The steps of research

Definition of a hypothesis

Types of hypotheses

Brainstorm agenda

Reminder

Research Methodology
Lecture 3: Forming Hypothesis

Course homepage:
http://www.bth.se/tek/abs.nsf/sidor/70f2d26fb0e4b2cc12574b200d3eb3IOpenDocument

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Outline

A. Find a problem
B. Research the problem
C. Form a research question and hypothesis
D. Validate your hypothesis
   * Plan an experiment
   * Measure, collect data
   * Analyze the results
E. Form a conclusion
F. Report

Research method

The methodological steps of research

Identification Solution Implementation Validation

What is a research hypothesis?

A hypothesis is a tentative explanation for certain behaviors, phenomena, or events that have occurred or will occur.

The hypothesis states the researcher’s expectations concerning the relationship between the variables in the research problem.

What is a research hypothesis?

The hypothesis is formulated following the review of related literature and prior to the execution of the study.

The related literature leads the researcher to expect a certain relationship.
What is a research hypothesis?

"A good hypothesis states as clearly and concisely as possible the expected relationship (or difference) between two variables and defines those variables in operational, measurable terms."


Formulating a research hypothesis

To formulate a research hypothesis we start with a research question and generate operational definitions for all variables, formulate a research hypothesis keeping in mind:

• expected relationships or differences,
• operational definitions

Making hypothesis?

When you think you know what variables may be involved (try to choose variables that you think act independently of each other) you are ready to translate your questions into hypothesis.

A hypothesis is a question which has been reworded into a form that can be tested by an experiment.

Making hypothesis?

Make a list of your answers to the questions you have.

This can be a list of statements describing how or why you think the observed things work.

These questions must be framed in terms of the variables you have identified.

There is usually one hypothesis for each question you have.

You must do at least one experiment to test each hypothesis.

Formulating a research hypothesis

Hypothesis can be classified in terms of how they were derived:

• inductive hypothesis
  - a generalization based on observation
• deductive hypothesis
  - derived from theory
• Picture

Formulating a research hypothesis

A hypothesis can be directional or non-directional.

Hypotheses can also be stated as:

• research hypotheses
• statistical hypotheses.
Formulating research hypotheses for various types of research problems

A hypothesis for an experimental or causal-comparative study:

A hypothesis for correlational research.

A hypothesis for descriptive research.

A model for stating hypotheses for an experimental or causal-comparative study.

Example:

Research Hypothesis:
*Girls will achieve higher reading comprehension test scores than boys at the end of the first grade.*

Operational Variables:
*Reading comprehension will be measured by the Iowa Tests of Educational Development, Reading Comprehension, administered at the end of the year.*

A model for stating hypotheses for an experimental or causal-comparative study.

Statistical Hypotheses:

When we get ready to analyze our data we might also wish to state statistical hypotheses for our problem.

The statistical hypotheses consist of the null hypothesis ($H_0$) and the alternative hypothesis ($H_1$).

A model for stating hypotheses for an experimental or causal-comparative study.

If we let $\bar{x}_g$ stand for the mean of the girls and $\bar{x}_b$ stand for the mean of the boys.

Our null hypothesis states that:
*there is no difference between the two means on the reading comprehension test scores.*

The alternative hypothesis states that:
*the girls mean score on the reading comprehension test will significantly exceed that of the boys.*

A hypothesis for correlational research.

If $A$ and $B$ are variables (note that we do not refer to them as independent and dependent variables in correlational research), and $C$ is the subject we can state our research problem as the relationship between $A$ and $B$ for $C$.

What is the relationship between $A$ and $B$ for $C$?

The example:

*An instructor investigates the relationship between the number of minutes needed to complete an examination and the score on the examination. He wants to use the data to determine whether there is a significant negative relationship between these two variables.*
A hypothesis for correlational research.

Research Hypothesis:

The length of time needed to complete an examination will be negatively correlated with the score on the examination for college students.

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A hypothesis for descriptive research.

Example:

A researcher wants to find out the educational characteristics of gifted students with learning disabilities in the middle school. When asked what is meant by "educational characteristics" the researcher lists the following variables:

- IQ
- reading achievement, mathematics achievement,
- written language achievement,
- locus of control (internal versus external locus of control).

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A hypothesis for descriptive research.

Research Question:

What is the average level of IQ, reading comprehension, mathematics performance, written language proficiency, and locus of control for gifted children with learning disabilities in the middle school.

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A hypothesis for descriptive research.

Operational Definitions:

- IQ - Scores on an individually administered IQ test
- Reading Comprehension - Scores on the Woodcock Reading Mastery Tests
- Mathematics Performance - Scores on the Woodcock Johnson Tests of Achievement: Mathematics Section
- Written Language Proficiency - Scores on the Woodcock Johnson Tests of Achievement: Written Language Section
- Locus of Control - A suitable measure for internal versus external locus of control will be selected

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What does each student need to show on the first brainstorm meeting?

Title or topic of the project
Research question(s)
Hypothesis
Keywords

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Brain storm meeting agenda and tasks

Agenda
Project plan
Minutes