

RESEARCH METHODOLOGY

Lecture 5: Use of Logic in Research

Knowledge Building Through History (Reliability Concerns)

- Common sense
- Faiths
- Revelations, Intuitions
- Authority as a source of knowledge
- Verification
- Experience and Logic/Reason
- From Aristotle to Bacon
 - Deduction to Perfect Induction to Probability
(induction based on limited cases observation)

Logical Argumentation

- Range of Logical Argumentation
- Logical systems have broad explanatory power – based on axiomatic certainties, *a priori*, linkage of factors or facts

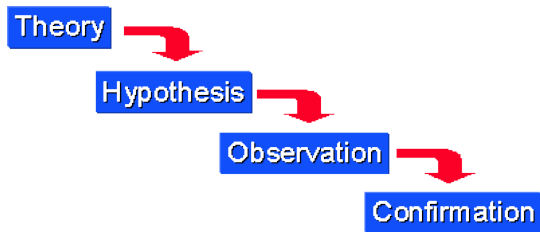
<p>Formal Mathematical Rule-based/Syntactic Equations Computer programs Test: Quantitative</p>	<p>Mathematical/Cultural Analytical Tools Models</p>	<p>Discursive World views Systematic Explanations Treatise Test: Normative in cultural milieu</p>
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- **Definition**
 - Quantity, quality, origins, conceptual delimitation, scope, content, terms
- **Relationship**
 - Necessity, Deduction-Induction, Syllogism, Implication
- **Rhetoric**
 - Naming, association/disassociation, story, image, group experience, authority

Syllogism

- Form of reasoning in which from two propositions a third is deduced
 - All crows are black (major premise)
 - This bird is a crow (minor premise)
 - Therefore, this bird is black (conclusion)
- But not ...
 - All crows are black
 - This bird is black
 - Therefore, this bird is a crow.
- Sequence of propositions is critical
 - A-B, C-A, C-B

Deductive Thinking



Deductive Approach

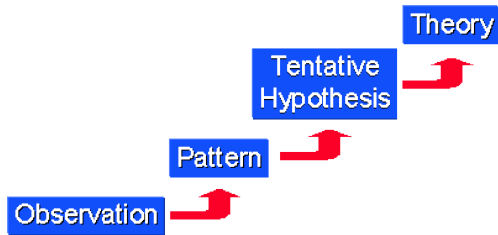
- Working from the general to the more specific
- Think up a *theory* > Narrow down to specific *hypotheses* > Narrow down even further to collect *observations* > Test the hypotheses with specific data -- a *confirmation* (or not) of original theory.
- Use and development of deductive logic > attributed to Greek philosophy (Aristotle)

Deduction

The Deductive approach begins explicitly with a theory that is used to postulate a tentative hypothesis, then proceeds to use observations to rigorously test the hypotheses.

- **Deductive propositions form a hierarchy from theoretical to observational; from abstract to concrete.**

Inductive Thinking



Inductive Approach

- Working from the specific to the general (theories)
- Specific observations >> patterns and regularities >> tentative hypotheses >> tests (further observations) >> extended to general conclusions or theories
- Perfect induction >> Baconian induction
- Imperfect Inductions >> limited observations and generalization >> certainty of the generalization and concept of probability >> continuous reassessment.

Induction

The Inductive approach to enquiry builds generalizations out of observations of specific events. It starts with singular or particular statements and ends up with general or universal propositions.

Induction

•The Inductive strategy assumes that all science starts with observations which provide a secure basis from which knowledge can be derived and claims that reality impinges directly on the senses.

Mix of Inductive and Deductive Logic

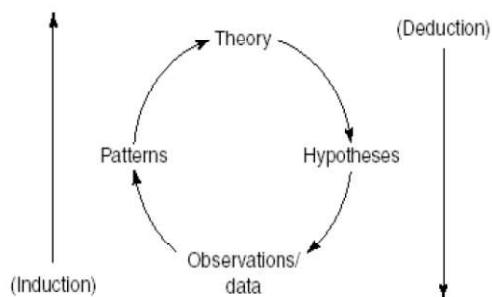
- Natural sciences > usually deductive and also objective (greater store of theories?) > Mathematics is almost totally deductive
- Social sciences > inductive and also normative in many instances.
- These days: Research methods use both types of logics in their procedure and methodologies

Combined approach

A scheme proposed by **Wallace (1971)**

that combines Inductive and Deductive strategies to capitalize on their strengths and minimize their weaknesses creating a cyclic process that allows for movement between theorizing and doing empirical research.

The Research Wheel



Retroduction

Retroductive research strategy involves the building of hypothetical models as a way of uncovering the real structures and mechanisms which are assumed to produce empirical phenomena.

The model, if it were to exist and act in the postulated way, would therefore account for the phenomena in question.

A phenomena is identified,
Explanation is based on a postulated existence A
generative mechanism is constructed
and empirically tested,
and this mechanism then becomes the
phenomenon to be explained
and the cycle repeats.

Astronomical examples:

heliocentric model,
earth's tilt and rotation and changing length of days
motion/s of earth, moon and sun and eclipses

**Retroduction starts with 'hypothesis formulation' as
the first stage of an enquiry.**

**in the second stage of an enquiry, consequences
are deduced from the hypothesis**

**and, in the third stage, these consequences are
tested by means of Induction.**

**Retroduction differs from Induction which infers
from one set of facts, another set of facts,
whereas Retroduction infers from facts of one
kind, to facts of another.**

Abduction

**The Abductive research strategy is used by
Interpretivism/phenomenology to produce
scientific accounts of social life by drawing on the
concepts and meanings used by social actors and
the activities in which they engage.**

**Access to any social world is by the accounts given
by the people who inhabit it. These accounts
contain the concepts that people use to structure
their world - the meanings and interpretations, the
motives and intentions which people use in their
everyday lives and which direct their behavior.**

Qualitative Research

- Observing through the eyes of Someone else using an Open Research Question
 - Use of characteristics and structure to frame a model or theory
 - Observations > grounded theory
 - Participant observation
 - Learning from inside out
 - Open question, exploring attitude

Quantitative Research

- Observing through the eyes of the Researcher using a Closed Research Question
 - Use of theory to frame and understand a problem
 - Model, theory, hypotheses > measuring variables
 - 'To measure is to know'
 - Learning from outside in
 - Closed question