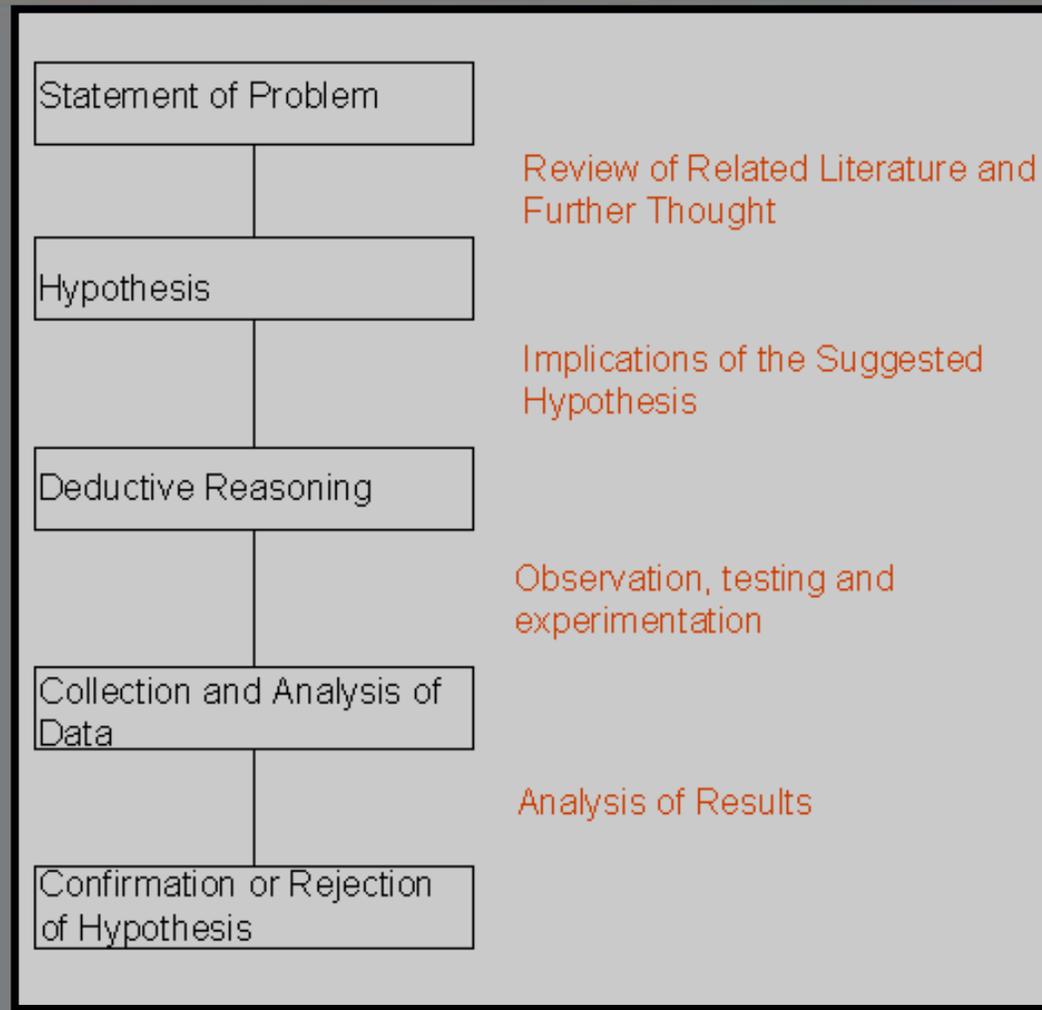


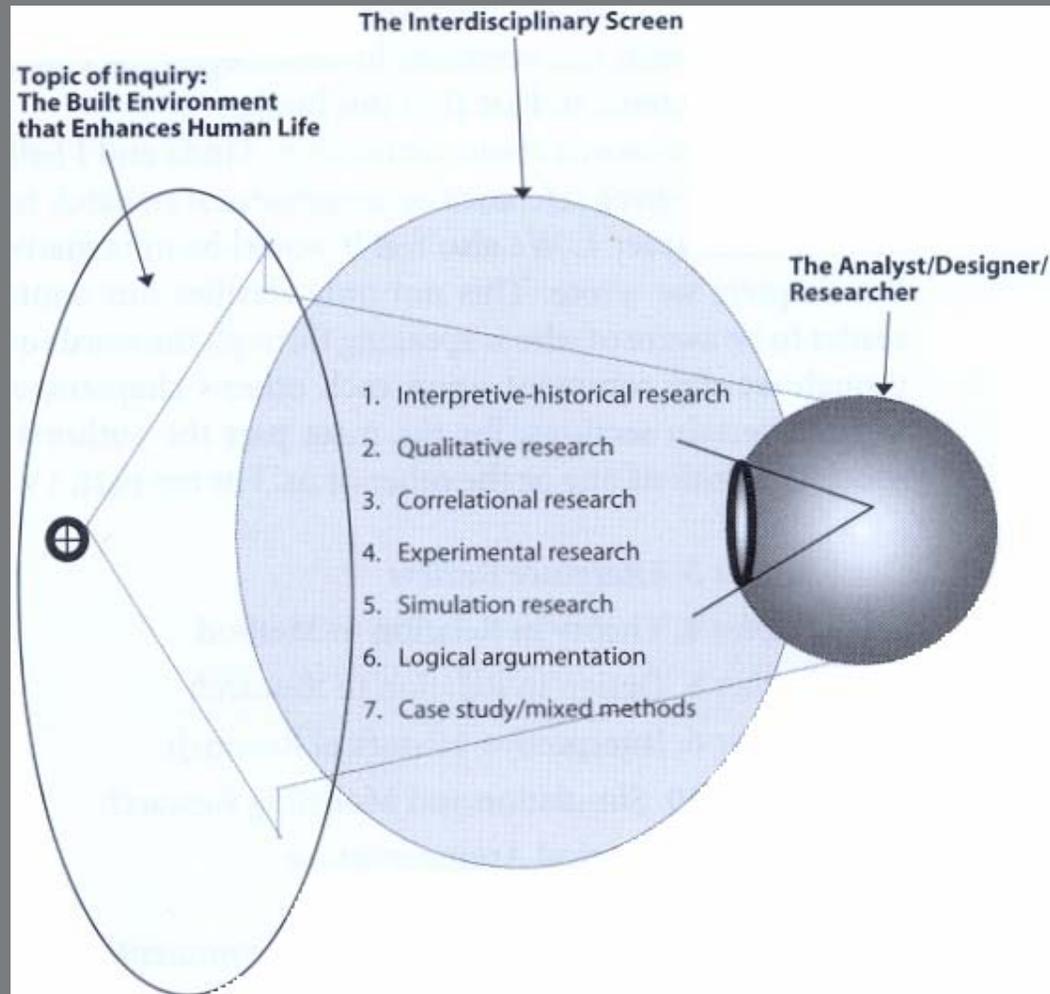
# DEVELOPING HYPOTHESIS AND QUESTIONS

## STEPS IN SCIENTIFIC RESEARCH:



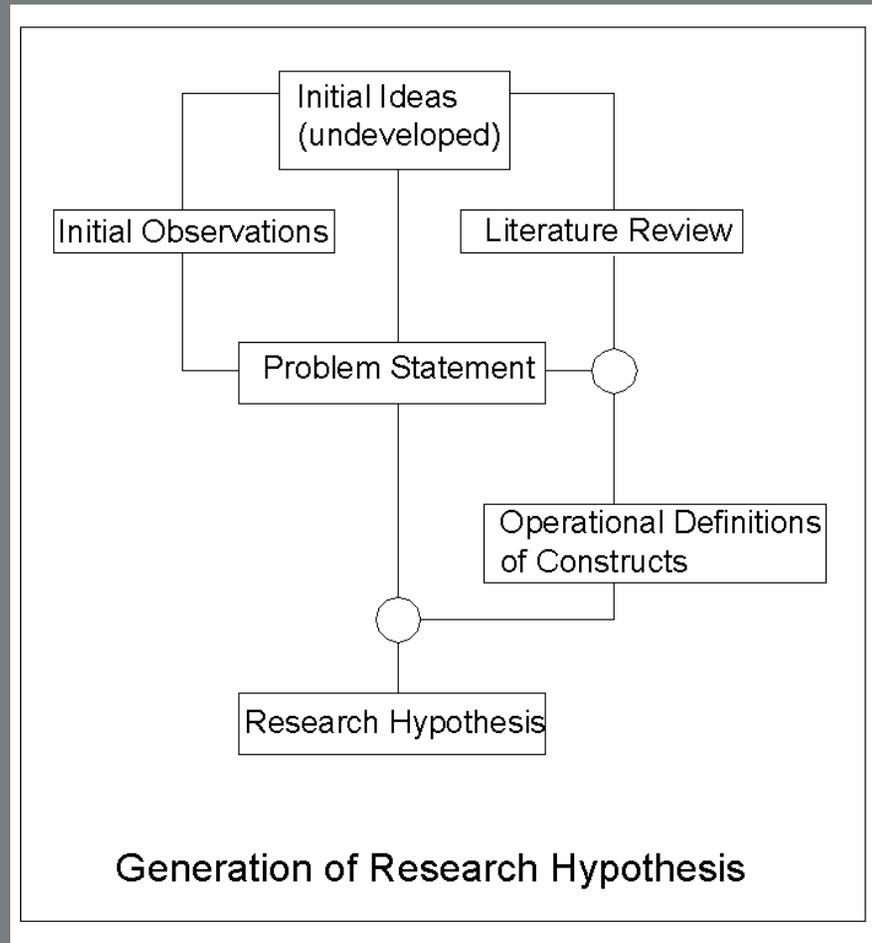
# DEVELOPING HYPOTHESIS AND QUESTIONS

## ARCHITECTURAL RESEARCH: AN INTERDISCIPLINARY REALITY



Hypothesis is a tentative explanation that accounts for a set of facts and can be tested by further investigation.

