Quantitative research in criminology

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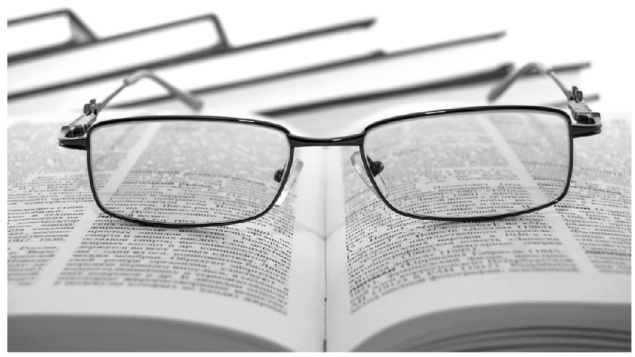

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MODULE DIAGRAM
RESEARCH METHODOLOGY IN CRIMINOLOGY

THEME 1: REFLECTION ON SCIENCE AND RESEARCH: THE APPROACH IN THIS MODULE

THEME 2: ORIGINS AND DEVELOPMENT OF THE SCIENTIFIC IDEA

THEME 3: QUANTITATIVE MEASUREMENT

THEME 4 RESEARCH PROCESS: DESIGN AND PLANNING

THEME 5: QUANTITATIVE RESEARCH TECHNOLOGY

THEME 6: REPORT WRITING

THEME 7: RESEARCH ETHICS

Orientation

Begin your study of methodology by reading tutorial letter 101

Welcome to the methodology section of this course. This is the study guide for the module CMY3709.

When we consider the many achievements of the previous century, especially in the field of technology, it is hardly surprising that our modern society holds science and scientific research in such high regard. In the times in which we are living, the terms ''science'' and ''scientific research'' have acquired an almost magical connotation. People seem to feel that anything that has been established ''scientifically'' or through ''scientific research'' does not need to be subjected to any further investigation. Science and scientific research, to which most of this study guide is devoted, play an important role in both our personal lives and society in general. As your lecturers, we therefore are confident that this section of the course, besides contributing to your academic career, will be of personal and social benefit to you.

In compiling this study guide we followed two approaches.

In choosing a practical functional or pragmatic approach to the objectives of research methodology, we assumed that the subject has important social relevance and therefore interfaces with or takes account of a community that demands services. Our first objective in making information available to you is to give you more insight into and a better understanding of research methods and to ensure that you apply the correct research methodology.

Our second objective is to provide you with guidelines to help you solve problems within the criminal justice environment. We would like you to master the information supplied in this guide in such a way that you will be able to apply it in your everyday life or, if you are employed in the criminal justice system, in your work. Your ability to be an informed consumer and experienced producer of research will help policy makers critically evaluate programme and policy proposals for decisionmaking.

The principles of curriculum design as outlined in the 1996 curriculum framework, which emphasised that outcomes-based curriculum development must be promoted, are:

1. learner centredness
2. lifelong learning
3. critical creative thought
4. nation building and nondiscrimination
5. credibility of the higher education system
6. quality assurance

In this orientation we will

- tell you more about this module and study guide
- present an outline of the course material

The purpose of this module

The purpose of this module is to equip you with the knowledge and skills you will need to conduct quantitative research in criminology. You will acquire a grounding in the use of quantitative methods in social science research, with a focus on how these techniques are used in the specific context of research in criminology. You will be introduced to various quantitative techniques, with a focus on the reasoning process required for their proper use. Apart from acquiring knowledge about quantitative research, you will also gain skills and basic experience in the collection and reporting of data and research findings.

This module will therefore be useful to students in the criminological sciences who are required to do research or to understand the research process and conventions in order to deal with the literature. It is a necessary preparation for those of you who wish to continue with criminology at postgraduate level, and it is therefore a compulsory module.

The general objective is to introduce you to

- the concepts ‘‘science’’ and ‘‘scientific research’’
- thinking relating to these concepts in the philosophy of science
- research methodology and research technology

The course material thus presents a broad but synoptic perspective of methodology in science that will also help you in your postgraduate studies.

We, your lecturers, have made every effort to ensure that

- the content covers the latest developments in the field
- you will find the subject matter accessible
- you will be well equipped for further study in this field

After studying this module, you should be able to

- design and plan quantitative research in the field of criminology
- display information retrieval skills and demonstrate the ability to critically analyse and synthesise quantitative data
- present quantitative research findings and your own ideas and opinions in the form of well-structured arguments, demonstrating an awareness of audience and using the academic/professional discourse appropriately

These are the specific learning outcomes for CMY3709.

In assessing your work, your lecturers will look to see whether you are able to

- demonstrate a coherent and critical understanding of quantitative research in criminology
- exhibit a coherent and critical understanding of the philosophical assumptions, paradigm and interpretive framework in quantitative research
- delineate a research problem using evidence-based solutions and theory-driven arguments
- solve unfamiliar concrete and abstract problems using appropriate theoretical frameworks based on a proper literature review
- critically analyse the suitability of a quantitative approach using theory-driven arguments demonstrate a coherent and critical understanding of various quantitative research designs

- draw on a comprehensive and systematic knowledge base relating to criminological ethics in quantitative research
- demonstrate a coherent and critical understanding of the logical decision-making steps in the quantitative research process
- demonstrate a coherent and critical understanding of data collection approaches in quantitative research
- demonstrate an understanding of the quantitative data analysis and interpretation methods that apply to the field of criminology
- demonstrate a coherent and critical understanding of standards of validation and evaluation in quantitative research
- use academic/professional discourse applicable to the field of criminology appropriately
- present and communicate information and your own ideas and opinions in the form of well-structured arguments
- adhere to accepted guidelines in preparing presentations according to prescribed formats and, where applicable, use IT skills appropriately

These are the assessment criteria for CMY3709.

Study package

The study package for this component of the course comprises the following:

- this study guide
- tutorial letters, which you may receive from us in the course of the year

Compilation of this study guide

This study guide has been compiled in order to systematise the study material and enable you to master it step by step. The aim of the study guide is to support you through your study.

The subject matter in the study guide is divided into **seven themes**. Each theme is explored through a number of study units. A theme begins with an introduction and a table of contents. In the introduction you will find an indication of what we, your lecturers, intend to teach in that particular theme. Most of the study units in this study guide contain the following elements:

- study objectives
- learning content and definitions of words
- activities
- self-assessment exercises
- answers to the self-assessment exercises

The objectives tell you what you should be able to do after completing the study unit; the activities help you to achieve the objectives; and the self-assessment gives you an indication of whether you have indeed achieved the objectives. As you progress through the study guide, fewer and fewer objectives, activities and self-assessment exercises will be provided, until we finally stop including them altogether. Here is some more information about these elements.

- **Study objectives**

The **study objectives** appear at the beginning of each study unit. They tell you exactly what knowledge and insight we expect you to demonstrate as a result of the tuition and learning exposure you receive in a study unit. Study objectives express previously formulated learning results and specify what you should be able to do after you have studied the study unit.

Here is an example of a study objective:

You should be able to define the concept ''research''.

- The keyword or core phrase is **the concept ''research''**. This tells you what you will learn about in that study unit.
- The verb (also referred to as an action word) is **define**. By ''define'', we mean provide a concise, clear and authoritative explanation or description of a concept or term.

In the **self-assessment exercises** at the end of the study unit you will find an instruction or assignment related to the study objective. A study objective is thus linked to a standard of achievement in the form of a self-assessment assignment. To complete the self-assessment, we expect you to study the section of the learning content of the study unit that deals with the concept (in this case, research). You have to study it so well that you understand the concept and can define it in your own words, and that you will be able to complete the relevant self-assessment assignment.

To make sure that you know exactly what we expect of you, below we have explained what you need to do when you encounter some of the most important verbs that we have used to formulate study objectives and self-assessment and other assessment tasks. The terms in brackets refer to a specific level of knowledge.

Complete: You need to fill in whatever words, phrases or information that is missing, for instance to make a full sentence (knowledge).

List (mention, state, give): You need to supply memorised learning content, such as facts, terms and concepts, in the form of single words or short sentences (knowledge).

Indicate (show, identify): You need to recognise symbols, names, concepts and so on from memory and briefly give information about them (knowledge).

Describe (explain, elucidate): You need to give the ''what'' and ''how'' of a particular topic, but without providing your own comments or arguments. You just need to ''sketch an existing picture''. You have to show whether you know what a particular phenomenon looks like or entails, or how a particular process works or proceeds (knowledge).

Sketch (give an outline/overview): You need to describe something just as it is, without any change, comment or reasoning (argument). Your discussion should usually be structured according to main points or sections and subsections (knowledge).

Define: You need to reproduce information by providing a concise, clear and authoritative explanation or description of a concept or term (knowledge). A definition consists of three parts, namely the ''term'', ''class'' and ''distinguishing characteristics''. ''Term'' refers to the thing that is being defined. ''Class'' is the category to which the term belongs. You would possibly state any similarities or differences between the term being defined and other terms mentioned in the

same class or category. ''Distinguishing characteristics'' are distinguishing features.

Explain (make clear/elucidate): You need to show that you have really understood the learning content, how things are linked (relate to each other), why this is so and not otherwise, and why a specific result follows. You must provide examples to illustrate the explanation, and you must give reasons for statements you make or conclusions you draw (comprehension/insight).

Illustrate by using either a sketch, diagram, or outline (depict graphically): You need to explain something with the help of a sketch/diagram/outline (comprehension/insight).

Interpret (construe): You need to comment on facts and give examples to substantiate/support the comments. Your assimilation of information, interpretation or construction must be clearly evident (comprehension/insight).

Discuss (argue, give reasons for, debate): You must single out or highlight and explain the essence of a matter (comprehension/insight).

Sum up/Summarise: You must provide the main points so as to supply a shortened version of the information (synthesis).

Demonstrate (show how): You need to substantiate information or illustrate it by providing an appropriate example (application).

Apply: You need to use acquired knowledge and understanding (comprehension) in new and actual situations (application).

Deduce (infer, conclude): You must show logical consequences (effects) from given information (application). You need to give reasons.

Classify (categorise): You need to place information in an existing classification system (application).

Distinguish/Differentiate: You need to make a clear distinction between the specific matters mentioned (analysis).

Compare: You must weigh up two or more matters against each other in terms of certain features (analysis).

Indicate differences and similarities: You need to compare two or more matters in order to point out specific similarities and differences (analysis).

Analyse: You need to identify distinguishing elements (features), state causes and effects, and indicate relationships between things (analysis).

Examine: You must analyse data or divide it into parts to show causes, effects, relationships and so on (analysis).

Design (create, develop, compile, combine, formulate, compose, build up): You need to create or develop a new combination or composition of information/data (synthesis).

Propose/Advise: You need to supply expert knowledge to solve a problem (synthesis).

Criticise/Judge (give an opinion on, account for, justify, take a stand on, evaluate/assess): You must give a value judgement based on particular points of departure, assumptions or criteria (evaluation).

- **Learning content and definitions of terms**

After studying the learning content, we expect you to **understand** all the information and arguments presented in the study units and the definitions of terms. You must not only understand these, however, but also be able to **render/define/state them in your own words**. This will enable you to complete the self-assessment exercises and assignments and at the same time prepare you for the examination. Superficial understanding of the study material and simplistic arguments based on insufficient evidence will not be sufficient: you must make sure that you have mastered the **details**.

We recommend that you first **read through** the study guide to obtain an overview of the content and see how the various topics relate to one another. Then study the content of the study units in light of the study objectives and with the aid of the activities and self-assessment exercises/tasks.

- **Activities**

Activities are learning experiences that help you to understand the study material better. In the case of each activity we explain

- why you need to do the activity
- how you should carry out the activity (we give you guidelines)
- how you should record your answer

Each activity is followed by a discussion or commentary that forms part of the learning content. First complete the activity, and only then read the commentary. If you read the commentary before completing the activity, you will not benefit from the activity as a learning experience. Also, the commentary will not make much sense if you have not done the activity first. If you have any difficulties in completing an activity, this may mean you have not fully internalised the relevant learning material.

- **Self-assessment**

Complete all the self-assessment exercises. The aim of these exercises is to help you to test your knowledge and understanding of the study material. Make sure that you are able to carry out the tasks or answer the questions, because they give you practice in answering the types of questions you can expect in the assignments (long essay questions, short essay questions and multiple-choice questions). However, in the examination you will be required to answer only long essay and short essay questions, not multiple-choice questions. The self-assessment exercises cannot cover every detail of the learning content of the study guide, however.

THEME 1

Reflection on science and research: the approach in this module

Introduction

Scientific research is a human activity. Research is not an isolated or independent phenomenon, as it is closely related to the concept of science. Reflection on science and scientific research involves a number of perspectives. Three of these are the philosophy of science, research methodology and research technology. We will explore these perspectives in more detail in this module.

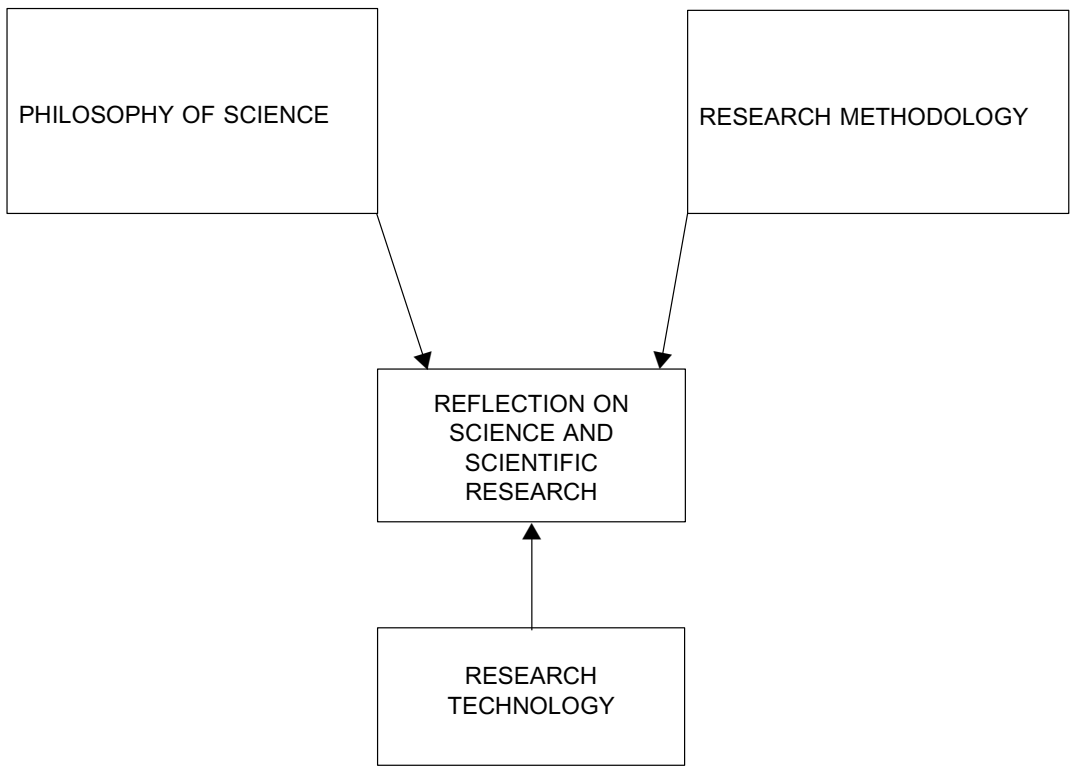


FIGURE 1.1: *Perspectives form which we reflect on science and scientific research in this module*

In this theme, we introduce you to a number of concepts associated with this approach. The following study units fall within this theme:

Study unit 1.1: Science and research

1.1.1 Science
1.1.2 Research

Study unit 1.2: Philosophy of science

1.2.1 Definition and perspectives
1.2.2 Naturalistic and antinaturalistic schools of thought
1.2.3 Positivistic and humanistic (antipositivistic) conceptions of science

Study unit 1.3: Research methodology

1.3.1 Definition of ''central question'' and ''focus''
1.3.2 Quantitative and qualitative research methodologies

Study unit 1.4: Research technology

Study unit 1.5: Pluralistic or mixed research methodology

Review

Activity

Why do you need to do this activity?

- To identify the two main concepts

Guidelines

Study-read the first paragraph of the introduction and circle the two key ideas/ thoughts.

The two key ideas are, of course, science and research. We will refer to these two concepts often in this study guide and in other undergraduate methodology study material.

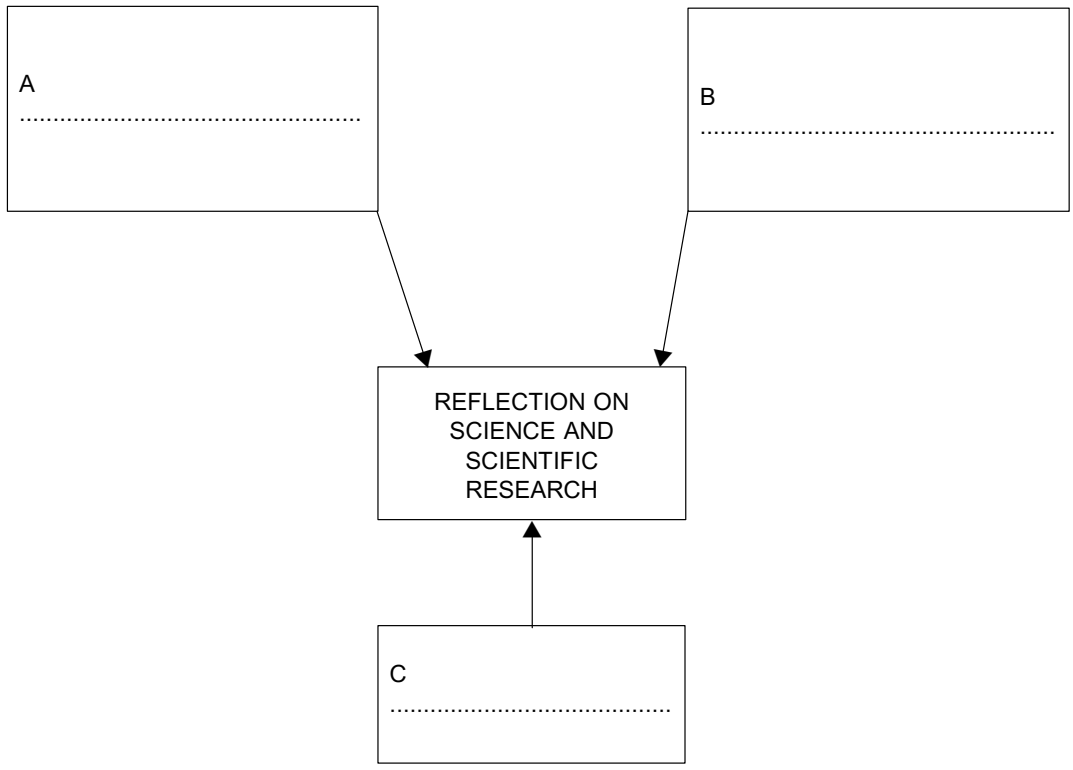
Activity

Why do you need to do this activity?

- To form an idea of how we will go about considering the two key concepts ''science'' and ''research''.

Guidelines

Study-read the introduction and pay close attention to figure 1.1 and the table of contents. Now fill in the information missing from blocks A, B and C in the diagram below, without turning back to figure 1.1 again.



The concepts you should have filled in are:

(a) Philosophy of science
This is concerned with the assumptions, foundations, methods and implications of science.

(b) Research methodology
This entails two issues, namely decisions in the research process and the manner or style of doing research. The term ‘‘methodology’’ is often used to refer to the study of scientific methods. We prefer the concept ‘‘research methodology’’.

(c) Research technology
This refers to the methods and techniques scientists use in the research process to gather and analyse information.

In study units 1.1 to 1.4 we will explain each of the four key ideas in figure 1.1.

STUDY UNIT 1.1

Science and research

After studying this unit, you should know the difference between science as a system of knowledge and research as a knowledge-enriching process. More specifically, you should be able to

- define the concept ‘‘science’’ correctly
- explain the distinction between the natural sciences and the human sciences
- define the concept ‘‘discipline’’
- describe the position of criminology as discipline
- define the concept ‘‘research’’
- list the logical decision-making steps in a research process
- explain the distinction between basic research and applied research
- list and briefly discuss scientific claims in the everyday world
- list and discuss the characteristic requirements for scientific knowledge

Activity

Why do you need to do this activity?

- To identify the keywords or phrases in the study objectives

Guidelines

Study-read the study objectives above. Circle the key terms or phrases.

You should have circled the following key words or phrases: science, research, natural sciences, human sciences, criminology, scientific claims (in everyday life), requirements (for scientific knowledge), decision-making steps (in a research process), basic research and applied research.

Key concepts

- **Scientific knowledge**: Knowledge that is acquired in a systematic and methodical way, and that can be verified or checked. Scientific knowledge is obtained through systematic observation and in a controlled way and must meet the requirements of validity and reliability.
- **Everyday or prescientific knowledge**: Nonscientific knowledge derived from everyday or ordinary experience.

- **Reality**: The whole of everything that exists.
- **Object of study**: Any phenomenon that is studied or researched. The term ''known object'' is also used, but less frequently.
- **Methods and techniques**: Procedures that scientists use to gather and process information or data.
- **Questionnaire**: A series of questions (also called items) about a single subject or a series of related issues that a respondent must answer. Questions can be used to measure elements such as attitudes and opinions and for collecting biographical information. In a structured questionnaire, the answer options are provided.
- **Gathering/Collecting data**: This step in the research process starts with a decision on what data gathering method and technique(s) will be used. The scientist is in search of valid knowledge and will therefore give preference to data gathering methods and techniques that will promote the validity and reliability of the research.
- **Processing research data**: This concept refers to the analysis and interpretation of information that has been gathered. Questions asked are: To what extent does the information collected allow scientists to analyse the research object in order to describe it (analysis)? and To what extent does the information collected reveal connections that allow scientists to understand and explain the research object (interpretation)?
- **Everyday world**: The environment in which human beings associate with their fellow human beings and the world. **Subjective idea of reality**: A judgement or observation that is unreliable and does not correspond to reality.
- **Precise and systematic observations**: The processes by which scientists gather information from the external or internal environment. The important role played by previous experience and priorities (preferences) is widely acknowledged. However, the specific definition of observation is determined by the scientist's point of departure in terms of the philosophy of science.
- **Validity**: A requirement that research acts (such as observation and the use of research techniques) and survey results (such as the processing of collected information and conclusions from analyses) must satisfy. Validity thus indicates: (i) that the scientist is not biased and that no chance errors have occurred; (ii) that there is a close correspondence or connection between the procedures carried out during the research process, the research results and the study object.
- **Reliability**: The replicability (repeatability) of surveys and research results by other researchers in the same research situations using the same methods and techniques.
- **Verifiability**: The degree to which scientific knowledge can be tested through the application of specific criteria in order to determine its veracity (truth), correctness, accuracy or validity.

1.1.1 Science

Science is an organised **system** of scientific knowledge that is logically arranged to form a whole. This system may be regarded as the result of the scientist's quest for knowledge and understanding. We can therefore say that all science is knowledge, but not all knowledge is science. The difference lies in the qualities of scientific knowledge, which distinguish it from everyday or prescientific knowledge. In section 1.1.2 we look at some of these characteristics of scientific knowledge.

Activity

Why do you need to do this activity?

- To formulate a definition of science

Guidelines

Study-read the preceding paragraph and also revise the three-part structure of the definition of science in the orientation to this study guide. Write down the three parts of the definition in the spaces provided below.

Term

.....

.....

Class

.....

.....

.....

.....

Distinguishing characteristics/features

.....

.....

.....

.....

The term is **science**. In the space provided for information relating to class you needed to specify that we are dealing with **scientific knowledge** as opposed to everyday or prescientific knowledge. The distinguishing characteristics/features of science are (i) the **organised** or **systematised nature** of the knowledge or the fact that it is **arranged to form a logical whole**, (ii) that it is the **result of the scientists quest for knowledge and understanding** and (iii) that it has **specific qualities.**

A definition of science could read as follows: Science is (may be defined/described/ regarded/presented as) scientific knowledge that is arranged to form a logical or ordered whole and is the result of a scientist's search for knowledge and understanding. We will discuss the qualities or characteristics of scientific knowledge in more detail in theme 3.

Some people attach a very narrow interpretation to the concept ''science'' and often associate it only with the medical fields and laboratory situations. Science is not only the knowledge in a particular field (like chemistry or biology as these are taught at school); it is a system of knowledge that is made up of many areas, such as astronomy, mathematics, economics, theology, criminology, psychology and sociology.

Traditionally, we distinguish between two types of science, namely the natural sciences and the human or cultural sciences. In this study guide we will use the term ''human sciences'', although the terms ''social sciences'', ''behavioural sciences'' and ''cultural sciences'' are also used in more or less the same context. The distinction is usually made on the basis of the subjects or areas of reality that the various sciences study, and the scientist's approach or perspective. The division may be represented as follows:

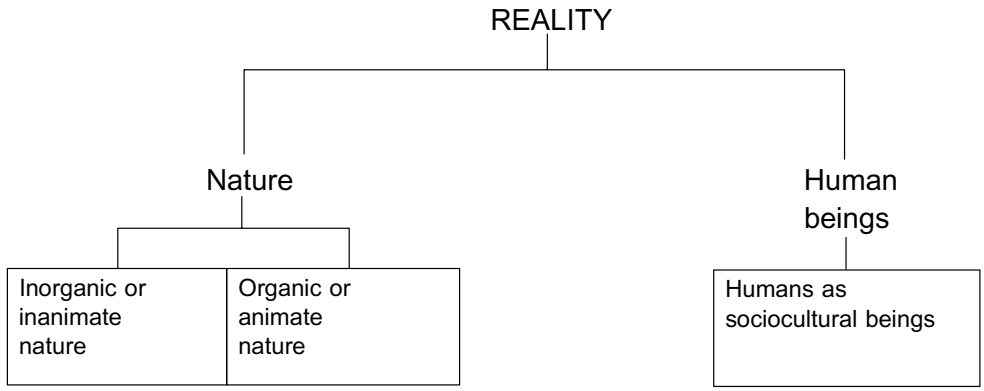


FIGURE 1.2: *Human beings and nature in reality*

According to this representation, the natural sciences are concerned with both inanimate (inorganic) nature, such as physical and chemical substances, and animate (organic) nature, such as the animal and plant kingdoms. The human sciences, on the other hand, consist of subjects involving the human mind, such as human actions/ behaviour, human society and products of the human mind.

A c t i v i t y

Why do you need to do this activity?

- To distinguish between aspects relating to nature and aspects relating to human beings

Guidelines

Study-read the preceding paragraphs and take careful note of figure 1.2. Below is a list of nine things. Write each one in the correct column of the table below. Write your answer on the dotted line provided.

rock, language, tree, book, sea sand, flower, crime, dog and water.

NATURE		**HUMAN BEINGS**
Inorganic or inanimate nature	Organic or animate nature	Humans as sociocultural beings
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....

Rock, **sea sand** and **water** are examples of inorganic things or inanimate nature.**Tree**, **flower** and **dog** are examples of organic things or animate (living) nature. **Crime** is a human act, a **book** is a human artefact and **language** is a product of the human mind and is therefore associated with humans as sociocultural beings.

A c t i v i t y

Why do you need to do this activity?

- To formulate a definition of natural sciences

Guidelines

Study-read the preceding sections in the study guide. Write the three parts of the definition of natural sciences in the space provided below.

Term

.....

.....

Class

.....

.....

.....

.....

Distinguishing concepts

.....

.....

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The term is **natural sciences**. For ‘‘Class’’ you needed to indicate that the natural sciences are a **type of science or system of scientific knowledge**. The distinguishing feature of natural sciences is that they **deal with inorganic or organic nature**. Natural sciences are therefore the types of sciences concerned with things in **inanimate or animate nature**.

A c t i v i t y

Why do you need to do this activity?

- To formulate a definition of human sciences

Guidelines

Study-read the preceding sections of the study guide. Write down the three parts of the definition of human sciences in the space provided below.

Term

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Class

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Distinguishing concepts

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The term is **human sciences**. For ‘‘Class’’ you needed to indicate that the human sciences are a **type of science or system of scientific knowledge**. The distinguishing feature of human sciences is that they deal with the **domain of the human mind**. Human sciences may thus be regarded as the type of sciences concerned with the human mind.

We call sciences that deal with a segment or part of reality, in other words sciences that deal with a particular subject in the spheres of the natural sciences or human sciences, **disciplines**. Chemistry, astronomy and physics are examples of technical disciplines with study fields within the boundaries of the natural sciences. Psychology, sociology and English (as literary science) are examples of human sciences concerned respectively with human behaviour/acts (psychology), human society (sociology) and products of the human mind (English). The object of study of criminology is human beings in the manifestation of crime; criminology is therefore an example of a discipline within the human sciences that is concerned with human behaviour/acts. The nature and characteristics of a discipline are therefore always defined in terms of a demarcated area of study, specific or adapted study methods, and a unique subject content and terminology.

The distinction between natural and human sciences is not absolutely clear cut, and it is, to a great extent, based on historical and practical grounds. Let us take geography as an example to illustrate this point. Geography is the study of rivers, mountain ranges and other natural phenomena, but it is also the study of the people of particular regions or countries and the way that they interact with the environment. It would be difficult, then, to classify geography exclusively as either a human or a natural science.

A very important question that we will consider later is whether there is a scientific difference between the natural and the human sciences. This question is highly

significant, because it relates to the way in which scientists try to reach their goal; in other words, it relates to the methods and techniques used in the human and natural sciences.

Self-assessment exercise

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(a) Define the concept ‘‘science’’ in your own words.

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(b) List the two types of sciences that we distinguish.

(i) ..... sciences
(ii) ..... sciences

(c) Indicate the two considerations on which the distinction between the natural sciences and the human sciences is based.

(i) .....
.....
.....
.....

(ii) .....
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.....
.....

(d) **Two** of theoptions below are correct. Identify the correct options by making a tick in the relevant boxes.

The natural sciences are concerned with

(i) subjects involving the human mind. ☐
(ii) inanimate (inorganic) nature. ☐
(iii) psychological features of people. ☐
(iv) human society. ☐
(v) animate (organic) nature. ☐

(e) **Three** of the options below are correct. Identify the correct options by making a tick in the relevant boxes.

The human sciences are concerned with

(i) the animal kingdom. ☐
(ii) human society. ☐
(iii) physical and chemical substances. ☐

(iv) human acts or behaviour. ☐
(v) products of the human mind. ☐

(f) State the three underlying characteristics of a discipline.

(i) .....
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.....

(ii) .....
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(iii) .....
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(g) **One** of the following options is correct. Identify the correct option by making a tick in the relevant box.

The object of study in criminology is

(i) human society. ☐
(ii) human deviant behaviour. ☐
(iii) human beings in the manifestation of crime. ☐

1.1.2 Research

Generally speaking, human beings' knowledge is broadened either by **accidental or chance discoveries**, or through the **deliberate search for new knowledge and insights**. Some very important discoveries have been made through chance observation or by accident. For example, in 1665 the mathematician and naturalist, Isaac Newton, while walking in his garden, saw an apple fall from a tree onto the grass. This accidental observation set him thinking and led him to the conclusion that there must be a force that attracts all bodies to the earth. He called this force the force of gravity, and from his accidental observation he went on to develop and formulate the law of gravity. In so doing Newton made a significant contribution to the system of scientific knowledge.

However, as we mentioned earlier, scientific knowledge can also be enriched through the deliberate quest or search for new knowledge and insights. The activity or process whereby scientific knowledge is gathered, processed and extended is known as **research**.

A c t i v i t y

Why do you need to do this activity?

- To formulate a definition of research

Guidelines

Study-read the preceding two paragraphs. Write the three parts of the definition in the space provided below.

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Class

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Distinguishing concepts

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The term is **research**. The class is **an activity or a process**. The distin-guishing features are:

- It usually takes the form of a **deliberate search for new knowledge and insights**.
- The goals are the **collection, processing and expansion of scientific knowl-edge**.

Research is therefore an activity or process that usually entails a scientist's purposeful (deliberate) quest (search) for new knowledge and insights. In the process, the scientist tries to collect, process and expand scientific knowledge.

The research process consists of **logical thinking activities** and **concrete actions**.

Theoretical research consists of logical thinking activities. The activities undertaken in this kind of research process are limited to reasoning by the human mind. A researcher could, for instance, theorise on what the causes of criminal conduct are – in other words, he or she could think carefully about what causes criminal conduct and come up with a theory or idea that explains why criminal conduct occurs. Theorisation is a logical thinking activity that requires penetrating reasoning. The researcher's thinking can be processed logically and contribute to the expansion of knowledge on the causes of criminal behaviour.

Another term for concrete actions in research is ''empirical activities''. These are actions that can be observed through the human senses and undertaken in tangible ways. The researcher will undertake a literature study, for instance, to establish what other scientists have written about the causes of criminal behaviour. The researcher will think carefully about this written information, and evaluate it. The researcher could then draw up (compile) a questionnaire to obtain information from a number of criminals to find out why they began to engage in criminal behaviour. In this way the

researcher arrives at new scientific knowledge and insight. In this example the researcher engaged in both logical thinking activities and concrete or empirical research actions.

Broadly speaking, a research process consists of a series of **logical decision-making steps**. You should not think of these steps as an unchanging recipe, since researchers who conduct different types of research do not all place the same emphasis on the same steps. We have listed them here to give you some context, and we will discuss them in more detailin theme 4. They are:

- **Becoming aware** of a research problem. The problem can come to the researcher's attention in different ways. For instance, there may be a sharp rise in the incidence of violent crime in a community, or the researcher may realise that there is a gap in his or her knowledge of and/or insight into the causes of violent crime.
- **Formulating** a research problem. The researcher defines and circumscribes (delineates or sets the boundaries of) the problem to be researched. For instance:
  - the form of violent crime to be researched is limited to murder with a firearm.
  - the area in which the investigation will be carried out is confined to the magisterial district of Johannesburg.
  - the researcher decides to undertake the study during the period 1 January to 31 December 2012.
- **Gathering/Collecting information or data**. Before gathering the information or data the researcher decides how he or she is going to do this. He or she could compile a questionnaire for this purpose, for example, and then ask respondents to fill it in.
- **Processing** the research data or information collected involves decisions about the analysis and interpretation of the data collected.
- Writing the **research report**. The research report contains a description of the whole research process, together with the researcher's findings and recommendations.
- **Utilising** or **applying**the results or findings is connected to the ideals of scientific knowledge, which are explained in study unit 1.2.

Activity

Why do you need to do this activity?

- To distinguish the different steps in a research process

Guidelines

Start by study-reading the information given above on the research process as a series of decision-making steps.

Now read through the ten statements below, which relate to a hypothetical research project on juvenile crime. They are not in the correct order.

(1) The period of the research project is set at 1 January to 30 April 2012.
(2) Press reports reflect the concern of school principals about the high incidence of vandalism in Gauteng school classrooms.

(3) The most serious forms of vandalism occur in secondary schools in the Wonderboom magisterial district.
(4) School principals need scientific knowledge about vandalism in schools in order to prevent the phenomenon.
(5) Information is collected from teachers and scholars by means of questionnaires.
(6) The vandalism mainly takes the form of damage to desks and broken window panes.
(7) The criminological literature contains very little scientific information on vandalism in schools.
(8) Completed questionnaires are processed by the Department of Criminology at Unisa with the aid of a computer program.
(9) Criminology lecturers at Unisa are responsible for the analysis and interpretation of the research data.
(10) Criminology honours students at Unisa compile the research report as part of their course.

Now indicate the decision-making step that each statement relates to by making a tick in the relevant block in the framework below. In other words, you will need to decide whether each statement relates to becoming aware of the research problem, formulating the research problem, data gathering, data processing, writing the report or utilising the findings.

