The Research Hypothesis, Variables, and Sampling

- Research Variables & Constructs
  Definitions, measurements & types
- Research Hypotheses
  Types of relationships
The Research Process

Research Variables

A variable is "a name for something that is thought to influence a particular state of being in something else .... a special kind of concept that contains within it a notion of degree or differentiation" (Hoover, 1980, pp.22).

Examples of variables are heat, pressure, temperature, age, etc.
A construct is "a hypothetical attribute or mechanism that helps explain & predict behavior in a theory" (Gravetter & Forzano, 2003, pp.85).

Examples of constructs are motivation, self-esteem, etc.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Constructs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well defined</td>
<td>Less well defined</td>
</tr>
<tr>
<td>Easily observable</td>
<td>Difficult to observe</td>
</tr>
<tr>
<td>Easily measured</td>
<td>Difficult to measure</td>
</tr>
<tr>
<td>Tangible, concrete attributes</td>
<td>Intangible, abstract attributes</td>
</tr>
<tr>
<td>Directly observed &amp; measured</td>
<td>Not directly observable</td>
</tr>
<tr>
<td>Height, weight</td>
<td>Motivation, self-esteem</td>
</tr>
</tbody>
</table>
Types of Variables

1. Independent variable (ID.V.)
   is the variable that influences another variable (the dependent variable).

2. Dependent variable (D.V.)
   is the one influenced by another variable (the independent variable).

An independent variable in one study can become the dependent variable in another study.
Operationalizing variables

An operational definition is a procedure for measuring & defining a construct. An operational definition specifies a measurement procedure (or set of operations) for measuring an external, observable behavior & uses the resulting measurement as a definition & a measurement of the hypothetical construct.

Measuring Constructs

Indirect method of measuring the construct: observe & measure the external factors & the behaviors that are associated theoretically with the construct, instead of directly observing & measuring the construct itself.

External stimulus factors → construct → behavior
Rewards, reinforcements → motivation → performance
Stimulus factors → intelligence → Response to questions (IQ test)
Operationalizing variables

Variables need to be clearly defined and in a way that permits some kind of measurement. The operational definition of a variable must retain the meaning of the original variable and allow possible measurement using the available resources. Any variable can be operationalized in different ways depending upon the hypotheses and focus of the study.

Measuring variables

Variables vary, but they may vary in different ways. Some vary in terms of differences of degree such as temperature or height, others vary in terms of differences in rank or order, others vary in terms of differences in variety such as nationality or religion, others vary in simply whether they exist or not. These different ways of variation represent what is known as "levels of measurements" for variables.
Levels of Measurements

<table>
<thead>
<tr>
<th>Level of M.</th>
<th>Allowable variable property</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Nominal</td>
<td>classification</td>
<td>ethnicity, race, religion, gender, marital status, occupation, group affiliation</td>
</tr>
<tr>
<td>2. Ordinal</td>
<td>classification &amp; order</td>
<td>social class, socioeconomic standing, formal education</td>
</tr>
<tr>
<td>3. Interval</td>
<td>classification &amp; order &amp; setting standard units of distance (zero is arbitrary)</td>
<td>Biblical time, temperature</td>
</tr>
<tr>
<td>4. Ratio</td>
<td>classification &amp; order &amp; setting standard units of distance &amp; locate absolute (true) zero</td>
<td>income, age, weight, distance</td>
</tr>
</tbody>
</table>

Research Hypotheses

"A hypothesis proposes a relationship between two or more variables" (Hoover, 1980, pp.31).

A hypothesis includes the variables of the study and the expected type of relationship that exists between them.

To correctly establish hypotheses for your study, you need to clearly define measurable variables (operationalization of variables), and precisely establish a measurable relationship between the variables.
Types of relationships that exist between variables in a hypothesis

<table>
<thead>
<tr>
<th>Relationship</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Null</td>
<td>No relationship is presumed to exist</td>
</tr>
<tr>
<td>2. Inferential /</td>
<td>A relationship is presumed, but it is a relationship that</td>
</tr>
<tr>
<td>correlative</td>
<td>deals with degrees of influence of one variable on another</td>
</tr>
<tr>
<td>3. Direct / Inverse</td>
<td>A specific correlative relationship is presumed in which one variable</td>
</tr>
<tr>
<td></td>
<td>has a predictable association with another--either one variable increases as the other increases (direct) or one increases while the other decreases (inverse)</td>
</tr>
<tr>
<td>4. Causal</td>
<td>Changes in one variable are presumed to result from variations in another</td>
</tr>
</tbody>
</table>

Causal relationship

العلاقة السببية

Cause and Effect

السبب و التأثير

ID.V. and D.V.
Correlation relationship

Variable A and Variable B
ID.V. and D.V.

Examples of research ideas in the field of architecture

One might be interested in finding out what causes some people and not others to like a certain building.

One might be interested in finding out what causes people to like a certain building more than another one of the same building type.

One might want to know the consequences of using a new glass specification on the heat gain of a certain building.

One might like to predict the behavior of a designed building towards weather conditions

One might want to understand why a group of people have abandoned a certain neighborhood.
Examples of research ideas in the field of architecture

One might want to explain why a certain structural element in a building has unexpectedly and suddenly collapsed.

One might want to understand why certain houses were designed in a certain way a hundred years ago.

One might be interested in investigating the change in architectural style of buildings in a particular city over a certain period of time.

One might be interested in knowing why tourists prefer to go to a certain destination more than to a neighboring and similar one.

Examples of research ideas in the field of architecture

One might be interested in understanding the reasons why a certain urban street in the old city has been designed the way it is.

One might be interested in discovering new ways to provide sustainable homes for the future.

One might like to explore the behavior of a new synthetic material when used in building walls.

etc.