## Generation of Research Hypothesis



Research usually starts with a **problem**.

Questions, objectives and Hypotheses provide a specific restatement and clarification of the problem statement/research question.

In qualitative research, the research question may assume two forms:

- The grand tour question

- Sub questions

## Criteria of Problem Statement/Research Question:

- Should express a relation between two or more variables.  
Is A related to B?
- Should be clearly stated and unambiguously in question form.  
“How do incentives affect the performance?” (Question form)  
“The problem is to question the relation between incentives and performance.” (Statement form)
- Should be such as to imply possibilities of empirical testing.  
Metaphysical questions, unrelated variables, not measurable and indefinable variables cannot be tested.

## Criteria of Hypotheses

- They should be statements expressing the relation between two or more **measurable variables**.
- They should carry clear implications for **testing the stated relations**.

## Difference between Hypotheses and Problems

Problem is a question and is not testable	Hypotheses can be tested
<b>Relation between variables in problem statements:</b>	<b>Relation between variables in hypotheses:</b>
Is A related to B?	If A, then B.
How are A and B related to C?	If A & B then C.
How is A related to B under conditions C and D?	If A, then B under conditions C and D.

### **Hypothesis needs to be structured before the data-gathering and interpretation phase of the research:**

- A well-grounded hypothesis indicates that the researcher has sufficient knowledge in the area to undertake the investigation.
- The hypothesis gives direction to the collection and interpretation of data.

**Finding the data first and then formulating the hypothesis is like.... throwing the dice first and then betting.**

## DEFINITIONS OF HYPOTHESIS

1. A hypothesis may be precisely defined as a tentative proposition suggested as a solution to a problem or as an explanation of some phenomenon. (Ary, Jacobs and Razavieh, 1984)
2. A hypothesis is a conjectural statement of the relation between two or more variables. (Kerlinger, 1956)
3. Hypothesis is a formal statement that presents the expected relationship between an independent and dependent variable. (Creswell, 1994)
4. Hypothesis relates theory to observation and observation to theory. (Ary, Jacobs and Razavieh, 1984)
5. Hypotheses are relational propositions. (Kerlinger, 1956)
6. Hypothesis is a tentative explanation that accounts for a set of facts and can be tested by further investigation.

## THE USABLE HYPOTHESIS

- It must have explanatory power.
- It must state the expected relationship between variables.
- It must be testable.
- It should be consistent with the existing body of knowledge.
- It should be stated as simply and concisely as possible.

## Purpose and Importance of Hypotheses in a Scientific Research

- • It provides a tentative explanation of phenomena and facilitates the extension of knowledge in an area.
- • It provides the investigator with a relational statement that is directly testable in a research study.
- • It provides direction to the research.
- • It provides a framework for reporting conclusions of the study.
- • It could be considered as the working instrument of theory. Hypotheses can be deduced from theory and from other hypotheses.
- • It could be tested and shown to be probably supported or not supported, apart from man's own values and opinions.

## NULL HYPOTHESIS

**A null hypothesis is a statement that there is no actual relationship between variables. ( $H_0$  or  $H_N$ )**

- A null hypothesis may read, “There is no difference between.....”
- $H_0$  states the opposite of what the experimenter would expect or predict.
- The final conclusion of the investigator will either retain a null hypothesis or reject a null hypothesis in favor of an alternative hypothesis.
- Not rejecting  $H_0$  does not really mean that  $H_0$  is true. There might not be enough evidence against  $H_0$ .

- **Example:**

“There is **no significant difference** in the anxiety level of children of High IQ and those of low IQ.”

