**Lesson 06 : Hypothesis in scientific research**

**Introduction:**

A scientific hypothesis is a tentative, testable explanation for a phenomenon in the natural world. It's the initial building block in the [scientific method](https://www.livescience.com/20896-science-scientific-method.html). Many describe it as an "educated guess" based on prior knowledge and observation. While this is true, a hypothesis is more informed than a guess. While an "educated guess" suggests a random prediction based on a person's expertise, developing a hypothesis requires active observation and background research.[[1]](#footnote-2)

**1-Formulate a Hypothesis:**

* Hypothesis is a possible answer to a question that can be tested
* based on observations and knowledge
* “If” “Then” “Because” statement
* **Example: Termites**
* **Termites:**
  + I hypothesis that if the termites follow a dark colored pen on a dark background then they follow the dark pen on a light background because of the color contrast since they see light and dark, but not color.[[2]](#footnote-3)

A scientific hypothesis states the ‘predicted’ (educated guess) relationship amongst variables.

Serve to bring clarity, specificity and focus to a research problem... But are not essential... You can conduct valid research without constructing a hypothesis... On the other hand you can construct as many hypothesis as appropriate.

Stated in declarative form. Brief and up to the point.

**A possible format (formalized):**

“If ...... then .... (because ....) “

In the case of a PhD dissertation, one hypothesis after tested becomes a thesis being defended.

One dissertation may include more than one thesis.

Sometimes people refer to the dissertation as the “thesis”

**2-Characteristics of a hypothesis :**

Should be simple, specific and conceptually clear.

... ambiguity would make verification almost impossible.

Should be capable of verification.... i.e. There are methods and techniques for data collection and analysis.

Should be related to the existing body of knowledge.... i.e. Able to add to the existing knowledge.

Should be operationalisable... i.e. Expressed in terms that can be measured.

**Example :**

“Shop floor control / supervision reengineering agility can be achieved if manufacturing systems are abstracted as compositions of modularized manufacturing components that can be reused whever

necessary, and, whose interactions are specified using configuration rather than reprogramming.”

Often PhD dissertations fail to make explicit their hypothesis / thesis.

Sometimes the reader can hardly “find” them implicit in a section of “contributions” of the dissertation.[[3]](#footnote-4)

* It should have elucidating power.
* It should strive to furnish an acceptable explanation of the phenomenon.
* It must be verifiable.
* It must be formulated in simple, understandable terms.
* It should corresponds with existing knowledge. [[4]](#footnote-5)

**3-Development of Working Hypothesis:**

• After extensive literature survey, researcher should state in clear terms the working hypothesis.

• Working hypothesis is tentative assumption made in order to draw out and test its logical or empirical consequences.

• Hypothesis provides the focal point for research.

• It also affects the manner in which tests must be conducted in the analysis of data and indirectly the quality of data which is required for the analysis.

• Hypothesis should be very specific and limited to the piece of research in hand because it has to be tested.

• The role of the hypothesis is to guide the researcher by delimiting the area of research and to keep him on the right track.

• It sharpens his thinking and focuses attention on the more important facets of the problem. It also indicates the type of data required and the type of methods of data analysis to be used.

**How to develop working hypothesis?**

a) Discussions with colleagues and experts about the problem, its origin and the objectives in seeking a solution;

b) Examination of data and records, if available, concerning the problem for possible trends, peculiarities and other clues;

c) Review of similar studies in the area or of the studies on similar problems; and

d) Exploratory personal investigation which involves original field interviews on a limited scale with interested parties and individuals with a view to secure greater insight into the practical aspects of the problem.

• Thus, working hypothesis arise as a result of a-priori thinking about the subject, examination of the available data and material including related studies and the counsel of experts and interested partie.[[5]](#footnote-6)

**4-Purpose and function of an Hypothesis:**

The purpose of hypothesis testing is to determine whether there is enough statistical evidence in favor of a certain belief about a parameter.