		1	2	3	4	5	6	7	8	9	10
DECISION MAKING STEPS	Becoming aware of research problem										
	Formulating research problem										
	Data gathering										
	Data processing										
	Writing report										
	Utilising or applying findings										

- Your categorisation should have looked like this:

Becoming aware of the research problem	:	Statements 2, 7
Formulating the research problem	:	Statements 1, 3, 6
Data gathering	:	Statement 5
Data processing	:	Statements 8, 9
Writing report	:	Statement 10
Utilising or applying findings	:	Statement 4

Research can be either **basic** or **applied**. **Basic research** consists of studies carried out for the primary aim of acquiring new knowledge about and insight into a particular phenomenon. This type of research can take the form of logical thinking activities or theoretical research. This type of research can also be carried out in the form of concrete actions or empirical investigations. **Applied research** is directed primarily at solving problems, and therefore has a specific practical application. Applied research studies may also be theoretical or empirical.

Activity

Why do you need to do this activity?

- To understand the difference between basic and applied research

Guidelines

Start by study-reading the preceding paragraph.

Below we have briefly described two research situations. Read through them and decide which one is an example of basic research and which one is an example of applied research.

Research situation 1

The research project relates to the armed theft of motor vehicles. The armed theft of motor vehicles is a frequent phenomenon in South Africa, and so there is a substantial amount of scientific information in the South African criminological literature on this subject. The researcher gathers information by conducting interviews with

- members of the South African Police Service who have handled armed theft of motor vehicle cases
- victims of armed theft of motor vehicles
- prisoners who have been sentenced for armed motor theft of vehicles

The researcher uses the research data to theorise on the causes of armed theft of motor vehicles. The research results/findings are published in a criminological journal.

Research situation 2

The research project relates to the theft of cars during business hours in the Johannesburg city centre. Information is collected from

- police dossiers
- data networks of three well-known car insurance companies
- victims of car theft
- prisoners sentenced for car theft

After the data have been processed, analysed and interpreted, the findings are used to draw up an information brochure for car owners on the prevention of car theft.

What did you decide?

In research situation 1 a frequent phenomenon is studied about which more scientific knowledge/information relating to the South African context is required. The researcher is not concerned with applying the research findings in order to solve a practical problem. This research project could therefore be broadly classified as basic research.

In research situation 2 the study is clearly aimed at coming up with a practical solution. It is therefore concerned with solving the problem of car theft. The findings of the investigation have practical implications, and so the research project is an example of practical research.

In doing this activity you would have realised that basic and applied research are not necessarily mutually exclusive.

- Findings in basic research may also have practical application value. Re-read research situation 1. The South African Police Service may take note of the researcher's theoretical views on the cause of armed theft of motor vehicles. Based on these views, the South African Police Service could develop and implement measures to prevent this type of crime. Although the primary aim of the research is to acquire knowledge, the findings could also lead to practical applications.
- Findings in applied research may also have implications in terms of new knowledge and insights. Re-read research situation 2. In the search for practical measures to prevent car theft, the researcher may encounter information that could lead to a reevaluation of theoretical views or even new information about the causes of car theft. Although the original aim of the research was to solve a problem, the findings might pave the way for new basic knowledge.

An important principle, then, is that the difference between basic research and applied research lies in the **aim** of the investigation.

In our discussion of the key terms **research**, **decision-making steps** (in the research process) and **basic and applied research**, we frequently referred to the concepts of knowledge and scientific knowledge. Let us take the discussion a step further and note

- first, the difference between claims to knowledge of people in the everyday world and scientists
- second, some characteristics of scientific knowledge

The enrichment of knowledge is not a phenomenon found only in scientific research. In our everyday life people claim to acquire knowledge of phenomena in various ways. Let us look at some of these claims to knowledge.

- Appeal to authority. People often accept something because an authoritative person

or institution says it is true. However, before we can say that this knowledge is scientific knowledge, we need to examine and verify how that authoritative person or institution obtained that information. Did the person or institution do any research to substantiate the ''authoritative'' view?

- Appeal to accidental observations. Claims to knowledge that are based on chance observation can often create an exclusively subjective or warped idea of reality. Accidental observations tend to be selective instead of methodical or systematic, with the result that in those circumstances people often see only what their suspicions or feelings confirm, and ignore the rest. Scientists prefer knowledge to be based on precise and systematic observations. However, this does not mean that accidental discoveries cannot contribute to the system of scientific knowledge remember the example of Isaac Newton and the apple!
- Appeal to conventions (custom) and tradition. This is a naive source of knowledge that is transferred from one generation to the next. This type of claim to knowledge is often found in idiomatic expressions like ''birds of a feather flock together'' and ''a chip off the old block'' (the first of these two expressions suggests that people always associate with similar people, and the second expression suggests that personality traits are hereditary). Scientists would prefer to gather information on these complex subjects through research.

These claims to knowledge allow us to conclude that there is a difference between scientific knowledge and everyday or prescientific knowledge. However, it is difficult to identify **features or requirements of scientific knowledge**, because different schools of thought emphasise different criteria for determining scientific knowledge. So, for instance, some scientists emphasise the methods and assessment aspects, while for others the acceptability of the knowledge for a particular scientific group is important. In theme 3 you will learn more about the characteristics or requirements of scientific knowledge, but for the present the three points below contain sufficient information.

- Scientific knowledge is **technomethodically formed knowledge**. The ordinary person forms knowledge without critically justifying the methods and techniques of knowledge enrichment. The scientist undertakes methodical and systematic observation within the framework of recognised scientific methods.
- Methodical and systematic observations, together with recognised informational processing techniques, ensure that scientific knowledge is **systematised knowledge**.
- Furthermore, scientists strive for **accurate and true**or certain knowledge. Some scientists classify this type of knowledge as valid and reliable, and then set the requirement that scientific knowledge be verifiable.

(a) Define the concept ''research'' in your own words.

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(b) **Three** of the following are examples of claims to knowledge in everyday life. Indicate the correct items by making a tick in the relevant boxes.

(i) scientific research ☐
(ii) appeal to authority ☐
(iii) precise and systematic observations ☐
(iv) appeal to conventions and tradition ☐
(v) appeal to accidental (incidental) observations ☐

(c) Scientific knowledge is distinguished from everyday or prescientific knowledge on the basis of three particular characteristics (requirements or criteria). **Three** of the following statements may be considered requirements or features of scientific knowledge. Which are they? Indicate the correct items by making a tick in the relevant boxes.

(i) The pronouncements of authorities are scientific knowledge. ☐
(ii) Scientific knowledge is systematised knowledge. ☐
(iii) Scientific knowledge is generally accepted knowledge. ☐
(iv) Scientific knowledge is valid and reliable knowledge. ☐
(v) Scientific knowledge is technomethodically formed knowledge. ☐

(d) Indicate whether each of the following statements is true or false by writing (T) or (F) in the appropriate block.

(i) Knowledge enrichment is a feature found only in scientific research. ☐
(ii) Claims to knowledge based on accidental observations can frequently create a warped idea of reality. ☐
(iii) The scientist must undertake methodical and systematic observation. ☐
(iv) Scientists pursue knowledge that is faithful to reality (authentic). ☐
(v) Human beings' knowledge can only be expanded by accidental discoveries or a deliberate quest for new knowledge or insights. ☐
(vi) Scientific research is indicative only of logical thinking **or** concrete actions. ☐
(vii) Philosophy of science, research methodology and research technology are three separate things that can be divided into watertight compartments. ☐

(e) List the logical (decision-making) steps usually found in research.

(i) Becoming aware of a .....
(ii) Formulating the .....
(iii) ..... information.
(iv) ..... or ..... data collected.
(v) Writing the .....
(vi) ..... the findings.

(f) The distinction between basic and applied research lies in the difference between their primary aims. Explain.

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STUDY UNIT 1.2

Philosophy of science

After studying this unit you should be able to

- define the concept ‘‘philosophy of science’’
- provide an overview of the most important perspectives or points of view in the philosophy of science
- distinguish between naturalistic and antinaturalistic schools of thought and list their main features
- set out the principal differences between positivism and humanism

Key concepts

- **Practice of science**: This is the particular way in which we explore everyday reality (our life-world or physical and psychological environment), adapt to it and learn to deal with it. Research is one of the instruments scientists use to obtain knowledge.
- **Objectivity**: The quality that allows a person to observe, describe and explain or understand phenomena without being influenced by personal interests, prejudices and emotional interests. Views on whether objectivity is possible and the specific meaning that is attached to it depend on the scientist’s point of departure in terms of the philosophy of science.

To be objective, scientists avoid making value judgements, and they follow research procedures and specific techniques.

- **Value-free**: Neutral; not influenced by personal convictions/persuasions and sentiments.
- **Paradigm**: A way of thinking or a set of assumptions that are accepted by practitioners of a discipline.
- **Deterministic system**: A doctrine or belief that there is no such thing as free will, and that human behaviour is determined by forces outside human control, such as genetics or environmental factors.
- **Cause-effect pattern**: It is assumed that human behaviour (therefore also criminal behaviour) is governed by the principles of cause and effect (causality) in the same way that natural scientists can explain and predict natural phenomena according to fixed laws. In the human sciences, however, we deal not with fixed laws but probabilities. If there is a high probability that a cause leads to an effect, we speak about a regularity/moderation of a pattern or of a law.
- **Empirical observations**: Observations based on sensory observations or experience (facts).

- **Empiricism**: The view that all scientific facts must be verifiable (for validity), and that knowledge can only be acquired/obtained through sensory observation.
- **Generalisation**: This is the process of making certain claims about a larger group or population on the basis of a study conducted on a similar smaller population.
- **Positivism**: The view that sensory observation, experimentation, testing and generalisation of knowledge (findings) are the accepted way to achieve objective and scientific knowledge. Positivists believe that human phenomena can be observed, described, explained, predicted and controlled in the same way that natural phenomena can.
- **Humanism**: A way of thinking that places the focus on the meaning that events have for people who are involved in them, in other words, how people give meaning to situations and the world around them. Scientists who follow this way of thinking also believe that there is a meaningful interaction between researcher and research object, in other words that the researcher and research object influence each other, and that the researcher construes or interprets what is observed. Humanists believe that authentic human situations and behaviour cannot be observed, described, explained and understood in the same way that natural phenomena can.
- **Continuum**: A range or sequence consisting of two extremes and all the positions between them.
- **Scientific ideal**: The goal pursued by the scientist.
- **Objectivity ideal**: The objective approach that the scientist strives to follow.
- **Survey method**: A method of gathering data, such as an opinion survey/poll. It usually involves random sampling to select a relatively small but manageable and representative group of people out of a larger group.
- **Participative or naturalistic observation**: The study of human behaviour in natural surroundings. The researcher is required to become involved in some way in the everyday lives of the people being studied.
- **Interview**: A conversation between a researcher and an informer or respondent (research object) aimed at gathering information.

Activity

Why do you need to do this activity?

- To identify the key terms or phrases in the study objectives

Guidelines

Study-read the study objectives at the beginning of this study unit. Circle the keywords or phrases.

The keywords or phrases you circled should have included: philosophy of science, perspectives in philosophy of science, features of naturalistic and antinaturalistic schools of thought, and differences between positivism and humanism.

1.2.1 Definition and perspectives

The philosophy of science involves critical reflection on the assumptions, foundations, methods and implications of science and scientific research. ‘‘Philosophy of science’’ is an umbrella term for the different ways in which science and scientific research are approached from a philosophical point of view. Let us look at some of the most important **perspectives in the philosophy of science**.

The first of these is the **functional** perspective, which is concerned with the place, function and meaning of scientific activities in society. Questions asked in relation to this perspective include: What is science? What is the relation between science and society? Is the purpose of science confined to knowledge for the sake of knowledge, or does science have a function in or even a responsibility towards society?

The second is the **structural** perspective, which is concerned with the nature, structure and dynamics of science as a typical human activity. Questions asked in relation to this perspective include: Are there fundamental differences between the natural and the human sciences? Is science practised in the same way in both groups of sciences? Can natural scientific methods also be used in human sciences?

The third is the **critical** perspective, which states that the scientist should not only analyse and describe phenomena, but should also adopt a critical approach in the practice of science. Research activities are also evaluated from this perspective.

The fourth perspective has to do with **knowledge as a product of science**. Questions asked in relation to this perspective concern the nature and characteristics of scientific knowledge. What is the relation between science and everyday life? Is scientific knowledge an authentic, true or reliable account (portrayal) of that aspect of reality that the scientist perceives? What is the relation between the knowing subject or scientific observer and the perceived object or object of study? This last question relates to the researcher’s **objectivity**and **whether value-free or neutral scientific knowledge is possible**.

A c t i v i t y

Why do you need to do this activity?

- To distinguish between the different perspectives in the philosophy of science

Guidelines

Study-read the information above dealing with the perspectives in the philosophy of science. Place each of the questions below relating to science and research in the correct section of the framework that follows. Start by reading the questions.

Questions

(1) Are there fundamental differences between natural and human sciences?
(2) What is the relation between science and society?
(3) Should researchers only analyse and describe phenomena?
(4) Is scientific knowledge a reliable reflection/portrayal of the researcher’s observations?
(5) Can natural scientific methods also be used in criminology?
(6) Is the purpose of science merely knowledge for the sake of knowledge?
(7) What is science?

Now write the number of each question in the appropriate category in the framework below. In some cases you will write more than one question number in a single category.

PERSPECTIVES IN THE PHILOSOPHY OF SCIENCE

FUNCTIONAL	STRUCTURAL	CRITICAL	KNOWLEDGE

Your completed table should have looked like this.

PERSPECTIVES IN THE PHILOSOPHY OF SCIENCE

FUNCTIONAL	STRUCTURAL	CLINICAL	KNOWLEDGE
2	1	3	4
6	5		
7			

Self-assessment exercise

.....

(a) Define the term ''philosophy of science'' in your own words.

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.....
.....

(b) Indicate whether each of the statements below is true or false by writing (T) in the block if the statement is true, or (F) if it is false.

(i) Scientists must only be able to analyse and describe phenomena. ☐

(ii) The functional perspective of philosophy of science is concerned with the dynamics of science, among other things. ☐

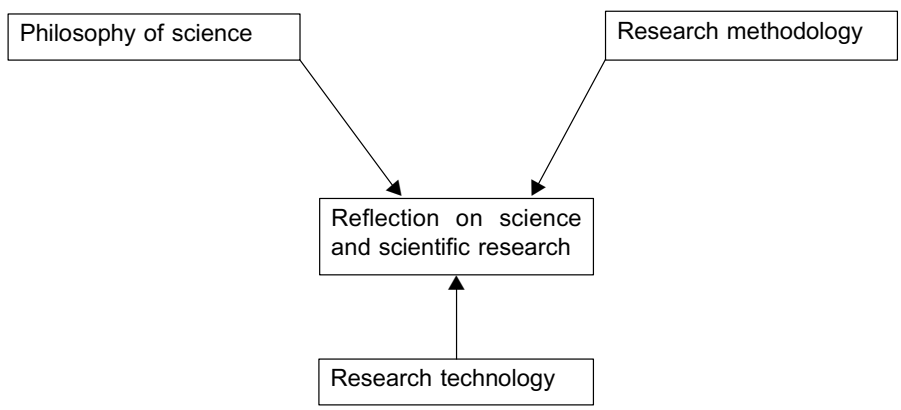
(iii) The structural perspective of philosophy of science looks at the features of scientific knowledge, among other things. ☐

(iv) In the research process, the object of study is also called the known object. ☐

(v) The knowing subject is the scientific observer in the research process. ☐

In the philosophy of science, we distinguish between **naturalistic** and **antinaturalistic schools of thought**. These schools of thought or scientific points of views (the terms ''scientific perspective'' and ''scientific approach'' also mean the same thing) are two different ways of approaching science and scientific research from a philosophical level.

Within each of these two schools of thought there are smaller groupings or subsections. We refer to these smaller groupings as conceptions of science (we also use the word ''traditions''), and within a particular context we refer to them as scientific paradigms. In section 1.2.3 you will learn more about two of these smaller groupings, namely the **positivistic** and **humanistic** scientific conceptions. The positivistic scientific conception is a subsection of the naturalistic school of thought in the philosophy of science. The humanistic scientific conception arises from the antinaturalistic school of thought. To refresh your memory, have another look at figure 1.1, which we presented to you in the introduction to theme 1, and which illustrates the perspectives we will be following in our reflection on science and research. Here is figure 1.1 again.



We will now explore the key terms ''science'' and ''research'' from the perspective of the philosophy of science. As you can see from figure 1.3 below, within the philosophy of science there are schools of thought and scientific conceptions.

Bear in mind that

- we are only introducing you to these concepts, so this is not a comprehensive discussion.
- there are points of contact or similarities between positivism and humanism, and they are not separated into watertight compartments.
- scientists differ regarding the division of schools of thought and scientific conceptions within the philosophy of science.

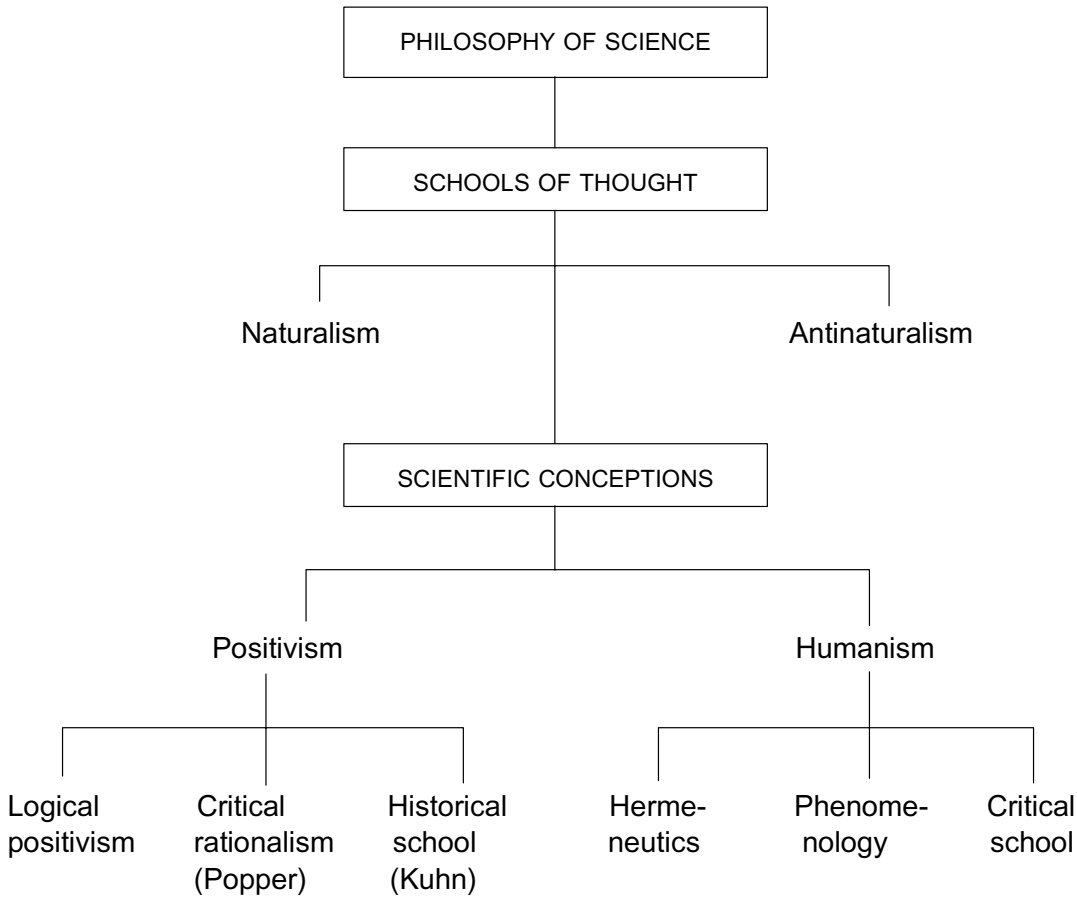


FIGURE 1.3: *Schools of thought within the philosophy of science*

1.2.2 Naturalistic and antinaturalistic schools of thought

The chief characteristics of the **naturalistic** school of thought or **naturalistic** scientific approach may be summarised as follows:

- Human beings and nature are viewed as forming a **natural unit**. Human nature is therefore seen as not differing in essence from natural phenomena. An important implication of this is that humans, like natural phenomena, are seen as a deterministic system. Human behaviour is seen as following a cause-effect pattern.
- Natural reality (humanity and nature) can only be fully known through **scientific knowledge** arising from empirical observations, not through speculation and reflection alone.
- **Scientific knowledge is viewed as the only form of true or valid knowledge**. Knowledge of what cannot be observed physically (this is known as the metaphysical) and prescientific or everyday knowledge are not accepted.
- The **empirical method** is accepted as the only valid scientific method for gathering scientific information (knowledge). The terms ''empirical method'' and ''empiricism'' refer to the view that **scientific knowledge** can only be acquired/obtained through sensory observation, and that scientific facts must be verifiable in other words, it must be possible to check that they are valid.
- Scientists who follow the naturalistic school of thought give preference to knowledge that can be generalised and thus applied in the form of generally valid laws to indicate the pattern of regularity of human behaviour.

Sciences (including the human sciences) are regarded as independent or authentic (genuine) sciences only if they display the characteristics we have just discussed.

If we accept these features of the **naturalistic** scientific view, this would imply that with regard to criminological disciplines:

- the phenomenon of crime (the broad study object to which human beings are central) is seen as part of natural reality.
- with regard to understanding and explaining criminal behaviour, we regard only scientific knowledge as valid.
- only the empirical method (sensory observation and testing of information in a specific way) is acceptable in understanding the phenomenon of crime.

The chief features of the **antinaturalistic** school of thought or **antinaturalistic** scientific approach may be summarised as follows:

- Supporters of this school of thought acknowledge **the uniqueness and fraughtness of human situations and actions**. The term ''fraughtness of human situations and actions'' means that human situations and actions are characterised by or cause distress.
- This has important implications for the method of studying phenomena in the human sciences. **Distinctive, genuinely human methods** must be followed to understand the situatedness of or contextual restraint on human behaviour. Situatedness or contextual restraint refers to the view that human behaviour must be understood within the context of circumstances such as time and place.
- **The value of everyday or nonscientific knowledge** in the study of human beings is acknowledged.
- Antinaturalism gives rise to the recognition of contextual restraint on knowledge in the human sciences, in terms of which the time and spatial situatedness of human actions must be acknowledged: knowledge of human behaviour or actions should also be judged within a particular context or circumstance. This assumption naturally has important implications for the human scientist when it comes to the **interpretation** (construal) and generalisation of findings.
- The **validity of a pluralistic (mixed or multiple) research methodology is accepted**. This means that different sciences (on the basis of the difference in study objects and the approach taken by the scientist) will use different methods or techniques of practising science. This principle also applies within a particular discipline.

If we accept these features of the **antinaturalistic** scientific view, this would imply that with regard to criminological disciplines:

- the study object (crime, in which human beings have a central place) is an authentic human phenomenon.
- the methods for studying the study object would differ radically from a natural scientific research technology for understanding the situatedness of human behaviour.
- value is also attached to nonscientific knowledge as a means to achieve a full understanding of the study object.
- the value of context-bound knowledge is acknowledged.

Activity

Why do you need to do this activity?

- To distinguish between the features of naturalism and antinaturalism

Guidelines

Study-read the preceding paragraphs on the chief features of the naturalistic and antinaturalistic schools of thought. Then read the list of ten core features below.

(1) Preference is given to knowledge that can be generalised.
(2) The value of everyday knowledge for science is acknowledged.
(3) The human sciences make use of distinctive research methods that are of a real human nature.
(4) Scientific knowledge can be obtained only through the use of empirical methods.
(5) Scientific knowledge is the only form of true knowledge.
(6) Every human situation and action is unique.
(7) Knowledge is context-bound.
(8) Human behaviour assumes a cause-effect pattern.
(9) Research data should be interpreted within the context of the research situation and the coherence of the circumstances of the study object.
(10) The application of a pluralistic or mixed research methodology is encouraged.

Now write the number of each core feature under the appropriate category below.

NATURALISM	ANTINATURALISM

Your answer should have looked like this.

NATURALISM	ANTINATURALISM
1 4 5 8	2 3 6 7 9 10

Self-assessment exercise

.....

(a) Which of the following statements related to the naturalistic scientific perspective are correct? Indicate the correct statements by making a tick in the relevant boxes.

(i) Human phenomena differ fundamentally from natural phenomena. ☐
(ii) Human behaviour follows a cause-effect pattern. ☐
(iii) Reality (human beings and nature) can only be known fully through scientific knowledge. ☐
(iv) Scientific knowledge can only result from empirical observations. ☐
(v) Everyday knowledge can be accepted as valid knowledge. ☐
(vi) The empirical method is the only valid scientific method for collecting information. ☐
(vii) Knowledge that does not originate in physical observation is accepted as scientific knowledge. ☐
(viii) Proponents of naturalistic thinking give preference to knowledge that can be generalised. ☐

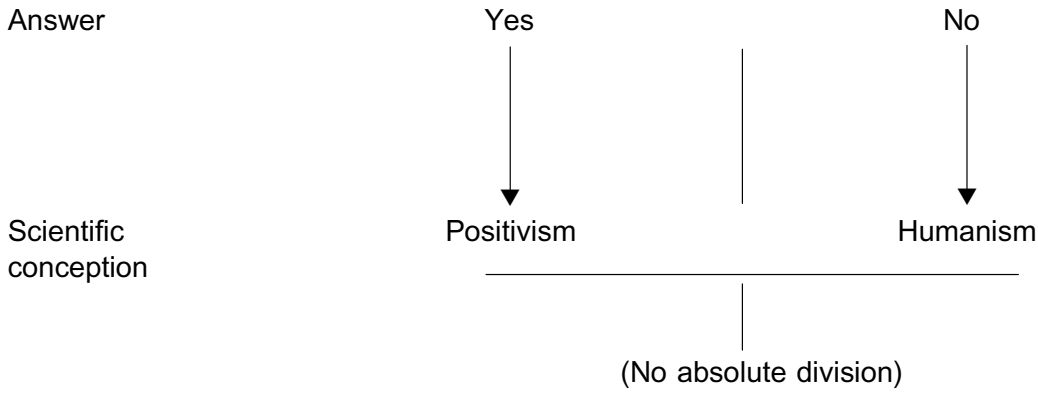
(b) Which of the following statements related to the antinaturalistic scientific perspective are correct? Indicate the correct statements by making a tick in the relevant boxes.

(i) Human situations and behaviour are unique by nature. ☐
(ii) The human sciences can use natural scientific methods to understand human behaviour. ☐
(iii) Everyday knowledge is of no value in the study of humanity. ☐
(iv) Recognition is given to the contextual restraint on knowledge. ☐
(v) All disciplines use the same research methods and techniques. ☐

1.2.3 Positivistic and humanistic (antipositivistic) conceptions of science

This distinction arises from the following question: Are the nature, structure and dynamics of practising science the same in both the natural and the human sciences? Scientists who answer "**yes**" to this question are known as **positivists**, and those who answer "**no**" are known as **humanists**. However, the distinction between positivism and humanism should not be regarded as a watertight division. With regard to this question, then, the two main scientific conceptions in the philosophy of science could be viewed as occupying positions on a continuum. We could illustrate this as follows:

Question: Do researchers in the natural and the human sciences use the same scientific working method?



The positivistic and humanistic conceptions of science differ in terms of their view of the **object** of the practice of science or **scientific ideal**, the **objectivity** of the researcher or the **objectivity ideal**, and the **preferred sources of information**.

Let's begin by discussing the **scientific ideal** pursued by positivism and humanism respectively.

In **positivism** the object of scientific practice is **generally valid explanations of phenomena**. To achieve or realise this aim, researchers rely on research with a universal or generally valid interest. Here is an example to illustrate this.

A positivistically-oriented researcher undertakes a study on the gang phenomenon in prisons. The purpose of the investigation is to establish why prisoners belong to gangs. The information is gathered from a group of prisoners who are a representative example of gang members in all South African prisons. The consideration in choosing a representative number of gang members in the survey group is to make the findings of the project applicable to other gang members. The researcher wants to generalise the results of the study to a defined population or universe. In this example, a defined population or universe is all gang members in South African prisons. The research group is representative of the universe in terms of aspects such as gender, age, crime category, length of prison sentence, province in which the prison is located and the type of gang. The conclusion to which the researcher comes, or his or her explanation of why prisoners belong to gangs, is generally valid knowledge and can be made applicable to gang members in all South African prisons.

In **humanism** the purpose of research is to **understand human situations and actions and explain them within specific circumstances**. This is therefore scientific practice with a context-bound interest. Let's take the same example of research into the gang phenomenon in prisons as we did earlier. A humanistically-oriented researcher does research on the phenomenon of gangs in prisons. The purpose of the study is to establish why prisoners join gangs. The information is obtained from a small group of gang members who belong to a typical prison gang in a particular prison. The researcher's intention is to

- study the unique situation and experiences of each gang member in depth
- describe the experiences of each gang member in detail
- understand the circumstances of the research cases and interpret information against that background

The researcher's findings are limited to the distinctiveness of the research objects. It is not the purpose of the study to generalise the findings to an entire population. Generalisation of findings is not scientifically feasible in this research situation. The

researcher's point of departure is that gang members create their own situations or circumstances and give meaning to things and events in the prison lifeworld in different ways. The researcher's conclusions about and explanation of why prisoners take part in gang activities are contextual by nature or limited to a particular context. They are related to the specific situations and circumstances of the cases investigated. The knowledge (information) is therefore not valid for all gang members in all South African prisons.

A c t i v i t y

Why do you need to do this activity?

- To distinguish between the positivistic and humanistic points of view on the scientific ideal

Guidelines

Study-read the information on the points of difference regarding the scientific ideal pursued by positivists and humanists given above. Then read the eight statements below relating to the scientific ideal.

(1) The results of an investigation must be generalised to a universe.
(2) The purpose (object) of research is to understand human situations and actions and explain them within a particular context.
(3) The research cases must be typical examples of a group or phenomenon.
(4) Research with a universal significance should be undertaken.
(5) The research group should be representative of the defined population.
(6) Value is attached to scientific practice with a contextual significance.
(7) Research findings are restricted to the uniqueness of the research cases.
(8) The purpose of scientific practice is to acquire knowledge (information) that can explain all similar phenomena or cases.

Now indicate whether each of these statements represents a positivistic or a humanistic scientific conception. Do this by making a tick in the appropriate block of the framework below.

CONCEPTION OF SCIENCE

Statement number	Positivism	Humanism
1		
2		
3		
4		
5		
6		
7		
8		

Your answer should have looked like this:

CONCEPTION OF SCIENCE

Statement number	Positivism	Humanism
1	✓	
2		✓
3		✓
4	✓	
5	✓	
6		✓
7		✓
8	✓	

Next, let us consider the positivistic and humanistic points of view on the **objectivity ideal**. The concept ‘‘objectivity of the researcher’’ can be explored through finding the answers to two questions, namely:

- Can the researcher observe, describe and explain phenomena in a neutral way without personal interests, prejudices and emotional preferences having an influence? In other words, is distantiation between the researcher and the research object or research case possible?
- Is value-free knowledge or knowledge that excludes the personal interests and values of the researcher at all possible? In other words, is neutral knowledge possible?

Supporters of the **positivistic** scientific conception proceed from the view that the area of research of the human sciences consists of **sensorily observable (perceptible) facts**. The researcher stands apart from, or is uninvolved in these facts and observes them objectively or **neutrally**. We therefore speak about **distancing/distantiation**, and say that a distance is maintained between the knowing subject or researcher and the known object or research object. **Value-free knowledge** can be achievedthrough

- uninvolved or neutral observation
- the use of effective research methods
- the application of standardised or tested techniques that ensure maximum control over the observation, collection and processing of data

Objectivity is set as a requirement or condition for scientific knowledge.

Let us return to our example of research into gangs in prisons.

- The **positivistically**-oriented researcher accepts that the gang phenomenon is something that is **sensorily observable**. It manifests in the form of such things as a

code of conduct, an organised gang structure and the functional role of gangs in the prison.

- The researcher is viewed as an outside observer, who is not a member of the Department of Correctional Services, and who can successfully fulfil the role of neutral, impartial and **objective observer**.
- To reinforce the claims of objective observation and ultimately value-free knowledge, the researcher uses the survey method. It is a tried and effective scientific method for gathering information from people, in this case gang members. The literature contains clear guidelines on the survey method, and the researcher follows these closely. Surveys are particularly useful in describing the characteristics of a large population. Data is gathered by means of the **questionnaire**, which is designed to satisfy the requirements for a valid measuring instrument.
- The information is processed statistically by means of a **computerised program**. The reliability of the questionnaire is calculated by means of a statistical test.

As you read through this example, you would have realised that all the research actions are directed at justifying (vindicating) the two most important components of the objectivity ideal, namely

- neutral observation
  and
- value-free knowledge.

Proponents of the **humanistic** scientific conception hold the view that the research domain or the terrain of the human sciences includes human situations and interactions and meaningful experiences that are not necessarily sensorily observable. For these researchers, distancing/distantiation or an uninvolved and impartial relation between researcher and research case is not always possible. They are of the opinion that observation cannot be neutral and that knowledge gathered by observation is not value free. The reasons for this view are:

- People do not live in a given reality of empirically observable things, but in a world of **human constructs** such assituations, experiences and interactions with other people.
- Social reality (or human constructs) is constantly being created and recreated by people themselves. People **constitute** or create situations themselves and in the process give a distinctive meaning to the social reality.
- The content or form of human constructs is determined to a great extent by people's**definition** or interpretation of situations in terms of their own unique circumstances and experiences.
- Observers or researchers **become involved** in the research case or research situation (human constructs) being studied in order to understand the phenomena.
- Researchers (investigators) **accord significance** or **give meaning** to the things they observe. The content of observation is determined to a great extent by the **context** or interdependent circumstances of what is being observed. The context has to be interpreted by the researcher and justified by observation.
- Observation is influenced by the researcher's **pre-knowledge** of the research case or situation.
- The scientist observes **selectively** in terms of aspects such as personal interest and what is significant (for the observer) in a particular situation.

For humanistically-oriented researchers, value-free knowledge and neutral observations are not requirements or conditions for scientific knowledge. Those who are of the opinion that value-free knowledge is in fact possible pursue this ideal in a different way from the positivistically-oriented scientists.

Let us again use the example of gang research in prisons to illustrate some humanistic points of view on the **objectivity ideal**.

The humanistically-oriented researcher accepts that gangs are a **human construct** or creation. To **understand** gangs, the researcher/investigator must take into account

- the social reality or prison circumstances in which gangs originate and function
- the unique experiences of individual gang members

The researcher cannot penetrate this distinctive social reality of the gang member through impartial or neutral observations. Unlike the positivistically-oriented researcher, the humanistically-oriented researcher experiences feels it necessary to **become involved** in the gang member's lifeworld in prison to gain a proper grasp and understanding of it.

The ideal way of coming to know and understand the experiential world of the gang member is to become a member of a gang. This is known as participative or naturalistic observation. The research situation makes the application of this method very difficult in practice unless

- the Department of Correctional Services is prepared to allow the researcher to masquerade as a prisoner
- the researcher is prepared to do research under such circumstances

There are definite risks involved. There is also the possibility that the researcher masquerading as a prisoner will not succeed in gaining the gang's trust, and that he or she will not be accepted as a gang member.

Another method of penetrating the experiential world (lifeworld) of the gang member is to win the trust and confidence of some gang members and then to gather information by means of in-depth or unstructured interviews (these methods are discussed in detail in theme 5). This method of data gathering implies not only creating a relationship of trust between the researcher and the research case, but also a long contact process involving a series of interviews.

Some of the information can be tested through comparison with official records, such as the police dossier, the pre-sentence report and prison file. Some of the data must be **interpreted** by the researcher by, for example

- noting the research case's body language and tone of voice or the manner in which information is given during the interview
- judging certain information in the context of the gang member's circumstances in the prison (for instance, the scarcity of goods and services in prisons explains why one prisoner will attack or assault another one for the sake of a packet of tobacco.)

