

ISS 305:002

Evaluating Evidence:

Becoming a Smart Research Consumer

3. Empirical vs. non-empirical statements

- I. Four basic canons of science
- II. Empirical Statements
- III. Analytic Statements
- IV. Value Statements
- V. Attitude Statements
- VI. Metaphysical Statements

Reminder: Turn on your I<CLICKER

Base is A or AA

Introduction

- This course focuses primarily on one type of statement (or assertion/claim/conclusion)--**empirical** statements
- We'll define such statements and distinguish them from other types of statements, but first...

We must be...

- **Research Producers** – be able to develop research methods skills to conduct your own experiments, or how to discover new knowledge.
 - Starbucks Managers are research producers?
- **Research Consumers** – be able to find, read, and evaluate the research behind important policies, therapies, and workplace decisions.
 - Making informed decisions by asking the right questions is a good thing, right?

Science

- FOUR basic canons of science:
 - 1) **Determinism**: Events have meaningful, systematic *causes*.
 - 2) **Empiricism**: The method of making observations. (Making observations is the best method.)
 - 3) **Parsimony**: If we have two competing theories, we should choose the simpler or more frugal of the two.
 - 4) **Testability**: You must be able to realistically test the theory (involves Validation, Falsification & Qualification).

Don't Forget!!! Publication: Spread the word!

Determinism

Events have meaningful, systematic causes.

–They are not random

–Specifically, they can be predicted

–If this weren't the case, there would be no point in studying things!

–HOWEVER, this does NOT mean that there is one cause for every event.

Empiricism

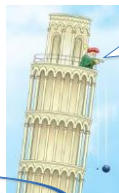
Making systematic observations

- Using senses or instruments to assist the senses
- Empiricism distinguishes science from things like philosophy and religion



Theory

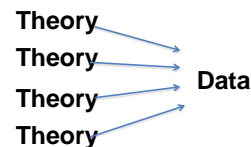
Heavier things fall faster than lighter things



Data

False.

But what if many theories fit our data?



How do we choose the best one?

Parsimony

If we have two competing theories that can explain a phenomenon, we should choose the simpler of the two

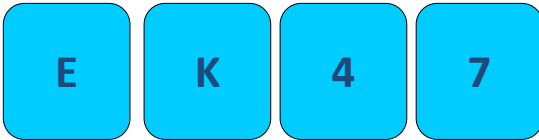
- **Occam's razor** – the fewer assumptions an explanation relies on, the better the explanation
- KISS
- My food! Where did it go?!?!
- So, we've chosen our best theory...
- ...now how do we know whether it's true?

Testability

- The ability to realistically test your theory with available measures
- When we test our theories, we tend to fall victim to positive test bias.
- Positive Test Bias (or, Confirmation Bias):
 - The tendency to seek out information that should *confirm* our theory,
 - And, conversely, we do not seek out or we ignore information that might *falsify* our theory.

Positive test bias (example)

- Fact: Every card has a letter on one side and a number on the other.
- Theory: Every card containing a vowel must have an even number on the other side.



What TWO cards do you turn over to test this theory adequately? (You need to turn over 2 cards only)

Let's get logical

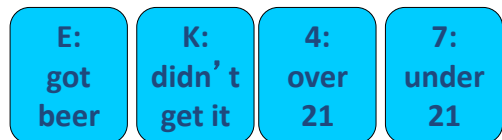
- *If a card has a vowel on one side, then it has an even number on the other side*
- If P then Q
- **This becomes a problem in deductive logic...**

Falsification

- According to Popper, **falsification** is the line of demarcation between science and non-science. You must be able to disprove a theory.
- **NOTE**: falsifiable does not mean a theory is false!
- We can show that the consequences of a theory (or an idea) are not empirically supported. Modus Tollens.
- If P then Q. If Idea P is true THEN Q should be observed.
- If we observe "Not Q" then we can conclude that P is somehow false.
- Popper (1968, p. 51)
 - "There is no more rational procedure than the method of trial and error – of conjecture and refutation: of boldly proposing theories; of trying our best to show that these are erroneous; and of accepting them tentatively if our critical efforts are unsuccessful."

Falsification

What TWO cards do you turn over to test this theory adequately?



