specifically define them for the study. In the obesity study, the concept of "individual's health" can be defined in hundreds of ways, such as physical, mental, emotional, or spiritual health. For this study, the individual's health is defined as physical health. The concept of physical health may also be defined and measured in many ways. In this case, the programmer decides to more narrowly define "individual health" to refer to the areas of weight, percentage of body fat, and cholesterol. By defining the terms or concepts more narrowly, the scope of the study is more manageable for the programmer, making it easier to collect the necessary data for the study. This also makes the concepts more understandable to the reader.

Step 5: Define the Population

Research projects can focus on a specific group of people, facilities, park development, employee evaluations, programs, financial status, marketing efforts, or the integration of technology into the operations. For example, if a researcher wants to examine a specific group of people in the community, the study could examine a specific age group, males or females, people living in a specific geographic area, or a specific ethnic group. Literally thousands of options are available to the researcher to specifically identify the group to study. The research problem and the purpose of the study assist the researcher in identifying the group to involve in the study. In research terms, the group to involve in the study is always called the population. Defining the population assists the researcher in several ways. First, it narrows the scope of the study from a very large population to one that is manageable. Second, the population identifies the group that the researcher's efforts will be focused on within the study. This helps ensure that the researcher stays on the right path during the study. Finally, by defining the population, the researcher identifies the group that the results will apply to at the conclusion of the study. In the example in table 2.4, the programmer has identified the population of the study as children ages 10 to 12 years. This narrower population makes the study more manageable in terms of time and resources.

Step 6: Develop the Instrumentation Plan

The plan for the study is referred to as the instrumentation plan. The instrumentation plan serves as the road map for the entire study, specifying who will participate in the study; how, when, and where data will be collected; and the content of the program. This plan is composed of numerous decisions and considerations that are addressed in chapter 8 of this text. In the obesity study, the researcher has decided to have the children participate in a walking program for six months. The group of participants is called the sample, which is a smaller group selected from the population specified for the study. The study cannot possibly include every 10- to 12-year-old child in the community, so a smaller group is used to represent the population. The researcher develops the plan for the walking program, indicating what data will be collected, when and how the data will be collected, who will collect the data, and how the data will be analysed. The instrumentation plan specifies all the steps that must be completed for the study. This ensures that the programmer has carefully thought through all these decisions and that she provides a step-by-step plan to be followed in the study.

Step 7: Collect Data

Once the instrumentation plan is completed, the actual study begins with the collection of data. The collection of data is a critical step in providing the information needed to answer the research question. Every study includes the collection of some type of data—whether it is from the literature or from subjects—to answer the research question. Data can be collected in the form of words on a survey, with a questionnaire, through observations, or from the literature. In the obesity study, the programmers will be collecting data on the defined variables: weight, percentage of body fat, cholesterol levels, and the number of days the person walked a total of 10,000 steps during the class.

The researcher collects these data at the first session and at the last session of the program. These two sets of data are necessary to determine the effect of the walking program on weight, body fat, and cholesterol level. Once the data are collected on the variables, the researcher is ready to move to the final step of the process, which is the data analysis.

Step 8: Analyse the Data

All the time, effort, and resources dedicated to steps 1 through 7 of the research process culminate in this final step. The researcher finally has data to analyse so that the research question can be answered. In the instrumentation plan, the researcher specified how the data will be analysed. The researcher now analyses the data according to the plan. The results of this analysis are then reviewed and summarized in a manner directly related to the research questions. In the obesity study, the researcher compares the measurements of weight, percentage of body fat, and cholesterol that were taken at the first meeting of the subjects to the measurements of the same variables at the final program session. These two sets of data will be analysed to determine if there was a difference between the first measurement and the second measurement for each individual in the program. Then, the data will be analysed to determine if the differences are statistically significant. If the differences are statistically significant, the study validates the theory that was the focus of the study. The results of the study also provide valuable information about one strategy to combat childhood obesity in the community.

As you have probably concluded, conducting studies using the eight steps of the scientific research process requires you to dedicate time and effort to the planning process. You cannot conduct a study using the scientific research process when time is limited or the study is done at the last minute. Researchers who do this conduct studies that result in either false conclusions or conclusions that are not of any value to the organization.

This is an excerpt from *Applied Research and Evaluation Methods in Recreation*.

1.6 How to Choosing a Topic

Choosing an interesting research topic is your first challenge. Here are some tips:

- Choose a topic that you are interested in! The research process is more relevant if you care about your topic.
- Narrow your topic to something manageable.
    - If your topic is too broad, you will find too much information and not be able to focus.
    - Background reading can help you choose and limit the scope of your topic.
- Review the guidelines on topic selection outlined in your assignment. Ask your professor or TA for suggestions.

- Refer to lecture notes and required texts to refresh your knowledge of the course and assignment.

- Talk about research ideas with a friend. S/he may be able to help focus your topic by discussing issues that didn't occur to you at first.

- Think of the who, what, when, where and why questions:

  - **WHY** did you choose the topic? What interests you about it? Do you have an opinion about the issues involved?

  - **WHO** are the information providers on this topic? Who might publish information about it? Who is affected by the topic? Do you know of organizations or institutions affiliated with the topic?

  - **WHAT** are the major questions for this topic? Is there a debate about the topic? Are there a range of issues and viewpoints to consider?

  - **WHERE** is your topic important: at the local, national or international level? Are there specific places affected by the topic?

  - **WHEN** is/was your topic important? Is it a current event or an historical issue? Do you want to compare your topic by time periods?