In reading through this example you would have realised that neutral or objective observation and acquiring value-free knowledge are not priorities for the humanistically-oriented researcher.

Activity

Why do you need to do this activity?

- To differentiate between the positivistic and humanistic views on the objectivity ideal

Guidelines

Study-read the information above on the differences between positivism and humanism in respect of the objectivity ideal. The following statements are related to a positivistic or humanistic point of view on the objectivity ideal. Circle the correct alternative in each case.

(1) Researchers ought to become involved in the experiential world of the research case. Positivist/Humanist
(2) Researchers/Investigators observe selectively. Positivist/Humanist.
(3) Objectivity is an absolute condition for scientific knowledge. Positivist/Humanist
(4) The research domain of the human sciences consists of human constructs. Positivist/Humanist
(5) There is a distance between researcher and research case. Positivist/Humanist
(6) Value-free knowledge is not possible. Positivist/Humanist
(7) The researcher can be impartial to things being observed. Positivist/Humanist
(8) The research terrain of the human sciences consists of concrete and sensorily observable things. Positivist/Humanist
(9) The feasibility of objective observation is questioned. Positivist/Humanist
(10) Value-free knowledge is an attainable scientific goal. Positivist/Humanist

You should have circled the following alternatives:

(1) Humanist
(2) Humanist
(3) Positivist
(4) Humanist
(5) Positivist
(6) Humanist
(7) Positivist
(8) Positivist
(9) Humanist
(10) Positivist

We will now discuss the positivistic and humanistic views on **sources of information**. In studying the various points of view on the objectivity ideal you took note of the points of difference regarding the sources of information.

Proponents or supporters of **positivism** maintain that the sources of information in the human sciences are factual and sensorily observable things. The study objects should be measurable and it should be possible to express them quantitatively or in figures (statistically). In the example of research into gangs in prisons, reference was made to things such as the code of conduct followed by gang members. Gang members' conformity or obedience to the code can be observed sensorily by the observer. The observer may be the researcher who is observing the phenomenon directly, a warder or another prisoner, or another person. The warder, other prisoner or other person

observing how gang members conform to the code can also be sources of information. The frequency of the phenomenon can be expressed in figures (numerically) to reflect the number of times it occurs per unit of time.

Scientists who support the **humanistic** conception of science proceed from the point of view that the sources of information in the human sciences consist of human constructs such as unique situations and interactions with other people. Here we are dealing with experiences in the social reality of the research case. In the hypothetical example of research into gangs in prison,

- the gang phenomenon is approached as a human construct
- the emphasis is on knowledge from the experiential or lifeworld of some gang members
- the researcher is not interested in how many times a thing happened, but instead paid attention to the qualitative description and understanding of some experiences

Self-assessment exercise

.....

(a) Indicate whether each of the following statements is true or false. If a statement is true, write T in the block next to the statement, and if the statement is false, write F in the block.

(i) The positivistic conception of science originates in assumptions associated with the naturalistic scientific perspective. ☐

(ii) The humanistic scientific conception of science arises from antinaturalistic points of view. ☐

(iii) Proponents of the humanistic conception of science are of the opinion that the nature, structure and dynamics of scientific practice are the same in the natural and human sciences. ☐

(iv) The purpose of scientific practice is also known as the scientific ideal. ☐

(v) The objectivity ideal is related to the researcher's disposition (relations between object and subject or research object). ☐

(vi) The qualitative research methodology can be linked to points of view in positivism. ☐

(vii) The scientist works only with factual and sensorily observable things. ☐

(b) **Three** of the following statements about points of departure in the humanistic conception of science are correct. Indicate which statements are correct by making a tick in the relevant block.

(i) The scientist is concerned with the contextual understanding and explanation of phenomena. ☐

(ii) Exact methods and techniques can ensure the scientist's objective observations. ☐

(iii) Observers in the human sciences are often approach fellow human research objects subjectively. ☐

(iv) The principle of contextual restraint is rejected in the human sciences. ☐

(v) Things that are not sensorily observable, such as human interactions and behavioural situations, are important sources of information for the scientific observer. ☐

STUDY UNIT 1.3

Research methodology

After studying this unit you should be able to

- formulate the central question in the area of research methodology
- identify the two aspects on which research methodology focuses
- describe the most significant points of difference between a quantitative and qualitative research methodology (with reference to research aims, conceptualisation, data gathering and analysis)

Key concepts

- **Research objective**: A focal point of research or a broad indication of what a researcher hopes to achieve by means of a research project. In theme 4 we explain that there are three basic types of research objectives, namely exploratory, descriptive and explanatory research objectives.
- **Conceptualisation**: The demarcation of terms or the delimitation of concepts that will lead to the organisation of observations and experiences of the research process.
- **Operationalisation**: The way in which a researcher changes concepts (demarcates terms) from the abstract to the concrete to make them measurable.
- **Hypothesis**: A supposition/presumption or direction-giving statement that serves as the basis for discussion or empirical research.
- **Theory**: A group of logically cohesive statements presented to categorise or explain phenomena. **Observational data**: Data or information gathered systematically for research purposes and serving as the basis for drawing conclusions. Information that has been gathered but has not yet been processed is called ‘‘raw data’’. Data are frequently factual or numerical, but may also have a theoretical character.
- **Nomothetic research strategy**: A type of research strategy according to which an attempt is made to find universally valid regularities underlying phenomena or behaviour. It points to the universal significance of science (see theme 3) and to research and methods aimed at pronouncements that apply to a specific group of phenomena.
- **Data printed descriptively**: Numerical or statistical data that is summarised by being presented graphically.
- **Ideographic research strategy**: Here the emphasis is on studying a single, unique event or phenomenon. It points to the contextual significance of science (see theme 3) and to research and methods that focus on what is distinctive and unique in a situation or interaction.
- **Field notes**: Recorded data or observations.

- **Inferential statistical techniques**: Statistics aimed at testing hypotheses and drawing samples.

A c t i v i t y

Why do you need to do this activity?

- To identify the key terms or phrases in the study objectives

Guidelines

- Study-read the study objectives at the beginning of this study unit. Circle the keywords or phrases.

The keywords or phrases you should have circled are:

- central question
- focus
- points of difference between quantitative and qualitative research methodology

1.3.1 Definition of ''central question'' and ''focus''

Our aim at this point is to find answers to the **central question**: How should scientific research be planned, structured and conducted to meet the requirements of scientific knowledge?

A c t i v i t y

Why do you need to do this activity?

- To see whether you can recall the three characteristics of scientific knowledge

Guidelines

You have already studied study unit 1.1, section 1.1.2, where the characteristics or requirements of scientific knowledge are discussed. Write the three features on the dotted lines below. If you are uncertain about the answers, revise study unit 1.1, section 1.1.2.

Requirements or characteristics of scientific knowledge

(a) .....

.....

.....

.....

.....

(b) .....
.....
.....
.....
.....

(c) .....
.....
.....
.....
.....

The three requirements or characteristics of scientific knowledge that we dealt with are:

(a) Scientific knowledge must be acquired by means of recognised scientific methods.
(b) Scientific knowledge is ordered or systematised knowledge.
(c) Scientific knowledge is valid knowledge.

In research methodology the **focus** is on:

- logical decisions that the researcher makes in carrying out the process of research
- the manner or style of doing research.

Let us start by considering the **decisions** in the research process. In study unit 1.1 we identified various areas in which many of the most important research decisions are taken, namely the

- formulation of the research problem
- collection of information
- processing of data
- writing of the research report
- utilisation or application of findings

We elaborated on these in study unit 1.2 and indicated how researchers' views in terms of the philosophy of science influence their decisions on the choice of (a) research objectives and (b) methods and techniques of data gathering and data processing. If you would like to refresh your memory regarding the application of this to the example of research on gangs in prisons, revise that section in study unit 1.2 before doing the next activity.

Activity

Why do you need to do this activity?

- To show that researchers' assumptions in terms of the philosophy of science influence their decisions on research objectives and choice of methods and techniques for data collection and processing

Guidelines

In study unit 1.2 you were introduced to the positivistic and humanistic views on the ideals of knowledge and objectivity in science. You learnt that these assumptions/premises influence researchers' decisions on research objectives and their methods and techniques of data gathering and processing.

Read the ten statements about research decisions below.

(1) The purpose of research is to collect universally valid knowledge.
(2) Research has a contextual significance.
(3) Data gathering is done through in-depth interviews.
(4) Data processing is done by statistical techniques.
(5) The sample group consists of a group that is representative of the universe.
(6) The purpose of research is to acquire knowledge of a phenomenon in a particular context.
(7) Data processing takes place through the classification of the information on the individual research cases into a scheme.
(8) Research has a general or universal significance.
(9) Data gathering is done through questionnaires.
(10) The sample group consists of individual typical instances of a phenomenon.

Now write the numbers representing each of the statements in the correct category below.

POSITIVISTIC RESEARCH DECISION	HUMANISTIC RESEARCH DECISION

Your answer should have looked like this.

POSITIVISTIC RESEARCH DECISION	HUMANISTIC RESEARCH DECISION
1 4 5 8 9	2 3 6 7 10

While completing this activity you would have realised that researchers' assumptions in terms of the philosophy of science also influence their manner or style of doing research.

1.3.2 Quantitative and qualitative research methodologies

The decisions that the positivistic and the humanistic researcher make about research and research style (the way of doing research) are determined by whether the researcher adopts the quantitative or the qualitative research methodology.

The research style in **quantitative research** is more structured and controlled. The range of the research is greater or more universal, and the research can be precisely demarcated. It is assumed that

- natural and social reality can be observed and studied in the same way scientific knowledge must be factually based on things that can be observed/perceived and measured sensorily
- the research process can produce value-free knowledge

It is accepted that human scientists and natural scientists involved in quantitative research conduct their research in a similar way. This does not mean literally ''in the same way'', in other words by using exactly the same methods and techniques. Instead, it means that they follow the same research strategy. This implies that human scientists and natural scientists doing quantitative research make the same kind of decisions about aspects such as conceptualisation, operationalisation and analysis, and that their techniques are similar. Hypotheses play an important role in quantitative research methodology, and observations are usually expressed numerically. Hypotheses will be discussed in more detail in study unit 3.5.

Natural scientists and human scientists doing **qualitative research**, on the other hand, conduct their research in different ways. In terms of the qualitative research methodology, the research object in the human sciences (the human being) makes different demands on the researcher than the research object in the natural sciences makes on the natural scientist. The idea is to study the study object under ''natural'' conditions; in other words, in the case of the human sciences, to study human beings in unique and meaning-loaded human situations or interactions. Theories are not necessarily projected on to or applied to data, but often arise out of observational data. Although qualitative research is not based on fixed and rigid procedures, the researcher has a set of strategies or tactics for organising research and gathering and processing or interpreting data. Qualitative research methodology is covered in module CMY3708.

A c t i v i t y

Why do you need to do this activity?

- To distinguish between quantitative and qualitative research methodologies

Guidelines

Study-read the information above.

Now read the introductory information and the descriptions of research projects 1 and 2 below.

The commanding officer of the local prison regularly receives complaints about sleeping facilities in the cells of male sentenced prisoners. The male sentenced prisoners are housed in four sections, each consisting of four cells. Each cell accommodates twenty-five prisoners. Criminology lecturers at Unisa

are granted permission to do research on the problem. One researcher is more positivistically oriented and gives preference to quantitative research methodology. The other researcher subscribes to humanistic assumptions and prefers to work according to qualitative research methodology. We will briefly describe the research decisions and style of both lecturers for you. Read through both descriptions and indicate which of the research projects was carried out according to the quantitative methodology and which according to the qualitative methodology.

Research project 1

The researcher decides to start by describing the research phenomenon very carefully on the basis of information gathered on particular aspects of the sleeping facilities. The view is that sleeping facilities are a given, and are the same for all the prisoners. Therefore, reasons for the dissatisfaction must be sought from a group that is representative of all the prisoners. The findings of the study should then produce generally valid knowledge that can be applied to all the prisoners in the institution concerned. This approach to the research objectives is known as a **nomothetic** research strategy. This is something we will be discussing further in theme 4.

The concepts to be used in the study are precisely demarcated and defined. This process is known as conceptualisation. Conceptualisation ensures that only one meaning is attached to a concept. The researcher decides to investigate the following five aspects of the sleeping facilities:

- the quality of the mattresses the number and quality of the blankets
- the type of pillows
- whether there are bunk beds (one bed permanently stacked on top of another)
- the hygiene of the cell facilities

Aspects like these, which sketch a phenomenon, are known as **indicators** or **pointers**. Each indicator is dealt with in one or more questionnaire questions or items. The answers to the questions are categorised beforehand in the form of response categories or answer options. For example:

Question or item — Answer option (choose one)

How comfortable to sleep on is the mattress on your bed?

Very comfortable		1	
Comfortable		2	
Uncertain		3	
Uncomfortable	x	4	
Very uncomfortable		5	4

This process (in which indicators of concepts are deduced and then expressed in items or questions of a questionnaire) is called **operationalisation**.

Data is gathered by means of a questionnaire that is completed by the sample group. The sample group is composed representatively from among all the

prisoners in the four sections and sixteen cells. This process is known as **sampling**. Each selected prisoner in the sample is

- informed by the researcher beforehand of the permission for and objective of the investigation
- asked whether he is willing to take part in the project
- assured of his anonymity

After this formality the prisoners or respondents who are literate complete the questionnaire themselves. If a respondent is illiterate (cannot read), the researcher reads the questions to the prisoner and writes down the answers he gives. The response or answer is marked with a cross in the blank block next to the correct response category, as in the example above.

In the data processing process the questionnaires are

- rounded off by recording the respondent's choices in the bottom right blank block (see example above)
- checked for completeness to make sure that all the items have been completed

The answer is then expressed numerically or quantified. After that the information is computerised. During this process the numeral representing the respondent's answer is keyed in opposite the question number and the information is statistically processed by a computer package. The researcher decided to

- print the data descriptively in the form of figures and percentages
- cross-tabulate the data of each question with the respondents' age, length of sentence and sleeping section

Here is an example of cross-tabulation.

How comfortable is the mattress on your bed to sleep on?						
Percentage						Total
Personal details of respondent number	Very comfortable	Comfortable	Uncertain	Uncomfortable	Very uncomfortable	
Age 21–29 years 30–39 years 40–49 years 50–59 years Above 60 years						
Sentence length Under 2 years 2–5 years 5–10 years Longer than 10 years						

How comfortable is the mattress on your bed to sleep on?						
Percentage						Total
Personal details of respondent number	Very comfortable	Comfortable	Uncertain	Uncomfortable	Very uncomfortable	
Sleeping section Section A Section B Section C Section D Total of research group						

Analysis of this table reveals that

- prisoners in the higher age categories find the mattresses very uncomfortable to sleep on
- the mattresses in section C need attention

This project is very structured, and is conducted under controlled conditions. The data are expressed quantitatively (numerically).

Research project 2

The study is aimed at understanding or grasping the situation or the prisoners' experience at bedtime in the cells. The researcher decides to make an in-depth study of the experiences of one prisoner in each cell. In this way the researcher can gain insight into

- the experiences of a prisoner at bedtime
- the situation in a specific cell
- the significance and meaning attached to experiences under specific circumstances

The researcher wants to collect information in this way to describe the situation in every sleeping cell and explain problems or complaints in the context of the experiences of a number of prisoners. This approach to research objectives is called an **ideographic** strategy. We will discuss it further in theme 4.

The researcher does not give the same priority to conceptualisation and operationalisation as the researcher conducting the first project. Rather than deciding beforehand what aspects of the sleeping facilities to concentrate on, the researcher tries to consider the whole situation. The researcher is aware that familiar things and concepts are experienced and interpreted differently in the prisoner's lifeworld. A certain gang refers to blankets as ''ropes'', for instance, because blankets were knotted together in the past and used as rope to escape from the cells on the second floor after the bars on a cell window had been sawn off.

The researcher begins to gather data by

- identifying a prisoner in each cell who has been detained there for some time already and knows the social interactions and circumstances well
- gradually building up a relationship of trust with that prisoner

The researcher gathers information by conducting a series of in-depth or unstructured interviews with these prisoners. The interviews take place in an unstructured way in other words, they do not follow a question-and-answer pattern. The researcher informs the prisoner what the object of the interviews is. The researcher may proceed only if the prisoner gives permission for the interviews. The interviewer arranges beforehand with the research case to record the conversation on tape. The prisoner is given free rein to talk about his experiences and conditions in his cell. The researcher will only interrupt him if he strays off the point, and when he or she does not understand something. In addition the researcher makes field notes as a way of recording significant information or things like moodiness or anxiety in the prisoner. After each interview the researcher analyses and interprets the content of the conversation. Follow-up interviews are arranged on a regular basis to

- collect more information about certain aspects
- clear up any obscurities
- check facts

A significant part of the data processing takes place in this way during the process of gathering information. The data are processed in final form by compiling a scheme for each research case. The researcher's notes on one prisoner's experiences could look something like this:

SUMMARY OF PRISONER NELS EXPERIENCES IN CELL 8

Positive experiences	**Negative experiences**
– Has slept next to friend for the last six months – Enjoys the community singing in the cell – The geyser works well – Good camaraderie among cell inmates	– Enjoys reading but the cell lights above his desk are poor – Ventilation often inadequate because of too many people in the cell – Sometimes irritated if cellmates continue to make a noise after lights out

The prison authorities ought to attend to:

- cell lighting
- silence rules after cell lights have been switched off
- overcrowding

In this activity you had to indicate which of the projects was an example of quantitative research and which was an example of qualitative research. What did you decide?

In the first example the researcher followed a quantitative research

methodology. The second research situation is in the tradition of qualitative research methodology.

While you were doing the activity, you probably realised that the two research methodologies are not always in opposition to each other. Both research methodologies are of value in the activity above, and in many cases both are followed in a single research project. You will learn more about this in study unit 1.5.

The main **differences** between the two research methodologies may be summarised as follows:

MAIN POINTS OF DIFFERENCE BETWEEN QUANTITATIVE AND QUALITATIVE RESEARCH METHODOLOGY

	Quantitative research methodology	Qualitative research methodology
Research objectives	Research is undertaken with a view to universal (generally valid) knowledge (nomothetic research strategy). Research is descriptive and explanatory (see theme 4).	Research is aimed at grasping/understanding a phenomenon in a certain context (ideographic research strategy). The objective is usually exploratory-descriptive, and the explanation points to a particular context (see theme 4).
Conceptualisation	Concepts are precisely demarcated so that only one meaning can be attached to each. Concepts can therefore be operationalised (quantified by items in a questionnaire, for example).	Concepts may be interpreted in various ways. Concepts used by research objects are given preference. A researcher interprets the phenomenon being investigated from the wealth of meanings of concepts.
Data gathering	Is done by means of quantitative methods.	Is done mostly by qualitative methods.
Data analysis	Is usually done by means of descriptive and inferential statistical techniques.	Is usually done by means of qualitative classification schemes or categories.

Self-assessment exercise

.....

(a) Describe the central question in research methodology in your own words.

.....

.....

.....

.....

.....
.....

(b) Mark the two **correct** response options concerning the focus in research methodology by making a tick in the appropriate blocks.

In research methodology the focus is on

(i) the distinction between the natural and human sciences. ☐
(ii) the researcher's actual decisions in the research methodology. ☐
(iii) the relation between science and society. ☐
(iv) the manner or style of research (a qualitative or quantitative research methodology. ☐
(v) the universal validity of research findings. ☐

(c) Complete the following sentence by filling in the missing words, phrases or terms:

A qualitative research methodology is related to a ..... conception of science, while a quantitative methodology is related to a ..... conception of science.

(d) Indicate whether each of the statements below is true or false by writing T in the block if the statement is true or F if it is false.

(i) In qualitative research it is accepted that the human scientist does research in the same way as the natural scientist. ☐
(ii) According to those who prefer the quantitative methodology, the quantitative research methodology is eminently suitable as a model for research in the human sciences. ☐
(iii) Proponents of the qualitative methodology emphasise the radical differences between the methodology of the natural and human sciences. ☐
(iv) Proponents of the qualitative methodology argue that the scientist's research object (the subject being observed) in research in the human sciences is basically the same as in the natural sciences. ☐
(v) Proponents of the qualitative research methodology are of the view that the research object in the human sciences makes methodological demands of a different kind on the researcher than the research object in the natural sciences. ☐

(e) The following statements are related to points of difference between quantitative and qualitative research methodologies. In each case indicate whether the statement is true or false by writing T in the block if the statement is true or F if it is false.

(i) In qualitative research the researcher is pursuing universal tenets. ☐
(ii) Proponents of the quantitative research methodology follow a nomothetic research strategy. ☐
(iii) Proponents of the qualitative research methodology strive to grasp and understand research objects in a particular context. ☐
(iv) An ideographic research strategy is associated with a qualitative Research methodology. ☐

(v) In qualitative research, research concepts must be of such an exact nature that they can be quantified. ☐

(vi) Proponents of the qualitative methodology do not focus on quantifiable concepts, but instead prefer concepts that relate specifically to the substance of the research object. ☐

STUDY UNIT 1.4

Research technology

After studying this unit you should be able to

- define the terms
  - research technology
  - method
  - technique
- state the considerations that determine a researcher's methods
- list the main methods and techniques associated with the quantitative methodology
- list the main methods and techniques associated with the qualitative methodology

Key concepts

- **Schedule**: A written list indicating what information must be collected. An information schedule is used to collect data from a documentary source, such as a police dossier.
- **Multivariate**: This term indicates any (observable or measurable) aspect of a phenomenon being studied or its surroundings that can assume different values, such as gender, age, scholastic qualifications, type of crime and length of sentence.
- **Life histories, using autobiographies and diaries**: Detailed, first-hand reports in which the inner experiences of individuals are documented, giving insight into how they regard, interpret and understand the world around them and situations in which they find themselves. These documents can be used for data gathering purposes.

Activity

Why do you need to do this activity?

- To identify the core words or phrases in the study objectives

Guidelines

Study-read the study objectives at the beginning of this study unit. Circle the keywords or phrases.

The key terms or phrases you circled should have included:

- research technology
- method

- technique
- considerations that determine a researcher's methods
- methods and techniques associated with quantitative methodology
- methods and techniques associated with qualitative methodology

Research technology includes the methods and techniques that scientists use in the research process to gather and analyse information. The researcher makes use of a method (a procedure for doing something) to make the phenomenon being observed accessible. The method is a systematic way of working that the scientist follows in his or her approach to the research phenomenon and the research object. Three considerations or factors determine the method(s), namely

- the researcher's approach in terms of the philosophy of science and research methodology
- the aim of the research project
- the nature of the research phenomenon (area of research/investigation) and research object (specific study object)

A scientific **technique** is an aid or one of the tools used to carry out scientific methods. For example, interviewing is a technique used as part of the survey method to gather data. Once a researcher has decided on a research method, he or she must then consider what conceptualisation, operationalisation, and data collection and data analysis techniques are the most suitable for the particular study or research. What we are referring to here is the technique, measuring instrument and test the researcher uses in collecting, analysing and testing information.

In **quantitative** research, researchers prefer the following methods and techniques:

- Conceptualisation of concepts that can be operationalised in measuring instruments. Revise study unit 1.3 if you are uncertain about the concepts ''conceptualisation'' and ''operationalisation''. Note in particular the example of a quantitative research methodology as applied in research on sleeping facilities for prisoners.
- Quantitative data gathering techniques, for example structured questionnaires and schedules. In a structured questionnaire the response options are listed. The respondent has to mark one or more, as in the example of the application of quantitative research methodology in research on prisoners' sleeping facilities (study unit 1.3).
- Quantitative data analysis techniques, which can vary from simple cross-tabulation of data to complicated multivariate analysis techniques. Revise study unit 1.3, paying particular attention to the explanation of the example on page 42 if you are uncertain of the meaning of the term ''cross-tabulation''.

In **qualitative** research, researchers prefer the following methods and techniques:

- Conceptualisation of concepts that encapsulate the meaning of the research object's ''lifeworld'' (situation), action or interaction.
- Open (unstructured) questionnaires and unstructured interviews. In unstructured questionnaires no response options are supplied. Instead, space is left for respondents to formulate and write their answers in their own words. You encountered the term ''in-depth or unstructured interview'' in study unit 1.3. If you are uncertain about its meaning, revise that study unit, paying particular attention to

the example where a qualitative research methodology is applied to research on prisoners' sleeping facilities.

- Naturalistic or participant observation.
- Writing down life histories, using autobiographies and diaries.
- Analysis by means of non-quantitative frameworks and category systems.

Self-assessment exercise

.....

(a) Complete the following sentences by filling in the missing words, terms or phrases:

(i) Research technology refers to the ..... and ..... that the scientist uses in the research process to collect and analyse information.

(ii) The researcher makes use of a scientific method to make the phenomenon being observed .....

(iii) Scientific ..... are aids that are used for collecting and processing observational data.

(b) The particular methods that a researcher uses in research is determined mainly by three factors or considerations. Describe each factor in a single sentence.

(i) .....
.....
.....

(ii) .....
.....
.....

(iii) .....
.....
.....

(c) The following statements relate to research technology (scientific methods and techniques). In each case indicate whether the statement is true or false by writing T in the appropriate block if the statement is true, or F if it is false.

(i) Data analysis in qualitative research is usually done according to descriptive and inferential techniques. ☐

(ii) Philosophy of science and research methodological assumptions have no significant influence on the researcher's choice of research methods and techniques. ☐

(iii) The structured questionnaire is an example of a quantitative data gathering technique. ☐

(iv) Participant observation is used in qualitative research to collect information. ☐

STUDY UNIT 1.5

Pluralistic or mixed research methodology

After studying this unit you should be able to

- show the relation between quantitative research technology and the naturalistic school of thought
- show the relation between qualitative research technology and the antinaturalistic school of thought
- define the term ‘‘pluralistic or mixed research methodology’’

Activity

Why do you need to do this activity?

- To identify the central terms or phrases in the study objectives

Guidelines

Study-read the study objectives at the beginning of this study unit. Circle the key terms and concepts.

The key terms and concepts you circled should have included the following:

- the relation between quantitative research technology and the naturalistic school of thought
- the relation between qualitative research methodology and the antinaturalistic school of thought
- pluralistic research methodology

From our discussion so far you should have realised that there is a specific relation between

- the positivistic scientific conception and the quantitative research methodology, with distinctive methods and techniques for data gathering and data analysis
- the humanistic scientific conception and the qualitative research methodology, with distinctive methods and techniques for data gathering and data analysis

From this we can conclude that a researcher who favours or subscribes to a positivistic conception of science will probably prefer a quantitative research

methodology. We can also conclude that a researcher who favours or subscribes to a humanistic conception of science will probably prefer a qualitative research methodology. This shows that the distinction between quantitative and qualitative research methodologies is based on the differences between positivism and humanism. Differences between positivistic and humanistic assumptions can in turn be traced back to the naturalistic and antinaturalistic scientific schools of thought, respectively.

A c t i v i t y

Why do you need to do this activity?

- To summarise the relation between scientific schools of thought, conceptions of science, research methodologies and forms of research technology

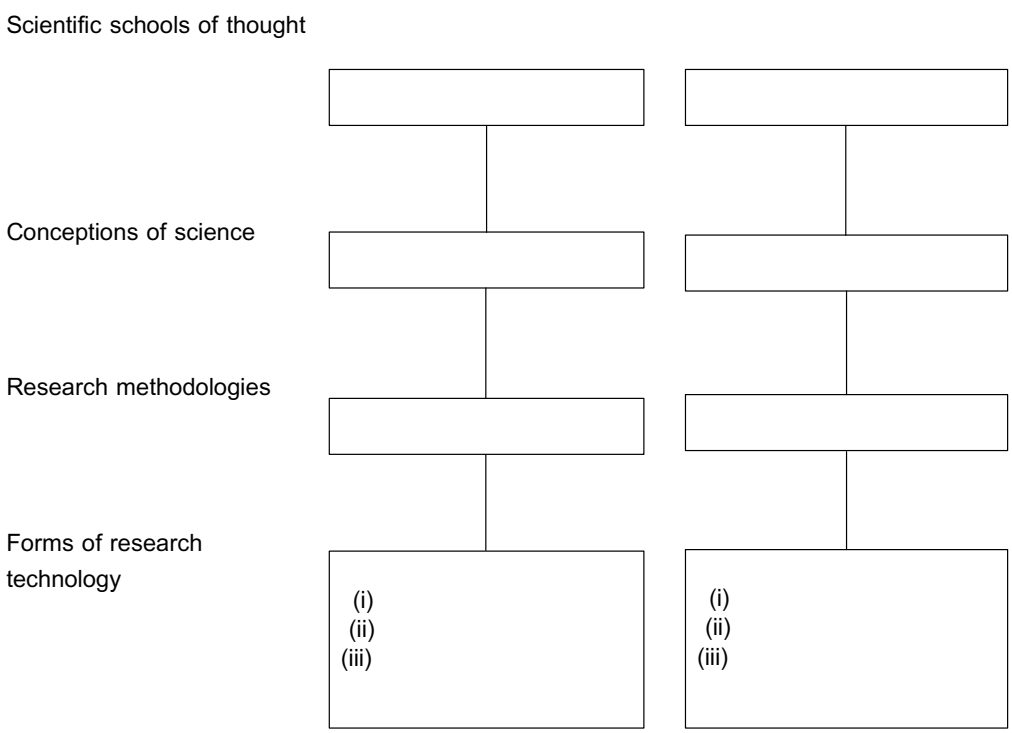
Guidelines

Study-read the information above and think about the principles we have discussed in theme 1 so far. Now complete the summary below by filling in the following key terms or phrases in the appropriate blocks.

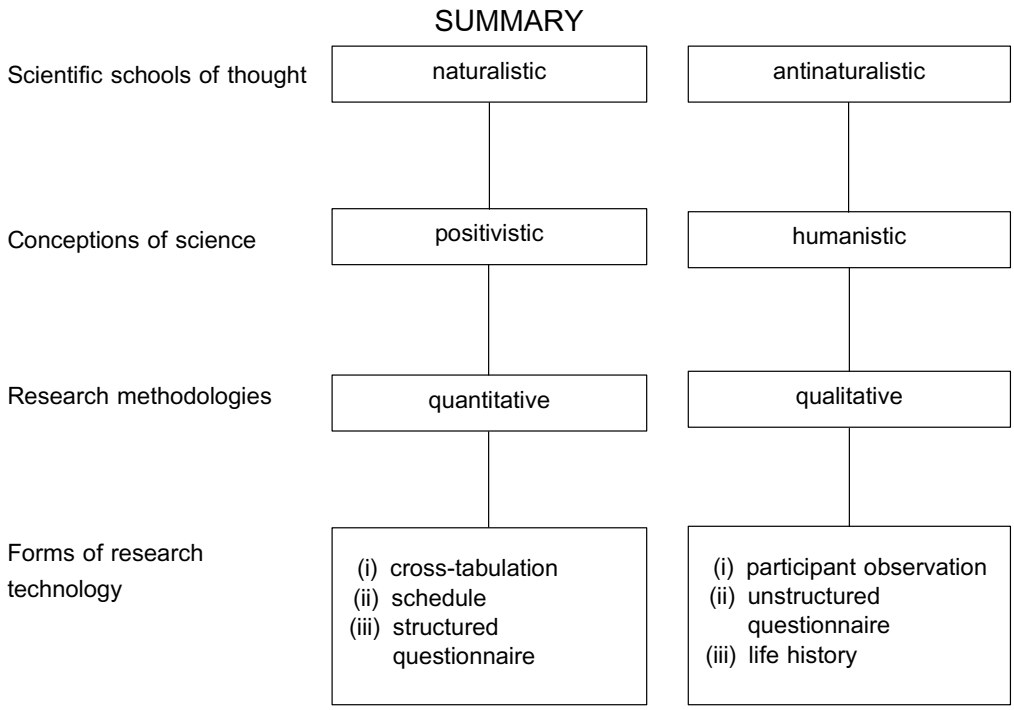
Key terms or phrases

Participant observation, positivistic, cross-tabulation, qualitative schedule, naturalistic, quantitative, unstructured questionnaire, life history, humanistic, structured questionnaire, antinaturalistic.

SUMMARY



- Your summary should have looked like this:



In this theme we stressed the differences between quantitative and qualitative research methodologies because

- the methodologies originate from opposing assumptions on social reality and knowledge, among other things
- each methodology has a distinctive research technology by means of which a specific type of data is collected

However, in some research projects, the quantitative and qualitative methodologies are used together. We refer to this research style as a **pluralistic or mixed research methodology**.

How did this situation come about?

Over the past few decades there have been some important changes in research philosophy. Certain positivistic principles, including assumptions about the objectivity ideal, value-free knowledge and generally valid knowledge, came to be questioned. The result of this has been a narrowing of the traditionally accepted distance between certain positivistic and humanistic ideas.This changed the way researchers thought about research methodology.

The most important effect of this changed way of thinking was a greater appreciation of the role of qualitative research methodology and qualitative research technology. Researchers came to realise that a qualitative research methodology produces distinctive information that differs from the type of data gathered through structured questionnaires and schedules, for instance. Data generated by a qualitative research methodology can thus make a supplementary contribution in a research project making use of both qualitative and quantitative research technologies. Quantitative and qualitative research methodologies may therefore complement each other – in other words, they work together to achieve an improved or perfect result.

Activity

Why do you need to do this activity?

- To formulate a definition of the pluralistic or mixed research methodology

Guidelines

Study-read the information above on the pluralistic or mixed research methodology. Write the three parts of the definition in the space below.

Term:

.....

.....

Class:

.....

.....

.....

Distinguishing features:

.....

.....

.....

.....

.....

The term is **pluralistic or mixed research methodology**. With regard to class, you needed to state clearly that this is a way of conducting research that is different from purely quantitative and purely qualitative research methodologies. The distinguishing features of this methodology are:

- Research decisions are based on assumptions from both the quantitative and qualitative research traditions.
- A research style is used that includes quantitative as well as qualitative methods and techniques.
- The data are applied in a complementary way.

A definition of the pluralistic or mixed research methodology could read as follows: The pluralistic research methodology is a style of research in which research decisions as well as methods and techniques are based on both the quantitative and qualitative research traditions. The research data are utilised or applied in a complementary way.

Think back to the example of research on prison sleeping facilities in study unit 1.3. If you are uncertain of the details, revise that activity, as that will help you understand the next application. The quantitative study using the questionnaire and the qualitative study using in-depth interviews could in fact be fruitfully combined in a pluralistic

research methodology. The researcher would then have started with a qualitative study by conducting a series of in-depth interviews with some prisoners. With these findings as a basis, the researcher would have been able to compile a questionnaire to be completed by a representative group of prisoners. In this way the researcher's research decisions and methods and techniques would have had a quantitative and qualitative basis. The data would have been applied in a complementary way. This would have been a study conducted according to the pluralistic research tradition.

Self-assessment exercise

(a) Complete the following sentences by filling in the missing words, terms or phrases:

(i) A researcher who favours a positivistic conception of science will be more attracted to a ..... research methodology.

(ii) A researcher who subscribes to humanistic principles would give preference to a ..... research methodology.

(iii) When methods and techniques of both quantitative and qualitative research methodologies are applied in a supplementary (complementary) way, we refer to a ..... methodology.

(b) Define the concept ''pluralistic research methodology'' in your own words.

Review

We started this theme by defining science as an ordered system of scientific knowledge and research as the process by which a system of scientific knowledge is established and continually evaluated and expanded. We distinguished between the natural and the human sciences, explained the concept ''discipline'' and asked the vital question whether there is a fundamental difference between the natural and the human sciences. We examined some claims to knowledge in everyday life and focused on certain features or requirements on the basis of which scientific knowledge is distinguished from everyday knowledge. One way in which knowledge is expanded is through scientific research, which is a process that consists of a number of logical decision-making steps.

We accepted the principle that reflection on science and scientific research takes place from different perspectives, and identified three important ones as the philosophy of science, research methodology and research technology.