Familiarity with the topic can help avoid positive test bias, and help seek out falsifying information.

Knowledge that is publicly verifiable

- Important to get science out into the world
- Findings that can be replicated, criticized, or extended by anyone in the community.
 - There is no place for private knowledge!
 - However, as Morling (2014) points out, we must be active and alert research consumers.

Empirical statements – Characteristics

- 1) Conveys information about the world that we experience with our senses.
- 2) Verifiable
- 3) Falsifiable
- 4) It is true or false depending on observed facts.

Empirical statements – Senses

- 1) Empirical statements *purport to convey information about the world which we come to know through the experience of our senses (i.e., through observation)*
 - only the usual physical senses (namely, seeing, hearing, smelling, tasting, touching & balance), which we all (mostly) share
 - NOT any other “senses” (for example, intuition, ESP, etc.)
- This experience of our senses may be indirect
 - gravity
 - we don't experience *intelligence* directly, but can experience some of its effects (e.g., see someone solve a problem quickly)
- We may sometimes trust in others' experiences
 - AIDS virus
 - A round earth

Empirical Statements – Verification

- 2) An empirical statement should* tell us** **what** sense experiences we should have if the statement is true (*Verifiability principle*)
 - * preferably explicitly, but at least implicitly
 - ** to verify an empirical statement, the words used in the statement have to have the **same** meaning about experience for **everyone** who wants to check
 - This will require an explicit (or implicit) definition of how one attaches experience to the words--i.e., an *operational definition*
 - “Traditional” – what does it mean?
- Example:
 - How would we **verify** the empirical statement “There are more than 200 people in this room” ?

Empirical Statements – Falsification

- 3) An empirical statement should also tell us (implicitly or, better yet, explicitly) just what sense experiences we should have if the statement is false. (*Falsifiability principle*)
- Unless there are some observations which could show that the statement is false, it is **not** an empirical statement
 - Unless an empirical statement **could** be false, it is not empirically meaningful.
- Examples: What observations would falsify each of the following statements?
 - Psychic's claim, “I can read your thoughts. Unless the vibes are bad.”
 - My astrological prediction is “You'll have an unusual experience today.”
 - The Utilitarian Principle: “All behavior is an attempt to gain some pleasure or to avoid some pain.”

Empirical statements - Observation

- 4) Tested via observation (the evidence of our senses)
 - Verifiable via observation
 - Falsifiable via observation

Empirical statements are not ...

- ...so vague that no one can tell for sure which observations are required to validate or falsify it.
 - e.g., use vague, imprecise language
 - use "weasel words" (may, might, perhaps, can, could)
 - What's wrong with the following as empirical statements?
 - "An unborn fetus is a human life."
 - "I might have the ability to read your mind?"
 - "There could be intelligent life elsewhere in the universe."

Empirical statements are not ...

- ...necessarily true (empirical statements can be true or false)
 - Bigfoot exists.
 - Creatures from other worlds visit our planet.
 - Whether an empirical statement is true or false ultimately depends upon observation, and observed reality may or may not confirm the statement.

Empirical statements are not ...

- ...necessarily provable at present
 - it may not be possible to make the necessary observations, **but** we still should know what observations would be necessary if it were possible to make them.
 - we do not need to be able to prove a statement for it to be empirical.
 - Some examples...
 - "There are mountains on the far side of the moon" (long unprovable; now confirmed)
 - "People are happier living on Mars."
 - It's not an "Appeal to ignorance" to say that such statements are empirical
 - although it would be to say that such statements are False

Examples of empirical statements

- "There are more than 200 people in this room." Checklist
 - ✓ Is it clear what observations would verify?
- "The average height of an MSU student is between 68 and 72 inches." Checklist
 - ✓ Is it clear what observations would falsify?
- "The number of elephants in Africa has fallen below 20,000."

