WEEK 4

Outline

I. Relationship among variables
II. Hypothesis and theory
III. Theoretical Framework
IV. Conceptual Framework/Model
V. Interactive quiz

I. RELATIONSHIPS AMONG VARIABLES
Examine relationship among variables as they exist naturally

- Positive correlation
- Negative correlation
- No or neutral correlation
- Differences in kind, degree

Positive Correlation

- Both variables change in same direction
  - As one increases the other increases
  - As one decreases the other decreases
- Examples:
  - (Height and Weight)
  - (Amount of Study time and GPA)

Negative Correlation

- Both variables change in opposite directions
  - As one increases the other decreases
  - (and vice versa)
  - (# of cigarettes smoked and # of years of life expectancy)
No or neutral correlation

- The variables are not related to each other.
- A is not related to B.
- B is not related to A.

Scatter Diagrams

Differences in kind, degree of variables

- Comparison between variables
- Compare a variable according to another variable

Example: compare CGPA between girls and boys (the extent of differences between 2 groups)
To actually measure relationships among variables, you have to know what level of measurement the variable is.

The level of measurement determines what kinds of mathematical operations can meaningfully be performed on the values of a variable.

In this course, we basically deal with just three kinds of relationships:

### Test for Relationship between/among variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Test for Relationship</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both variables are nominal level</td>
<td>Chi-square test</td>
<td>See which divisions have the most female employees</td>
</tr>
<tr>
<td>Independent variable is nominal, Dependent variable is interval or ratio</td>
<td>T-test (if indep has 2 categories only); ANOVA</td>
<td>Test hypothesis that male employees are more satisfied than female employees</td>
</tr>
<tr>
<td>Both variables are interval level</td>
<td>Correlation; Regression</td>
<td>Look at relationship between job satisfaction and salary level</td>
</tr>
</tbody>
</table>

### II. Hypothesis and theory

A successful hypothesis becomes a scientific theory.

**What is a Hypothesis:**

- hunch or expectations that social scientists have about relationships between or among variables,
- commonly but not always expressed as the expectation that variation in an independent variable will "cause" or be associated with variation in a dependent variable.
A hypothesis is a specific, testable prediction about what you expect to happen in your study.

For example, a study designed to look at the relationship between study habits and test anxiety might have a hypothesis that states, "This study is designed to assess the hypothesis that students with better study habits will suffer less test anxiety."

Unless your study is exploratory in nature, your hypothesis should always explain what you expect to happen during the course of your experiment or research.

Characteristics of Hypothesis

- contains at least 2 variables.
- states the relationship between 2 variables.
- stated in a simple, clear, accurate and specific form.
- present the study variable in an operational term.
- can be tested to determine the extent to which it can be supported or rejected.
- can be deduced from theory, past research or observation, thus, it must be consistent with the existing knowledge or what is already known.
- provides the guide for which research strategy to use.
- help to identify the type of data to be collected.
- help to identify which statistic to use in analyzing data.
- facilitate in how to reach a conclusion in solving the research problem.
Forms & Classes of Hypothesis

**Form**
- Null hypothesis
- Alternative hypothesis

**Classes**
- Directional
- Non-directional

**Null Hypothesis**
- also known as statistical hypothesis or zero hypothesis.
- labelled as $H_0$
- states that there is no difference or relationship between the groups or variables measured.
- statement to be rejected.

**Alternative hypothesis**
- also known as the research hypothesis or working hypothesis.
- labelled as $H_a$
- states that there is a difference or relationships between groups or variables that are being measured.
- statement to be accepted.
**Directional Hypothesis**

- is a hypothesis that specifies the direction of the predicted relationship that is whether the predicted relationship will be positive or negative.
- enough evidence to deduce for the direction of the expected results (IV on DV).

**Non-directional hypothesis**

- is a hypothesis that does not indicate the direction of the expected research results.
- positive or negative results of the investigation will not be stated.

**Some examples**

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Null</td>
<td>There is no significant relationship between number of hours studying and test score.</td>
</tr>
<tr>
<td>Alternative</td>
<td>There is a significant relationship between number of hours studying and test score.</td>
</tr>
<tr>
<td>Directional</td>
<td>Students who study longer hours will get higher score on the test.</td>
</tr>
<tr>
<td>Non-directional</td>
<td>Number of hours studying will influence test score.</td>
</tr>
</tbody>
</table>
Theory and Role of Theory

- A theory is a set of propositions meant to explain a class of phenomena
  - Propositions are causes, the phenomena are the effects induced by the causes
- Theories often lead to the generation of hypotheses that confirm or disconfirm the theory
- Theories are constructed by scientists

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

- Theory guides the research process, forms the research questions, aids in design, analysis and interpretation.
  - A theoretical framework can be thought of as a map or travel plan.
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 is has been extensively tested and is generally accepted, while a hypothesis is a speculative guess that has yet to be tested.