We distinguished between positivism and humanism as conceptions of science on the basis of the naturalistic and antinaturalistic schools of thought in the philosophy of science. With regard to research methodology, the emphasis is on the research process and the actual decisions that a researcher has to make when undertaking a research task. The distinction between the quantitative and qualitative research methodologies is based on differences between the positivistic and humanistic conceptions of science. Each of these research methodologies is carried out by means of a distinctive research technology.

Although we accept that there is a definite relation between a positivistic conception of science and a quantitative research methodology/research technology, and between a

humanistic conception of science and a qualitative research methodology/research technology, we also saw that recent developments in the philosophy of science and research methodology have laid the foundation for the concept of a pluralistic research methodology and mixed methods.

Answers to self-assessment exercises

Theme 1

Study unit 1.1

1.1.1

(a) Your definition should have included the following core notions:

(i) Science is a system of scientific knowledge.
(ii) This knowledge is arranged logically or systematically.
(iii) This knowledge has specific features.

(b) (i) Natural
(ii) Human

(c) (i) The subjects or areas of reality being studied
(ii) The scientist's approach

(d) (i) ☒
(ii) ☑
(iii) ☒
(iv) ☒
(v) ☑

(e) (i) ☒
(ii) ☑
(iii) ☒
(iv) ☑
(v) ☑

(f) (i) A demarcated area/field of study
(ii) Own or adapted study methods
(iii) A distinctive subject content and terminology

(g) (i) ☒
(ii) ☒
(iii) ☑

1.1.2

(a) Your description should have contained the following key ideas:

- It is an activity or process that entails a scientist's search for new knowledge and insights.
- It consists of the collection, processing and expansion of knowledge.

(b) (i) ☒
(ii) ☑
(iii) ☒
(iv) ☑
(v) ☑

(c) (i) ☒
(ii) ☑
(iii) ☒
(iv) ☑
(v) ☑

(d) (i) F
(ii) T
(iii) T
(iv) T
(v) T
(vi) F
(vii) F

(e) (i) problem
(ii) research problem
(iii) Collecting
(iv) Ordering; processing
(v) research report
(vi) Using or applying

(f) The primary aim in basic research is to obtain new knowledge and insights, while applied research is directed at a specific practical problem.

Study unit 1.2

1.2.1

(a) Your definition should have contained the following concepts:

- critical reflection on the assumptions, foundations and implications of science and scientific research
- functional perspective
- structural perspective
- critical perspective

1.2.2

(a) (i) ☒
(ii) ☑
(iii) ☑
(iv) ☑
(v) ☒

(vi) ☑
(vii) ☒
(viii) ☑

(b) (i) ☑
(ii) ☒
(iii) ☒
(iv) ☑
(v) ☒

1.2.3

(a) (i) T
(ii) T
(iii) F
(iv) T
(v) T
(vi) F
(vii) F

(b) (i) ☑
(ii) ☒
(iii) ☑
(iv) ☒
(v) ☑

Study unit 1.3

(a) Research methodology is concerned with the question of how a study is planned and carried out to ensure that the knowledge or findings emerging from it are of a scientific nature.

(b) (i) ☒
(ii) ☑
(iii) ☒
(iv) ☑
(v) ☒

(c) humanistic
positivistic

(d) (i) F
(ii) F
(iii) T
(iv) F
(v) T

(e) (i) F

(ii) T
(iii) T
(iv) T
(v) F
(vi) T

Study unit 1.4

(a) (i) methods; techniques
(ii) accessible
(iii) techniques

(b) (i) The researcher's views in terms of the philosophy of science
(ii) The object of the research report
(iii) The nature of the research area and specific study object

(c) (i) F
(ii) F
(iii) T
(iv) T

Study unit 1.5

(a) (i) quantitative
(ii) qualitative
(iii) pluralistic

(b) It is a research methodology in which the researcher's decisions on the study (investigation) and the methods and techniques for gathering and analysing data are based on quantitative and qualitative research principles. The data are applied in a complementary (supplementary) way.

THEME 2

Origins and development of the scientific idea

Introduction

In the first theme we decided on a particular approach to science and research. One of the perspectives we adopted as part of this approach was the philosophy of science, and particularly the philosophical question ‘‘What is science?’’ Before we try to answer this question, we need to consider the development of the scientific idea. Theme 2 will briefly show you how the scientific idea developed from the thinking of the Greek philosophers to contemporary positivism and humanism.

This theme is divided into three study units.

Study unit 2.1: The Greek philosophers

2.1.1 Characteristic features of scientific thought in this period
2.1.2 Socrates
2.1.3 Plato
2.1.4 Aristotle

Study unit 2.2: The Renaissance

2.2.1 The natural sciences
2.2.2 Humanism

Study unit 2.3: Rationalism and empiricism in the 17th and 18th centuries

2.3.1 Introduction
2.3.2 Rationalism
2.3.3 Empiricism

Review

Activity

Why do you need to do this activity?

- To identify the key concept in this theme

Guidelines

Study-read the introduction above and circle the key concept.

The key concept is **scientific idea**. The scientific idea or scientific thought

refers to notions of what science is, and to the approaches and conceptions of science adopted by those belonging to various schools of scientific thought. Those who adopt different scientific approaches and support different schools of thought often disagree about the nature of science.

Key concepts

- **Rational beings**: A reference to people as organisms with the ability to reason, or intellectual powers. In terms of the branch of philosophy that studies what knowledge is, or epistemology, this implies that human reason rather than empirical reality or experience is the principal (main), most reliable source of knowledge. In terms of behaviour it means that a person's behaviour is a product of logical, conscious decisions.
- **True knowledge**: Valid, reliable knowledge as defined in study unit 1.1 of theme 1.
- **Cosmos**: The universe or the orderly whole of reality.
- **Objectivity**: In this context the term does not refer to the researcher's attitude, but to something which is real in itself, which is really observable and which exists in the external environment outside the human body.
- **Scepticism**: The doctrine that all knowledge is uncertain and that everything in the human world is subject to systematic doubt.
- **Induction**: In this study guide the term relates to inductive arguments and inductive methods. In inductive arguments, although there is some relation between the premises (supporting evidence) and the conclusion, the conclusions are only probable. The supporting propositions or premises offer only gradual support for the conclusion. An inductive method or research strategy refers to the careful collection of facts, which are then used as a basis for generalisations.
- **Theory of Ideas**: Plato's theory, in terms of which earthly reality is just a shadowy reflection of true reality, which lies in the realm of ideas.
- **Dualism**: The notion that reality consists of two kinds of entities or things, namely matter (the given or empirical reality of sense perception) and mind (an ideal reality).
- **Idealism**: The school of thought that holds that the human mind (intellect or reason) is primary and that the ''external world'' (what people perceive with their senses) is construed by the mind. Reality is therefore dependent on intellect, or is somehow determined by it.
- **Rationalism**: An umbrella term for approaches that emphasise the importance of reason or intellect in scientific work. The basic idea is that reason is the highest principle of insight and that the whole of reality can be understood and explained in terms of rational principles. This approach is associated with a particular view of the origin of knowledge and of human behaviour that will be discussed in study unit 2.3.
- **Mythic tradition**: Traditions about gods and religion. A myth is sometimes described as a story about gods.
- **Deduction**: In this study guide the term relates to deductive arguments and deductive methods. In deductive arguments it is claimed that the conclusion follows with absolute certainty from the premises (supporting evidence) of the argument. In valid deductive arguments the truth of the conclusion is contained in the truth of the premises. Scientists who use a deductive method or research strategy start by recognising some universal (generally valid) law, theory or principle and then apply

it to explain or interpret particular phenomena. (In interpreting or explaining a phenomenon or event researchers will try to show that the phenomenon is a particular instance of a general law, theory or principle.)

- **Empiricism**: This approach holds that knowledge can be obtained only through sensory observation of the world. Science is limited to objectively observable things, and all scientific facts must be testable.
- **Experimentation**: Making observations (in this case of nature) under strictly controlled conditions to test the correctness of a hypothesis (see 2.2.1).
- **Exactitude**: Precision, correctness, rigour.
- **Construction**: In this context the word means ‘‘synthesis’’, which is usually given as the opposite of analysis. Whereas analysis refers to the separation of the parts making up a whole or a phenomenon, synthesis is the combination of these parts into a whole. **Verifiability**: Another word for verifiability is ‘‘testability’’, which is discussed in theme 1 in relation to the features or requirements of scientific knowledge. Verification is the process whereby a premise or hypothesis is proven correct or is acceptable.
- **Objectivism**: The view that the human mind can perceive and know ideas that exist independently of it.
- **Subjectivism**: The view that human consciousness is the primary reality and that the only reliable way of knowing reality is through individual experience.

STUDY UNIT 2.1

The greek philosophers

After studying this unit you should be able to

- list and briefly discuss the characteristic features of the Greek philosophers' ideas about science
- explain what you understand by
  - Socrates's views of self-knowledge
  - Socrates's views of knowledge
  - the Socratic dialogue
- describe Plato's views of reality and how people obtain knowledge about the world
- show how Plato's ideas link up with idealism and how they later formed the basis of rationalism
- describe Aristotle's views of reality and how people obtain knowledge about the world
- explain how Aristotle's ideas about reality and knowledge formed the basis of realism, and later developed into empiricism

Activity

Why do you need to do this activity?

- To identify the keywords or phrases in the objectives

Guidelines

Study-read the study objectives at the beginning of this study unit. Complete the following sentences by filling in the appropriate keywords or phrases.

(1) ..... and, later, ... developed from Aristotle's concept of science.
(2) The ..... of the Greek philosophers' ideas about science.
(3) Plato's views of ..... and .....
(4) Socrates's views of ....., ... and .....
(5) Aristotle's views of ..... and .....
(6) ..... and, later, ... developed from Plato's concept of science.

You should have filled in the following key terms and phrases:

(1) Realism; empiricism
(2) characteristic features
(3) reality; knowledge
(4) self-knowledge; knowledge; Socratic dialogue

(5) reality; knowledge
(6) Idealism; rationalism

2.1.1 Characteristic features of scientific thought in this period

The Greek philosophers' notions of what science is relate to the following characteristic features of the philosophy of the period:

- Humans are rational beings and human reason is primary, so true knowledge is determined by reason or the mind. The Greek ideal was ''sophia,'' meaning wisdom, which should not be confused with learning or scholarship or academic achievement. The main characteristic of a wise person was seen as the ability to discern rationally so as to obtain knowledge of people and reality.
- Through their scientific thinking the Greek philosophers tried to penetrate to the essence of things via observable phenomena. Take the concept of ''nature'' derived from the Greek word ''phusis''. Nature is not just the world of observable things; it is the true character and essence of these things that which makes things – what they are.
- Reality forms one great, orderly and harmonious whole known as the cosmos. The human intellect is capable of understanding the cosmos.
- The assumption was that the orderly whole or cosmos is objectively knowable.

A c t i v i t y

Why do you need to do this activity?

- To indicate the characteristic features of the Greek philosophers' scientific ideas

Guidelines

Study-read the information above.

Some of the statements below do not reflect the Greek philosophers' scientific ideas. Mark these statements by making a cross in the relevant block.

(i) Humans are irrational beings. ☐
(ii) The Greek philosophers tried to penetrate to the essence of things via observable phenomena. ☐
(iii) Reality forms one great, orderly and harmonious whole (cosmos). ☐
(iv) The human mind cannot know reality objectively. ☐
(v) Because human reason is primary, the human mind or reason can attain true knowledge. ☐
(vi) ''Wisdom'' and ''learning'' (scholarship) are synonymous. ☐
(vii) The human mind can understand the cosmos or orderly reality. ☐

You should have marked the following statements with a cross:

(i)

(iv)

(vi)

The rest of section 2.1.1 contains the background to the Greek philosophers' scientific thinking. You just need to read this information.

Greek philosophy of science can be divided into three phases:

- the period of natural philosophy, which focused mainly on the origin, character and structure of nature
- the classical period, which focused on human beings' place in nature
- the late period, when Greek philosophy dominated; it ended after Plato's death and the closing of the Platonic Academy in 529 CE

During the first period the philosophers concerned themselves with questions relating to the origin and nature of reality. When they paid attention to human beings at all, they did so mainly in the context of the religion of the time. During the classical period the focus shifted, and human beings became the centre of scientific interest. As students of the human sciences, our main concern is with the Greek philosophers of the classical period and their conceptions of science. This period started at the end of the Persian wars (466 BCE) and continued until Aristotle's death in 322 BCE.

The search for knowledge and the beginning of systematic scientific work are generally traced to the three great Greek philosophers of the classical period: Socrates (470–399 BCE), Plato (428–348 BCE) and Aristotle (384–322 BCE). Socrates's contribution to the development of science is associated mainly with his epistemology. Plato and Aristotle grappled with the question: ''What is reality and how can we know it?''

The late period was marked by the decline of Athens. This period is also known as the Hellenistic era. During this period, people began to question the traditional values of Greek civilisation. One of the schools of thought dating from this time, known as scepticism, questioned all certainty about truth, knowledge and generally accepted values.

2.1.2 Socrates

Socrates's main epistemological premise is summed up in his ideas about self-knowledge and knowledge, which found expression in the Socratic dialogue. He assumed that humans are rational beings with the ability to understand. True knowledge or wisdom is therefore hidden in every being in the form of unchanging concepts that are, so to speak, just waiting to be discovered. Self-knowledge consists in becoming aware of, and gaining insight into, these unchanging concepts which are present in all human beings because human beings are ration. Socrates's insistence on self-knowledge implies that nobody can obtain true knowledge unless he or she starts with self-knowledge and self-criticism. Socrates's famous claim that he was the wisest of all human beings because he knew that he did not know was not a confession of ignorance, but rather an acknowledgement that he did not yet understand himself properly. For this reason he could not claim to have worked out a complete system of true knowledge.

His view of knowledge was that all true knowledge is knowledge of general concepts. Knowledge of phenomena (in a broad sense) comes from empirical or sensory observation as well as from the concepts and opinions that one finds among people. When Socrates studied a concept such as ''justice'', for example, he would observe many examples of justice as it occurred in practice and in people's ideas. Then, through comparison and analysis, he would arrive at a formulation or definition of

justice. His aim was therefore to define justice as a general concept (the essence of justice). This method gave rise to the principle of induction. Through his formulation or definition of concepts Socrates emphasised the importance of conceptualisation, or the clear demarcation of concepts in scientific work.

Socrates's main scientific method of collecting knowledge was conversations. This method became known as the Socratic dialogue. He believed that truth emerged from the interaction between questions and answers, which he used to lead people to self-knowledge and true insight. In the course of rational conversation he critically assessed individuals' opinions, corrected and supplemented them, and in the end reformulated them as universally valid definitions.

A c t i v i t y

Why do you need to do this activity?

- To understand Socrates's views of self-knowledge, knowledge and dialogue

Guidelines

Study-read the information above on Socrates's idea of science.

Indicate whether each of the following statements about Socrates's idea of science is true or false by writing T in the block if the statement is true, or F if it is false.

(i) Human beings are not capable of rational understanding. ☐

(ii) Knowledge lies outside a person and is, so to speak, just waiting to be discovered. ☐

(iii) Nobody can have knowledge unless he or she starts with self-knowledge and self-criticism. ☐

(iv) Knowledge is based partly on sensory observation. ☐

(v) Socrates's method first introduced the principle of induction. ☐

(vi) Socrates was the first to emphasise the importance of the clear definition of concepts (conceptualisation). ☐

(vii) The Socratic dialogue was a method of conversing with the purpose of leading the dialogue partners to self-knowledge. ☐

All the statements were true except (i) and (ii).

2.1.3 Plato

Plato was Socrates's pupil and Aristotle's teacher. In the context of our discussion in this theme, Plato is known mainly for the following:

- He supported the idea that rationality (mind or reason) dominates human life. Plato's view of human rationality was the core and basis of his concept of science and was expressed in his famous Theory of Ideas, in which he stated his view of the

nature of reality and how it can be known. This was Plato's greatest contribution to later scientific thought.

- He was the founder of the famous Platonic (also called Athenian) Academy. It was the first known institution for tertiary education, and can be regarded as the forerunner of modern universities. The Academy existed for nearly nine centuries.
- Most important for our discussion is Plato's view of the nature of reality and how we can obtain knowledge of it. Plato's scientific ideas about reality and knowledge rest on the notion of a dualism between the world of sensory observation and the world of ideas.
  - On the one hand there is the given world (empirical reality) of sensory observation, which is changeable and transient or impermanent. This world is not a true, unchanging reality, and is considered inferior. Our sensory observation and the material world can produce only opinions, not true knowledge. True knowledge is unchanging, certain and final and we can only obtain it from an unchanging reality.
  - Beyond the given world of sensory observation is a **world of ideas**. The word "idea" refers to a notion or concept that cannot be perceived by the senses, but can only be known through human reason or the mind. This means that true reality is not the world of sensory observation and changing, transient phenomena, but the realm of eternal, unchanging and indestructible ideas to which people have access only through the mind or reason.

Activity

Why do you need to do this activity?

- To distinguish between Plato's given world or empirical reality and his world of ideas

Guidelines

Study-read the information above. Then read the statements below.

(1) True reality is a realm of eternal ideas.
(2) The things we observe around us are subject to change.
(3) We have access to reality only through human reason.
(4) True knowledge is not knowledge or opinions about the world of sensory observation.
(5) True reality does not consist of transient phenomena, but of ideas.
(6) What we perceive with our senses is not true, eternal reality.

Now write the number of each statement in the appropriate category of the framework below.

World of sensory observation	World of ideas

Your completed framework should have looked like this:

World of sensory observation	World of ideas
2 4 6	1 3 5

Plato placed the emphasis on people's rational ability and presented a rational construction of an unchanging, eternal world of ideas as the essence of science. The scientist's task is to gain knowledge of this unchanging, ideal reality through pure rational thought and conceptualisation. This means that reality is dependent on the human mind, or is somehow determined by it. This view of reality later became known as idealism, and laid the foundation for rationalism.

A c t i v i t y

Why do you need to do this activity?

- To distinguish between the concepts ''idealism'' and ''rationalism''

Guidelines

Study-read the information above. The following statements about the concepts ''idealism'' and ''rationalism'' are incorrect. Rewrite them in your own words in the space provided and correct the mistakes.

(i) Idealism holds that the human intellect or reason is secondary and that reality can be construed through sensory observation.

Correction:

.....
.....
.....
.....

(ii) Rationalism is an approach that emphasises the importance of experience and sensory observation as a source of knowledge.

Correction:

.....
.....
.....
.....

Your corrections should have contained the following ideas:

(i) Idealism holds that only ideas actually exist and that the world of sensory observation is an illusion. The human mind dominates, and what we perceive is construed by the intellect. Reality is therefore determined by the mind.

(ii) Rationalism is an approach that emphasises the importance of human reason or intellect in research and scientific work. We must accept only knowledge that the human mind can understand.

2.1.4 Aristotle

This Greek philosopher, in contrast to Plato, emphasised a sense of realism in the search for the essence of things. From his reflections on questions such as ‘‘Do the things around us really exist?’’ and ‘‘How do they exist and why are they the way they are?’’, he concluded that the world of sensory observation (empirical reality) is the only true, concrete reality. Scientists can know the world only through experience and can explain phenomena rationally through sensory observation. Before Aristotle, scientific explanation of phenomena through empirical observation and rational reflection was fairly undeveloped and was mixed with a measure of superstition and mythic tradition. Aristotle not only helped to get rid of the mythic element, but also laid the foundation for the development of empirical studies on a scientific basis.

Socrates introduced induction as a scientific method. In addition to induction, Aristotle also recognised **deduction** as a scientific method.

Aristotle’s views about reality (the empirical world) and knowledge (through sensory observation) later became known as realism. This approach holds that objects exist independently of the human mind and can be known by the human intellect or reason. In other words, there is a physical reality that exists independently of the human mind. This premise provided the basis of 17th and 18th century empiricism.

A c t i v i t y

Why do you need to do this activity?

- To distinguish between the concepts ‘‘realism’’ and ‘‘empiricism’’

Guidelines

Study-read the section above.

The following two statements about realism and empiricism are both incorrect. Rewrite them in your own words in the space provided and correct the mistakes.

(i) Realism holds that reality is an ideal world and can only be known through rational thought.

Correction:

.....
.....
.....
.....

(ii) Empiricism is an epistemological theory which emphasises the importance of human reason in the process of obtaining knowledge.

Correction:

.....
.....
.....
.....

Your corrections should have contained the following ideas:

(i) Realism holds that observable reality exists independently of the human mind. It focuses on concrete things around us that we perceive through our senses.

(ii) Empiricism is a theory that accepts experience or sensory observation as the only source of scientific knowledge about reality.

Self-assessment exercise

.....

(a) Socrates's main epistemological premises are contained in his views on (write them down):

(i)
(ii)
(iii)

(b) Complete the following sentences by filling in the missing words, phrases or terms.

(i) Plato's view of human ..... was the core and basis of his idea of science and was contained in his famous .....

(ii) The basic structure of Plato's scientific ideas about reality and knowledge is a ..... . On the one hand there is a ....., and above it there is an ..... .

(iii) True reality is not the world of sensory observation but the eternal realm of ....., to which people have access only through ..... or the ..... .

(iv) The scientist's task is to gain knowledge of reality through pure ..... and ..... . This view of reality later became known as ..... .

(c) Indicate which three of the following statements relate to Aristotle's idea of science by making a tick in the relevant blocks.

(i) The world of sensory observation is the only sure, concrete reality. ☐

(ii) Reality is what humans construe rationally (through intellect or reason). ☐

(iii) Aristotle introduced deduction as a scientific method. ☐

(iv) Reality can be known only through empirical observation. ☐

STUDY UNIT 2.2

The renaissance

After studying this unit you should be able to

- describe the development of scientific thought in the natural sciences during the Renaissance
- explain what the term ‘‘humanism’’ means and how this approach developed during the Renaissance

Activity

Why do you need to do this activity?

- To identify the keywords or phrases in the learning objectives

Guidelines

Study-read the study objectives at the beginning of this study unit. Circle the key terms and concepts.

The key terms and concepts you circled should have included the following:

- development of scientific thought during the Renaissance
- development of humanism

In the scientific sphere the Renaissance (14th to 16th centuries) is known particularly for developments in two areas: the natural sciences and humanism.

2.2.1 The natural sciences

During the Middle Ages, thinkers followed ancient ‘‘authorities’’ and their ideas about nature. The natural scientists of the Middle Ages never tried to prove anything experimentally, and quite happily accepted the claims and statements of the ‘‘authorities’’ of antiquity. During the Renaissance the natural sciences were revived when the Renaissance scholars broke free from the views of ancient ‘‘authorities’’ and began to study nature, both animate and inanimate, for themselves. Observations based on their own senses replaced speculations based on theoretical knowledge. During the Renaissance the focus also shifted specifically to the mathematical

sciences. The mathematical character of the natural sciences led to a methodological accuracy and exactitude which impressed people. This gave rise to the idea that natural science held the key to all human problems, and had limitless possibilities.

2.2.2 Humanism

Alongside this interest a new spirit arose in Western Europe, namely humanism. Humanism can be defined as a school of thought or approach which placed human beings and their world in the spotlight. At first humanism was associated with the realisation of true, free humanity. According to the humanists of the time, the ancient Greek and Roman writers had already to a great extent described this ideal. This explains the humanists' intense interest in classical writings. What is significant for us as students of the human sciences is the development of these **human sciences** as a new branch, in addition to the natural and religious sciences. Later (especially in the 20th century) the concept of humanism broadened to include approaches that focused on human beings and humanity. **In the philosophy of science, humanism is usually seen as an alternative to positivism, as explained in theme 1.**

A c t i v i t y

Why do you need to do this activity?

- To distinguish between developments in the natural sciences and developments in humanism during the Renaissance

Guidelines

Study-read sections 2.2.1 and 2.2.2 above. The statements below relate to developments in either the natural sciences or humanism during the Renaissance. In each case, circle the correct alternative.

(1) The focus was on the importance of human beings and humanity. Natural sciences/Humanism
(2) Accuracy of knowledge was emphasised. Natural sciences/Humanism
(3) Attention was focused on mathematical methods. Natural sciences/Humanism
(4) Great importance was attached to human freedom and the essence of human nature. Natural sciences/Humanism
(5) The foundation was laid for the development of the human sciences. Natural sciences/Humanism
(6) Knowledge of natural sciences can be used to solve human problems. Natural sciences/Humanism

You should have circled the following alternatives:

(1) Humanism
(2) Natural sciences
(3) Natural sciences
(4) Humanism
(5) Humanism
(6) Natural sciences

Self-assessment exercise

.....

(a) Indicate whether each of the following statements about the development of scientific thought in the natural sciences during the Renaissance is true or false. In each case, write T in the block if the statement is true, or F if it is false.

(i) Natural scientists during the Renaissance relied heavily on the ideas of ancient authorities'' about nature.
(ii) Renaissance scholars started making empirical observations of nature and experimenting with nature rather than relying on outdated theoretical knowledge.
(iii) The mathematical sciences flourished during the Renaissance.
(iv) During the Renaissance the natural sciences lost their exactitude.

(b) The following statements relate to the development of humanism during the Renaissance. Fill in the missing words or phrases.

(i) Humanism is a school of thought in which ..... and their ..... were placed in the spotlight. ☐
(ii) The establishment of humanism during the Renaissance laid the foundation for the development of the ..... sciences. ☐

STUDY UNIT 2.3

Rationalism and empiricism in the 17th and 18th centuries

After studying this unit you should be able to

- distinguish between the premises of rationalism and empiricism
- explain the difference between objectivism and subjectivism

Activity

Why do you need to do this activity?

- To identify the key terms or phrases in the learning objectives

Guidelines

Study-read the study objectives at the beginning of this study unit. Rewrite the key terms or phrases in your own words below.

The key terms or phrases you wrote down should have included:

- distinction between rationalism and empiricism
- difference between objectivism and subjectivism

2.3.1 Introduction

Scientific development in the 17th and early 18th century amounted to a scientific revolution which also influenced the general idea of science. During the preceding era very little systematic, organised scientific thought had taken place. Now there was a concerted effort to organise and systematise the wealth of scientific data and findings and reduce it to elementary principles. The overemphasis of analysis made way for a new focus on construction. Two other characteristics of the period were the following:

- The old scholastic approach was increasingly replaced by critical thought.
- The emphasis now fell on human reason.

"Truth" became the main criterion of scientific knowledge, and people believed that science was indeed a system of true knowledge. Scientists merely had to agree on

what that truth was. The scientific debate on issues such as what constituted reality, truth and knowledge gave rise to the rationalist and empiricist approaches of that period.

2.3.2 Rationalism

Rationalism is a broad philosophical approach. It is based on Plato's thinking and has significant implications for the idea of science. The underlying philosophy of 17th and 18th century rationalism – idealism – tried to explain the world in terms of ideas and thoughts and to identify some sort of spiritual basis for all existing things. To arrive at true knowledge, for example, scientists had to turn to the abstract level. ''Abstract'' is the opposite of concrete, and so refers to

- things that cannot be perceived directly through the human senses
- things that do not relate to the visible world

We can state this differently, and say that true understanding of any phenomenon is not a matter of its physical form, but the form it assumes in the human mind. The actual truth of anything that we perceive exists only in the abstract. What we see and experience, then, is not truth, but mere objects of perception, like shadows on the wall. As a result, all the emphasis was placed on human reason.

With regard to the origin of knowledge, the rationalists believed that knowledge came from both sensory observation and intellect, but that only intellect could produce true, reliable and valid knowledge. Knowledge obtained via the senses was viewed as unclear, questionable and only relatively valid. Human reason was seen as the primary source of knowledge. In explaining human behaviour, rationalism held that behaviour is the outcome of logical, conscious decisions by an individual rather than a product of irrational, unconscious forces.

Rationalism springs from the antinaturalist tradition, which we discussed in theme 1. This antinaturalist tradition gave rise to antipositivism or humanism, with its qualitative research methodology.

2.3.3 Empiricism

Empiricism is another broad philosophical approach that grew from Aristotle's realism. The empiricist axiom is that objects exist independently of the human mind and can be known by the human mind. Like rationalism, the principles of empiricism have implications for the philosophy of science and specifically for the scientific idea.

Empiricism takes experience as its point of departure. All knowledge is based on experience. (This is the direct opposite of rationalism, which takes human reason as its point of departure.) According to the empiricists, knowledge can be obtained only through sensory observation. It is not innate and cannot be obtained through reasoning. Empirical knowledge is therefore based on observation and experience rather than on pure speculation and reflection. This premise gives rise to certain methodological principles, including the views that

- science should occupy itself only with objective, observable things, and scientific facts must be verifiable

  and

- the environment plays a role in the development of an individual's or a group's characteristics and capabilities.

This school's critical attitude towards rationalism is based on naturalism, which we discussed in theme 1. Ultimately empiricism led to positivism, the basis of quantitative research.

Activity

Why do you need to do this activity?

- To distinguish between the concepts ''rationalism'' and ''empiricism''

Guidelines

Study-read sections 2.3.1, 2.3.2 and 2.3.3. The following statements relate to rationalism and empiricism. In each case, circle the correct alternative.

(i) The rationalist approach originated from Aristotle's/Plato's views.
(ii) Realism/Idealism holds that objects exist independently of the human mind and can be known by human beings.
(iii) Empiricism/Rationalism holds that knowledge is based on experience.
(iv) Rationalists/Empiricists argue that knowledge is based on empirical observation rather than on pure speculation or reflection.
(v) Empiricists emphasise the rational powers of human beings/sensory observation of reality.

You should have circled the following alternatives:

(i) Plato's
(ii) realism
(iii) empiricism
(iv) empiricists
(v) sensory observation of reality

The one-sided emphasis on either human reason (Plato, and later rationalism) or sensory observation of reality (Aristotle, and later empiricism) in the scientific idea culminated in the dogmatic absolutisation of both approaches. ''Dogmatic absolutisation'' means clinging to one's own view and refusing to consider anyone else's opinions or new information. Empiricism was a result of the absolutisation of objectivism, and rationalism was a result of the absolutisation of subjectivism.

Self-assessment exercise

.....

(a) Complete the following sentences:

(i) Objectivism proceeds from the premise that

.....
.....

(ii) Subjectivism proceeds from the premise that

.....

.....

(b) Circle the correct alternatives:

(i) With which of the following philosophers do you associate rationalism?

(a) Socrates
(b) Plato
(c) Aristotle

(ii) Idealism emphasises

(a) sensory observation.
(b) dialogue.
(c) human reason.

(iii) Empiricism can be traced to

(a) Aristotle.
(b) Plato.
(c) Socrates.

(iv) Which of the following keywords or phrases would you use to explain the main premise of empiricism?

(a) intellect
(b) logical decisions
(c) sensory observation

Review

.....

In the first theme we pointed out the differences between the naturalist and antinaturalist approaches in the philosophy of science. We also mentioned that the quantitative and qualitative research methodologies respectively developed from positivism and humanism. We began this theme by explaining that the development of the scientific idea was triggered by the philosophical question, ''What is science?'' The purpose of this theme was to indicate briefly how the scientific idea developed. We have given you just an overview, however.

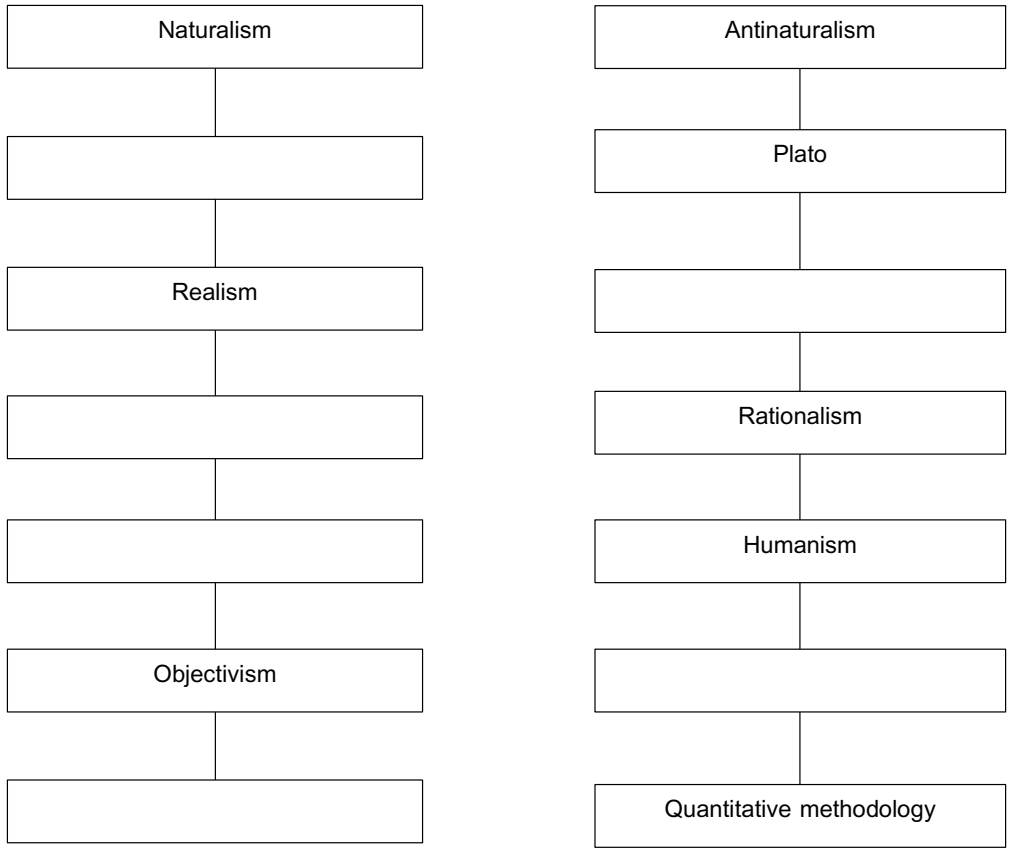
Activity

Why do you need to do this activity?

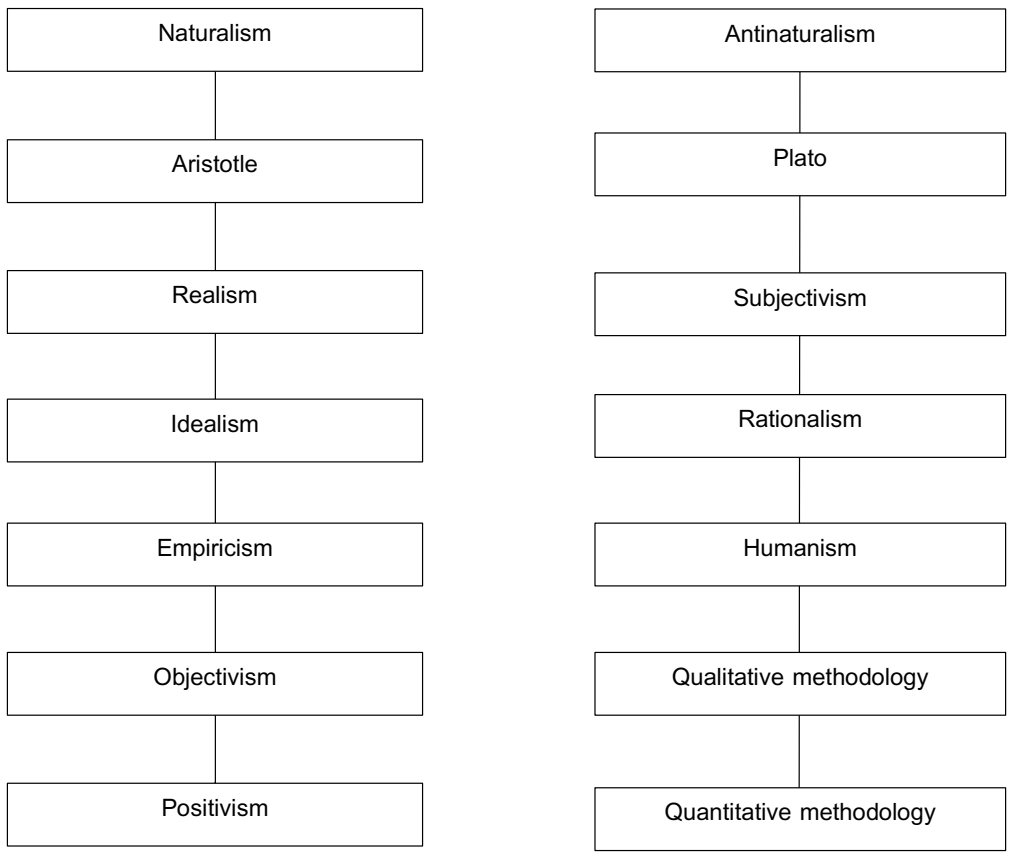
- To show the connection between the study material in themes 1 and 2

Guidelines

Read themes 1 and 2 as a whole. Below is a diagram of the content of these two themes. Complete the diagram by filling in the missing information.