An hypothesis is a preliminary or tentative explanation or postulate by the researcher of what the researcher considers the outcome of an investigation will be.   It is an informed/educated guess.

It indicates the expectations of the researcher regarding certain variables.  It is the most specific way in which an answer to a problem can be stated.

A tentative statement about a population parameter that might be true or wrong

It offers explanations for the relationships between those variables that can be empirically tested

It furnishes proof that the researcher has sufficient background knowledge to enable him/her to make suggestions in order to extend existing knowledge.

It gives direction to an investigation.

It structures the next phase in the investigation and therefore furnishes continuity to the examination of the problem. [[6]](#footnote-7)

**5-Tips on Formulating a Hypotheses:**

Shape and guide a research study in terms of:

• identification of study sample size

• what issues should be involved in data collection

• the proper analysis of the data

• data interpretation

--- Formulate a hypothesis

--- Frame the hypothesis in a format that is testable

--- Test the hypothesis

* Observations from:
  + Literature (review PubMed on topic area)
  + Natural experiments (e.g. migrant studies)
  + Multi-national comparisons
  + Descriptive studies (assessment of person, place, and time characteristics)
  + Creativity.[[7]](#footnote-8)

**6-Stating a hypothesis or research question:**

* Research Question – A formally stated question intended to provide indications about some; it is not limited to investigating relationships between variables. Used when the researcher is unsure about the nature of the problem under investigation.
* Hypothesis – a formal statement regarding the relationship between variables and is tested directly. The predicted relationship between the variables is either true or false.
  + Independent Variable (Xi)– the variable that is systematically varied by the researcher
  + Dependent Variable (Yi) – the variable that is observed and whose value is presumed to depend on independent variables.[[8]](#footnote-9)

**7-The Difference Between An Hypothesis And A Problem:**

* Both an hypothesis and a problem contribute to the body of knowledge which supports or refutes an existing theory.
* An hypothesis differs from a problem.
* A problem is formulated in the form of a question; it serves as the basis or origin from which an hypothesis is derived.
* An hypothesis is a suggested solution to a problem.
* A problem (question) cannot be directly tested, whereas an hypothesis can be tested and verified. [[9]](#footnote-10)

**Conclusion :**

The research hypothesis is of great importance, as it is a temporary answer to the questions that the researcher raises from the beginning, and through his study he seeks to confirm or deny them, but what should be noted is that the hypothesis is not built improvised, but rather is subject to the laws of knowledge and basic theories in the specialty.

1. [Alina Bradford](https://www.livescience.com/author/alina-bradford): **What is a scientific hypothesis?** , 19- 2022, https://www.livescience.com/21490-what-is-a-scientific-hypothesis-definition-of-hypothesis.html [↑](#footnote-ref-2)
2. Steps of the Scientific Process: SPICE – University of Florida [↑](#footnote-ref-3)
3. Luis M. Camarinha-Matos : SCIENTIFIC RESEARCH METHODOLOGIES AND TECHNIQUES, Camarinha-Matos, 2009-2012 [↑](#footnote-ref-4)
4. Srinivasaragavan: **Research Methodology**, Dept. of library & information science

   Bharathidasan university [↑](#footnote-ref-5)
5. Ganesh Dive : Stages in Scientific Research

   Process, p 04 - 09 [↑](#footnote-ref-6)
6. Srinivasaragavan: **Research Methodology**, Dept. of library & information science

   Bharathidasan university [↑](#footnote-ref-7)
7. Thomas Songer: **Introduction to Research** **Scientific Method** **Identifying Hypotheses** , university of Pittsburgh, p07

   [↑](#footnote-ref-8)
8. Andrew L. Luna: **Everything You Wanted to Know about Statistics but Were Afraid to Ask** ,

   The University of North Alabama [↑](#footnote-ref-9)
9. Srinivasaragavan: **Research Methodology**, Dept. of library & information science

   Bharathidasan university [↑](#footnote-ref-10)