## ALTERNATIVE HYPOTHESIS

**An alternative hypothesis is a statement that suggests a potential outcome that the researcher may expect. ( $H_1$  or  $H_A$ )**

- Comes from prior literature or studies.
- It is established only when a null hypothesis is rejected.
- Often an alternative Hypothesis is the desired conclusion of the investigator.
- The two types of alternative hypothesis are:

**Directional Hypothesis**

**Non-directional Hypothesis.**

## DIRECTIONAL HYPOTHESIS

**Is a type of alternative hypothesis that specifies the direction of expected findings.**

- Sometimes directional hypothesis are created to examine the relationship among variables rather than to compare groups.
- Directional hypothesis may read, "...is more than..", "...will be lesser.."
- **Example:**

“Children with high IQ **will exhibit more** anxiety than children with low IQ”

## NON-DIRECTIONAL HYPOTHESIS

**Is a type of alternative hypothesis in which no definite direction of the expected findings is specified.**

- The researcher may not know what can be predicted from the past literature.
- It may read, “..there is a difference between..”
- **Example:**

“ There **is a difference** in the anxiety level of the children of high IQ and those of low IQ.”

## DERIVATION OF HYPOTHESIS

### Inductive:

Researcher notes the **observations** of behavior, **thinks** about the problem, turns to **literature** for clues, makes **additional observations**, derives **probable relationships**, and the **hypothesizes** an explanation. Hypothesis is then tested.

- May be limited in scope.
- Can lead to unconnected findings, which could explain little about the research.

**Observations   Study   Probable relationship   Hypothesis   Theory**

## DERIVATION OF HYPOTHESIS

### Deductive:

Researcher begins by **selecting a theory**, derives a **hypothesis** leading to deductions derived through symbolic logic or mathematics. These **deductions** are then presented in the form of **statements** accompanied by an argument or a rationale for the particular proposition.

- Theories are not speculations but are previously known facts.
- Process is a technique to test the adequacy of the theory.

**Theory    Hypothesis    Study & Deduction    Statement**

## FORMULATION OF HYPOTHESIS

Formulation of Hypothesis differs with the method of research conducted.

- **Qualitative method.**
- **Quantitative method.**

The enquirer uses research questions, not objectives or hypothesis.

- The enquirer poses a central question, which is being examined in the study in the most general form-“ the broadest question that can be asked in a study.”
- Several sub-questions are raised related to the central question to narrow the focus of study but to leave the questioning at an open end.
- They are under continual review and restructuring along the course of research.
- Questions begin with “what”, “how”
- They focus on a single concept.
- The questions use non-directional terminology.

The researcher uses questions and hypothesis to compose and focus the purpose of study.

- Hypothesis or research questions:
  1. May be used to **compare** the variables.
  2. May be used to **relate** the variables.
  3. May be used to **describe** the variables.
- The research follows from a test of theory and the question and the hypothesis or the research questions are included in the theory.
- Independent and dependant variables are measured separately.
- Not a combination of both. Either a research questions or a hypothesis.

## Generality and Specificity of Hypotheses

Too General – *creativity is the function of the self-actualization of the individual.*

Cannot be tested!

The more specific the problem or hypothesis, the clearer are its testing implications.

Too specific – *The speed of reading depends on the size of type.*

Too thin for study!

## TESTING THE HYPOTHESIS

Hypothesis tests are procedures for making rational decisions about the reality of effects.

Tools for testing Hypotheses:

- Data Collection

- Ideas

- Expert opinions

- Deductions

## TESTING THE HYPOTHESIS

### Testing a hypothesis involves

- Deducing the consequences that should be observable if the hypothesis is correct.
- Selecting the research methods that will permit the observation, experimentation, or other procedures necessary to show whether or not these do occur.
- Applying this method and gathering the data that can be analyzed to indicate whether or not the hypothesis is supported.

### There are two possibilities:

Nothing Happened

the Null Hypothesis( $H_0$ )

Something Happened

the Alternative Hypothesis( $H_1$ )

## TYPE I AND TYPE II ERRORS

### Type I error:

- Rejection of a true null hypothesis is called the type I error.
- The subsequent results might not produce the result observed in the original investigation.
- Leads to changes that are unwarranted.

### Type II error:

- Retention of false null hypothesis is called the type II error.
- The ultimate truth remains unknown although evidence might support an alternative hypothesis.
- Leads to maintenance of a status quo when a change is warranted.

## Negative Findings

Even if hypotheses are not confirmed, they have power.(Kerlinger, 1956)

Negative findings are as important as positive ones, since they cut down ignorance and sometimes point up fruitful hypotheses and lines of investigation. It acts as a guiding factor for future research in that field.

Hypothesis cannot be proved or disproved; but only supported or not supported.  
(Ary, p.85)

## SOURCES

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## EXERCISES

State a hypothesis based on the research question stated below:

- Does living in interracial housing affect one's attitude toward members of another race?

Rewrite the following hypothesis in null form:

- Children who read below grade level will express less satisfaction with school than those who read at or above grade level.

Write a directional and a non-directional hypothesis based on the research question:

- What is the relationship between the maturational status of adolescent boys and their self-concepts?