Your completed diagram should look like this:



Answers to self-assessment exercises

THEME 2

Study unit 2.1

(a) (i) knowledge
(ii) self-knowledge
(iii) Socratic dialogue

(b) (i) rationality; theory of Ideas
(ii) dualism; given world of sensory observation; ideal reality
(iii) ideas; reason; intellect
(iv) rational thought; conceptualisation; idealism

(c) (i) ☑
(ii) ☒
(iii) ☑
(iv) ☑

Study unit 2.2

(a) (i) F
(ii) T
(iii) T
(iv) F

(b) (i) human beings; world
(ii) human

Study unit 2.3

(a) (i) there is a reality existing independently of human beings and that the human mind can perceive and know that reality.
(ii) human consciousness is the primary reality and that the only reliable way of knowing reality is through individual experience.

(b) You should have circled the following alternatives:

(i) b
(ii) c
(iii) a
(iv) c

THEME 3

Quantitative measurement

Introduction

Quantitative research can be defined as the type of research in terms of which observations of a phenomenon or phenomena are described through **numerical** discourse. This type of research refers to the systematic empirical investigation of quantitative traits and phenomena and involves the collection and analysis of **numerical data** to identify statistical relations. More specifically, in this context, quantitative research is associated with research that seeks to explain crime in **causal** terms for example, you may want to relate changes in the crime rate to changes in other features, such as levels of unemployment. The justification in using statistical data arises from the idea that most social problems are best understood through positivism or the positivistic application of science. One of the hallmarks of quantitative research is that there is already an established theory and practice that has been built up over a number of centuries. In this theme we focus on the vital aspect of quantitative measurement. This theme is divided into five units.

Study unit 3.1: The concepts of validity and reliability

3.1.1 When is thought or reasoning valid?
3.1.2 The validity and reliability of knowledge
3.1.3 How do we test the validity of knowledge?

Study unit 3.2: Levels of measurement

3.2.1 The nominal level of measurement
3.2.2 The ordinal level of measurement
3.2.3 Interval measurements
3.2.4 Ratio measurements

Study unit 3.3: Measures of central tendency

3.3.1 The mode
3.3.2 The median
3.3.3 The mean

Study unit 3.4: Measures of dispersion

3.4.1 Index of dispersion
3.4.2 The range
3.4.3 The variance and the standard deviation

Study unit 3.5: Hypotheses and levels of statistical significance

3.5.1 Types of hypotheses
3.5.2 Levels of statistical significance

Review

STUDY UNIT 3.1

The concepts of validity and reliability

In this unit you will learn more about validity and reliability as criteria of scientific knowledge. Although the concepts ‘‘validity’’ and ‘‘reliability’’ do not mean exactly the same thing, the two terms are often used in the same context to refer to requirements that scientific knowledge has to satisfy.

3.1.1 When is thought or reasoning valid?

The epistemological relationship (the relationship between subject and object) is a rational relationship, that is, a relationship in which intellect plays a significant role. Intellect translates perceptions into concepts, analyses the concepts and draws conclusions. We call this activity ‘‘thought’’ to indicate the particular way in which the intellect acts. (Because of this, thought can be regarded as a major component of knowledge. Positivists do not always agree with this statement, however.)

Thought (or reasoning) is valid (logical) when it does not conflict with the rules of reasoning (or laws of logic). The laws of logic are principles of reasoning which we can define as formal rules that all thought must obey in order to be valid. These laws are a priori. This means that they are not learnt from experience, but are instead accepted as given. The laws of logic are

- independent of experience and true in all places and at all times (in other words, they are true a priori)
- essential for organising our thinking scientifically
- descriptive, that is, they provide a form for the exact description of the activity of reasoning
- prescriptive, that is, they provide the absolute conventional or established standards of correct reasoning

We will now briefly discuss some of the most important traditional laws of logic or fundamental rules of reasoning.

- **Principle of identity**

This rule requires that we should in all instances of reasoning use a term consistently in the same way or with the same meaning.

Example: A = A. When we say that A = A, we are not providing any additional information about A except that the term is repeated. It implies that if we do add something to A or omit something from A, then we are no longer speaking about A. So when I say A = A, I am also saying that A remains A in all situations. A remains the same in spite of changes that happen around A.

- **Principle of noncontradiction**

We can express this rule as follows: A cannot be both B and non-B at the same time; we cannot both affirm and negate something simultaneously. For example, a chair cannot be both grey and not grey at the same time.

The principle of noncontradiction tells us that the same thing cannot at the same time both have and not have certain characteristics; the same statement cannot be true and false at the same time.

- **Principle of sufficient reason (also known as the principle of rationality)**

The basic axiom or rule is the following: any existing thing or true statement must have sufficient reason for being the way it is and not some other way. For example, we have to give reasons, justification or corroboration to prove that a statement or argument is true or valid.

- **Principle of cohesion**

The truth of a statement (eg an argument) depends on its cohesion with other statements. This principle relates to **analysis**and **synthesis**. Whereas analysis refers to taking a phenomenon apart, synthesis refers to establishing a relation between the cohering parts.

The logical principle of cohesion relates to synthesis. Knowledge should not be broken up into separate parts, because then there is a danger that words, ideas and statements may become meaningless. In the lifeworld, too, things do not exist atomistically, but occur in contexts and relationships which give meaning to the individual things.

The statement, ''This person is a criminal'', for example, can only be meaningful in relation to what precedes it and what follows is. (Has the person committed a crime? What was the nature of the crime? Has the person been convicted by a court? and so on.)

A c t i v i t y

Why do you need to do this activity?

- To distinguish between the major traditional laws of logic

Guidelines

Study-read the information above on the fundamental laws of logic. On the dotted line next to each of the statements below, indicate which principle of logic applies to it.

(1) An argument cannot be both correct and incorrect at the same time.

.....

(2) The truth of a statement depends on whether or not its cohesion has been demonstrated convincingly.

.....

(3) The meaning that is attached to a concept must be unambiguously the same in all instances.

.....

(4) A claim must be supported by rational proof or logical reasons.

.....

Your answers should have been as follows:

(1) Principle of noncontradiction
(2) Principle of cohesion
(3) Principle of identity
(4) Principle of sufficient reason

3.1.2 The validity and reliability of knowledge

The term ‘‘validity’’ refers to a methodological requirement set for

- research activities (eg observation, use of measuring instruments and other techniques)
- research findings (eg the analysis and interpretation of collected data, conclusions from analyses)

So if we say that knowledge is valid, we are referring to

- an absence of **systematic bias** and **unsystematic (chance) errors**. These terms indicate
  - preferences or an illogical attitude on the part of the researcher
  - errors that may sneak in during data collection and processing
- the existence of a close correlation between activities performed in the research process, the research results and the study object

We speak of internal validity and external validity.

Internal validity refers to validity **within the research process or project**. Internal validity includes **three** kinds of validity: conceptual validity, content validity and inferential validity.

- Some aspects of a study object may be only partially or not at all accessible through sense perception, for example attitudes to the death penalty and fear of crime. You would research aspects like these by means of theoretical and hypothetical concepts in, for example, a questionnaire. In the following cases you could claim **conceptual validity:**
  - if the concepts (eg items in a questionnaire) accurately express the aspect that you are investigating (eg fear of crime)
  - if the meaning of the concept really captures and reflects the meaning of the aspect that you are investigating (see conceptualisation and operationalisation in theme 4)
  - Conceptual validity is sometimes called theoretical validity.
- **Content validity** (validity of measurement) usually becomes an issue when measuring instruments (eg questionnaires) or observation schedules are used. The following questions have to be answered: Are the instruments suitable for

examining the study object? Do they really test and measure what they are supposed to test and measure?

- **Inferential** (or logical) **validity** refers to the extent to which research results can be logically inferred from the research setup. One question is whether the research data offer enough evidence or support to allow us to draw certain conclusions according to the laws of logic. Since inferential validity refers to the validity of logical arguments in scientific work, we should briefly explain the difference between inductive and deductive arguments. A logical argument (in which statements are made to support or corroborate certain conclusions that are drawn) consists of two parts: statements made to support or prove a conclusion (premises); and the conclusion itself. We can represent a typical argument schematically as follows:

Statement or premise 1 Statement or premise 2 Statement or premise 3	**Premise of argument:** reasons for or justification or corroboration of the conclusion
Conclusion or inference	**Conclusion or argument:** statements made on the basis of the premises; what "follows logically" from the premises

The relation between premises and conclusion depends on support or corroboration. This makes it possible to distinguish between two types of arguments. In **deductive arguments** the claim is that the conclusion follows from the premises with absolute certainty. That is to say, if the premises are valid, so is the conclusion.

Here is an example of a deductive argument:

Premise 1: Shortly after Jack was assassinated, James was seen in the bar from which the shots were fired.

Premise 2: James's fingerprints were found on a gun that was found in the bar.

Premise 3: An eyewitness identified James as the assassin.

Premise 4: Ballistic tests showed that James's gun could have fired the fatal shot.

Conclusion: James assassinated Jack.

This argument is deductive because the conclusion follows with absolute certainty from the premises.

In **inductive arguments** there is some relation between premises and conclusion (the supporting evidence is relevant), but the premises offer only a (considerable) degree of support for the conclusion, so that the conclusion is characterised by a high degree of probability.

Here is an example of an inductive argument:

Premise 1: James said in front of witnesses that he wanted to kill Jack.

Premise 2: Shortly after Jack was assassinated, James was seen in the bar from which the shots were fired.

Conclusion: James assassinated Jack.

This argument is inductive because

- there is some relation between the premises and the conclusion or inference
- the relation is based on probability

External validity refers to the generalisation of the findings and conclusions of a study to a larger group of similar phenomena. (We are speaking of research or scientific work of universal or generalised/representative significance.) Not all research has to meet the requirement of external validity (eg qualitative research or scientific work of contextual significance need not be externally valid).

Let us explore the question of validity in relation to empirical scientific work of contextual significance (research done according to a qualitative methodology) and validity in relation to empirical scientific work of universal or generalised significance (research done according to a quantitative methodology).

We know from experience that (almost) everything that is said and every question that is asked is said or asked in a certain context. If we ignore this context we run the risk of misconstruing or misinterpreting what has been said or asked. The more complete the context, the clearer the meaning of what has been said or asked. Not only the things we say but also our actions are contextual, including actions that are not accompanied by words. Raising a wine glass, for example, could be any of the following actions, depending on the context: drinking a toast, clinching a deal or participating in a religious ceremony.

From this it should be evident that scientific work has both contextual significance and a more representative or universal significance in the lifeworld. There is no rigid separation between the two kinds of significance. It would be more correct to say that the contextual significance and the universal significance of science are actually two poles of a continuum. In the case of contextual scientific work (research), a phenomenon is studied in its immediate context for the sake of its intrinsic significance for that researcher. Examples of contextual research of contextual significance are studies in the human sciences which are aimed at researching an individual case, group or subculture in depth. Familiar instances in the criminological disciplines are studies of specific phenomena or groups such as gangs, prostitutes and bank robbers, with the aim of giving an in-depth description and explanation of the particular phenomenon or group in the unique context where it occurs. Research of contextual significance concentrates on internal validity, implying that these studies produce accurate, realistic findings of the research object. To the extent that these studies offer explanations, we speak of contextual explanation. Consider the example of the humanist researcher who studied the phenomenon of gangs in prisons (study unit 1.2).

When scientists study phenomena for the sake of their universal significance, they want their research object to be a representative example of a larger group or population of similar phenomena. Often the aim of this kind of research is to study a representative group of phenomena or people and then to generalise the findings of the study to a (circumscribed) population. Hence the significance of these generalising studies is not determined by the uniqueness of the research group. In fact, the research group is chosen precisely because it is representative of a larger population. So what we have is a sample of the total population. To produce universal results, the

sample must be representative. When the findings of such a study can be generalised to all similar cases, these findings can lay claim to external (universal) validity (as well as internal validity). It follows that the range of explanation of this kind of study is universal. Consider the example of the positivist researcher who studied the phenomenon of gangs in prisons (study unit 1.2).

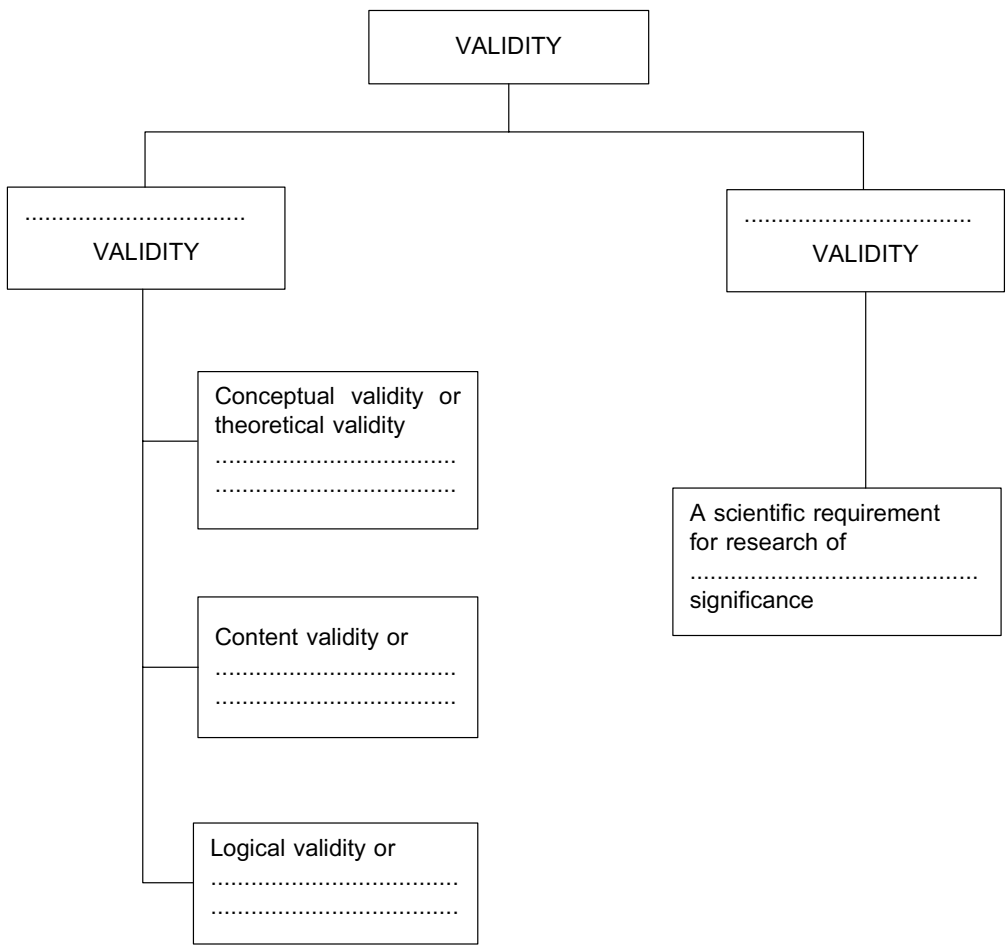
A c t i v i t y

Why do you need to do this activity?

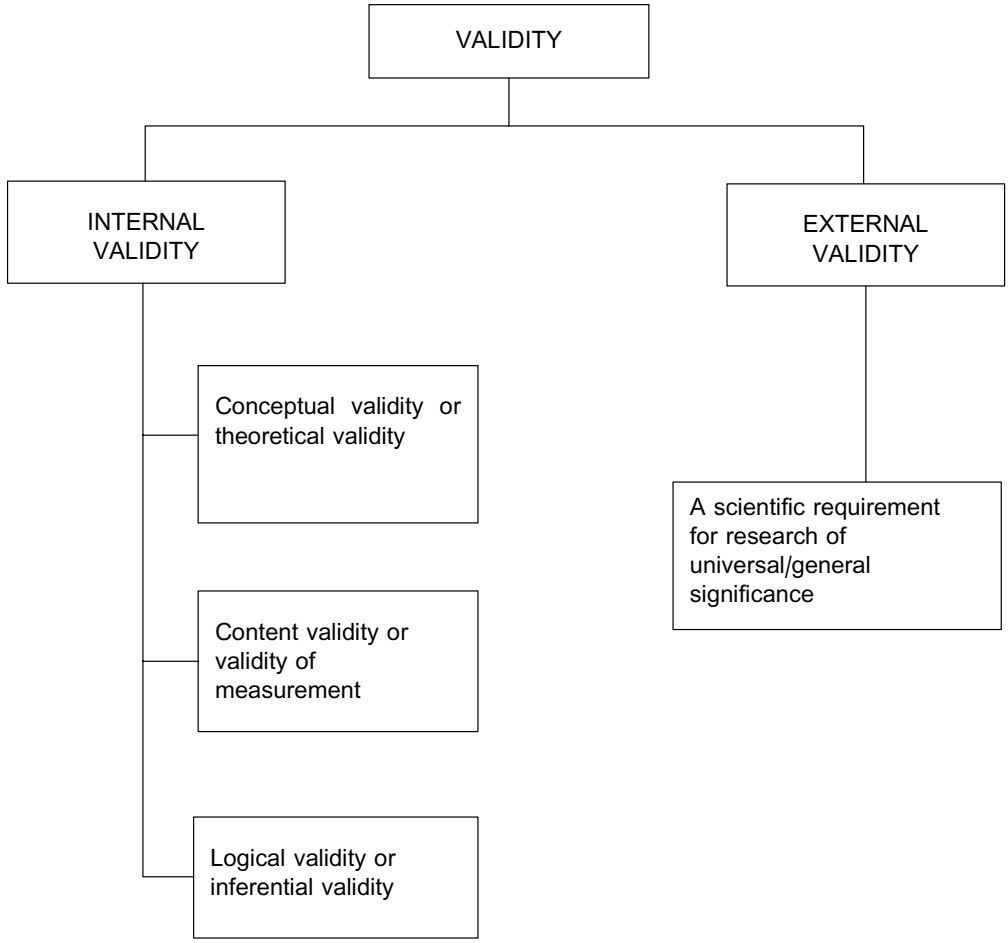
- To distinguish between internal and external validity

Guidelines

Study-read the information above on internal and external validity and research of contextual and universal significance. Below is a diagram representing the key concepts. Complete the diagram by filling in the missing information.



- Your completed diagram should have looked like this:



The term ''reliability'' normally refers to the repeatability of studies and research results by other researchers who use the same methods and techniques in similar research situations. Reliability implies that both the researcher or research team and the research object are characterised by a high degree of stability. (The stability of the observer or the research object cannot always be assumed.) There is a difference between external and internal reliability.

- External reliability relates to the repeatability of studies and research findings.
- Internal reliability requires consensus among researchers about what happened in a research project and about the exact results of a piece of research.

3.1.3 How do we test the validity of knowledge?

Positivist researchers and supporters of quantitative research methodology tend to emphasise the testability of knowledge. For the validity of knowledge to be testable, that knowledge has to meet certain requirements (known as scientific requirements).

To make it possible for scientists to test or control knowledge (in their search for true, certain or valid knowledge), that knowledge usually has to meet the following three requirements:

- The way in which the knowledge was obtained must be repeatable (reliable). The scientist's method (arguments, choice of research object, data collection, analysis,

interpretation of results, and findings) should be accessible to other scientists for careful critical evaluation. For example, if we say, ''All water boils when it is heated to a certain temperature'', we are making a universal statement. This is acceptable, because the statement can be tested at any time simply by heating water to that temperature. If this were not possible, the statement would not be scientifically valid.

- Knowledge must be obtained through systematic observation.
- Data must be collected in a controlled way.

Self-assessment exercise

.....

(a) Define the concepts below. In each case, write just one sentence.

(i) Laws of logic:

.....

(ii) A priori:

.....

(b) Explain the following principles. In each case, your answer should not be longer than eight lines.

(i) Principle of identity

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(ii) Principle of noncontradiction

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(iii) Principle of rationality

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(iv) Principle of cohesion

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(c) The following sentences relate to the concept ''validity''. Complete each sentence by filling in the key terms or concepts.

(i) There are two kinds of validity, namely ..... and..... validity.

(ii) Internal validity refers to

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.....

(iii) External validity refers to

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.....

(d) Write each of the terms or phrases from the list below on the dotted line below the sentence that best defines its meaning.

inductive argument
validity of measurement
conceptual validity
deductive argument
inferential validity

(i) Concepts should accurately express the things that are being investigated.

.....

(ii) The conclusion necessarily follows from the premises.

.....

(iii) It becomes an issue when measuring instruments or observation schedules are used.

.....

(iv) It relates to the extent to which research results can be deduced logically from the research setup.

.....

(v) The premises offer only probable support for the conclusion.

.....

(e) Draw a line connecting each of the terms in column A with the term in column B that has the same meaning.

Column A	**Column B**
logical validity	theoretical validity
conceptual validity	validity of measurement
content validity	inferential validity

(f) The following sentences relate to the concept ''reliability''. Complete each sentence by filling in the missing information.

(i) Reliability refers to the ..... of studies and the ..... of research results by other researchers in similar research situations.

(ii) Reliability implies the ..... of the researcher(s) and the ..... of the research object.

(iii) Repeatability of studies and repeatability of research findings indicates ..... reliability.

(iv) Consensus among researchers about what happened in a research project and about the significance of the results refers to ..... reliability.

(g) State three requirements for the testability of scientific knowledge.

.....

.....

.....

.....

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.....

.....

.....

(h) Complete the following sentences by filling in the missing information.

(i) Attempts to prove a hypothesis to be true are known as .....

(ii) Attempts to prove a hypothesis to be false are known as .....

STUDY UNIT 3.2

Levels of measurement

In criminological research there are four levels of measurement of empirical data, namely the nominal, ordinal, interval and ratio levels (Hoover 1984:104; Brown & Curtis 1987:61; Phillips 1976:145, 149).

3.2.1 The nominal level of measurement

This is the "lowest" (simplest) level of measurement. Van der Westhuizen (1982:94) defines it as the allocation of numerical values to persons, things, cases or concepts according to the rule that each person, thing or concept receives exactly the same value rating in order to determine its presence or absence. In this type of measurement all cases are arranged according to different categories or characteristics in order of the frequency in which they occur (Huysamen 1976:13). In this way, each case is placed in only one category (Corbetta 2003:71). The categories are mutually exclusive. The only distinction between the categories is that they differ, for instance, with regard to race, sex and marital status. Nominal measurements of this kind have no quantitative value, and mathematical functions cannot be used to manipulate them. Race can, after all, be measured only as race. There are no other categories in which it can be measured. One of the most common inferential statistical techniques applied at the nominal measurement level by criminologists is the chi-square (Brown & Curtis 1987:61–62). The chi-square reveals whether the differences that occur are coincidental or whether they can indeed be linked to the characteristics that are being measured. We will elaborate on this important statistical technique and give a practical example in theme 5, study unit 5.4.

3.2.2 The ordinal level of measurement

This level of measurement is somewhat more complicated. It is based on principles of identity, discrepancy, and an excluded mean value (Phillips 1976:146). It arranges the data in classes from highest to lowest (Van der Westhuizen 1982:101). An example is social class, which is divided into upper, middle and lower classes (Corbetta 2003:71). When we arrange police officers in order of rank, such as sergeant, lieutenant and captain, we are applying the ordinal level of measurement. In ordinal measurement there is no definition of the distances between the categories. Therefore, mathematical functions cannot be applied to ordinal measurements (Brown & Curtis 1987:62).

3.2.3 Interval measurements

In interval measurements there is a fixed and constant distance between each point of measurement (Phillips 1976:146; Corbetta 2003:72). Van der Westhuizen (1982:106)

states that this involves the allocation of identical numerical values to differences of variable degrees, so that the intensity of the occurrence of the particular features of people, things and phenomena can be measured. There is no absolute zero. Intelligence measurements can be taken by means of interval measurements. Interval measurements are a good way of measuring crime trends. Inferential statistical techniques can be used to manipulate such data without their losing their meaning. The correlation coefficient in particular is applied in this case (Brown & Curtis 1987:62). Smit (1983:209) states that interval measurements also indicate how much one category differs from another.

3.2.4 Ratio measurements

Ratio measurements have equal intervals and an absolute zero (Van der Westhuizen 1982:114). They include all the features of nominal, ordinal and interval measurements (Phillips 1976:147). Van der Westhuizen (1982:114) states that in ratio measurement particular variations in degree of the characteristics of people, things and phenomena are arranged in such a manner that the ratios between the different variations of degree can be included. Victimisation investigations can therefore produce data that stretch from zero to any maximum frequency. Normally the interval and ratio measurements are used together in criminological research.

Hoover (1984:105) illustrates the measurement levels in the figure below.

Level of measurement	**Function**	**Illustration**	**Example**
Nominal	Classify	Xhosa/Zulu	Ethnicity
Ordinal	Classify and Order	Lower/Middle/High	Classes
Interval	Classify Order Standardise	10BC 10AD 98 °C	Time divisions Temperature
Ratio	Classify Order Standardise Absolute zero	0/20/30	Income Age Weight Distance

FIGURE 3.4: *The nature of measurement levels*

A c t i v i t y

Why do you need to do this activity?

- To identify the four levels of measurement

Guidelines

Study-read the information above, making sure that you understand how each level is relevant to criminological research.

STUDY UNIT 3.3

Measures of central tendency

Objects of the same kind may vary in terms of their dimensions and characteristics. We therefore tend to measure a reasonable number of objects if we want to find out something useful about them. To describe the scores of a data set, we use those measures that best represent a frequency distribution. We count the number of times that a data value is obtained in a sample of scores, or we refer to a table. The measures that describe scores that we will be discussing here are the mode, the median and the mean.

3.3.1 The mode

The mode is the score that occurs most commonly in a distribution, or the category with the highest frequency. In table 4.1, Frequency Distribution Prisoners Executed 1977–1995, in your prescribed book (Vito, Blankenship & Kunselman 2008:64) the mode is 0. This is because 24 states (as indicated in the *f* column and as 0 in the X column) did not execute a single convicted offender between 1977 and 1995. Note that the mode is not 104, which is the highest number in column X reflecting the number of prisoners executed in one state. Neither is it 24, which is the highest number in column *f*, representing the number of states. The mode is 0 because it is the score linked with the greatest number of cases in the *f*column.

TABLE 4.1 Frequency Distribution Prisoners Executed 19771995

X (Number of prisoners executed)	***f* (Number of states that executed X prisoners)**	***f*X (*f* times X)**
104	1	104
36	1	36
29	1	29
22	1	22
20	1	20
17	1	17
12	1	12
11	1	11
8	1	8
7	1	7
6	1	6
5	3	15
4	3	12
3	1	3
2	3	6
1	5	5
0	24	0
	N = 50	$\Sigma fx = 313$

(Vito et al 2008:64)

A frequency distribution may have more than one mode. For example, if another value (number of executions) had a frequency of 24 in table 4.1, it would also have been the mode. If a frequency distribution has two modes we say that it is bimodal, and if it has more than two modes we say that it is multimodal. The mode occurs in or near the centre of a distribution, but it can occur anywhere in the distribution and indicates the responses or categories that occur most frequently. The simplest way of determining the mode is to construct a frequency table from a data set, and then construct a polygon or histogram. This will not only indicate the mode, but will also show whether the distribution is unimodal (whether there is only one mode), bimodal or multimodal.

3.3.2 The median

The median is the middlemost score in a data set that has been ranked from lowest to highest, like the one below. In this case the total number of observations is 13. Half the observations fall above the median, and half fall below it. The median can also be calculated by adding 1 to the total number of cases, and dividing the result by 2.

47, 48, 48, 49, 49, 50, 50, 50, 51, 51, 52, 52, 53

In the ranked series above, the middle 50 is the median because there is an equal number of ranked figures on either side of it.

Have another look at table 4.1 above. The data on executions were collected from 50 states (*f* column). If we apply the formula, (50 + 1) 2 = 25.5. Counting from the bottom of the *f* column, we see that 24 jurisdictions did not execute any prisoners during the period 1977 to 1995. Next we see that 5 jurisdictions executed 1 prisoner during that period. Therefore, the median (25.5) falls within the category 1, and shows that about 26 (almost half) of the jurisdictions executed 1 or 0 prisoners between 1977 and 1995 (Vito et al 2008:64–66). These authors also explain that one of the characteristics of the median is its stability, because it is unaffected by extreme scores. If one jurisdiction had executed 1 000 prisoners, it would be just one more state in the frequency distribution. This shows that the median is calculated by considering the **number** of cases, not their value. Even though the execution of 1 000 prisoners would make this jurisdiction the leading state in terms of the number of executions, it would not affect the median. Like the mode, the median does not take into account the magnitude of the scores on either side of it, and so it is not always a very suitable figure to represent data. However, in data sets where there are a few very extreme scores, the median is a better estimate of central tendency than the mean. For example, the median would be a better estimate of the typical income of people in a country.

3.3.3 The mean

The mean is the most common measure of central tendency. It is simply the sum of the numbers divided by the number of numbers in a data set. The mean is also known as the average.

The mean is the preferred measure of central tendency because it takes all the observed values into account in deriving an estimate. Ideally it should be used only with interval data, but in practice it is frequently used for ordinal and nominal data. The researcher must be cautious in interpreting results.

Table 4.1 in your prescribed book shows that a total of 313 prisoners were executed in the United States between 1977 and 1995, and as we have already noted, there were 50 jurisdictions. The mean obtained by dividing 313 by 50 is 6.26. We can interpret this by reporting that each state executed an average of 6 prisoners during the period 1977 to 1995. The authors of your prescribed book point out that unlike the mode and median, the mean is sensitive to extreme cases either very high or very low in a distribution. They use the example of the Texas jurisdiction, where 104 prisoners were executed between 1977 and 1995. This was an extreme score in this distribution, since in the next closest jurisdiction 36 prisoners were executed, representing a substantial difference of 68 prisoners. Bear in mind that the median for this distribution was only 1, reflected in the fact that half the jurisdictions executed one prisoner or no prisoners at all. The number of executions in Texas drove up the average number of prisoners executed over the same period. Therefore, the mean of 6.26 was 5 points above the median.

Activity

Why do you need to do this activity?

- To identify the three measures of central tendency

Guidelines

Study-read the information above and make sure you know how to identify and interpret the three measures of central tendency in criminological research.

Self-assessment exercise

.....

(a) Use the frequency distribution for ‘‘Number of prior drug arrests for probationers and parolees’’ on page 76 of your prescribed book and compute the mode, median and mean. Also explain what the mean represents.

(b) Use the frequency distribution for ‘‘Executions in the ‘Top Ten’ states between 1976 and 1995,’’ which also appears on page 76 of your prescribed book to compute the mean of this distribution, and state what it represents.

(c) Do exercise 1 on page 77 of your prescribed book. Choose State Data Set I from your CD, and use the Statistical Package for Social Sciences (SPSS) to obtain a frequency distribution and measures of central tendency for the variables listed from (a) to (f).

(d) Do exercise 2 on page 77 of your prescribed book. Choose the NCSD Data Set from your CD and use the SPSS to obtain a frequency distribution and measures of central tendency for the variable ‘‘Respondent’s Age’’.

STUDY UNIT 3.4

Measures of dispersion

Measures of dispersion are also known as measures of variability. These measures describe how scores are distributed around certain central tendency values. Look at the following example of two sets of scores. The means are the same for both distributions, but the scores are distributed differently, being more or less scattered around the same point.

Distribution 1: 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65

Distribution 2: 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110

In both distributions, the mean is 60. However, the scores in distribution 1 are more closely distributed around the mean of 60, while the scores in distribution 2 are more sparsely distributed around 60. In order to maximise our descriptive information about any array of scores, we must know both the central tendency and its dispersion. We will briefly discuss measures of dispersion such as the index of dispersion for nominal levels of measurement, the range for ordinal levels and standard deviation for interval-ratio levels of measurement.

3.4.1 Index of dispersion

The index of dispersion is a value between 0 and 1, and is used mainly when analysing nominal data; however, in exceptional circumstances it can also be used for ordinal level data. The value of 0 or approximate 0 is the index of dispersion when one category of a variable appears in most cases. This value means that the data have minimal dispersion or variability. However, when the value is 1 or close to 1, the frequencies of the variable categories are more equally dispersed, and this value means that the cases have maximum dispersion or variability. The example in your prescribed book illustrates clearly that in a room of 20 individuals – all of them male – there is no variability and the index of dispersion would be 0. But if there were 10 males and 10 females in the room, then the index of dispersion would be 1, as each category of the variable gender (male and female) contains an equal number for maximum variability across the categories.

3.4.2 The range

The range is the difference between the smallest and the largest values in a set. Look at the following series of values, where the mean (m) is 28.

26, 27, 27, 28, 28, 28, 29, 29, 30

12, 16, 20, 24, 26, 30, 34, 40, 50

4, 8, 12, 20, 28, 30, 36, 50, 64

The ranges of these three series are:

30–26 = 4

50–12 = 38

64–4 = 60

From one point of view, these numerical data do provide a measure of the dispersion of the data. However, they do not take into account the number of scores. It is evident that the value would be seriously affected by a single large or small score at the ends of the data series. The range has limited use, and so ordinal or higher data are required. This point is also made in the examples in tables 5.1 and 5.2 of your prescribed book.

TABLE 5.1 Number of Prior Arrests for Drug Offenses Among Tuesday's Drug Court Clients

X	***f***	***f*X**	**X (X – the mean)**	***fx*²**
6	1	6	2	4
5	1	5	1	1
4	1	4	0	0
3	1	3	-1	1
2	1	2	-2	4
	N = 5	$\Sigma fx = 20$	$\Sigma x = 2$	$\Sigma fx = 10$

(Vito et al 2008:80)

TABLE 5.2 Number of Homicides Committed in 30 Cities in the State (pop. > 50,000)

X	***f***	***f*X**	**X (X – the mean)**	**x²**	***fx*²**
10	1	10	5.1	26.01	26.01
9	2	18	4.1	16.81	33.62
8	3	24	3.1	9.61	28.83
7	1	7	2.1	4.41	4.41
6	2	12	1.1	1.21	2.42
5	12	60	0.1	0.01	0.12
4	1	4	-0.9	0.81	0.81
3	1	3	-1/9	3.61	3.61
2	3	6	-2.9	8.41	25.23
1	2	2	-3.9	15.21	30.42
0	2	0	-4.9	24.01	48.02
	N = 30	S$fx = 146$			$fx^2 = 203.5$

(Vito et al 2008:80)

Table 5.1 shows a frequency distribution of the number of prior arrests for drug offences. We see that in the X column the highest number of prior arrests for drug

offences was 6 and the lowest was 2. Therefore the range was 4. Table 5.2 presents data on the number of murders committed in 30 cities in the state with a population larger than 50,000 (pop. > 50,000). We note that the highest number of murders was 10 and the lowest was 0, so the range was 10 (10–0). Both these examples involve range calculations using ratio level data, namely ''the number of prior arrests'' and ''the number of homicides committed''. The authors argue that if the data in table 5.2 were grouped in categories by city population such as: 50,001 – 60,000; 60,001 – 70,000, and continue until 150,001 – 160,000 They maintain: ''Though the range in the number of murders among these cities is 10, we may also interpret the range by city population, for example, ''the greatest difference in the number of homicides is between cities with 70–80,000 and 100–110,000 people.'' This interpretation is possible when data are ordinal level data or frequencies are presented using grouped data'' (Vito et al 2008:81).

