

1 **Critical Thinking: An Introduction.
Logic and Logical Fallacies**

Lecture II

2 **Truth Tables and Logical Operators**

- Face it...some things are either true or false (specifying this formally is called "propositional calculus")
- A "proposition" is a meaningful statement
- Limited number of operators: not, and, or, if...then, if and only if
- Truth tables chart truth value of proposition by laying out state-of-world possibilities
- Use of conditional logic (if certain conditions are met, then a proposition is true)

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4 **Forms of Conditional Reasoning,
based on "If P then Q"**

- Valid Forms
 - Modus Ponens: $P, \therefore Q$
 - Modus Tollens: $\text{not } Q, \therefore \text{not } P$
- Invalid Forms
 - Affirming the Consequent: $Q, \therefore P$
 - Denying the Antecedent: $\text{not } P, \therefore \text{not } Q$

5 **Logical Fallacies**

- It is important to identify common ways of thinking falsely so that you can sharpen your own logical analyses
- Identifying source of fallacious reasoning often helps clarify ideas you are trying to communicate
- TA's will call you on logical errors (in public)

6 **Fallacies of Distraction**

- Fallacy lies in that you are distracted from "true" premises and led to assume something faulty
- Illegitimate use of a logical operator is key
- You can identify these fallacies by showing that the main premise doesn't accurately reflect what's really going on

7 **False Dilemma (misuse of "or")**

- A limited number of options (usually two) is given, while in reality there are more options. A false dilemma is an illegitimate use of the "or" operator.
- Putting issues or opinions into "black or white" terms is a common instance of this fallacy
- Examples:
 - *You're either for me or against me.*
 - *America: Love it or leave it.*
 - *If you ain't a Gator, you're Gator bait (this one's true).*

8 **Slippery Slope (misuse of 'if-then')**

- If the first step in a "possible" series of events occurs, the other possible steps in the series must inevitably occur.
- Examples
 - If you drink alcohol once, then you'll want to drink it again, and pretty soon you'll be an alcoholic and lose your job.
 - If we pass laws against fully-automatic weapons, then it won't be long before we pass laws on all weapons, and then we will begin to restrict other rights, and finally we will end up living in a communist state. Thus, we should not ban fully-automatic weapons.

9 **Appeals to Motives**

- The key here is to appeal to emotions or psychological factors instead of evidence
- In this way, the reasons supporting the belief are not really provided

10 **Appeal to Force**

- The listener is told that unpleasant consequences will follow if they do not agree with the speaker
- Examples:
 - Agree with our position or we'll vote you out of office
 - Support mental health or I'll kill you.
- Identify the proposition and the consequence and show they are not necessarily related

11 ☐ Appeal to Pity

- The listener is told to agree with a statement because of the pitiful state of the speaker
- Examples:
 - (to a referee: "How can you say that ball was out? I'm already down 10-2!")
 - We hope you'll accept Mr. Smith's recommendations. He spent the last three months working extra time on the report.

12 ☐ Prejudicial Language

- Loaded or emotive terms are used to attach value or moral goodness to believing the proposition.
- Examples:
 - Right-minded individuals vote for Bob!
 - The proposal is favored by the bureaucrats on Capitol Hill.

13 ☐ Changing the Subject

- The fallacies in this section change the subject by discussing the person making the argument instead of discussing reasons to believe or disbelieve the conclusion.
- While on some occasions it is useful to cite authorities, it is almost never appropriate to base the argument on the person instead of the substance

14 ☐ Attacking the Person

- ad hominem (abusive): instead of attacking an assertion, the argument attacks the person who made the assertion.
 - **You may argue that we have to reduce military spending, but you're just a bleeding-heart liberal.**
- ad hominem (circumstantial): instead of attacking an assertion the author points to the relationship between the person making the assertion and the person's circumstances.
 - **Governor Smith's endorsement of President Bush is invalid because they served together on the Texas Cattle Board.**
- ad hominem (tu quoque): this form of attack on the person notes that a person does not practice what he preaches.
 - **Senator Kerry says he's for improving the life of families, but he voted against a bill that would have given aid to pregnant mothers**

