

Methodology and Justification in Academic Inquiry

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1

Overview

Part I: Background

My current work
Why am I doing this work?

Part II: Examples of inquiry activities

Justification
Methodology

Part III: A framework to understand inquiry

Ingredients of inquiry/research
Modes of Inquiry/research

Part IV: More examples

Part V: Concluding remarks

2

Part I:

Background

3

My current work

My current interest

- Investigating the nature of (academic) knowledge and inquiry/research.

My current project

- Constructing a web-course (with no classroom instruction), for university students, accessible across the world, on **Academic Knowledge and Inquiry**.
(An early incarnation: the units on inquiry in the NUS web-course on Academic Culture at <http://emodule.nus.edu.sg/ac/>) open to all.

4

My current work

Goal of the web-course:

helping students develop

- a rudimentary ability to engage in various forms of academic inquiry, and
- a conceptual understanding of the nature of academic inquiry and knowledge.

5

Why am I doing this work?

Research: Researchers pursuing multi-disciplinary inquiry need to understand and appreciate one another's modes of inquiry.

Education: The value of education lies not only in

- the understanding of the conclusions (= knowledge) that result from research, and
- the ability to apply those conclusions, but also, among other things, in
- the understanding of the evidence/justification for those conclusions, and
- the ability to engage in independent inquiry and critical thinking [= the ability to arrive at and justify conclusions, and critically evaluate one's own as well as others' conclusions].

6

Why am I doing this work?

Both research and education call for an **integrated framework** that helps us **understand** the nature of Academic Knowledge and Inquiry.

Education, in addition, calls for **pedagogical tasks/exercises** to develop inquiry (and critical thinking) abilities.

Hence my preoccupation with this work.

Part II: Examples of Inquiry Activities

Examples of Inquiry

Are the following statements true or false?

- I (K.P.Mohanan) will die before 8th June 2198.
- Honey is sweeter than dates.

Points:

Stringent standards of truth of academic inquiry
Deductive reasoning
Inductive reasoning from sample to population
Interpretation of the particular based on a theory
Correlation
Variability
Subjectivity, inter-subjective variability, inter-rater reliability

Examples of Inquiry

Why is there suffering in the world?

(e.g., diseases, natural disasters, pain caused by humans ...)

- A. Suffering in this life is punishment for evil deeds in a previous life.
- B. Suffering in the world is God's punishment for the first humans on earth disobeying Him.
- C. Suffering is God's way of making us purer and stronger.
- D. Suffering is God's will.

Points:

Null-hypothesis; Occam's Razor
Justified conclusions vs. foundational assumptions
Hermeneutic inquiry, internal consistency
Assumptions taken for granted (=presuppositions)

Part III:

A Framework to Understand Inquiry

Ingredients of inquiry/research

Inquiry: the process of finding out and figuring out, relying primarily on our own experience and thinking. (For the purposes of this talk, I won't distinguish between "inquiry" and "research".)

Ingredients of (academic) inquiry:

- finding interesting and worthwhile questions to investigate;
- finding **reliable answers to those questions and arriving at conclusions (methodology)**;
- critically evaluating our answers and conclusions;
- **establishing the answers/conclusions to the satisfaction of the academic community (justification)**; and
- critically evaluating the answers, conclusions, and the justification that others present.

Ingredients of inquiry/research

Methodology vs. Justification

- **Methodology:** how do we *arrive at* plausible conjectures/hypotheses/guesses?
- **Justification:** how do we *prove* the conjectures/hypotheses/guesses that we think are true?
("prove" = convince the skeptical fellow inquirers that the conjecture is correct.)

13

Modes of inquiry/research

Evidence-gathering

Collecting data, information, documents, and so on that would allow us to answer a question.

Contemplation

Thinking carefully and systematically about the question on the basis of what we already know.

14

Modes of inquiry/research

Imagine an accomplished researcher in a coma, unable to move, and unable to receive any sensory input from the world, but with a mind perfectly intact.

Which of the following areas would he be able to do research in, using only his mind?

Mathematics, theoretical science,
experimental science, philosophy

Would he be able to use any of the following methodologies?

Surveys, interviews, textual analysis, field work.

15

Methodologies

Kinds of research using evidence-gathering

- Hypothesis testing:** experiments, statistics, instruments, surveys, ... ('positivistic' research);
- Qualitative generalizations:** field work, case studies, textual analysis, ...;
- Theory building and evaluation:** using the methodologies of A or B;
- Semiotic interpretation:** ethnography, textual analysis, ...;
- Critical inquiry:** textual analysis, ...;

16

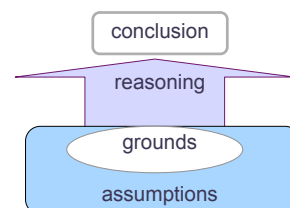
Methodologies

Strategies of Contemplation

- deducing knowledge from what we already know;
- constructing axioms and definitions, and seeing patterns arising from them;
- clarifying abstract concepts;
- inventing explanations and concepts;
- constructing theories, taking intuitions and thought experiments as the grounds;
- critically evaluating the assumptions and practices that our communities or we ourselves tend to take for granted.

17

Structure of justification



18

Soundness in justification

- A. Reliability:** The grounds and assumptions must be accepted as legitimate/correct.
- B. Validity:** The conclusion must follow from the grounds (and assumptions).
- C. Robustness:** The conclusion must withstand potential objections; counter-evidence (=grounds that could refute the conclusion); and competing conclusions from the same grounds.