3.4.3 The variance and the standard deviation

More precise and more commonly used measures of dispersion are the variance and the standard deviation. The variance gives us a sense of how closely concentrated a set of values is around the mean value, and is calculated as follows:

1. Subtract the mean of the distribution from each of the values.
2. Square each result.
3. Add all of the squared results.
4. Divide the result by the number of values minus 1.

We will calculate the variance of the first set of values we used in section 3.4.2, which is reproduced below.

26, 27, 27, 28, 28, 28, 29, 29, 30 (the mean (m) = 28)

Here is the calculation.

$$\text{Variance} = [(26 - 28)^2 + (27 - 28)^2 + (27 - 28)^2 + (28 - 28)^2 + (28 - 28)^2 + (28 - 28)^2 + (29 - 28)^2 + (29 - 28)^2 + (30 - 28)^2] \div 8 = 1.5$$

The variance of a distribution gives us the average of how far, in squared units, the values in a distribution are from the mean. This allows us to see how closely concentrated the scores in a distribution are.

Another measure of the spread of values around the mean of a distribution is the standard deviation. The standard deviation is simply the square root of the variance. Therefore, the standard deviation for the set of values is:

$$\sqrt{1.5} = 1.22$$

The variance and the standard deviation of distributions are the basis for calculating many other statistics that estimate associations and differences between variables. In addition, they provide us with important information about the values in a distribution. For example, if the distribution of values is normal, or close to normal, we can conclude the following:

1. Approximately 68% of the values fall within 1 standard deviation of the mean.
2. Approximately 95% of the values fall within 2 standard deviations of the mean.
3. Approximately 99% of the values fall within 3 standard deviations of the mean.

Therefore, assuming that the distribution is normal, we can estimate that because the mean was 28 and the standard deviation was 1.22, approximately 68% of the respondents are within approximately 1.22 (1 standard deviation) of the mean of 28. Likewise, we can estimate that 95% of the respondents are within 2.44 (2 standard deviations) of the mean of 28. This information has several important applications for the researcher. It allows the researcher first to describe the overall characteristics of a sample, second to compare individual respondents on a given variable (for example gender), and third to compare an individual participant's performance on one variable.

In your prescribed book the authors explain how to calculate the variance and standard deviation by using the data in tables 5.1 and 5.2. Make sure that you understand how the variance of 2 and the standard deviation of 1.41 are calculated by using the data in table 5.1. Also make sure that you understand how the variance of 6.8 and the standard deviation of 2.6 are calculated by using the data in table 5.2. Remember that the variance is the mean of the distribution of squared deviation scores and the standard deviation is the square root of the variance. Also use State Data Set I from your CD to calculate measures of dispersion for the variable ''Prisoners executed between 1977 and 1995'' using the SPSS. Follow the seven steps listed in the prescribed book (Vito et al 2008:81–89).

Activity

Why do you need to do this activity?

- To identify the measures of dispersion

Guidelines

Study-read the information in the section above and make sure that you know how to identify and interpret the measures of dispersion in criminological research.

Self-assessment exercise

(a) Do exercise 2 on page 89 of your prescribed book, and using the given data of 50 burglary cases first construct a frequency distribution from these data, and second calculate the mean, variance and standard deviation.
(b) Do exercise 3 on page 89 of your prescribed book, and using the number of murders reported for the period 1990 to 2005:
    (i) Construct a frequency distribution from these data.
    (ii) Calculate the mean, variance and standard deviation.
    (iii) Construct a line graph using these data and comment on the mean and the pattern of the graph.

(c) Do exercise 1 on page 90 of your prescribed book. Choose State Data Set I from your CD and use the SPSS to calculate the mean, variance, and standard deviation for the crimes in 1997, namely murder, rape, robbery, assault and burglary. Make appropriate comments.
(d) Do exercise 4, which also appears on page 90 of your prescribed book.

Choose State Data Set II from your CD and use the SPSS to calculate the mean, variance and standard deviation for the index crimes of murder, rape, robbery, assault and burglary in 2003. Also write appropriate comments.

STUDY UNIT 3.5

Hypotheses and levels of statistical significance

A hypothesis is an assumption or expectation about differences in the population or relationships among variables. We get a better idea of the purpose of the hypothesis by looking at the meaning of the Greek origin of the word. The compound Greek word hypo-thesis means a sub-statement, or a proposition underlying a theory. The hypothesis is the basis for a model, and a model is a road map for research. The hypothesis lets us make new discoveries. A hypothesis is often described as the researcher's attempt to explain the phenomenon of interest. The hypothesis can take various forms, depending on the question being asked and the type of study being conducted. A hypothesis must make a prediction or predictions, usually about the relationship between two or more variables. It should then be tested, and to do this the researcher must gather and analyse data. After that, the hypothesis can be either accepted (supported) or rejected (falsified). A prediction can be defined as a description of things or events that have not yet occurred and have not yet been observed. Scientific predictions are based on existing (tested) knowledge, and relate to scientists' ability to give universal explanations of phenomena.

A hypothesis is an assumption that is used as a basis for an argument or for empirical research. Scientists have to test or prove hypotheses before they can claim that their knowledge is certain or valid. Scientists therefore try to verify their hypotheses (in other words, prove that their hypotheses are true). For example, a scientist can formulate the following hypothesis: ''Children whose parents are divorced commit crime.'' This scientist will then study a number of children of divorced parents. Suppose the scientist finds that each of these children has committed crime. The scientist will then generalise this finding to include all children whose parents are divorced. This is an example of induction.

Induction always contains an element of doubt, and the scientist cannot prove the hypothesis conclusively because it is not possible to observe all cases, present, past and future (think of our example of children whose parents are divorced). Researchers therefore proposed that hypotheses should be tested by **falsifying** them (proving them false). So, in our example of children of divorced parents and crime, if we find one case of a child with divorced parents who has not committed crime, then the hypothesis has definitely been falsified. In this case falsification is deductively valid, because we have argued as follows: if hypothesis is H, then observation O follows. (If my hypothesis is correct and I study children of divorced parents, I will find that they commit crime.) But O does not follow (not all children of divorced parents commit crime). H is therefore false. That is a valid deductive argument.

Because falsification is deductive, some scientists are of the view that it is better to falsify hypotheses than to verify them. In falsification scientists do not try to affirm their

own statements (hypotheses) or those of other scientists; instead they look for evidence against these statements. Until this evidence is found, they assume that the statements are true with a certain degree of probability. The greater the number of unsuccessful attempts to falsify the hypothesis, the greater the probability that the statement (''Children whose parents are divorced commit crime'') is true. This approach is more modest than verification, because it recognises or assumes that a scientist's statements may be wrong despite all the information that is available at that time.

Regardless of what criterion of validity we apply, the testability of scientific knowledge is always important. Empirically testable or operationalised concepts and hypotheses remain the ideals of scientific research. However, scientific work must always allow scope for statements that cannot be empirically proven. In the human sciences, scientifically justified theorising also occurs in ways that are not empirically and statistically testable.

3.5.1 Types of hypotheses

There are two types of hypotheses, namely the null hypothesis (H_0) and the alternative or research hypothesis (H_1). The null hypothesis always predicts that there will be no differences between the groups being studied, as for example in research studies involving two groups of participants. However, if a particular research study does not involve groups of study participants, but instead involves just an examination of selected variables, the null hypothesis predicts that there will be no relationship between the variables being studied. By contrast, the alternative hypothesis predicts that there will be a difference between groups being studied or a relationship between the variables being studied.

To get a better idea of the difference between null hypotheses and alternative hypotheses, let us take an opinion poll of the public's attitude regarding the controversial topic of capital punishment as an example. The aim of the research is to find out whether people are in favour of the death sentence, or are in favour of its abolition. The public's reaction will be measured, taking into account variables such as education, age, race, sex, religion, occupation and marital status. The independent variables are already present in the background data of the people being questioned. The dependent variable is their opinion regarding the imposition of the death sentence. This can be stated in the null hypothesis (H_0) as follows:

There is no relationship between a person's background and his or her attitude toward the imposition of the death sentence.

The research hypothesis (H_1) will be stated as follows:

There is a relationship between a person's background and his or her attitude toward the imposition of the death sentence.

When our actual results show a very low probability if the null hypothesis is true, we have some empirical support for our alternative hypothesis. At this point we need to realise that if we reject the null hypothesis when our observed results show a low probability, we are taking a risk. Although the results are unlikely to have occurred by chance under the null hypothesis, there is a remote possibility that they may have occurred by chance in this particular instance. This remote possibility, or in statistical terms low probability, shows how important it is to carry out repeated or cross validation studies.

In quantitative studies a researcher or a team of researchers tends to include several null and alternative hypotheses. How many null and alternative hypotheses are included in a particular study will depend on the scope and complexity of the study and the specific questions the researchers are asking. It is important to bear in mind that the number of hypotheses has implications for the number of people who will be participating in the study. As the number of hypotheses increases, the number of participants needed also increases.

3.5.2 Levels of statistical significance

The level of significance will lead us to either reject or retain the null hypothesis. This level can be set at any value the researcher chooses before the research project begins. There are three levels that are commonly adopted, namely the .05 level, the .01 level and the .001 level. A significance level of .05 means that we run the risk of making a type 1 error 5 times out of 100. A type 1 error means that the null hypothesis is rejected when it is in fact true. A significance level of .01 reduces the risk of making a type 1 error to 1 time in 100. The highest level of significance for our purposes is the .001 level, which reduces the risk of making a type 1 error even further, to 1 in 1 000. In statistical thinking we never speak of proving or disproving an hypothesis; instead, we speak of either retaining it or rejecting it. Owing to the uncertainty regarding the null hypothesis, we can only accept or reject it within the set limits of probability. Having stated the null hypothesis, we can then apply one of the statistical techniques to the data. If the technique reveals that the difference between two variables would manifest with a probability greater than 0.05 ($p > 0.05$), this would be considered a common event, and the null hypothesis should be retained. This means that we accept the assumption that there is no significant difference between the two variables. If the statistical technique indicates that the difference between the variables or the sample means would occur with a probability of 0.05 or less ($p \leq 0.05$), this would be considered an uncommon occurrence, and therefore the null hypothesis should be rejected. We can thus state that there is probably a significant difference between the variables.

What is the value of the data where the difference between two means has a probability of 10% ($p \leq 0.10$ and $p > .005$) and we have set the upper limit of significance at the5% ($p < .005$) probability level? The data definitely has value, but we place less confidence in the difference. We also bear in mind that although statisticians have laid down permissible levels of error, it is ultimately up to the researcher to set his or her own levels. For example Siegel (1954) considered and set the permissible level for his research projects at 10%.

A c t i v i t y

Why do you need to do this activity?

- To understand the stating of hypotheses and the concept of significance

Guidelines

Study-read the information above and ensure that you know how to set hypotheses and appropriate levels of significance.

Self-assessment exercise

(a) Explain what a hypothesis is.
(b) Formulate a null hypothesis and an alternative hypothesis and discuss their rejection or retention.
(c) Explain the effect of the independent variable (X) on the dependent variable (Y) by using an example of a criminological theory similar to the general deterrence used by the authors of your prescribed book in chapter 2 (Vito et al 2008:31).
(d) Give a practical example of a probability $p \leq .01$ level of significance after you decided to reject the null hypothesis. Also state what the chance is that your decision may be wrong.

Review

In this theme we firstly elaborated on the important concepts of validity and reliability. This was followed by the four levels of measurement and the measures of central tendencies and dispersion. The last study unit dealt with the types of hypotheses and the concomitant levels of statistical significance.

THEME 4

Research process: design and planning

Introduction

To understand what research design and planning are, you need to have a good grasp of what design and planning in other contexts entail. In most contexts, the goal of design and planning is to avoid possible mistakes before the actual work is done, and this also applies to research in the human sciences. Research design and planning are aimed at preventing mistakes before a research project is undertaken. Research in the human sciences is subject to errors, which are called ''invalidities''. Invalidity means that an observation or analysis of social problems and so on may be inaccurate or incorrect. We could therefore describe research design and planning as the blueprint of a proposed research project.

One of the aims of research in the human sciences is to find solutions to human problems and to determine the facts. Before they can carry out these two actions, researchers must determine exactly what they want to study, and they must decide what will be the best way of conducting the study. These decisions fall within the scope of research design and planning.

The content of this theme is dealt with in the following study units:

Study unit 4.1: Research design: towards formulating the problem

4.1.1 Decision-making steps in the research process
4.1.2 Step 1: Choosing a research topic
4.1.3 Step 2: Formulating the problem

Study unit 4.2: Research design: data collection

4.2.1 Step 3: Data collection

Study unit 4.3: Research design: data processing and analysis

4.3.1 Step 4: Data processing and analysis
4.3.2 Step 5: Report writing

Key concepts

- Contract research. This type of research is sponsored by organisations and is mainly problem oriented.
- Self-initiated research. Type of research undertaken by researchers at their own initiative.

- Units of analysis. These are major entities that are being analysed in a research study.
- Research goal. It refers to the aim that research should pursue.
- Research strategy. It is a plan of action that gives direction to research efforts.
- Quantitative data collection. Collection of specific data in quantifiable form.
- Study of literature. It refers to the effective evaluation of a body of text on a research topic
- Questionnaire. It is a list of research or survey questions asked of respondents and designed to extract specific information.
- Quantitative data analysis. It refers to the use of mathematical and statistical modelling to collated numerical data.
- Report writing. Putting in writing the findings of a research project.

Activity

Why do you need to do this activity?

- To identify what can be researched and how a study is conducted

Guidelines

Suppose you are a student of the criminological disciplines and you are asked to investigate government corruption in a particular country.

The topic is certainly relevant and worth investigating. However, you cannot begin until you have asked certain questions and found answers to them.

- Answer the following questions for yourself:
  - What interests me specifically as a researcher?
  - What does ‘‘corruption’’ mean?
  - What kinds of misconduct must be studied?
  - What does ‘‘government’’ mean?
  - Who should be studied?

    That is, should I study
    - all civil servants?
    - only civilian employees?
    - elected civil servants?

  - What is the aim of the research?
  - Must I determine the extent of corruption?
  - Should I investigate why there is corruption?

First you had to decide what aspects of the topic you want to research. You had to clarify the meaning of ‘‘corruption’’ and ‘‘government’’. You had to select the kinds of conduct or misconduct that are relevant. The aim of the research had to be spelled out. You had to ask all the other questions, like the extent of corruption and the reasons for it. This activity shows why research design and planning are essential if research is to proceed smoothly.

STUDY UNIT 4.1

Research design: towards formulating the problem

After studying this unit you should be able to

- identify the decision-making steps in the research process
- discuss two types of research that help to determine the choice of a research topic
- formulate or state a research problem

4.1.1 Decision-making steps in the research process

In the human sciences researchers have to carry out various decision-making steps before they are able to systematically undertake a research project. These decision-making steps have to be taken in logical sequence, and although we will discuss them individually, they cannot really be taken in isolation from one another. Together, these steps make up research design and planning. They are:

- step 1: choosing a research topic
- step 2: formulating the problem
- step 3: data collection
- step 4: data processing and analysis
- step 5: report writing

4.1.2 Step 1: Choosing a research topic

The researcher must choose what phenomena to study in the research domain or area within his or her discipline. The motives or reasons for this choice are important.

- **Self-initiated research**

Research is done for various reasons. Often it is self-initiated, which means that researchers undertake the study at their own initiative or of their own accord. There are several reasons for undertaking self-initiated research. Researchers often do so because they are intrigued or puzzled by an interesting phenomenon and want to know more about it.

Another reason for self-initiated research is to test a theory. Existing theories have to be tested in practice to find provisional support for them or to refute them. The results

are accepted provisionally, because it is possible that some other theory might explain the same phenomenon just as well. Typical examples of this are the many criminological theories to explain the causes of crime.

Self-initiated research can also generate hypotheses. In that case it usually takes the form of exploratory research in some unexplored research area. The aim is to formulate new hypotheses when the research has been completed. These hypotheses provide a starting point for future research.

- **Contract research**

Contract research is usually commissioned by organisations such as the Human Sciences Research Council, government departments or private companies. These organisations then sponsor or finance the research. In contract research the sponsor normally determines the research topic. Contract research is mainly problem oriented. It looks for answers to problems that the sponsor is experiencing. Sponsors face practical problems, so answers have to be found in the short term. This kind of research is called action research.

A c t i v i t y

Why do you need to do this activity?

- To see how many options there are when choosing a research topic

Guidelines

Indicate which kind of research commission you would prefer.

Contact research	Yes	No
Self-initiated research	Yes	No

Choose any relevant research topic in criminology, penology or police science and write it down in the form of a single sentence.

.....

.....

.....

First you had to state whether you prefer contract research or self-initiated research. Remember, though, that in practice researchers have to be available for both kinds of research commissions. Your choice of a research commission will partly determine your choice of a research topic. Review the research topic that you have written down to make sure that it is relevant. The topic must be formulated as briefly as possible and should contain only the essential concepts.

Self-assessment exercise

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(a) Why would a researcher undertake self-initiated research?

.....

.....

(b) Why would a researcher undertake contract research?

.....

.....

4.1.3 Step 2: Formulating the problem

Formulating a problem that ought to be researched is a complicated part of research design and planning. In step 1 we said that the fact that a research project is either self-initiated or contracted can limit and determine the choice of a research topic. There are also other points to consider before a researcher can finally formulate the research problem. These are the units of analysis, research goal and research strategy.

- **Units of analysis**

The researcher must determine exactly **who**and **what** to study. These are the units of analysis. Usually the units of analysis are the entities that the researcher will observe and study in order to describe them. There are different kinds of units of analysis.

In the human sciences there are mainly four kinds of units of analysis: individuals, groups, organisations and social artifacts. An example of research with **individuals** as the units of analysis is a study of a number of individual prisoners' experience of punishment. Groups are a separate unit of analysis, since groups have certain qualities that do not occur in individual behaviour. An example of research with **groups** as the units of analysis is a study of the characteristics of juvenile gangs (eg their jargon). Organisations as units of analysis are formal organisations with distinctive characteristics such as organisational management, formal lines of authority and policy. An example of research with **organisations**as the units of analysis would be a study of criminology curriculums at South African universities. We can define **social artifacts** as products of society, in other words, products of human beings and human behaviour. In the criminological disciplines, social interaction, such as traffic offences and crime, are particularly important.

Once you have chosen a unit of analysis, you can identify a population. The population is the entire set that makes up the unit of analysis, for example ''All victims of crime in South Africa from 1985 to 1995''. Usually the population is so large that you can study only a portion of it. The portion has to be selected scientifically. This is known as sampling. Samples may be representative or not representative of the population. We will not describe sampling in detail here.

- **Research goal**

The research goal indicates what the research should achieve. The most common and useful research goals in the human sciences are exploration, description and explanation.

- **Exploratory studies**

Exploratory studies aim at exploring a relatively unknown field. Exploratory studies also have various research objectives, for example:

- to gain fresh insight into a phenomenon
- to serve as a pilot study
- to determine priorities for further research
- to determine the need for research on a particular topic
- to develop methods for a more complicated study

An example of an exploratory study would be research into a new criminal subculture among juveniles.

- **Descriptive studies**

Descriptive studies concentrate on in-depth description of a specific individual, situation, group or organisation. The researcher observes a phenomenon and describes what he or she has observed. Observation takes place according to scientific principles and the description of what has been observed must also satisfy scientific requirements. An example of a descriptive study would be a survey of the prison population in South Africa according to variables such as age, gender and qualifications.

The criminologist Mannheim (1973:3–4) has pointed out the importance of descriptive studies in the criminological disciplines, and explains that the description of data should result in understanding of those data. The criminologist's task is not simply to describe data, but to understand them, since facts serve no purpose unless we understand them.

- **Explanatory studies**

The research goal of explanatory studies is to explain certain phenomena. The following example illustrates this. If a researcher decides to report on the incidence and extent of crime in South African cities, the research goal would simply be description. But if the same researcher wanted to find out why the incidence of crime differs from one city to another, he or she is looking for an explanation of this phenomenon. The goal of explanatory research is therefore to look for causes in order to explain a phenomenon. This is also known as the determination of causal connections.

Causal explanations are subject to conditions such as the following:

- There has to be a particular sequence of cause and effect.
- The observed phenomenon or phenomena must be the authentic cause(s) of something else.
- There must be a relation between the phenomena.

In the criminological disciplines explanatory research is often used to study causation.

- **Research strategy**

In 1894 the philosopher Wilhelm Windelband made a distinction between nomothetic and idiographic research strategies. Since then it has become customary to classify research in the human sciences according to these two main categories. According to

Windelband, human scientists strive partly to determine general patterns or regularities, and partly to research specific experiences. The first kind of research looks for things that remain constant; the second looks for the unique content of events. The search for general patterns is called a **nomothetic** research strategy, while the search for unique content is called an **idiographic** research strategy. The extent of alleged offences reported to the South African Police Service is an example of a general pattern that remains constant. In this case you would use a nomothetic research strategy. However, to research the personal experience of a police officer working in a charge office you would use an idiographic research strategy.

Nomothetic research is considered to be universal. This means that you can generalise your conclusions to a population on the basis of, for example, a representative sample. Idiographic research is contextual. This means that the aim is to give an in-depth description of the phenomenon, event or group within the context of its unique lifeworld and world of meaning.

The difference between nomothetic and idiographic research strategies corresponds to the difference between quantitative and qualitative research methodologies. The nomothetic or general pattern approach is quantitative, that is, it uses measurements and figures. The idiographic research strategy corresponds to qualitative research in that observation focuses on underlying, unique and meaningful contents or the quality of the data. There is therefore a clear distinction between a quantitative, nomothetic research strategy and a qualitative, idiographic research strategy.

- **Stating the problem**

– Orientation

Stating or defining the problem is an outcome of step 1. Once you have chosen a research topic, you carry out the first three phases of step 2, namely identifying the unit of analysis, setting the research goals and deciding on the research strategy that will be used. All this forms part of the overall process of formulating the problem. Stating the problem rounds off this process.

– Source of problems

The source of problems is the entire human lifeworld. There is a clear distinction between personal problems and problems that need to be researched. To be researchable, a problem must meet the requirements of scientific research methodology. It must be of such a nature that it can be researched scientifically.

Professional experience is often a source of researchable problems. Teachers, for example, may observe serious juvenile behavioural problems in the classroom. This could lead to the identification of juvenile misbehaviour as a problem that should be researched in the school context. Researchers also identify research problems through reading recent research findings in a discipline. Research often leads to more research: recommendations in a research report indicate a need for further research into the topic. The original researcher may do this additional research, or some other researcher may decide to investigate aspects of existing research findings. Testing of theories is another source of research problems. There are many theories in the criminological disciplines. Some of them, for example individually oriented theories and social process and structure theories, are attempts to explain crime. Although some of these theories have been tested already, there is always scope for further

research. It is possible, for instance, to test a theory to explain crime by studying the incidence of a particular type of crime in a particular residential area or among a particular group of people.

From what we have said it is evident that there are different sources of research problems. However, a problem must be scientifically researchable before we can call it a research problem.

– Stating the research problem

A research problem has to be formulated in such a way that the reader will understand exactly what problem the researcher is trying to solve. The problem must be expressed in a grammatically correct, full sentence, and not in telegram style. However, it should be expressed as concisely as possible (in other words, it should be expressed in as few words as possible). The statement must be specific, and must spell out the researcher's exact meaning.

The title of the report should also reflect the main problem of a research project. The title of a research report must meet the following requirements:

- It should clearly demarcate the research with regard to time and geographic location.
- It should be clear.
- It should be interesting.

A main problem is often too broad and complex to study in its entirety. Often it is subdivided into subproblems to make research easier. The subproblems are part of the overall problem and have to meet the same requirements. Each subproblem should be a unit that can be researched fully. A next step is, where possible, to convert the statement of the problem into a research hypothesis or hypotheses, as already discussed in study unit 3.5.

A c t i v i t y

Why do you need to do this activity?

- To examine an example of human sciences research in order to illustrate the discussion so far

Guidelines

- Photocopy or scan any research article in a human sciences journal, preferably one dealing with one of the criminological disciplines.
- Read the article carefully.
- Identify the unit of analysis that was used.
- Indicate the research goal(s) pursued in the project described in the article by making a cross in the relevant block below.

  Exploration ☐ Decription ☐ Explanation ☐

- What research strategy is used in the project described in the article?

  .....

  .....

- Do you think that the research problem is stated clearly in the article?

Yes	No

- If it is not clear enough, reformulate it in your own words.

  .....

  .....

Whether you are able to do this activity successfully depends on whether you consulted a research article. Remember that a research article is based on research done in practice or in empirical reality. You should have concentrated especially on step 2 of the research process, namely problem formulation. The unit of analysis used in the project described in the article influences the author's choice of research goals. For example, if the unit of analysis is a newly established organisation for crime prevention, the research goal would be exploratory. Whether the unit of analysis chosen made quantification either possible or impossible indicates whether the research strategy is nomothetic or idiographic. Finally you should have paid attention to the problem stated in the article. Although this statement can assume many forms, a research article should always deal with a specific problem. If the article states the problem too vaguely, you should have tried to state it more clearly by reformulating it.

Self-assessment exercise

.....

(a) Complete the following sentences by filling in the missing words, terms or phrases:

(i) Units of analysis are usually the ..... that are observed.
(ii) The research goal indicates what the ..... is meant to achieve.
(iii) Windelband calls attempts to determine general patterns or regularities a(n) ..... research strategy and the search for the unique content of events a(n) ..... research strategy.

(b) List the four units of analysis in the human sciences.

(i) .....
(ii) .....
(iii) .....
(iv) .....

(c) List the three most common and most useful research goals in the human sciences.

(i) .....
(ii) .....
(iii) .....

STUDY UNIT 4.2

Research design: data collection

After studying this unit you should be able to

- distinguish between the nature and types of data in the human sciences
- compile a survey of literature that relates to a research problem
- apply a quantitative data collection technique

4.2.1 Step 3: Data collection

- **Nature of data in the human sciences**

Data are information or facts gathered through observation. In order for information or facts to be regarded as data, the observation must have been carried out scientifically; that is to say, data collection has to be methodologically correct. Unprocessed data are generally called ‘‘raw data’’, while the term ‘‘data’’ usually refers to processed data.

The unit of analysis and research goals of a project determine what research strategy will be used. This leads to a statement of the research problem, as discussed in study unit 4.1. The research strategy in turn determines the nature of the data that will be collected. A quantitative research strategy will lead to the collection of numerical data, and a qualitative research strategy will lead to the collection of mainly verbal data.

- **Preparing for data collection**

Before starting to collect data, a researcher has to make some practical preparations. He or she has to decide on and arrange the locality where the data will be collected. The choice of fieldworkers, if necessary, is also important. The researcher has to think about such things as what training fieldworkers should have. Deciding on the number of fieldworkers and their remuneration is part of the preparation for data collection. Preparation also includes deciding on the manner in which research subjects should be approached. The researcher has to decide what undertakings to make to subjects, for instance assuring them that all information will be treated confidentially. In the case of people with criminal records, the researcher may have to promise not to reveal the research subjects’ names. The researcher should also establish whether the techniques to be used are available and whether they can be applied to the specific research project. Other things to calculate are what the research will cost and how much time it will take to complete.

- **Study of the literature**

It is essential to study the subject literature before actually starting to collect data. Obviously the focus will be on literature that relates to the research problem. The main purpose of a literature study is to give the researcher a better grasp of the research problem. The research problem is always focal in a literature study.

A survey of the literature offers the following advantages:

- It introduces the researcher to similar research.
- It may provide methods to solve similar problems.
- It can introduce the researcher to previously unknown sources of data.
- It can introduce the researcher to leading experts in his or her field.
- It helps the researcher to evaluate his or her own efforts by comparing them with the research of other human scientists.
- It can help the researcher to establish whether a research topic is relevant and has practical significance.

A survey of the literature fulfils some essential functions in a research project. The discussion of the subject literature should be systematic and properly organised. As a researcher, you should first outline the structure of the survey before you start discussing the literature. Your statement of the research problem can be a useful guideline when planning the survey of the literature.

You should clearly indicate the connection between the subject literature and the research problem, and emphasise this throughout the survey. Always remember that what you are writing is a survey of the literature that relates to your research problem.

What you are presenting is a **survey** of the literature. This means that you should not just copy from the subject literature; instead you should focus on the purpose of your discussion. Here are some guidelines for writing a survey of the literature:

- The discussion must be your own.
- Paraphrase sentences.
- Use short direct quotations where necessary.
- Use long quotations only in exceptional cases.

- **Example of a quantitative data collection technique**

The rest of this discussion will focus on an example of a quantitative data collection technique. The emphasis is not so much on an actual statistical technique, since this will be dealt with in theme 5 as part of quantitative research technology. Instead, the focus is on the role of the questionnaire as a data collection technique in the design and planning of the research process. Remember that you have to take a number of decisions in order to complete each step in the research process.

In the human sciences, data often lie hidden deep in people's attitudes, minds or reactions. Consequently, the first problem is to design a technique that will allow you to access these data. In the human sciences, questionnaires are probably the most common technique for obtaining information from people.

An important advantage of questionnaires is that this technique enables a researcher to reach people with whom he or she is not in direct, face-to-face contact. Questionnaires can be sent via the postal service, or mailed electronically.

The language used in formulating the questionnaire must be perfectly clear and unambiguous. The level of difficulty of the language should be adapted to the age, educational level and language proficiency of the people who will be completing the questionnaire.

Questionnaires must be designed in order to achieve a specific research goal. Many questionnaires are not properly designed to indicate their purpose. If questionnaires are poorly designed, respondents may not bother to complete and return them.

To obtain good feedback, follow these suggestions:

- Approach the respondent politely.
- Keep the questionnaire as simple and clear as possible.
- Consider the respondent's convenience (eg enclose a stamped, addressed envelope in which the respondent can return the questionnaire).
- The emphasis should be on general problems, not personal matters.
- The questionnaire should be as short as possible and should collect only data that are necessary for the research project.
- The results of the research project should be made available to the respondent.
- Plan the data processing in advance, because that will determine how the questionnaire is compiled.

Activity

Why do you need to do this activity?

- To obtain some introductory experience of quantitative data collection in the human sciences

Guidelines

- Consult section 4.1.2 of study unit 4.1 about step 1 of the research process (choosing a research topic).
- Consult section 4.1.3 of study unit 4.1 about step 2 of the research process (formulating or stating the problem). Reread the activity in section 4.1.2 of study unit 4.1 and your answer to it.
- Consult one book on the criminological disciplines in order to compile a questionnaire. Ask someone with experience in your chosen research topic to complete the questionnaire.

Self-assessment exercise

.....

(a) Write a paragraph on conducting a study of the literature.
(b) Write a paragraph on questionnaires as an example of a quantitative data collection technique.

STUDY UNIT 4.3

Research design: data processing and analysis

After studying this unit you should be able to

- discuss data processing and analysis as a decision-making step in the research process
- describe the basic process of quantitative data processing and analysis

4.3.1 Step 4: Data processing and analysis

- **Quantitative data processing and analysis**

The first phase of processing a questionnaire is known as editing. It is very important to edit raw data, because this phase directly affects the analysis of the results of the research project. Every questionnaire that is returned must be checked before being processed.

Editing also includes a critical examination of completed questionnaires in terms of the following criteria:

- **Meeting sampling requirements**. Questionnaires that are completed by respondents who fall outside the sample should not be taken into account.
- **Relevance.** Make sure that respondents have not misunderstood questions, since this could result in wrong answers.
- **Completeness**. All questions, sections and pages of the questionnaire must have been completed.
- **Legibility**. All answers to open-ended questions must be clearly legible.
- **Intelligibility.** A written answer must be intelligible; respondents should not use their own abbreviations that nobody else understands.

Often researchers have to contact respondents to check on aspects in the completed questionnaires that are unclear. If the respondents cannot be traced, these questionnaires may have to be omitted, either partly or completely.

After editing, the questionnaires have to be coded. This is a technical process in which the researcher assigns a code to respondents' answers so as to tabulate the collected data.

Tables are usually compiled with the aid of a computer program. Tabulating entails counting responses to questions and placing them in categories. For example, the researcher will determine how many people answered either yes or no to a question

such as: ''Have you ever been the victim of a crime?'' Respondents who have been crime victims form one category, and those who have never been victims of crime form another.

Data is tabulated to determine the following things:

- How are the data distributed, or who gave what answers?
- What is typical of the data?
- How do the responses differ?
- Are there any significant correlations between different sets of data?

Quantitative data are analysed mainly by applying statistical techniques such as correlation analyses, analyses of variance, chi-square tests, t-tests and non-parametric techniques. We will discuss some of these in detail in theme 5. When analysing quantitative data the researcher has to take decisions such as the following:

- What will data analysis entail from a research point of view?
- What still has to be done to solve the research problem?
- What plan should be implemented to complete the data analysis?

After answering these questions, the researcher can draw conclusions from the data. Another goal of data analysis is to make recommendations. These recommendations could include possible solutions to the research problem, practical improvements or ideas for future research.

Self-assessment exercise

.....

(a) List the criteria for a critical examination of completed questionnaires.

(i) .....
(ii) .....
(iii) .....
(iv) .....

(b) List the decisions that have to be taken when analysing quantitative data.

(i) .....
(ii) .....
(iii) .....
(iv) .....

4.3.2 Step 5: Report writing

- **Goal of report writing**

The last part of a researcher's task involves sharing the findings of a research project with other researchers or fellow scientists. The goal of research is to increase our knowledge about a particular problem. This new knowledge must be made available to other human scientists so that they can research the problem further. New knowledge should also be released to people who can use it in practice. New research findings

should also become part of the existing system of knowledge. A report can assume various forms, for example a journal article, a book, a master's dissertation, a doctoral thesis or a research report.

- **Methodological guidelines**

When writing a research report of whatever kind the writer has to follow certain methodological guidelines. This means that the research report has to satisfy methodological requirements. The entire research design that was used must be indicated so as to enhance the validity of the data that were collected.

Here are some general methodological guidelines.

- The problem must be clearly stated.
- The report must specify the goals of the research.
- The report should contain information about the nature and relevance of data sources.
- The report should provide all relevant details about the data collection.
- The report must describe the processing and analysis of the data.
- The conclusion must be based on data that relate to the research problem.
- The report should satisfy the technical requirements of the organisation (eg a university). These technical requirements could relate to format, length, number of copies, reference style and a summary.

A report should cover and reflect all the steps in the research process. One could even say that a report should reflect not just the actual research process, but the entire methodological procedure that was followed. We will discuss report writing for quantitative research in theme 6, where we will focus specifically on how a research report is compiled.

Activity

Why do you need to do this activity?

- To get some introductory experience of report writing in the human sciences

Guidelines

- Consult section 4.3.2 of study unit 4.3 about step 5 of the research process (report writing).
- Note the purpose of report writing.
- Consult section 4.1.2 of study unit 4.1 about step 1 of the research process (choosing a research topic).
- Reread the activity in study unit 4.1. Take the research topic that you chose there and write a table of contents for a report based on it.
- Make sure that your table of contents follows the methodological guidelines discussed in section 4.3.2 of study unit 4.3. Also make sure that your table of contents accords with your chosen research topic.

This activity introduces you to creating a framework for report writing. The table of contents provides the framework of any research report. Think of it as a skeleton: it holds up and gives structure to the report in the same way that a human skeleton holds up and gives structure to the body. In compiling the table of contents you had to keep your research topic in mind to make sure that the table of contents related to the topic. Your table of contents should also have followed the methodological guidelines discussed in section 4.3.2 of study unit 4.3.

(a) Make a list of the methodological guidelines that have to be followed in report writing:

.....
.....
.....
.....
.....
.....
.....
.....

Review

.....

