

# **SCIENTIFIC METHOD AND HYPOTHESIS**

- The scientific method is an overarching perspective on how investigations should be carried out.
- It consists of a set of research principles and methods that help researchers obtain valid results from their research studies.

- Researchers generally agree that the scientific method is composed of the following key elements;
  - An empirical approach
  - Observations
  - Questions
  - Hypotheses
  - Experiments
  - Analyses
  - Conclusions and
  - Replication

# Research Questions and Hypothesis

- From the list shown in the preceding slide, hypothesis is the fourth element of the scientific method.
- However, we may not use hypothesis for all types of research.
- In a qualitative study, the researchers usually state the question which should address the specific goals for the research or hypothesis (i.e. predictions that involve variables and statistics).

- In a qualitative research, the research question assumes two forms:
  - a central question.
  - associated sub questions.
- The central question is a statement of the question being examined in its most general form so as not to limit the inquiry.

# Guidelines For Writing Broad Qualitative Research Questions.

- Ask one or two central questions followed by no more than five to seven sub-questions.
- Relate the central question to specific qualitative strategy of enquiry (like ethnography, phenomenology etc).
- Begin the research question with the words “what” or “how” to convey an open and emerging design.

- Examples: How do women in a chemistry doctoral programme describe their decisions to return to school?
- What is it like for a woman to live with a man dying of cancer?
  - Remember to focus on a single phenomenon or concept.

- Use exploratory verbs that convey the language of emerging design of research. These verbs tell the reader that the study will,
  - discover (eg. The double helical nature of DNA
  - seek to understand (eg. Standard reduction potentials of metals).
  - Explore a process (eg. A case study).
  - Describe the experiences (eg. Phenomenology)
  - Report the stories (eg. Narrative research)

- Use non-directional language
- Expect the research questions to evolve and to change during the study
- Use open ended questions without reference to literature or theory
- If the information is not reductant with the purpose statement, specify the participant and the research site for the study.



- Hypothesis can be defined as
  - an educated guess
  - a tentative point of view
  - a proposition not yet tested
  - a preliminary observation
  - a preliminary postulate

# Definition of Hypothesis by Various authors

- A hypothesis is a conjectural statement of the relation between two or more variables.  
-Ker Linger, 1956.
- Hypotheses are single tentative guesses, good hunches-assumed for use in devising theory of planning experiments intended to be given a direct experimental test possible.  
-Eric Rogers, 1966

# Definition of Hypothesis by Various authors Contd.

- Hypothesis is a formal statement that presents the expected relationship between an independent and dependent variable.  
- Cresswell, 1994.
- A hypothesis is a logical supposition, a reasonable guess, an educated conjecture. It provides a tentative explanation for a phenomenon under investigation.  
- Leedy and Ormrod, 2001

# Hypothesis vs Theory vs Facts

- A **theory** is a well established principle that has been developed to explain some aspects of the natural world.
- A **theory** arises from repeated observation and testing and incorporates facts, laws, predictions and tested hypothesis that are widely accepted.

- A hypothesis is a specific testable prediction about what you expect to happen in a study.
- For example, a study designed to look at the relationship between study habits and test anxiety might have a hypothesis that state “this study is designed to assess the hypothesis that states that students with better study habits will suffer less test anxiety”.
- Unless the study is exploratory in nature, the hypothesis should always be what is expected to happen during the course of the experiment or research.

- While the terms are sometimes used interchangeably in general practice, the difference between a theory and a hypothesis is important when studying experimental design. Some important distinctions to note include:

- ***A theory predicts events in general terms, while a hypothesis makes a specific prediction about a specified set of circumstances.***

- ***A theory has been extensively tested and is generally accepted, while a hypothesis is a speculative guess that has yet to be tested.***

| <b>HYPOTHESIS</b>  | <b>THEORY</b>  | <b>FACT</b>   |
|--|--|---|
| A specific testable prediction of what is expected to happen in a study. | Well established principle which predicts events in general terms.                   | Is something which is assumed to be true.   |
| Makes a specific prediction about a specified set of circumstances       | Arises from repeated observation and testing   | Once a theory has been confirmed over and over again, we get to the point that it will treated as fact. |
| A speculative guess that has yet to be confirmed                         | Incorporates facts, laws, predictions and tested hypothesis that are widely accepted | Does not mean 'absolute certainty'  |
| Is new and relatively untested   | Extensively tested and is generally accepted   |   |
| The probability of error and corrections are high                        |  |   |

- One common feature of facts, theories and hypothesis in science is that they are all treated as fallible.
- The likelihood of error might vary greatly but they are all still regarded as something less than absolute truth.



# FORMS OF HYPOTHESIS

- Hypothesis can take various forms, depending on the question being asked and the type of study being conducted.
- Some hypothesis simply describe how two things may be related. eg. Correlational research.
- In others the researcher might hypothesize that one variable causes a change in the other variable (causal relationship).
- *In their simplest forms, hypothesis are typically phrased as “if-then” statements.*