15 ☐ Appeal to Authority/Anonymous Authority

- While sometimes it may be appropriate to cite an authority to support a point, often it is not. In particular, an appeal to authority is inappropriate if:
 - (i) the person is not qualified to have an expert opinion on the subject ("Dr. Laura says Tide cleans best")
 - (ii) experts in the field disagree on this issue ("Noted developmentalist Dr. John Smith argues that all a fetus is a human being from the moment of conception").
 - (iii) the authority was making a joke, drunk, or otherwise not being serious ("We are headed for nuclear war. The President said we will begin bombing Russia in five minutes")

16 ☐ Inductive Fallacies

- **Hasty Generalizations:** the sample is too small to support an inductive generalization about a population
 - ("Fred, the Australian, stole my wallet. Thus, all Australians are thieves.")
- **False Analogy:** two dissimilar objects/events are being equated
 - "Employees are like nails. Just as nails must be hit in the head in order to make them work, so must employees."
- **Unrepresentative Sample:** a sample used for an inductive inference is not representative (not just smaller) of the population as a whole
 - "A sample of 200 subscribers to National Review clearly shows that Bush's margin of victory in the national election is likely to be substantial"

17 ☐ Causal Fallacies

- **Post Hoc:** It is assumed that because one thing follows another that the one thing was caused by the other.
 - "Immigration from foreign countries has grown recently, as has unemployment. Therefore, most immigrants are unemployed"
- **Insignificant:** an object/event held as a cause for an effect is a genuine cause, but is insignificant relative to other potential causes.
 - "Rain in the Midwest has ruined the Gulf fishing this year."
- **Complex cause:** the effect is caused by many events, one of which is the reported cause
 - "The accident was caused by the wet road". [neglecting to report the drunken driver and the jaywalking pedestrian]

18 Missing the Point

- **Begging the Question:** The truth of the conclusion is assumed by the premises. Often, the conclusion is simply restated in the premises in a slightly different form. In more difficult cases, the premise is a consequence of the conclusion. ("We know that God exists, since the Bible says God exists. What the Bible says must be true, since God wrote it and God never lies. [Here, we must agree that God exists in order to believe that God wrote the Bible.]")
- **Straw Man:** The opponent attacks a form of the argument that is different from, and usually weaker than, your stated argument. ("We should have a draft. People don't want to enter the military because they find it an inconvenience. But they should realize that there are more important things than convenience.")

19 Fallacies of Ambiguity (important in Advertising)

- Equivocation: "The sign said 'Fine for Parking', so I parked here"
- Amphiboly: "Last night I shot a burglar in my pajamas" (double meaning)
- Accent:

it would be illegal to give away

Free Beer!!!

20 Category Errors

- **Composition:** Because the parts of a whole have a certain property, it is argued that the whole has that property. ("Conventional weapons did more harm than nuclear weapons in WWII. Therefore, conventional weapons are more dangerous than nuclear weapons")
- **Division:** Because the whole has a certain property, it is argued that the parts have that property. ("Americans are the world's most overweight population. Therefore, we all need to lose 20 pounds.")

21 Syllogistic Errors

- **Undistributed Middle:** middle term in a syllogism never refers to all of the members of the category it describes ("All trespassers are shot, someone was shot, therefore, this someone was a trespasser")
- **Fallacy of Exclusion:** The Red Sox will probably win tonight, since they've won five out of the last six (neglects that they're playing the Yankees, and that the last wins have been against the lower half of the league)

22 Fallacies of Explanation

- **Subverted Support:** An explanation is intended to explain why some phenomenon happens. The explanation is fallacious if the phenomenon does not actually happen or if there is no evidence that it does happen. ("The reason most bachelors are timid is that their mothers were domineering")
- **Untestability:** the explanation offers a theory that can't be tested or refuted ("Aircraft in the mid-Atlantic disappear because of the effect of the Bermuda Triangle, a force so subtle it cannot be measured on any instrument.")

23 Fallacies of Definition

- **Too Broad:** "An apple is something that is red and round."
- **Too Narrow:** "A book is pornographic if and only if it contains pictures of naked people." ("An apple is something that is red and round")
- **Circular Definition:** "An animal is human if and only if it has human parents"
- **Conflicting Conditions:** "A society is free if and only if liberty is maximized and people are required to take responsibility for their actions."