19

Modes of justification

Grounds:

- sensory experience (with or without experimental, instrumental, or numerical enhancement)
- verbal evidence
- intuitions

Defeasible and non-defeasible reasoning

- Classical deduction (as in math)
- Probabilistic deduction
- Defeasible deduction
- Sample-to-population reasoning
- Abductive reasoning
- Speculative deductive reasoning

20

Modes of justification

Classical deduction

All human beings have exactly one heart.
Socrates is a human being.
Therefore Socrates has exactly one heart.

Probabilistic deduction

Most human beings have ten fingers.
Socrates is a human being.
Therefore it is most likely that Socrates has ten fingers.

21

Modes of justification

Defeasible deduction

It is immoral to choose to cause death.
It is immoral to choose not to prevent suffering.
Socrates intentionally caused Zeno's death.
Socrates prevented Zeno's suffering (intense pain) by taking off his life support system.
Zeno was terminally ill, with no hope of recovery and no way of easing pain except through death.
Conclusion? Did Socrates do anything immoral?

22

Modes of justification

Sample-to-population reasoning

Every individual in our random sample of 10,000 human beings has the heart on the left.

Conclusion? Does every individual in the population of humans have the heart on the left?

Abductive reasoning

Flu causes fever, a sore throat, and body ache.
Socrates has fever, a sore throat, and body ache.
Conclusion: Does Socrates have flu?

23

Modes of justification

Speculative-deductive reasoning

Observation: the daily cycle of the sun, the nightly cycle of the stars around the Pole star, the yearly north-south cycle of the sun, the retrograde motion of the planets, the results of Foucault's pendulum experiment, ...

We can explain these observations if we assume a theory that says that the earth rotates around a north-south axis and revolves around the sun.

In the absence of (a) evidence to the contrary, and (b) an equally good alternative explanation, we conclude that the theory is correct.

24

Part IV:

More examples

Justification

Is the following statement true or false?

- Susan Belliti was five years old when her (=Susan Belliti's) grandmother was born.

(cf: Susan Belliti was five years old when Jane Perkell's grandmother was born.)

Justification

Proof that the proposition that Sue Belliti was five years old when her mother was born is false.

- 1) The mother of any human being is born before that human being is born.
- 2) Sue Belliti is a human being.
- 3) Given (1) and (2), it follows that Sue Belliti's mother was born before Sue Belliti was born.
- 4) Given (3), it follows that that Sue Belliti was five years old when her mother was born is false. (QED)

Justification

Proof that the mother of a human being is born before that human being is born.

1. Def: The mother of a human being x is a female human being who produces the egg that combines with a sperm to produce the embryo that develops into x .
2. The formation of the egg takes place before the formation of the embryo.
3. The human being who produces an egg must be born before that egg is produced.
4. The embryo that develops into a human being must exist before that individual is born.
5. Given (2) - (4), it follows that the human being who produces an egg must be born before the formation of the embryo that develops into another human being.
6. Given (1) and (5), it follows that the mother of a human being x must be born before the formation of an embryo that develops into x .
7. Given (4) and (6), it follows that the mother of a human being x must be born before x is born. (QED)

Methodologies

Contemplative methodology

Hermeneutic pursuit of consistency

Cotard's syndrome: brain impairment that results in the patient's belief that (s)he is dead.

Methodologies

Contemplation vs. Evidence-gathering

- Suppose you go to the moon, make a 10 ft radius hole extending from one side to the other through the centre, and drop a coin from one end. Describe what would happen to the coin.
- How would you find out if it is true that women are better drivers than men?
- How would you find out if it is true that there is a tendency among humans for the eldest to get married to the eldest?

Part V:

Concluding remarks

Institutional divisions of knowledge

Institutional divisions like

- the Sciences vs. the Arts/Humanities
- the Natural Sciences vs. the Social Sciences

are not useful for the exploration of the nature of Academic Knowledge and Inquiry as the foundation for either

- multidisciplinary research, or
- educational programs to help students develop the ability to engage in academic inquiry, as they do not reflect differences in the modes of inquiry.

Institutional divisions of knowledge

For instance,

- Mathematics, unlike the physical and biological science, does not use evidence-gathering methodologies.
- Biologists, unlike physicists and linguists, are not preoccupied with the search for laws.
- Psychology is concerned with the mind, not society, so the label "social science" is a misnomer.
- Neither history nor cultural anthropology is a science.
- Experimental inquiry into the structure of Bharathanatyam can be as much a predictive science as cognitive neuroscience.

An alternative

A framework that is needed for research and education is not one of

TWO cultures (C P Snow),

but one with

MANY partially overlapping cultures that locate themselves differently along a multidimensional space.

An alternative

For the purposes of research and education, what would be more useful than subject-wise distinctions are distinctions in terms of:

- **Methodology:** evidence gathering vs. contemplation; sensory vs. non-sensory evidence, experimental vs. non-experimental evidence, quantitative vs. qualitative evidence, verbal evidence, intuition, thought experiments, ...;
- **Justification:** (types of) grounds, assumptions, (types of) reasoning, claims/conclusions;
- **Critical thinking:** values, norms and criteria for the evaluation of conclusions and justification.

Thank you!