Answers to self-assessment exercises

THEME 4

Study unit 4.1

4.1.2

(a) Reasons for undertaking self-initiated research:

- personal interest
- to test theory
- to generate hypotheses

(b) Reasons for undertaking contract research:

- commissions
- problemsolving

4.1.3

(a) (i) units
(ii) research
(iii) nomothetic; idiographic

(b) (i) individuals
(ii) groups
(iii) organisations
(iv) social artifacts

(c) (i) exploration
(ii) description
(iii) explanation

Study unit 4.2

4.2.1

(a) Your paragraph should contain the following key concepts:

- Study of the literature
- main purpose of the survey
- advantages of the survey
- points to bear in mind when writing a survey

(b) Your paragraph should contain the following key concepts:

- Questionnaires as an example of a quantitative data collection technique
- practical guidelines when using questionnaires
- important considerations when compiling a questionnaire
- in order to get good feedback

Study unit 4.3

4.3.1

(a) (i) satisfy sampling requirements
(ii) relevance
(iii) completeness
(iv) legibility
(v) intelligibility

(b) (i) What are the results of the statistical tests?
(ii) What will data analysis entail?
(iii) What still has to be done to solve the research problem?
(iv) What plan should be implemented to complete the data analysis?

4.3.2

(a) (i) The problem must be clearly stated.
(ii) The research report must specify the goals of the study.
(iii) The report must contain information on the nature and relevance of data sources.
(iv) The report must contain all relevant details about data collection.
(v) It must describe data processing and analysis.

(vi) The conclusions must be based on data that relate to the research problem.

(vii) The report should satisfy the technical requirements of the organisation (eg a university).

THEME 5

Quantitative research technology

Introduction

The basis of any discipline is its theory and its methodology. Theory has to do with such questions as ‘‘Why?’’ and ‘‘How?’’, whereas methodology asks the question, ‘‘What is ...?’’ Theory represents attempts to find rational explanations of reality. It structures the essential elements of the subject, sums them up and examines them in order to find answers to questions like ‘‘What causes crime?’’ or ‘‘Why do some people become criminals?’’ Methodology includes the collection and analysis of accurate data or facts, for example, ‘‘What is the incidence of crime?’’ or ‘‘Who commits crime?’’ Quantitative researchers have at their disposal various techniques for collecting data that allow them to answer questions such as these. Quantitative technology is associated with numerical data, for example official crime statistics. Quantitative researchers guard against any unwanted influence on the quality of the scientific data that may arise from the personal preferences and prejudices of either the researcher or the researched. These researchers try not to overstep the boundary between respondent and scientist, and so maintain a safe but healthy distance between the provider of scientific data, who presumably will benefit from it, and the person who collects it.

When deciding which technique or method to use, quantitative researchers remember that techniques or methods are not an end in themselves but a means to an end, namely the development of knowledge. In a sense the topic of a study determines which techniques or methods are appropriate. A basic assumption of research is therefore that the nature of the data determines the techniques that can be employed.

Quantitative data may lead to the use of sophisticated statistical analyses. You will be introduced to some of these in study unit 5.4. You will also learn more about them at postgraduate level. Especially in experiments, researchers single out certain factors to determine how they influence the situation. This gives the researcher greater control over the situation, even if the situation is artificial (eg experiments carried out in a laboratory).

The five study units that follow deal with some of the quantitative methods and techniques. This theme focuses on methods and techniques of data collection and interpretation; you will learn about the characteristics of these methods and techniques, and we will give you some examples. Your prescribed book will be a valuable tool in helping you to understand and apply these methods and techniques and to prepare for future studies at postgraduate level.

This theme is divided into the following study units:

Study unit 5.1: Experiments as a quantitative method

5.1.1 Introduction
5.1.2 Characteristics
5.1.3 Advantages of experimental studies
5.1.4 Drawbacks of experimental studies
5.1.5 Conclusion

Study unit 5.2: Surveys as a quantitative method

5.2.1 Introduction
5.2.2 Characteristics
5.2.3 Advantages of surveys
5.2.4 Drawbacks of surveys

Study unit 5.3: Quantitative techniques

5.3.1 Introduction
5.3.2 Questionnaires
5.3.3 Postal or electronically mailed questionnaires

Study unit 5.4: Statistical techniques in data analysis and interpretation

5.4.1 Introduction
5.4.2 Correlation
5.4.3 The chi-square test
5.4.4 The t-test
5.4.5 Analysis of variance (ANOVA)
5.4.6 Regression analysis

Review

Key concepts

- **Experiments:** Studies conducted in a controlled environment in which the researcher assumes a cause-effect relation between two or more variables and manipulates these variables in a test situation.
- **Survey research**: Systematic data collection to explore the relation between variables by giving each respondent an identical set of questions to answer.
- **Questionnaire**:a set of questions on a form, submitted to a number of people in order to collect statistical information for analysis. A questionnaire may be administered again for replication and cross-validation purposes.
- **Statistical techniques**: Tools for analysing collected data.

Activity

Why do you need to do this activity?

- To identify the role of theory and methodology in a discipline
- To distinguish between quantitative and qualitative data

Guidelines

Study-read the introduction above, then answer the questions below.

(a) What is the function of **theory** in a discipline like criminology?

.....

.....

.....

(b) What is the function of **methodology** in a discipline like criminology?

.....

.....

.....

(c) What is the difference between quantitative and qualitative data?

(i) Quantitative data

.....

.....

(ii) Quantitative data

.....

.....

.....

Your answers should have contained the following information:

(a) The functions of **theory** include

- developing explanations of a phenomenon such as crime
- investigating and summing up aspects relating to the phenomenon, and in that way structuring the study
- answering questions like ‘‘Why?’’ and ‘‘What causes it?’’

(b) The functions of **methodology** include

- collecting and analysing data by means of various data collection techniques

(c) Quantitative data are presented numerically. An example is crime statistics. Qualitative data are presented verbally (in words), for instance to express subjects’ feelings and experiences.

STUDY UNIT 5.1

Experiments as a quantitative method

After studying this unit you should be able to

- distinguish between laboratory and field experiments
- identify the advantages and drawbacks of experimental studies

5.1.1 Introduction

When researchers want to study possible relationships between cause and effect, they may perform experiments. Schaefer (1989:41) defines an experiment as an artificially created situation that allows researchers to manipulate variables and introduce control variables at the same time. What this means will become clear to you as you study this unit.

5.1.2 Characteristics

There are different types of experiments, but for the purpose of this study unit we distinguish between

- the classical experimental design or laboratory experiment
  and
- the quasi-experimental design or field experiment (Neuman 1994:187)

(a) **The classical experimental design** or **laboratory experiment** involves three key elements:

- equivalence
- pretesting and posttesting
- experimental and control groups

Example 1: VIEWS ON ABORTION

Two groups of female students, both in favour of abortion, are selected for an experiment. The experimental group watches the film ''The silent scream'', in which a foetus is expelled by means of instruments. The control group does not watch the film. After watching the film more than half the students in the control group have changed their minds and are now anti-abortion.

In the example above, two groups of students were selected and compared in terms of corresponding characteristics such as gender, educational qualifications and a

positive attitude towards abortion. The subjects were then placed in one of two groups, either the experimental group or the control group. The first group was subjected to an experimental intervention, the film; the second group was not. Both groups' reactions were observed. Pretests were conducted to note conditions before the experiment took place. After the experiment had been completed, further tests or observations were done.

Hagan (1990:43) states that according to the logic of the experiment, it is assumed that since the two groups were equivalent in the pretest phase, any differences observed in the posttest phase are attributable to the fact that one group was subjected to an independent variable and the other group was not. The independent variable (the film) therefore brought about the change in the experimental group.

Not all experiments make use of a control group, as the next example shows.

Example 2: MOCK PRISON

Haney, Banks and Zimbardo (1973) created a pseudo-prison situation. Undergraduate students acted as volunteers and were given the roles of warders and prisoners. Eventually the experiment had to be stopped because the ''warders'' got so carried away by their roles that they became more and more brutal and aggressive towards the ''prisoners''. The prisoners, on the other hand, became more hostile towards the warders and behaved passively.

(Hagan 1990:45)

Activity

Why do you need to do this activity?

- To identify the classical experiment with reference to three key elements

Guidelines

Study the characteristics and examples of the classical experiment. Then read the example below, and answer the questions that follow.

Example 3: ELDERLY PEOPLE AND FEAR OF CRIME

A group of elderly people participated in an experiment in order to find an answer to the following research question: ''Does fear of crime influence the behaviour of elderly people by motivating them to seek self-protection and security?''

The elderly people's fear of crime was heightened by showing them photographs of real-life crime situations. The reactions of the subjects were noted. Most of them planned to fit new alarms and other security systems in their homes.

- In what respect are the members of the research group equivalent?

  .....

- Is there a control group? | Yes | No |

- To what experimental intervention was the research group exposed?

  .....

  .....

  .....

- Did the posttest indicate heightened awareness of security?

  .....

  .....

You should have answered as follows:

- Members of the research group were equivalent in respect of age.
- There was no control group.
- The experimental intervention entailed photographs of real-life crime situations.
- The planned installation of new alarms and security systems reflected heightened awareness of security.

(b) **Quasi-experimental designs or field experiments** are more commonly conducted in the criminological disciplines. Generally, the situation is more realistic. The advantage of field experiments is that they have greater external validity because the more realistic situation allows broader generalisation. Subjects in field experiments usually do not know that they are participating in an experiment, and react spontaneously. Internal validity is lower, however, because the researcher has less control over the experimental situation than in the case of a laboratory experiment (Neuman 1994:187).

Below are two examples of field experiments.

Example 4: FAMILY VIOLENCE

In 1984 two sociologists, Sherman and Berk, in collaboration with the Minnesota state police, devised an experiment to examine the problem: ''How should the increasing incidence of family violence be dealt with?'' The project focused on the desirability of three different police responses to charges of family violence.

The police officers were divided into three groups. When they were called out to investigate charges of family violence in homes, each of the three groups was told to follow a particular procedure. The three procedures were:

- Arrest the alleged offender.
- Force the alleged offender to leave the home, as that person would then be separated from the people being assaulted or threatened.
- Offer the people who are being assaulted or threatened advice, counselling or mediation.

(Schaefer 1989:42)

In this experiment there was no control group, as the purpose was to find out which procedure would be most effective in preventing future family violence.

Schaefer (1989:42) reports that Sherman and Berk used two methods to determine which of the three procedures was most effective.

- Police records were checked for the next six months to see whether the suspect was associated with any further instances of domestic violence.
- Telephone interviews were conducted with the victims over a period of six months to determine whether there were any further incidences of violence in which the same alleged offender was involved.

The main finding in this experiment was the effectiveness of the first procedure. Suspects who were arrested were less inclined to be involved in similar violence at a later stage than in the case of the other two procedures that the police followed. Arrest therefore appears to be an effective deterrent against family violence.

Example 5: PROJECT RAPE

In 1985 Harari and White conducted a field experiment on the San Diego State University campus to find out whether a male passerby would attempt to prevent a rape from happening. The scene was set in the evening on a fairly isolated campus footpath. The ''attack'' was clearly visible to all male passersby, who were either alone or in groups of two or three. In the ''attack'' a powerfully built male who was hiding among the bushes grabbed a female student. While the man was dragging her off, the female student dropped her books and screamed, ''Rape! Rape! Help!'' Hidden observers told the actors when to start an attack, and the same observers recorded the behaviour and reactions of passersby.

(Neuman 1994:187)

Assistance by passersby was measured in two ways:

- movement towards the place of assault
- movement towards a police officer who was visible in a parking lot opposite the scene

The finding of this field experiment was that 85% of males in groups and 65% of solitary males made a clear attempt to help the woman (Neuman 1994:187).

Activity

Why do you need to do this activity?

- To identify a field experiment

Guidelines

Carefully study the two examples of field experiments given above. Then read the example below and answer the questions that follow.

Example 6: CANDID CAMERA

The Seattle Police Department conducted an experiment in an attempt to find a better way of catching people who robbed shop owners.

Two groups of shops were selected in a high-crime area. Hidden cameras were installed in the shops in the experimental group. These cameras were activated by the shop owner when the shop was robbed. As soon as a

particular banknote was removed from the till, the camera would take photographs, which could be used to identify the criminal.

A posttest of the two groups of businesses showed that in cases of robbery involving the experimental group 30% more suspects were arrested, charged and taken to court for prosecution. Almost 50% of these robbers were convicted and sentenced by the court, whereas only 19% of the robberies in the case of the control group led to convictions.

(Hagan 1990:43)

- Why is this classified as a field experiment?

  .....
  .....

- What was the experimental intervention in this study?

  .....
  .....

- The posttest indicated that the photographs were effective in two respects. What are they?

  (i) .....
  (ii) .....

The example illustrates the following:

- The experiment was conducted in shops, which is a realistic situation typical of field experiments.
- The experimental intervention was the use of hidden cameras.
- The photographs were effective in the following two respects:
  (i) They led to the arrest of a larger number of suspects.
  (ii) They were effective evidence, which contributed to the conviction of the accused.

5.1.3 Advantages of experimental studies

- Experimental studies can be conducted fairly quickly and are usually economical.
- Control of aspects such as factors to which subjects are exposed and the duration of the experiment increases the validity of these studies.
- According to Haralambos and Holborn (1991:704), experiments lend themselves to repetition. As long as the exact nature of the experiment is recorded, other scientists can create identical situations and see whether they obtain the same results.

5.1.4 Drawbacks of experimental studies

- Particularly in the case of laboratory experiments the situation is unnatural because it is created artificially. According to Hagan (1990:45), the control exercised in fact

leads to the creation of exceptional or atypical groups or situations, which limits generalisation. The reactions of subjects in an artificial laboratory setting may differ from the reactions of people in less structured but more realistic situations. Subjects know that they are being observed, and this may influence their behaviour.

- It is difficult to find suitable people and conditions to conduct an experiment, and for that reason students on campuses are often used as subjects. These subjects are not necessarily representative of the general public. This creates problems relating to generalisation.
- There are underlying ethical problems associated with experimental studies. The subjects are human beings, and they can be manipulated by researchers to produce the desired results.
- The final objection raised by Haralambos and Holborn (1991:704) is that experiments cannot be conducted over a long enough period to allow one to study things such as social change in a community.

5.1.5 Conclusion

Experiments are not really the most effective research method, particularly in the criminological disciplines. One valid objection is that they assume that a population consists of two mutually exclusive subclasses: criminals and noncriminals. A case in point is the assumption that the prison population represents the criminal class and the outside community represents the noncriminal class.

Activity

Why do you need to do this activity?

- To describe the advantages and disadvantages of experimental studies

Guidelines

Construct a table consisting of two columns in order to compare the advantages and drawbacks of experimental studies. Identify what you regard as the principal advantages and what you regard as the greatest weaknesses of experiments.

Your answer could have looked like this.

EXPERIMENTAL STUDIES	
ADVANTAGES	DRAWBACKS
Quick to perform	Unnatural situation
Economical	Limit generalisation
Control of factors to which subjects are exposed	Problems of finding suitable subjects to participate in the experiment
Duration	Ethical problems
Repeatable	

The greatest advantage of experimental studies is the extensive degree of control that is exercised over the situation. The unnaturalness of the situation is the greatest weakness.

Self-assessment exercise

.....

(a) Discuss the three key elements of the classical experimental design with reference to example 1, which deals with abortion.

.....

.....

.....

(b) In what way does ‘‘Project rape’’ (example 4) reflect the more realistic nature of field experiments?

.....

.....

(c) List four advantages of experimental studies.

(i) .....
(ii) .....
(iii) .....
(iv) .....

(d) List two important drawbacks of laboratory experiments.

(i) .....
(ii) .....

STUDY UNIT 5.2

Surveys as a quantitative method

After studying this unit you should be able to

- describe the survey method
- identify the advantages and disadvantages of survey research

5.2.1 Introduction

Surveys are a common data collection method and are used mainly when the population that is being studied is too big for direct observation. Market research organisations, for example, conduct surveys to determine the popularity of products, such as a certain brand of cooldrink. Television and radio programmes, too, are evaluated by means of survey research. In the criminological disciplines survey research is used to record self-reporting crimes, for example, or to determine public opinion on such things as the seriousness of crime, the efficiency of the police service and the fairness of the criminal law system. Except in the case of large-scale surveys like censuses (when the entire nation is counted), sampling is used for economic and practical reasons. The value of a survey depends on the extent to which the sample represents the population. The composition of the sample is therefore a determinant of the success of a survey.

5.2.2 Characteristics

Surveys are a method of data collection that can be used to determine the incidence, extent and distribution of a social phenomenon, such as car theft or taxi violence, at a given time. Standardised data relating to a large number of people are collected: usually the data are in statistical form and the most practical way of collecting data is to use questionnaires. The following questions come from a questionnaire in a national crime survey that was conducted in the USA in 1977.

Example 7: Were you a victim of crime?

The following questions refer to things that happened to you during the last six months

''Did you have your purse snatched?''	☐	Yes – how many times?
No	☐	

"Did anyone beat you up, attack you with something, such as a rock or a bottle?"	☐	Yes – how many times?
No	☐	
"Was something stolen from you while you were away from home, for instance at work?"	☐	Yes how many times?
No	☐	

(Hagan 1990:48)

Haralambos and Holborn (1991:728) identify three types of surveys:

- **Factual surveys**, which are used to collect descriptive data, as in the case of censuses.
- **Attitude surveys**, which try to determine the community's views on problems such as fear of crime or capital punishment.
- **Explanatory surveys**, which attempt to test theories or hypotheses or to produce new theories.

Townsend (in Haralambos & Holborn 1991:728) undertook a survey of poverty which was both descriptive and explanatory. The survey was used both to determine the extent of poverty and to develop theories to explain poverty.

Researchers try to generalise data by means of surveys. For this reason, surveys are based on carefully selected samples. The success of a survey ultimately depends on the quality of the data that it produces.

Activity

Why do you need to do this activity?

- To identify the survey method on the basis of its characteristics

Guidelines

Study-read the section above. Then read the example below and answer the questions that follow.

Example 8: BANKSTON AND THOMPSONS STUDY OF FIREARMS (1989)

Ownership of firearms was researched in the American state of Louisiana. The researchers wanted to find out to what extent people carried firearms when they were away from home because they were afraid of crime.

The following hypothesis was tested:

Persons who are most afraid of crime and who believe that a firearm will protect them will be more inclined to carry a firearm.

Questionnaires were posted to more than 4000 people. The questions focused on background information, attitudes, and the ownership and use of firearms. The researchers found that roughly one third of the 1000 respondents who returned the questionnaire occasionally carried firearms.

(Neuman 1994:115)

(a) What kind of survey was this?

.....

(b) What characteristic of this research shows that it used a survey method?

.....

.....

(c) Identify the dependent and independent variables in this study.

(i) Independent variable:

.....

.....

(ii) Dependent variable:

.....

.....

The study of firearms was an attitude survey. The fact that questionnaires were sent to a large number of people indicates that it was a survey. Firearms were the independent variable that was used to test fear of crime, which was the dependent variable.

5.2.3 Advantages of surveys

- Surveys can produce large volumes of data on a large number of people in different localities within a short time.
- Surveys are valuable sources of information, provided the samples are properly drawn and questions are accurately phrased.
- Surveys are the best method for describing certain characteristics of large populations.
- The data produced by surveys are original.
- Survey data are collected relatively quickly and the methods used to obtain the data are uniform.

5.2.4 Drawbacks of surveys

- Owing to the nature of surveys, survey data are often considered to be superficial. A survey is a structured situation in which the researcher and the respondent each plays a particular role. The researcher asks the questions and the respondent answers, so there is no real dialogue. As a result questions are not always qualified, since there is no scope for further explanation or clarification.
- Schnetler (1989:4) mentions that the design of survey research can be problematic. Respondents may be questioned about things which they know little about or which

they do not think important, for example computer fraud. As a result they may be unable to respond properly or may not be motivated to participate in the survey. Both these problems cast doubt on the validity of the data.

Activity

Why do you need to do this activity?

- To identify the advantages and drawbacks of surveys

Guidelines

Study-read the information above. Then construct a table consisting of two columns in which you identify the advantages and drawbacks of surveys.

Your answer should have included the following information:

SURVEYS	
ADVANTAGES	DRAWBACKS
Large volume of data Large number of respondents Short duration Valuable source of information Describe characteristics of large populations Produce original data Data collected quickly by uniform methods	Nature of surveys leads to superficial data Validity of data questionable

Self-assessment exercise

.....

(a) Identify three types of surveys. Give an example of where an attitude survey would be appropriate in your own subject.

.....

.....

.....

(b) What do you consider to be the main advantage of surveys?

.....

.....

(c) Why is the information collected by means of surveys often considered superficial?

.....

.....

.....

STUDY UNIT 5.3

Quantitative techniques

After studying this unit you should be able to

- discuss open-ended and closed questions as they appear in questionnaires
- discuss postal and electronically mailed questionnaires

5.3.1 Introduction

The main quantitative techniques, especially in survey research, are questionnaires and interviews. Schaefer (1989:45) defines a survey as a study that is conducted mainly by means of interviews or questionnaires, which provide researchers with information on how people think and act.

5.3.2 Questionnaires

Questionnaires are probably the most widely used data collection technique. However, drawing up a good questionnaire is not easy. To be effective, each question must be simple and clear, so that respondents will understand it. The questions must also be specific so that there will be no problems when the results are interpreted. Even fairly unstructured questions must be formulated carefully in order to obtain the desired information.

Kerlinger (1986:444–445) suggests that any researcher formulating questions for a questionnaire should consider the following:

- Does the question relate to the research goal and the research problem?
- Is it the right kind of question?
- Does the question suggest what will be deduced from the answer?
- Does the question require knowledge and information that the respondent does not have?
- Does the question involve sensitive information that may cause resistance among respondents?

The key requirements are that questions should be as clear, relevant, simple and unambiguous as possible. Each question should present only one idea. The following are examples of common errors.

POORLY PHRASED QUESTIONS	PROBLEM	IMPROVED VERSION OF QUESTION
Has your mother ever worked?	Confusing	Has your mother ever gone out to work for a salary?
Are you in favour of legalising the use of alcohol and dagga by 16-year-olds?	Two ideas in the same question	Are you in favour of legalising the use of alcohol by 16-year-olds?
Don't you think that the press is biased and we should distrust all reporting?	Leading question: the respondent is led towards a particular response	Are you in favour of legalising the use of dagga by 16-year-olds?
		Would you say that you have a lot of confidence, some confidence or very little confidence in the press?

(Adapted from Schaefer 1989:45)

In questionnaires, two main kinds of questions are asked. These are open-ended or unstructured questions, and closed or structured questions (Babbie 1990:127).

(a) Open-ended or unstructured questions

In the case of open-ended questions, respondents are requested to provide their own answers to the questions. In other words, the question leaves everything to the discretion of the respondent. Respondents are free to answer in their own words, since no alternatives are offered. An example of an open-ended question would be: ''What do you regard as the most serious crime problem in the new South Africa?''

Usually open-ended questions are useful in the early stages of a study. They may help researchers to demarcate their field more precisely. On the other hand, answers to open-ended questions are difficult to interpret, tabulate and summarise in a research report.

(b) Closed or structured questions

In the case of closed questions respondents are requested to select an answer from a list of alternatives. Closed or structured questions are formulated so that answers can be short and to the point. Sometimes the questions can be answered with a simple ''yes'' or ''no'', for example: ''Have you ever been a crime victim?'' In other cases, respondents may have to choose between a number of alternatives (this limits the number of possible responses), for example: ''The primary task of the police service is to protect society against crime. Do you fully agree/partly agree/disagree with this statement?''

Structured questionnaires are easy to complete, take up less time, make respondents stick to the question, and are relatively objective, more acceptable and convenient to complete. The questionnaire is cheaper, especially when large samples are involved. Since the questions are in writing, there is a large measure of consistency. The data obtained from questionnaires are also easy to tabulate and analyse, and there is less risk of misinterpretation.

The main drawback of closed questions, however, is the structure of the responses (Babbie 1990:128). Response categories have to include all possible answers and must also be mutually exclusive (ie respondents should not feel obliged to choose more than one category).

Activity

Why do you need to do this activity?

- To determine the requirements that a questionnaire should satisfy

Guidelines

Study-read the information about questionnaires above and reformulate the poorly phrased questions below.

Poorly phrased question

Are you in favour of abolishing the death penalty and corporal punishment as forms of punishment?

Don't you think that the police should be unarmed for the sake of better relations between the police and the community?

Improved versions of questions

Are you in favour of abolishing the death penalty?

Are you in favour of abolishing corporal punishment?

An unarmed police service will promote good relations between the police and the community.

Agree/partly agree/disagree

5.3.3 Postal or electronically mailed questionnaires

These questionnaires are posted or electronically mailed to respondents and are returned to the researcher by post or electronic mail. The main characteristic of this kind of survey is that respondents complete questionnaires on their own, and the questionnaires are the only means of communication between respondent and researcher (Dixon 1989:19). These questionnaires normally consist of structured questions so that responses can be processed quickly.

Expenses are limited to the cost of printing and postage. The researcher is able to reach people throughout the country, even in remote areas. Information can be obtained from a large number of people in a short space of time.

A major drawback of these questionnaires is the low response rate, since respondents are free to choose whether or not to complete the questionnaire. A poor response rate can influence the value of the data, since the people who do not complete the questionnaire may be the very ones who have a particular opinion about the topic.

Poor feedback is particularly common in the case of questionnaires on sensitive issues like abortion. There is also a lack of control, since the researcher cannot verify who completed the questionnaires and how correct the responses are.

Activity

Why do you need to do this activity?

- To identify the advantages and limitations of postal or electronically mailed questionnaires

Guidelines

Study-read section 5.3.3. Formulate a table consisting of two columns and use it to identify the advantages and limitations of postal and electronically mailed questionnaires.

Your answer could have looked like this.

POSTAL AND ELECTRONICALLY MAILED QUESTIONNAIRES	
ADVANTAGES	**LIMITATIONS**
Respondents complete questionnaires on their own	Low response rate
Responses are processed quickly	Poor feedback influences value of data
Expenses are low	
Information obtained from large numbers of people within a short time	No control over who has completed the questionnaires and how correct the information is

STUDY UNIT 5.4

Statistical techniques in data analysis and interpretation

After studying this unit you should be able to

- list the characteristics of the various statistical techniques
- state the advantages and limitations of each technique

5.4.1 Introduction

In this study unit we consider analysis and interpretation of data by means of statistical techniques. Statistical techniques can be viewed as the keys to interpreting the information contained in a data set. A data set contains information that has been collected and organised by the researcher. The validity and reliability of the data are extremely important. As we explained earlier in this study guide, validity is the degree to which an instrument measures what it intends to measure, and reliability refers to the extent to which the measure is a consistent and dependable indicator of something the level of crime, for instance.

5.4.2 Correlation

In statistics, an association or relationship between variables as shown by their measurements or scores is known as correlation. One of the most commonly used correlation coefficients is the Pearson product-moment correlation coefficient, which is written **r**. The size of the correlation coefficient varies from + 1 through 0 to -1. Most correlation coefficients tell us two things. First, they give an indication of the magnitude of the relationship. A correlation of -.92 is the same size as one of + .92. The sign has nothing to do with the size of the relationship, but it does give information about the direction of the relationship. When two variables are positively related, as one increases, the other one also increases. Here is an example of a positive correlation: as violent crime increases, fear of being a victim of crime also increases. Now here is an example of a negative correlation: as violent crime decreases, fear of being a victim of crime also decreases. Other variables may be inversely related. By this we mean that as the one increases, the other decreases, for example, when visible policing in a particular area increases, the number of burglaries decreases. The absence of a relationship is denoted (reflected) by a correlation coefficient of .00 or thereabouts.

Second, in addition to showing the direction and the strength of a correlation, the coefficient can be used to determine the proportion for variance accounted for by the association. This is known as the coefficient of determination (r2). The coefficient of

determination is easy to calculate, as you just need to square the correlation coefficient. For example, if we found a correlation of .70 between cigarette smoking and the use of cocaine, we could calculate the coefficient of determination as follows:

$$.70 \times .70 = .49$$

The coefficient of determination is then turned into a percentage. Therefore, a correlation of .70, as indicated in the equation, explains approximately 49% of the variance. In this example, we could deduce that 49% of the variance in cocaine use is accounted for by cigarette smoking. Alternatively, a correlation of .20 would have a coefficient of determination of .04 ($.20 \times .20 = .04$), strongly indicating that other variables are likely to be involved. Remember that correlation is not causation. Therefore, we cannot infer from this correlation that cigarette smoking causes or influences cocaine use. It is just as probable that cocaine use causes cigarette smoking, or that both unhealthy behaviours are caused by a third, unknown variable.

Although correlations are typically regarded as descriptive, they can unlike measures of central tendency and dispersion – be tested for statistical significance. Tests of significance allow us to estimate the probability that that a relationship between variables in a sample actually exists in the population and is not simply the result of chance.

Vito et al (2008:185–191) examine the bivariate correlation technique and compute the Pearson product-moment correlation coefficient. You can also open State Data Set I on your CD in order to examine the relationship between two ratio level variables in each state, namely: ''Percentage of People in Poverty, Average 96–97'' (X is the independent variable) and ''Burglary per 100,000: 1997'' (Y is the dependent variable). In this case the set hypothesis is that the relationship is positive. This means that as the average percentage of people living in poverty (X) increases, the burglary rate (Y) also increases. Now click on the four choices of the menu (on pages 186–187) in order to obtain information identical to figures 10.6, 10.7, 10.8, 10.9, 10.10, 10.11 and 10.12. It is important to understand the interpretation of table 10.2 (page 191) ''SPSS output Correlation Matrix, Poverty and Burglary.'' The $r = .425$. This figure squared is $r^2 = .18$; thus, only 18% of the variation in the burglary rate per 100 000 (Y scores) is determined by the variance in the percentage of people living in poverty (X scores). What is equally important is that it also means that 82% of the variation in the burglary rate is determined and should thus be explained by other factors.

Self-assessment exercise

Use State Data Set I on topics 2, 3 and 4 as directed on page 193 of your prescribed book. In your analysis include the scatter plot and the bivariate correlation matrix. Specify the independent and dependent variables and state your research hypothesis.

5.4.3 The chi-square test

The chi-square statistical technique enables researchers to test hypotheses using nominal or ordinal data. It does this by testing whether one set of proportions is higher or lower than you would expect it to be by chance. This test summarises the discrepancy between observed and expected frequencies. The smaller the overall discrepancy between the observed and expected frequencies, the smaller the chi-

square will be. Conversely, the larger the discrepancy between the observed and expected frequencies, the larger the value of the chi-square will be. The chi-square is therefore a type of significance test that is widely used in criminological research. It is based on the null hypothesis, which is the assumption that there is no relationship between two variables in a population. To put it simply, the chi-square test compares what you actually get with what you expected, given a null hypothesis or no relationship.

Example of the chi-square quantitative data analysis technique applied manually

Let us imagine that we are investigating a possible relationship between gender and whether people fear becoming victims of crime. To test this relationship, we select a sample of 200 people at random. Our sample is made up of 80 men and 120 women; 140 (70%) of our sample report that they fear becoming victims of crime and the remaining 60 (30%) do not. If there is no relationship between gender and fear of becoming a victim of crime, then 70% of the men in the sample should report fear of becoming a victim of crime and 30% should report no such fear. Moreover, women should report fear of becoming a victim of crime in the same proportion. Table 5.1 (part I) shows that based on this model, 56 men and 84 women expressed fear of becoming a victim of crime, and 24 men and 36 women reported no such fear.

Part II of table 5.4.3 shows the observed fear of becoming a victim of crime for the sample of 200 people. Note that 40 of the men say they are afraid of becoming a victim of crime, and the remaining 40 say they are not. Of the women in the sample, 100 report being afraid of becoming a victim of crime, and 20 report no such fear. If we compare the expected and observed frequencies (parts I and II), we note that somewhat fewer men report fear of becoming a crime victim than expected, whereas somewhat more women than expected experience this fear.

The chi-square is computed as follows: For each cell in the tables, we first subtract the expected frequency for that cell from the observed frequency. We then square this quantity, after which we divide the squared difference by the expected frequency. We carry out this procedure for each cell in the tables, and then add the results. Part III of table 5.1 presents the cell-by-cell computations. The final sum is the value of the chi-square, namely 25.39. The magnitude of the chi-square value allows us to estimate the probability of a relationship or not between the two variables. To determine the statistical significance of the observed relationship, we must use a standard set of chi-square values. We must therefore compute the degrees of freedom. For the chi-square, the degrees of freedom are computed as follows: the number of rows in the table of observed frequencies, minus one, is multiplied by the number of columns, minus one. This is written as $(r - 1) * (c - 1)$. In the present example, we have two rows and two columns, so there is 1 degree of freedom. Turning to a table of chi-square values (see appendix A: Distribution of X^2) we find that, for 1 degree of freedom and random sampling from a population in which there is no relationship between two variables, 10% of the time we should expect a chi-square value of at least 2.7. Thus, if we select 100 samples from such a population, we should expect about 10 of those samples to produce chi-squares equal to or greater than 2.7. Moreover, we should expect chi-square values of at least 6.6 in only 1% of the samples and chi-square values of at least 10.8 in only 0.1% of the samples. The higher the chi-square value, the less probable it is that the value can be attributed to sampling error alone. In our example, the computed chi-square value is 25.39. In this case we can assume no relationship between gender and fear of becoming a victim of crime in fewer than 0.1% of a large number of samples. Thus, the probability of obtaining a chi-square of this

magnitude is less than 0.001 if random sampling has been used and if there is no relationship in the population. This result can be reported by stating that the relationship is statistically significant at the 0.001 level, and we reject the null hypothesis by accepting the alternative hypothesis that a relationship does indeed exist between the two variables of gender and fear/no fear of becoming a victim of crime.

TABLE 5.4.3 Illustration of Chi Square (Adapted from Maxfield & Babbie, 2008:423)

I Expected cell frequencies			
	Men	**Women**	**Total**
Fear of victimisation	56	84	140
No fear of victimisation	24	36	60
Total	80	120	200
II Observed cell frequencies			
	Men	**Women**	**Total**
Fear of victimisation	40	100	140
No fear of victimisation	40	20	60
Total	80	120	200
III (Observed Expected)^2 ÷ Expected			
	Men	**Women**	
Fear of victimisation	4.57	3.05	Chi square = 25.39
No fear of victimisation	10.66	7.11	P < .001

The chi-square test is an approximation, because it is not completely exact. However, it is a very good approximation when the sample size is large. When the sample size is very small, the chi-square test is not necessarily valid even if the *p* value is less than or equal to .05 ($p \leqslant .05$). The general rule is to try to avoid using the chi-square when fewer than 5 cases are expected in any category. The problem of small sample size can sometimes be avoided by grouping similar categories together, and adding up the counts in each one.

Self-assessment exercise

(a) Calculate the chi-squarevalue for a similar scenario with the same variables (**gender** and **fear of being a victim of crime**) consisting of 100 observed frequencies: 40 men, 20 fearing being the victim of crime and 20 not fearing this and 60 women, 50 fearing being the victim of crime and 10 not fearing this; and 100 expected frequencies: 40 men, 28 fearing being a victim of crime and 12 not fearing this and 60 women, 42 fearing being a victim of crime and 18 not fearing this.

(b) Calculate the chi-square manually following the procedure in the example on pages 96 to 97 and in table 6.2 of your prescribed book.

(c) Calculate the chi-square using the SPSS according to the example in your prescribed book, starting on page 97.

Open the NCSD data set on your CD in order to examine the relationship

between race and attitude toward capital punishment. Follow the 8 steps on pages 97 to 102 of your prescribed book, and have a look at the SPSS output in table 6.3. The interpretation of the chi-square value of 86.304 shows it to be highly significant, because the probability value (p) value is .000, which is less than .05.

5.4.4 The t-test

The t-test was designed to determine whether or not a significance difference exists between the means of two small samples, each consisting of three or more items. It can be used when we have a dichotomous categorical independent variable (either nominal or ordinal) and a continuous interval or ratio dependent variable that can be used to calculate a mean. Small samples may be used. A sample of 30 is adequate, but larger samples are preferred.

Vito et al (2008:145–157) distinguish between

(a) the t-test for related or paired samples and

(b) the t-test for independent samples.