**Theory:** a hypothesis that becomes very well supported over a period of time.

The word theory applies to a well-tested hypothesis that unifies a broad range of observations.

**E.g. of how theory develops**

<table>
<thead>
<tr>
<th>Scientific Method</th>
<th>Car Repair</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation</td>
<td>Engine won't turn over.</td>
</tr>
<tr>
<td>Hypothesis (prediction)</td>
<td>Predict battery is dead.</td>
</tr>
<tr>
<td>Test</td>
<td>Replace battery.</td>
</tr>
<tr>
<td>Observe result</td>
<td>Engine now turns over.</td>
</tr>
<tr>
<td>Revise hypothesis?</td>
<td>Not needed.</td>
</tr>
<tr>
<td>New test?</td>
<td>Not needed.</td>
</tr>
<tr>
<td>Scientific Theory</td>
<td>Cars won’t work without a fully charged battery.</td>
</tr>
</tbody>
</table>

[neu.uor.edu/faculty/tyler_nordgren/.../FYS_ScmMethod.ppt](neu.uor.edu/faculty/tyler_nordgren/.../FYS_ScmMethod.ppt)
E.g. of how theory develops

<table>
<thead>
<tr>
<th>Scientific Method</th>
<th>Making Spaghetti Sauce</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation</td>
<td>Spaghetti sauce should be red.</td>
</tr>
<tr>
<td>Hypothesis (prediction)</td>
<td>Try a tomato sauce.</td>
</tr>
<tr>
<td>Test</td>
<td>Heat pot of tomato sauce.</td>
</tr>
<tr>
<td>Observe result</td>
<td>Taste the sauce - bland.</td>
</tr>
<tr>
<td>Revise hypothesis?</td>
<td>Use tomato sauce and garlic!</td>
</tr>
<tr>
<td>New test?</td>
<td>Add garlic, taste - not so bland.</td>
</tr>
<tr>
<td>Scientific Theory</td>
<td>The Final Recipe.</td>
</tr>
</tbody>
</table>

A theory is a highly successful hypothesis.
• All hypotheses make predictions.
• All theories make predictions.
• All theories can be tested.
• Any scientific theory is subject to change as our ability to make tests, or make observations of a test's results, improves with time.

Theoretical framework
• The theoretical framework of the study is a structure that can hold or support a theory of a research work. It presents the theory which explains why the problem under study exists.
• Thus, the theoretical framework is but a theory that serves as a basis for conducting research.
Theoretical Framework
A process model of the determinants of parenting (Belsky, 1984)

Purpose of theoretical framework:
- It helps the researcher see clearly the variables of the study;
- It can provide him with a general framework for data analysis;
- It is essential in preparing a research proposal using descriptive and experimental methods.

Theoretical vs Conceptual Framework

- While the theoretical framework is the theory on which the study is based, the conceptual framework is the operationalization of the theory.
**Conceptual Framework**

- It is the researcher’s own position on the problem and gives direction to the study.
- It may be an adaptation of a model used in a previous study, with modifications to suit the inquiry.
- Aside from showing the direction of the study, through the conceptual framework, the researcher can be able to show the relationships of the different constructs that he wants to investigate.

**Interactive Quiz**

1. A good scientific hypothesis must be ______
   - A. correct.
   - B. able to be tested.
   - C. obvious.
   - D. based on common sense.
Interactive Quiz

2. A well-tested explanation that unifies a broad range of observations is a
A. hypothesis
B. variable
C. control
D. theory

For each of the following, indicate whether the expected relationship between the two variables will be positive (+), negative (−), or zero (0):

___ A. Air temperature and the amount of snow on the ground
___ B. The number of minutes of exercise per day and score on a physical fitness test
___ C. The number of years since having a driver’s license and age
___ D. The number of pages in a textbook and cost of that textbook
___ E. Age at which a child takes its first step and educational level of the parents

Homework:
Write in your own words the meaning of the following research language:

Hypothesis:

Null Hypothesis: