

1 Introduction to Critical Thinking

Lecture III

Fall 2008

2 Appeal to Authority

- I'm becoming a vegetarian. I.B. Singer said it is the ethical thing to do, and he won the Nobel Prize!
- I'm buying a Bumpster mountain bike. My critical thinking instructor says they're the best, and s/he's very intelligent.
- I'm going to go see "The Dark Knight". My best friend said it was very good, and we always like the same things.
- I'm practicing safe sex. My accountant said it's important, and he was honored as the Gainesville CPA of the Year for 2001.

3 Review – which is most precise? Which is most easily refuted?

- China has about one quarter of the world's population
- China has more than a quarter of the world's population
- China has one quarter of the world's population
- China has about 25% of the world's population

4 Which would be easiest to disprove?

- Tim Tebow will throw for a lot of yards on August 30
- Tim Tebow will throw for 158 yards on August 30
- Tim Tebow will throw for more yards than Cam Newton on August 30
- Tim Tebow will throw for more than 38 yards on Saturday

5 Which of these statements is an evaluative claim?

- Bernie Machen is President of the University of Florida
- Charles Young is not President of the University of Florida
- Charles Young secretly roots for Florida State
- Bernie Machen is a good President

6 Which of these is an advocacy claim?

- Returning money that you found is the right thing to do.
- We should try to help the homeless whenever we can.
- There should be enough gas to make it to Crescent Beach.
- Admitting you were lying is an example of honesty.

7 A good argument

- Reasons are given to support a certain claim.
- The reasons are not opinions but statement of facts.
- These statement of facts must have some logical relation to the asserted claim.

8 Using authorities/experts

- Is s/he an expert in the particular issue?
- Does s/he have an interest in the issue?

- Do we have the time, desire, resources and ability to reason or find out ourselves (i.e., not rely on the expert)?

9 **The Singles Bar**

- While sitting in a club where all single men tell the truth and all married men lie, a woman is approached by three men. She asks the first guy if he is married, but the music is so loud that she can't hear his answer. So she turns to the second guy, who tells her, "The first guy said, 'I am married,' but he really is single." Then she turns to the third guy, who says, "The second guy is single." Determine the marital status of each of the three men.

10 **Causal Reasoning**

1. **how acceptable or demonstrable the implied comparison is** (for example, do we think that there is a basic similarity in most respects between the circumstances of this accident and those of the many other times bicycles and cars have traveled on this street safely);
2. **how likely the case for causation seems to be** (for example, do we think that a bicycle swerving into an car's lane can cause an accident?);
3. **how credible the "only significant difference" or "only significant commonality" claim is** (for example, do we believe that the illegally parked truck is the only significant difference between this case and the many other times bicycles and cars went down that street without an accident?).

11 **Don't Eat the Potato Salad!!**

- **Five people become ill at a company picnic. Which is the most likely cause?**
 - They all work in the same department.
 - They all ran in the 3-legged race
 - They all ate the warm yellow potato salad
 - They all had another party to go to
- **Which of the following might be considered the most significant "difference" between them and others?**
 - They all ate from the same bowl.
 - No one else at the picnic ate the potato salad.
 - They all ate different kinds of sandwiches.
 - No one else knew they were sick until the next day.
- **Which of the following is the most significant factor in judging whether the potato salad caused the workers' illness?**
 - At least one other person ate the potato salad and did not get sick.
 - The potato salad was supposed to be refrigerated, but was left out on the counter the night before the picnic.
 - They got sick immediately after eating the potato salad, while the incubation period for the illness was at least 24 hours.
 - Two of the people who got sick had two helpings of potato salad.

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13 **Wason's Selection Task: "turn over only those cards that need to be turned over"**

- Best strategy: turn over E and 7
- Most subjects turn over E and 4 or E only
- Possible bases:
 - verification of the rule (rather than refutation)
 - response matching (selecting cards mentioned in rule)
- Subjects more accurate with realistic materials, more so for relevant or experienced tasks

14 **Conditional Reasoning Exercises**

- **If you do your homework, you should pass the test. You've done your homework.**
 - Conclusion: You should pass the test
 - Conclusion: You should fail the test
 - Conclusion: You really can't say
 - Invalid
- **If my dog could talk, she'd have interesting things to say. But she can't talk.**
 - Missing premise: She has nothing interesting to say.
 - Conclusion: She has interesting things to say.
 - Conclusion: She has nothing interesting to say.
 - Can't conclude anything (Invalid)

15 **Premises**

- Premises are statements that directly support a conclusion. Each argument is made up (at least) of two premises and a conclusion (e.g., syllogisms). Premises support the conclusion,

and are themselves supported by:

- Supporting arguments
- Assumptions/Beliefs
- Evidence
- Authority
- Explanations and anecdotes

16 Premise Identifiers

- since
- for
- because
- supposing that
- given that
- assuming that

17 Conclusion Identifiers

- therefore
- thus
- so
- as a result
- consequently
- we can conclude that

18 Conjunctions and Disjunctions

- "**And**": **affirm all, negate one** ("Bill and John came late to class")
 - To affirm an "and" claim, all parts of the "and" must be affirmed as true.
 - To negate an "and" claim, at least one part of the "and" must be negated as false.
- "**Or**": **affirm one, negate all** ("Bill or John came late to class")
 - To affirm an "or" claim, at least one part of the "or" must be affirmed as true.
 - To negate an "or" claim, all parts of the "or" must be negated as false.

19 Using "or"

- Typically **inclusive** (e.g., taking course A or B to satisfy a requirement; the requirement is still satisfied by taking both)
- Occasionally **exclusive** (e.g., dinner includes soup or salad)
- Avoid and/or...it's highly ambiguous (i.e., meaningless)

20 Syllogisms

- Major premise: asserts a generalization
- Minor premise: asserts that a specific instance is, or is not, covered
- Conclusion
- Types
 - Universal: composed of universal claims ("all, etc.)
 - Non-universal: composes of non-universal claims ("some", etc.)

21 "Only bills that pass both the House and Senate become laws."

Based on this major premise, which of the following minor premises and conclusions offer valid reasoning?

- Some of these have passed the House. Therefore, some of these have become laws.
- Some of these have passed the House. Therefore, some of these have not become laws. (a little ambiguous, what if you said, "Some, but not all of these have passed the House"?)
- ☉ Some of these have not passed the House. Therefore, some of these have not become laws.
- Some of these have not become laws. Therefore, some of these have not passed the House.

22 **Human Reasoning**

- Are we (as humans) consistently able to follow logical rules in order to reach rational conclusions?
- Do we accurately calculate probabilities, utilize data, etc., or do we utilize rules of thumb to help ourselves along?

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24 **Linda Probability Results**

- 85% of people rate "h" as more likely than "f"
- Fallacy in reasoning: probability of "h" cannot strictly be higher than "f", since "h" is a subset of "f"

25 **Probability Judgments**

- Three candidates, A, B, and C are running for Mayor of Gainesville. In 6 separate polls, A led B five times. In 18 polls, C led B 9 times. In a comparison of A and C, who is more likely to win?
- It is known that 5% of the population is affected by rubadubitis. A new diagnostic test gives true positives of the disease 85% of the time, but has a 10% false positive rate. Bub has tested positive. What is the probability that he has rubadubitis?

26 **Heuristics and Biases (Kahneman & Tversky)**

- People commonly use short-cuts (heuristics)
- Heuristics lighten cognitive load, but lead to greater biases and errors
- Example heuristics:
 - REPRESENTATIVENESS: how representative instance is of universe
 - AVAILABILITY: how easily instances are called to mind

27 **Common Heuristics in Probability Judgments**

- **Frequency Heuristic:** making use of number of occurrence, rather than probability of occurrence
 - candidate example: C has more wins, but A has greater proportion of wins (5/6); most people choose C

28 **Common Heuristics (cont'd)**

- **Representativeness Heuristic:** making choices based on how similar/representative a person or sample is, rather than relying on calculated probability
 - fail to use conjunctive rule: Linda is regarded as "representative" of a feminist, so most people choose "b"
 - fail to use baserates: rubadubitis example, estimates are around .85 (actual answer is .31)

29 **Common Heuristics (cont'd)**

- **Availability Heuristic:** using most salient, or apparent answer to guide judgment

- Which is more likely: death by tornado or death by asthma? (asthma)
- Is the letter "k" more likely to occur in the first or third position in English words? (3rd)
- **Conclusion:** people aren't very good at calculating probabilities; they rely on heuristics

30 Examples

- All families having exactly 6 children in Pleasantville were surveyed. In 72 families, the exact birth order was GBGBBG. What is your estimate of the number of families in which the birth order was BGBBBB?
- Are there more words in English that begin with the letter R, or that have R as their third letter?

31 Examples (cont'd)

- In a 2000 word passage, estimate the number of words of the form '_____ing'. Estimate the number of words of the form '_____n_'.
- What percentage of men in a health survey have had one or more heart attacks? What percentage of surveyed men who are both over 55 and have had one or more heart attacks? (conjunction fallacy)

32 Anchoring and Adjustment Effects

- Anchoring effect (ans = 40,320)
 - Estimate: $8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$ (2,250)
 - Estimate: $1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8$ (512)
- Framing effects
 - the way that options are presented affects option selection
 - risk aversion when presented with a gain options (pick small but certain gain over large but uncertain one)
 - risk seeking when presented with potential losses (choose large, uncertain loss rather than smaller, certain loss)

33 Example

- 600 people are at risk of dying of a particular disease. Vaccine A could save 200 of these lives. For Vaccine B, there is a .33 likelihood that all 600 people would be saved, but a .66 likelihood that all 600 people will die. Would you choose A or B? (most choose A)
- 600 people are at risk of dying of a particular disease. If Vaccine C is used, 400 of these people will die. If Vaccine D is used, there is a .33 likelihood that no one will die, but a .66 likelihood that all 600 people will die. Would you choose C or D? (most choose D)

34 Other Judgment Phenomena

- Illusory correlation: tend to see associated characteristics as causally related
- Overconfidence: overvaluing one's own skill or knowledge
- Hindsight bias: ability to see signs and events leading up to an outcome