The t-test for related or paired samples is used when the same people are compared over time, and the analysis is therefore based on two measurements of the same variable for the same people over a period of time. Vito et al compared the means of mathematics and reading scores of 20 prison inmates before and after completion of the inmate literacy programme. They established that the higher the reading scores on the Comprehensive Adult Student Assessment System (CASAS) scale, the better the performance. The analysis was performed using the SPSS, and the results showed that the mean score in mathematics went up 10.4 points (from 216.2 to 226.6). The t-test value of 3.611 was statistically significant at the $p = .002$ level, which is much lower than the $p \leqslant .05$ level of significance set. This meant the rejection of the null hypothesis and the acceptance of the alternative hypothesis, thus indicating that the findings had some relevance beyond the existing population, as the chances seemed good that the programme implemented would benefit prison inmates in other similar locations. The mean score on the reading test also showed an improvement of 12.75 points (from 221.85 to 234.6) and the t-test value of 4.45 was statistically highly significant at the .000 level; again the null hypothesis could be rejected. This means that the reading scores of prison inmates would probably improve if they participated in the educational programme.

Vito et al also used the SPSS to compute an independent samples t-test. This time they used the NCSD set to compare the mean scores awarded by Anglo and Minority respondents when rating the police. You will be given this data set to help you gain practical experience in data analysis and interpretation. In the survey, respondents were asked to rate the police according to (i) how quickly they responded to calls, (ii) their friendliness, and (iii) their fairness in dealing with the public. Responses to each question were associated with the following scores: (5) very high, (4) high, (3) average, (2) low and (1) very low; thus, the higher the score, the higher the respondent's rating of the police. Previous research findings revealed race to be one of the strongest predictors of attitudes toward the police, with minority groups being distrustful of the police and viewing themselves as victims of discriminatory treatment. The null hypothesis set by the researchers posited that there would be no difference in mean police rating scores between the Angloand Minority respondents.

In using the SPSS, you need to take the following steps to run the t-test for independent samples:

1. Open the NCSD data set.
2. Click on ''Analyse,'' then on ''Compare Means,'' and then on ''Independent-samples T test''.
3. The next window shows the box ''Independent-Samples T test''. Scroll down until you find the variable ''Police Rating Score'' and click on the arrow to paste it into the ''Test Variable(s)'' window.
4. Find the variable ''Race Recode,'' click on it, and then click on the arrow in the box to paste it into the ''Grouping Variable'' window. Then click on the box ''Define Groups.''
5. The next screen shows the box ''Define Groups.'' Type ''1'' in the blank space for Group 1 and ''2'' in the blank space for Group 2. Then click on the box labelled ''Continue.''
6. You will then return to the''Independent-Samples T test'' screen. Click on the box labelled ''OK'' to obtain your computer output and statistics.

The data under Group Statistics in the output file contains descriptive statistics concerning the two groups. The mean police rating score of the ''Anglos'' variable is 10.85. The mean police rating score of the ''Minorities'' variable is 9.52. The ''Anglo'' survey respondents gave the police a higher average rating than the ''Minority'' respondents. However, to find out whether this mean difference of 1.33 between the scores awarded by the ''Anglos'' and ''Minorities'' also exists in the entire population from which the sample was drawn, the t-test must be correctly interpreted in terms of direction and value before the null hypothesis can be either rejected or retained. What must be borne in mind is that for the null hypothesis to be rejected, the significance of the statistical results must be equal to or less than .05 ($p \leqslant .05$). If we look at the output file, we note that the significance level of F is .199. We cannot reject the null hypothesis, because .199 is greater than .05. We will have to assume that the variance in police rating scores is equal across the two groups. We can therefore use the results labelled ''Equal variances assumed'' to interpret the t-test values. The t value is 6.031 with 876 degrees of freedom, and because the SPSS always computes the level of significance for a two-tailed test, we can directly interpret the significant level in the standard way. In this case our research hypothesis is one-tailed, and we simply divide the listed level of significance by 2 (.000 divided by 2 is .000). Because the significance level is below .05 we can reject the null hypothesis and accept the alternative hypothesis, namely that the ''Anglos'' have a higher opinion of the quality of police service than the ''Minorities'' do.

Vito et al (2008:154) summarise the process of significance testing and the null hypothesis in the steps below.

1. The research and null hypotheses are developed and stated.
2. The means of two samples (or of the parts of the sample divided into two) are computed and compared.
3. Based on this analysis, a conclusion is reached about
   (a) whether there is a difference between the means and
   (b) the nature of this difference (whether it supports the research hypothesis or not).
4. The equality of variance between the two samples is calculated and determined.
5. The *t* ratio (the difference between the sample divided by the standard error of the difference) is computed.

6. The probability of this ratio is determined.
7. A decision is made concerning the null hypothesis. If the probability of the *t* ratio is equal to or less than .05, the null hypothesis is rejected. If it is greater than .05, the null hypothesis is accepted. If we are to reject the null hypothesis, the significance level in the printout must be less than or equal to .05.

5.4.5 Analysis of variance (ANOVA)

Analysis of variance (ANOVA) is a statistical technique designed to examine means across more than two groups by comparing variances. It is based on the variability, that is, variance from the mean, in each sample and in the combined samples. Essentially, ANOVA is a technique that separates the variation that is present into independent components, which are then analysed in order to test certain hypotheses. The simplest application of ANOVA is one-way analysis of variance, also called the one-variable-of-classification analysis of variance. The hypothesis that is tested by means of the analysis of variance is that the means of several populations are equal. In a one-way variance situation each observation is classified into one sample or another on the basis of a single criterion, namely the population from which it came. There is also a two-way analysis of variance (also called the analysis of variance for two variables of classification). This is a little more complicated than the one-way analysis, and we are not going to deal with it in this module.

The one-way analysis of variance is used to test for differences among three groups or more, since the two-group case can be dealt with by means of a t-test. When the scores are divided into three or more groups, the variance can be divided into two parts.

1. The average variability of the scores (means) within each group is called **within group variance.** This variation due to differences within individual samples is also known as SS(W), which stands for ''sum of squares within groups''.
2. The variation of group scores (means) from the total mean of all groups is referred to as **between group variance.** This variation due to the interaction between the samples is also known as SS(B), which stands for ''sum of squares between groups''.

ANOVA therefore compares the ratio of between group variance and within group variance, in other words the variance among the individual means in the groups and the variance among the means of the different groups. What needs to be established is whether the between group variance is significantly larger than the within group variance; if this is proved to be the case, then the null hypothesis should be rejected. The F-test (F-ratio) is a ratio of the two estimates of variability and can be computed by dividing the between group mean square by the within group mean square. This measures how different the group means are from one another (the numerator) with regard to the general overall amount of randomness in the situation (the denominator). Thus, it provides a measure of whether the group means are ''more different from one another than is reasonable'' for the situation if the groups were identically distributed. If the null hypothesis is accepted, the observed and estimated within group and between group variation should be about the same and the F-test value equals 1. If the null hypothesis is rejected, it means that the observed between group variation should exceed its estimate and the F-ratio is greater than 1. One-way ANOVA establishes whether or not the F-ratio exceeds 1 by an amount so great that it cannot be explained by chance. If the F-test value is statistically significant, the group means are not equal

and the null hypothesis can be rejected, but in order to highlight where the differences come from, we have to use the Bonferroni comparison procedure to tell us where the significant difference between the means originates.

Your prescribed book emphasises the following requirements for the effective use of ANOVA.

1. The data must be a random sample from a population.
2. The single dependent variable must be a measure at the interval level in order to compute the mean.
3. The independent variable must be a measure categorically at either the nominal or ordinal level.

Activity

Your prescribed book gives guidelines for calculating ANOVA manually and by using the SPSS. Since calculating ANOVA manually is a very complicated procedure, we recommend that you use the SPSS State Data Set I on your CD by following the five steps from pages 165 to 172. Pay particular attention to the F-ratio of 3.69, the significance level of .018 and the application and interpretation of the Bonferroni procedure.

5.4.6 Regression analysis

Regression analysis is a technique that helps researchers to determine or predict the specific function relating variable Y to variable X. The general formula for describing the association between these two variables is $Y = f(X)$, which we read as "Y is a function of X". This is also called the linear regression formula. Like correlations, regression analysis examines the association or relationship between variables, but unlike correlations, the main purpose of regression analysis is prediction. For example, correctional institutions may be able to predict or come close to predicting whether a prisoner about to be released will reoffend or not reoffend by considering the person's age when they were first committed to an institution, whether or not they engage in substance abuse, employment history, current behavioural patterns and release plan.

There are two basic types of regression analysis, namely simple regression and multiple regression. In simple regression, we aim to predict the dependent variable with a single independent variable. In multiple regression, we may use any number of independent variables to predict the dependent variable. It is therefore a technique that allows additional factors to enter the analysis separately so that the effect of each can be estimated.

Another type of regression is logistic regression, which is unique in its ability to predict dichotomous variables, such as the presence or absence of a specific outcome, based on a specific set of independent or predictor variables. Like a correlation, logistic regression provides information about the strength and direction of the association between the variables. Furthermore, logistic regression coefficients can be used to estimate odds ratios for each of the independent variables in the model. These odds ratios can tell us how likely it is that a dichotomous outcome will occur, given a particular set of independent variables.

A difficulty associated with regression models is that they may be controversial owing to the nature of the data used to develop the model and not because of the statistical techniques employed to attain it. The researcher should therefore be careful before drawing causal inferences and making predictions.

Note on pages 198 to 199 of your prescribed book and in table 11.1 how accurate regression analysis provided information on the expected size of the US prison population from 1995 to 1999. Then study the example of how to calculate regression coefficients manually and conduct a regression analysis on the murder rate per 1 000 000 for the USA during the period 1976 to 1998. You need to consult tables 11.2 and 11.3, figures 11.1 and 11.2 and the formulas on page 201 in order to predict the murder rate for 2005.

Activity

Perform the SPSS procedure using Data Set I on the CD and follow the seven steps to conduct a linear regression analysis to predict what the burglary rate will be for a given rate of poverty (in this case 50%). Consider the graph ‘‘Burglary per 100,000: 1997’’ in figure 11.8 and the ‘‘SPSS Regression Output Poverty and Burglary Rates’’ in table 11.4, which lead to Y = 2116.54. This means that if 50% of people live in poverty, the burglary rate should be 2116.54/100 000.

Review

In this theme we introduced you to various methods and techniques associated with the quantitative approach to research. We explained that the nature of the research determines what approach, method(s) and techniques are suitable for data collection, processing and interpretation.

THEME 6

Report writing

Introduction

Writing the report is the final stage of the research process. Some research may consist of only literature research and quantitative data, whilst other research may consist of data from the literature and qualitative data. Some may even contain quantitative or qualitative data only. But as a general rule, and as the ideal, research should contain all three elements to ensure the most valid and reliable data.

In this theme you will be guided through the process of producing a research report. You will learn how to combine the data from literature research, quantitative research and qualitative research to produce a research report.

This theme consists of the following study units:

Study unit 6.1: Guidelines for good research report writing

6.1.1 Introduction
6.1.2 Guidelines for good report writing
6.1.3 Summary

Study unit 6.2: The research report writing process and some common mistakes

6.2.1 Introduction
6.2.2 The writing process
6.2.3 Common mistakes
6.2.4 Summary

Study unit 6.3: Quantitative research report writing

6.3.1 Introduction
6.3.2 Quantitative research report writing
6.3.3 Summary

Study unit 6.4: Preparing for publication

6.4.1 Introduction
6.4.2 The starting point
6.4.3 Rationale
6.4.4 Classification of articles
6.4.5 Choosing a journal
6.4.6 Submitting an article
6.4.7 How articles submitted for publication are evaluated
6.4.8 Reacting to the evaluation of your manuscript
6.4.9 Summary

KEY CONCEPTS

- Readers
- Style and tone Logic and clarity
- Honesty and objectivity
- Findings and recommendations
- Composing
- Rewriting
- Abstract
- Evaluation of manuscript
- Journal
- Publication

STUDY UNIT 6.1

Guidelines for good research report writing

6.1.1 Introduction

Research findings must be reported so that they can be shared with other researchers. The findings are recorded in a research report, which may take the form of a dissertation (at master's level), thesis (at doctoral level), article (for a scientific journal) or an assignment (as for an academic course). While the presentation and layout of the various reports differ, all have to comply with certain basic requirements (Goddard & Melville 2001:8893).

6.1.2 Guidelines for good report writing

- **The readers**

A very important aspect to be considered by the author of a report is who the readers of the report are likely to be, because this will determine the form it should take. The writer must consider the background knowledge of his or her readers and inform them fully, since they must be able to evaluate the reliability of the results for themselves.

Communication is more effective when tailored to a specific audience. Therefore, the research report will look different depending on whether it is prepared for an instructor, students, professional scientists or the public.

Instructors may want more emphasis on clear, logical thinking, whereas reports aimed at students should concentrate on a solid grasp of the methodological and substantive concepts. So, when writing for students, it is good policy to define technical terms and label each part of the report. Start with the research question and present the report as an answer, using straightforward language to explain why you have conducted the various steps of the research (Neuman 2000:465).

If the research report is meant for scholars, it is not necessary to define technical terms. It is probably also not necessary to explain standard procedures such as random sampling. Scholars are more interested in how the research links to abstract theory or to previous findings in the literature. Only a condensed description of the research design is needed. Scholars would rather pay close attention to how the data was collected and how variables were measured. They want the section on the data analysis to be comprehensive, so the section discussing the results should be meticulously written. A research report aimed at scholars should be compact and tightly written (Neuman 2000:465).

When a research report is prepared for the general public, the language should be simple and nontechnical, and concrete examples should be included. The focus should be on the practical implications of the findings. No details of the research design are needed in the reports for this audience (Neuman 2000:465).

- **Style and tone**

Because they are scientific documents, research reports are written in a narrow range of styles with a distinct tone. This is because their goal is to communicate the research methods and research findings clearly. Therefore, they do not advocate a particular position (Neuman 2000:465). The proposed readership influences the style and tone of the report.

Style refers to the types of words as well as the length and form of sentences and paragraphs, while tone refers to the attitude of the writer toward the subject matter. The style of research reports is formal and succinct in other words, they are not conversational and they say a lot in a few words. Their tone reflects distance from the subject matter, because research reports are professional and serious. Research reports do not use flowery language, because they do not aim to entertain (Neuman 2000:465).

The style of research reports should be objective, accurate and clear. When readers find carelessness in the writing or in disclosing how the research was conducted, they will question the results. Because the detail of research reports can be complex and the complexities can lead to confusion, clear writing is essential. To facilitate clear writing, short, declarative sentences are the answer. Conclusions must be limited to what was supported by the evident findings (Neuman 2000:466).

- **Logic and clarity**

While the research may be of very high quality, and be valid and reliable, the effective transfer of knowledge depends on the standard of the report. According to Van der Westhuizen (1977:126) the author must ensure that his or her report complies with the requirements of scientific logic and clarity at least. Follow a logical train of thought. Be sure that each point follows logically from the previous one. Write clearly, without repeating yourself. State your point of view concisely and avoid woolliness or padding. Avoid words that sound impressive, but do not mean anything. If you use tables, they must be clear and understandable. If explanatory notes are required, they must be comprehensive.

Logic and clarity in writing do not ‘‘just happen’’. They require hard work, and certain steps are involved. The research report covers aspects such as the research question, the research design, the data collection techniques, the findings and the implications of the findings. An outline is used to organise all these elements for a proper report. Outlines consist of topics, also called subheadings. If topics are not used properly, they can become a barrier to clarity in writing (Neuman 2000:466–467). One way to test whether or not a particular topic contributes to the clarity of the report is to read just the outline (the topics or subheadings). If the outline reflects a logical train of thought, the various topics are likely to contribute to the clarity of the report.

Landman (1980:412) provides the following guidelines for writing a report:

- **Theme**

  Keep to the theme. If you digress, there is a danger that you will begin to write about subjects unrelated to the theme.

- **Honesty and objectivity**

  Be honest and objective. Present the standpoints as you have encountered them. Do not become subjectively involved or make the situation look better (or worse!) If uncertainties exist, mention them. In fact, do not hesitate to highlight them, as these uncertainties may stimulate future research. It is also extremely important to be honest about sources. Sources must be correctly acknowledged and recorded so that recognition is given to the authors quoted, and also so that readers can examine the original text themselves. All sources consulted must be listed.

- **List the findings and recommendations**

  In the last part of the research report, inferences and deductions have to be made, based on the findings. The researcher must state without bias what he or she has ascertained. It is also important to make recommendations about improvements to current practice and suggest possible new subjects for research. This part of the report is very important, since it contains the researcher's own ideas and recommendations. Many reports fail because the researcher does not reveal his or her own ideas.

6.1.3 Summary

Good report writing boils down to common sense: consider the readers. This implies that the style and tone should be set to their level of expertise, that the report should be logical and clear, and that the writer should stick to the theme. Social scientists will not read your work again if they suspect dishonesty or detect subjectivity instead of objectivity.

STUDY UNIT 6.2

The research report writing process and some common mistakes

6.2.1 Introduction

When a reader reads a piece of research for the first time, he or she usually does not think about it in terms of the writing process. Writing may seem easier than it is, especially when you read the work of a skilled and seasoned researcher. However, easy reading does not equal easy writing. There is a process behind the printed result, and common mistakes may slip in.

The techniques below are associated with good writing (Neuman 2000:467).

6.2.2 The writing process

- Prewriting

  You learn to write by writing! It takes time. It takes effort. It only improves with practice. Starting is the difficult part. Begin with a file full of notes, outlines and lists. You could file some or all of these in a computer folder.

- **Composing**

  The first draft consists of the ideas you have to capture. Free-writing, drawing up the bibliography, preparing the data presentation and drafting the introduction and conclusion are the first steps in composing the report. Many writers start with free-writing (writing down as quickly as possible whatever comes to mind regarding the topic). During free-writing you do not stop to reread what you have written, you do not struggle to find the correct word, and you do not worry about grammar and spelling. The idea of free-writing is simply to capture the ideas, and you can clean up later.

- **Rewriting**

  This phase consists of evaluating and polishing the report. This is the phase during which you improve coherence, proofread for errors, check citations and review the use of language. Rewriting helps the report writer to express himself or herself better. It is not unusual for professional researchers to rewrite reports a dozen times. Rewriting should not discourage you. Actually, it reduces the pressure. It lets you produce a rough draft, which can be polished later. A draft is a complete report, from introduction to conclusion. During rewriting the focus is on improving clarity. Therefore it consists of slow re-reading. It also helps to ask others to read and comment on the rough draft. Constructive criticism is very helpful.

Revising and editing are important during rewriting. Revising refers to inserting new ideas, and editing refers to correcting spelling, grammar, verb tense, sentence length, and the organisation of paragraphs. Check the voice: passive voice tends to obscure the meaning. Avoid repetition of words, ideas and phrases.

It is important to rewrite the introduction (and the title!) after you have completed the draft. This will ensure that the introduction and title are true reflections of the content and what is said.

6.2.3 Common mistakes

De Wet, Monteith, Venter and Steyn (1981:296) cite several mistakes commonly made in writing a report:

- The problem was not clearly defined.
- The researcher did not study what he or she was meant to study.
- The problem was too broad to be dealt with by only one person with limited means. The research was not clearly defined in the first part of the report.
- Instead of stating and defining the problem and objective in the first chapter, the writer deals with these facets in various places throughout the report, making it difficult to form a clear picture of the objective and problem.
- An unimportant problem has been studied; as a result, the entire report is worthless.

Although the above applies to all kinds of research reports, there are differences between quantitative and qualitative research reports.

6.2.4 Summary

The important thing is to start writing! During the writing process the researcher should be on the lookout for common mistakes. There are differences between quantitative and qualitative research reports.

STUDY UNIT 6.3

Quantitative research report writing

6.3.1 Introduction

As you know by now, research reports should incorporate the results of literature surveys, qualitative research and quantitative research. In this unit, we will focus on writing quantitative research reports.

6.3.2 Quantitative research report writing

Research reports that are based on quantitative data are usually more structured than those based on qualitative data. Quantitative criminological research reports usually contain the following:

- **Executive summary or abstract**

Neuman (2000:471–472) explains that these reports usually begin with an abstract or executive summary, which is between 50 and 300 words in length. If a report is published in the form of an article in a scholarly journal, the abstract is usually printed on the first page of the article. An abstract or executive summary contains information regarding the topic, the research problem, the findings and any elements of unusual research design or unusual aspects of data collection. Abstracts or executive summaries tell less informed readers what is in the report, and tell more informed readers whether or not the full report may contain particular information they need. Readers therefore use abstracts and executive summaries to help them decide whether it would be helpful to read the full report.

- **Presentation of the problem**

Neuman (2000:472) explains that the first part of a quantitative research report sets out a definition of the research problem. This is usually done under subheadings such as ''Introduction'', ''Problem definition'', ''Literature review'', ''Hypotheses'', or ''Background assumptions''. Whichever subheading the writer uses, the presentation of the problem includes a statement of the research problem as well as the rationale (reasons) for the research that was conducted.

- **Description of the research methods**

Following the presentation of the problem, the quantitative research report continues with a description of the research methods. This includes an account of how the research was designed and how the data was collected. Researchers use subheadings such as ''Methods'', ''Research design'' and ''Data''. This section can also include information under subheadings such as ''Measures'', ''Sampling'', or

''Data manipulation''. This is the most important section of the report when the research methodology is evaluated. For this evaluation, the following questions are important: What type of study was it (experiment, survey)? How were the data collected (questionnaires, interviews)? How were the variables measured, and how were the validity and reliability of the measurements tested (statistical techniques)? What is the sample? How many subjects were involved? How were they selected? How did the researcher deal with ethical issues?

- **Findings and tables**

When they present the data, researchers use the minimum number of charts or tables. They very rarely present the raw data in the report. The tables are used to analyse the data and test hypotheses. For this purpose researchers publish frequency distributions, tables with means and standard deviations, correlations, chi-square and other statistics. When the findings and tables are presented, the researcher's focus is on presenting a complete picture rather than providing excessive detail or irrelevant data.

- **Discussion**

In this section the writer gives the readers a concise, unambiguous interpretation of the findings. This takes the form of a candid discussion of the results. The reader is given the opportunity to examine the data and arrive at either the same or different interpretations. One approach is to organise the discussion section according to the hypotheses. However, unanticipated findings, as well as alternative interpretations, weaknesses and limitations should also be discussed.

- **Conclusion**

In the conclusion, the research question and the summarised findings are restated. The purpose is to summarise the report. The summary is the last section of the research report, followed only by source references and appendices.

6.3.3 Summary

Because they are more structured, research reports based on quantitative data captured by means of questionnaires are easier to write. Research reports based on qualitative data captured by means of interviews are less structured, and so they are more difficult to write. This gives the writer more freedom with regard to the layout, but he or she is hampered by the fact that these research reports may be more difficult to publish because they are usually much longer than those based on questionnaire data capturing.

STUDY UNIT 6.4

Preparing for publication

6.4.1 Introduction

Researchers want to share their findings with the scientific community. They do this by publishing the results of their research in scholarly journals. This is the true testing ground for the active researcher. However, as you will see in this unit, having research published is not always easy.

6.4.2 The starting point

The starting point for publication is acceptable research. Usually scholarly journals accept only first-time work, in other words, research that has not been published previously in other journals. The research should promote new ideas and should have yielded new results. Most scholarly journals emphasise empirical research, and so the proposed article should be based on newly acquired quantitative or qualitative data.

6.4.3 Rationale

Knowledge dissemination is the most important reason for publishing research. New research results form the basis for further research by other scientists. Publication is also a strong incentive when scientists require funding for further research.

6.4.4 Classification of articles

Scholarly journals publish different types of articles. The research article is one in which new findings are promoted. Review articles review existing researched results. Announcements state the findings only, and precede the publication of a full-fledged research article. Correspondence between scientists who are arguing a point is also published. Scholarly journals also publish book reviews, which review and evaluate the content of new books.

6.4.5 Choosing a journal

When selecting a journal to publish in, keep certain points in mind. Your research should be written in the language preferred by that journal. Select a journal that generally publishes research in your field of specialisation. Consider the status of the journal. Status is usually determined by whether it is a national journal, an international journal or a departmental journal (in other words, a journal published by a particular academic department).

6.4.6 Submitting an article

When the researcher writes an article, he or she has to follow the technical requirements for that particular journal. Usually these are listed in each journal. If not, you can ask the editor to supply them. Editors usually require at least two copies of your article, typed in double spacing. They send these to review editors. The review editors evaluate the articles and advise the editor whether or not to publish them. When you choose a title for your article, choose one that makes a statement (captures readers' interest) without being dramatic. You need to supply an abstract or executive summary, which is placed at the very beginning, even before the introduction.

6.4.7 How articles submitted for publication are evaluated

The editor starts the evaluation process. He or she sends the article to two or more specialists. The names of the author(s) are removed during the evaluation process so that the evaluator does not know who the writer is. This is called blind evaluation. The review editors apply the guidelines for evaluation, which may differ from journal to journal. After completing the evaluation, the review editor writes a report and submits it to the editor. Review editors are usually instructed to answer the following questions:

1. Does the research make a definite contribution to the field?
2. Are theoretical points clear?
3. Are theory and empirical work integrated?
4. Was enough relevant literature consulted?
5. Was the empirical research conducted thoroughly?
6. Were the correct data analysis techniques applied?
7. Were the data interpreted correctly?
8. Is the layout of the manuscript clear and logical?
9. Is the use of language clear and appropriate?
10. Are the headings, tables and figures in accordance with the requirements of this journal?

6.4.8 Reacting to the evaluation of your manuscript

Most manuscripts have to be rewritten! Very few manuscripts are accepted the first time! If the editor of a journal returns a report stating that the article has been summarily rejected, it is unlikely that he or she will reconsider it for publication even after some changes. However, if the article is accepted in principle, the researcher should start rewriting it as soon as possible and resubmit it to the same journal. When the editor recommends a drastic review, the problems are usually related to research methods and it will be difficult for the same journal to reconsider publication without a comprehensive methodological review which usually boils down to repeating the research.

6.4.9 Summary

Publication is the final stage of research. This is the stage during which the researcher shares his or her newly acquired knowledge, which may form the basis of further research by the scientific community.

THEME 7

Research ethics

Introduction

Babbie (2001:469) points out that we would probably all agree that conducting research that requires children to be tortured is unethical. However, there are other aspects of research ethics that are not so obvious. Research ethics refers to conforming to the standardised conduct of a given profession or group. This definition is also the driving force behind various ethical codes of conduct for research.

In the brief study units making up this theme we will focus on the principles that are generally agreed on as being proper in social research. You will then be given two ethical research codes. These will not be discussed.

This theme consists of the following study units:

Study unit 7.1: The four pillars

7.1.1 Introduction
7.1.2 Pillar 1: Voluntary participation
7.1.3 Pillar 2: No harm to the participants
7.1.4 Pillar 3: Anonymity and confidentiality
7.1.5 Pillar 4: No cheating of colleagues
7.1.6 Summary

Study unit 7.2: The ethical code of the American Sociological Association

Study unit 7.3: Code of conduct of the American Association for Public Opinion Research

Key concepts

- Voluntary participation
- No harm to participants
- Anonymity
- Confidentiality
- Responsibility
- Integrity
- Credibility
- Ethical codes
- Professional contribution

STUDY UNIT 7.1

The four pillars

7.1.1 Introduction

When human behaviour is researched, ethical issues are always involved. The credibility of the social researcher is linked to how he or she deals with these issues. All of us consider ourselves ethical. Yet we all (sometimes!) plunge into things without seeing the ethical issues that may be apparent to others, and which we recognise only once they have been pointed out to us (Babbie 2001:469). The aim of this study unit is to focus on the four pillars on which ethical social research rests.

7.1.2 Pillar 1: Voluntary participation

Any type of social research intrudes on the lives of the respondents. Filling in a questionnaire and participating in interviews are activities the respondents did not request, and may take up a lot of their time. Research always disrupts the regular activities of respondents (Babbie 2001:470). This sentiment is echoed by Neuman (2000:282), who observes that researchers intrude into the private life of the respondents with what are sometimes very personal questions. Therefore, social scientists agree that an ethical requirement for responsible social research is the voluntary participation of the respondents.

Social research often requires very personal information about the respondents. It may be so personal that it is unknown even to the respondents' own friends and family members, yet sometimes social research requires that this information be revealed to total strangers. Other professionals, such as the medical profession, may also require very personal information, but this may be justified by the fact that obtaining this information is meant to serve the best interest of the patient. Social researchers can seldom make such claims, yet they may require even more personal information than the medical doctor. However, when the researcher wants to generalise the findings of the research, it would probably be good if a fairly large number of reluctant respondents could also be "forced" to participate. This is important, because society as a whole does not consist only of people who are always willing to participate in any venture, and the views of the reluctant should also be heard (Babbie 2001:471; Neuman 2000:283).

7.1.3 Pillar 2: No harm to the participants

Whether or not they volunteer for the study, the respondents should never be harmed in any way by social research. In practice this means that no information should be released that could embarrass them, including information about any unpopular attitudes, demeaning characteristics, or even deviant behaviour (Babbie 2001:471).

Social research has the potential to harm respondents psychologically, and so the researcher should be extremely careful. The nature of the questions asked could cause the respondent to start agonising about his or her morality or even injure a fragile self-esteem (Babbie 2001:471).

The most important aspect concerning voluntary participation is informed consent: the respondent must understand all the risks involved in participating in the research before he or she actually participates in it (Neuman 2000:283; Babbie 2001:471).

7.1.4 Pillar 3: Anonymity and confidentiality

Guaranteeing a respondent's anonymity means making sure that no-one can associate a given response with a given respondent. Guaranteeing confidentiality means that the researcher is able to identify a given person's response, but promises not to do so in public (Babbie 2001:472).

Anonymity makes it difficult to trace who has and who has not returned questionnaires. Confidentiality may make the respondent reluctant to participate when very personal information has to be revealed to a total stranger. It may not always be easy to maintain confidentiality, because courts of law do not consider social research data to be a ''privileged communication''.

To ensure anonymity and confidentiality, researchers can remove all identifying information from the questionnaires the moment it is no longer required. Similarly, once all follow-up interviews have been conducted with respondents, their details can be removed (Babbie 2001:474).

7.1.5 Pillar 4: No cheating of colleagues

Pillars 1 to 3 related to the ethical responsibilities of the researcher toward the respondents. This one relates to the researcher's responsibility to the scientific community (Goddard & Melville 2001:110–111). No-one knows better than researchers themselves what the limitations and failures of a particular research project were. Researchers are under obligation to make these known to their readers. Even negative findings should be reported, because these too are related to the research. Generally speaking, social science grows through honesty and openness. Deception retards its growth. When researchers do not cheat their colleagues, they may save them from making the mistakes they themselves made (Maxfield & Babbie 2008:59–60).

7.1.6 Summary

The four pillars of voluntary participation, no harm to the respondents, anonymity and confidentiality and no cheating of colleagues actually boil down to good manners to be observed during research. When we study any form of human behaviour, ethical issues are always involved. However, informed consent, the right to privacy and protection from harm are fairly subjective ethical criteria for guiding research ethics. Violations are sometimes justified by arguing that the harm to the individual outweighs the benefit to society. However, to ensure their credibility as scientists, creative researchers should adhere to the requirements of ethical research at all times.

The ethical code of the American Sociological Association

Bailey (1982:509–510) cites the ethical code of the American Sociological Association, which is reproduced below.

1. Objectivity in research
   In their research sociologists must maintain scientific objectivity.
2. Integrity in research
   Sociologists should recognise their own limitations and, when appropriate, seek more expert assistance or decline to undertake research beyond their competence. They must not misrepresent their own abilities, or the competence of their staff to conduct a particular research project.
3. Respect of research subject's rights to privacy and dignity
   Every person is entitled to the right of privacy an dignity of treatment. The sociologist must respect these rights.
4. Protection of subjects from personal harm
   All research should avoid causing personal harm to subjects used in research.
5. Preservation of confidentiality of research data
   Confidential information provided by a research subject must be treated as such by the sociologist. Even though research information is not a privileged communication under the law, the sociologist must, as far as possible, protect subjects and informants. Any promises made to such persons must be honoured.
6. Presentation of research findings
   Sociologists must present their findings honestly and without distortion. There should be no omission of data from a research report which might significantly modify the interpretation of findings.
7. Misuse of research role
   Sociologists must not use their role as a cover to obtain information for other than professional purposes.
8. Acknowledgement of research collaboration and assistance
   Sociologists must acknowledge the professional contributions or assistance of all persons who collaborated in the research.
9. Disclosure of sources of financial support
   Sociologists must report fully all sources of financial support in their research publications and any special relations to the sponsor that might affect the interpretation of the findings.
10. Distortion of findings by sponsor
    Sociologists are obliged to clarify publicly any distortion by a sponsor or client of the findings of a research project in which they have participated.

11. Disassociation from unethical research arrangements
    Sociologists must not accept such grants, contracts, or research assignments as appear likely to require violation of the principles above, and must publicly terminate the work or formally disassociate themselves from the research if they discover such a violation and are unable to achieve its correction.
12. Interpretation of ethical principles
    When the meaning and application of these principles are unclear, sociologists should seek the judgment of the relevant agency or committee designated by the American Sociological Association. Such consultation, however, does not free sociologists from their individual responsibility for decisions or from their accountability to the profession.
13. Applicability of the principles
    In the conduct of research the principles enunciated above should apply to research in any area either within or outside the United States of America.

STUDY UNIT 7.3

Code of conduct of the American Association for Public Opinion Research

This code, as reproduced by Babbie (2001:478), upholds just two basic principles, each with some clarifying stipulations. It starts off with a declaration, as follows:

We, the members of the American Association for Public Opinion Research, subscribe to the principles expressed in the following code.

Our goal is to support sound practice in the profession of public opinion research. (By public opinion research we mean studies in which the principal source of information about individual beliefs, preferences, and behaviour is a report given by the individual himself or herself.)

We pledge ourselves to maintain high standards of scientific competence and integrity in our work, and in our relations both with our clients and with the general public. We further pledge ourselves to reject all tasks or assignments which would be inconsistent with the principles of this code.

The code

I Principles of professional practice in the conduct of our work

A We shall exercise due care in gathering and processing data, taking all reasonable steps to assume the accuracy of the results.

B We shall exercise due care in development of research designs and in the analysis of data.

1. We shall employ only the research tools and methods of analysis which, in our professional judgment, are well suited to the research problem at hand.
2. We shall not select research tools and methods of analysis because of their special capacity to yield a desired conclusion.
3. We shall not knowingly make interpretations of research results, nor shall we tacitly permit interpretations, that are inconsistent with the data available.
4. We shall not knowingly imply that interpretations should be accorded greater confidence than the data actually warrant.

C We shall describe our findings and methods accurately and in appropriate detail in all research reports.

II Principles of professional responsibility in our dealings with people

A The public

1. We shall cooperate with legally authorised representatives of the public by describing the methods used in our studies.
2. We shall maintain the right to approve the release of our findings whether or not ascribed to us. When misinterpretation appears, we shall publicly disclose what is required to correct it, notwithstanding our obligation for client confidentiality in all other respects.

B Clients or sponsors

1. We shall hold confidential all information obtained about the client's general business affairs and about the findings of research conducted for the client, except when the dissemination of such information is expressly authorised.
2. We shall be mindful of the limitations of our techniques and facilities and shall accept only those research assignments that can be accomplished within these limitations.

C The profession

1. We shall not cite our membership in the Association as evidence of professional competence, since the Association does not certify any persons or organisations.
2. We recognise our responsibility to contribute to the science of public opinion research and to disseminate as freely as possible the ideas and findings that emerge from our research.

D The respondent

1. We shall not lie to survey respondents or use practices and methods which abuse, coerce, or humiliate them.
2. We shall protect the anonymity of every respondent, unless the respondent waives such anonymity for specific uses. In addition, we shall hold as privileged and confidential all information that tends to identify the respondent.

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