Analytic (Semantic) statements – Characteristics

- 1) True or false by definition
- 2) When true, it conveys information about words only
- 3) When False, it conveys no information at all
- 4) Carries no empirical meaning

Analytic (Semantic) statements

- Analytic statements assert something about the **meaning of words** (not about the observable world; analytic statements have no empirical meaning).
 - "All bachelors are unmarried."
 - "A mother has a child."
- Analytic statements are true or false **by definition (of the words used)**
 - We resolve questions about analytic statements by checking the dictionary, or by imposing our own **shared** meaning on words, but **not** by observing the world

Analytic (Semantic) statements

- True analytic statements are **tautologies**
 - A is A
 - Bachelors are unmarried men.
- Note that such statements are not real arguments, but instances of “begging the question/circular reasoning”
 - A is true because A is true.
 - “You have to go to bed because I say so”
=
“I say you have to go to bed and this is true because I say you have to go to bed”

Analytic (Semantic) statements

- False analytic statements are **contradictions**
 - “All bachelors are married.”
- many **paradoxes** (“assertions that are essentially self-contradictory”) contain such contradictions
 - e.g., “All I know is that I know nothing.”
 - e.g., “*The silence of midnight, to speak truly, though apparently a paradox, rung in my ears.*” (Mary Shelley)

Analytic (Semantic) statements

- Examples
 - A hat is something you wear on your head.
 - God created himself.
 - A puppy is a young dog.

Value Statements - Characteristics

- 1) Used to judge
- 2) Contains a value word or mixture word
- 3) True or false depending on observations
- 4) Carries empirical meaning...potentially

Value Statements - Characteristics

- Value statements express some positive or negative evaluation of something or someone
 - Mark is sweet.
 - Mr. T is a fool.
- Value statements may contain
 - Pure value words (e.g., good, bad, right, wrong) which **judge** rather than **describe**,
 - Or, “mixed” words which both evaluate/judge and also describe (e.g., brave, dishonest, kind)

Value Statements - Characteristics

- Value statements **can** be empirically meaningful **if** we can agree upon observable criteria for our mixed words.
 - “Capital punishment is cruel and unusual punishment” could be an empirical statement
 - If, we can reach some agreement about what “cruel and unusual” means
 - If, those criteria are **observable**
- But, if we cannot agree upon such observable criteria, value statements are **not** empirical statements,
 - those that simply express a personal evaluation become **attitude statements**

Attitude Statements – Characteristics

- 1) Expresses speaker's feelings
- 2) Conveys information about the Speaker only
- 3) Can be mistaken as an empirical statement
- 4) Lacks falsifiability (and verifiability)
- 5) No empirical meaning

Attitude Statements – Characteristics

- Attitude statements express how someone **feels** or **thinks** about something, but little or nothing observable about that something.
- Examples:
 - “I love to watch basketball.”
 - (I believe that) “Basketball is the most entertaining spectator sport.”
 - (I believe that) “Abortion is evil.”
 - (I believe that) “Marriage is sacred.”
 - (I believe that) “Human life is sacred.”
 - “I love you.”

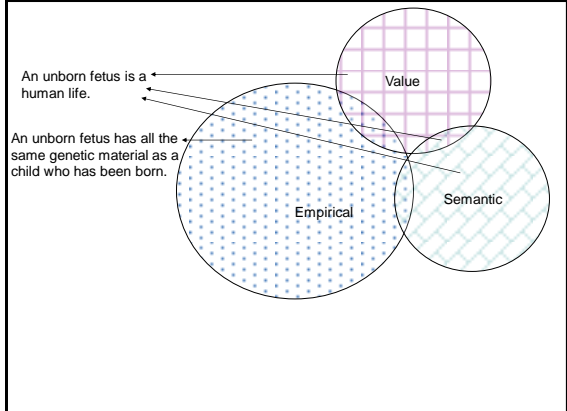
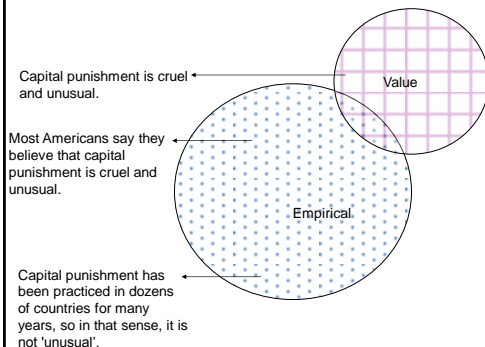
Attitude Statements – Characteristics

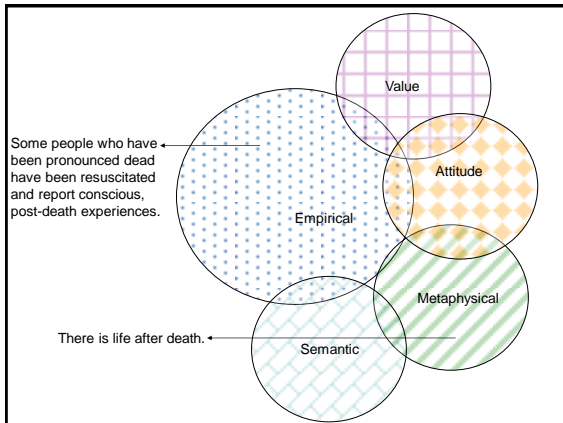
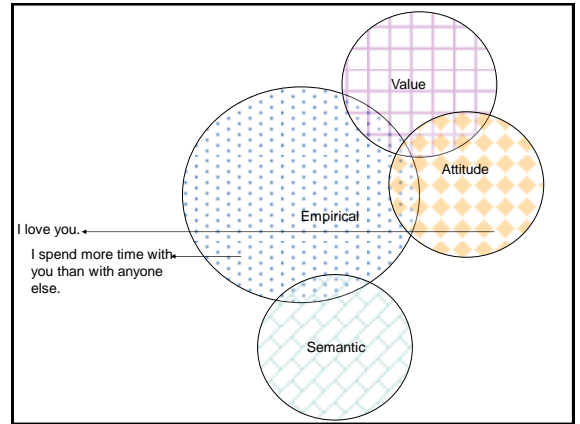
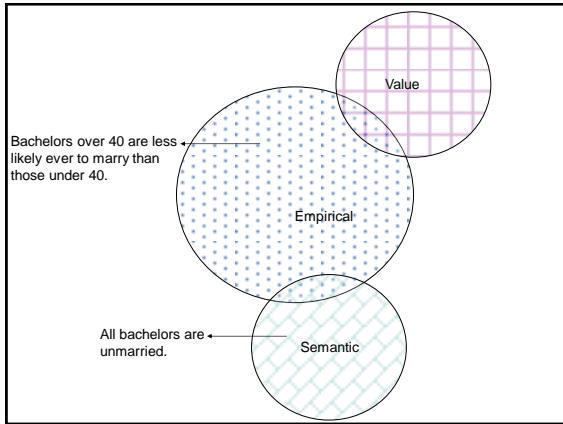
- A genuine attitude statement cannot be validated or falsified through observation. WHY?
 - For example, how could one validate or falsify via observation the assertion “I love you”?
 - Attitude statements convey information about the speaker (their feelings or thoughts).
 - Those feelings/thoughts can be affected by what happens outside the person, in the observable world, and
 - they can affect observable behavior (e.g., self reports of attitudes), BUT there are no particular observable events which make their statement true or false.
 - this assumes that our private evaluations cannot be accessed
 - some new measurement techniques (e.g., IAT; facial EMG; FMRI; polygraphs) are starting to challenge this assumption.
 - someday, attitude statements might indeed be empirical statements.

Metaphysical Statements – Characteristics

- 1) Metaphysical statements assert something that cannot, in principle, be observed (or perceived) by our senses.
- 2) Does not tell us what sense experiences we will have if it is true or false
 - Lacks empirical meaning
- Examples:
 - The Greek Gods created everything.
 - There is life after death.
 - Every dog has a soul.
 - Dr. Weaver's house is haunted.
 - The Ouija board works through the action of spirits.

Often, associated with a non-empirical statement there are potential empirical questions.





Focus of ISS 305

- This course offers techniques for evaluating the truth of **empirical statements** (and those value statements which can be cast as empirical statements through agreement on descriptive criteria)
- This course offers **no** techniques for assessing analytic, attitude, metaphysical or most value statements
- Hence, a critical **first step** of applying the course's techniques is deciding whether or not one is considering a real empirical question.
- **This restriction to empirical issues does not deny or minimize the importance of non-empirical statements**
 - Non-empirical can be very important to us; for example
 - "I love you."
 - Attitude
 - "I believe in a merciful God."
 - Metaphysical
 - "A legally married couple need not be a man and a woman."
 - Semantic