Essential Elements of Logical Argumentation (Part 1)

Academic authors often use logic to convince their readers of a certain point. Understanding the basics of logic will not only improve the reasoning of your papers, it will also help you analyze the arguments of others.

Academic authors typically explicitly state their premises and conclusion. Identify the premise or thesis statement in the introduction to understand the author's main argument and their reasons for that claim.

3 Basic Laws of Logic

Logic is built on three basic, related, intuitive laws.

1. **The Law of Identity** – *A* is *A*.

   Sometimes stated as "a thing is itself." The Law of Identity states that if *A* is true, then *A* is true, or conversely, if *A* is false, then *A* is false. Each thing has its own identity, and each thing has only one identity. If the statement "*Introduction to Logic* is a textbook" is true, then it is true, but if the statement is false, then it is false.

2. **The Law of Non-contradiction** – *A* cannot be non-*A* at the same time and in the same sense.

   For example, your textbook cannot be your textbook and not your textbook at the same time and in the same sense. At a different time, it may not be your textbook, perhaps if later you sell it. Similarly, it may not be your textbook in the sense that you did not write it, but it is your textbook in the sense that you possess it. Ultimately, the Law of Non-contradiction states that if something is true, the opposite cannot also be true; something cannot be both true and false at the same time and in the same sense.

3. **The Law of Excluded Middle** – Either *A* or non-*A*; either a proposition or its negation is true.

   While the Law of Non-contradiction states that *A* cannot be both true and false, the Law of Excluded Middle explains that *A* is either true or non-*A* is true with no middle alternative. For example, consider the proposition, "Your textbook was published in 2004." Either the proposition is true, or its negation ("Your textbook was not published in 2004") is true, but there is no middle option.

Structure of a Logical Argument

A logical argument consists of one or more ***premises*** that attempt to prove a single ***conclusion***. If the conclusion logically follows from the premises and the premises are true, the argument is ***sound***.

Inaccurate Premises – The first way to challenge the soundness of an argument is by examining the accuracy of the premises.

> Premise – All dogs bite their owners.
> Premise – Rover is a dog.
> Conclusion – Rover bites his owners.

Although the conclusion follows from the premises, the first premise is untrue. Therefore, the conclusion is unreliable.

Invalid Conclusion – The second way to challenge the soundness of an argument is by examining the ***validity*** of the conclusion to see if the conclusion logically follows from the premises.

> Premise – All dogs have tails.
> Premise – Sam has a tail.
> Conclusion – Sam is a dog.

Regardless of the truth of the premises, the conclusion is ***invalid*** because having a tail is not unique to dogs; other animals have tales. The conclusion does not logically follow from the premises.

Inductive Argument – An argument can either be ***inductive*** or ***deductive***. Inductive reasoning uses specific evidence to draw a broad conclusion. In an inductive argument, the conclusion is likely to be true if the premises are true.

> Premise – My new sweater is made out of wool.
> Premise – Most wool is scratchy.
> Conclusion – My new sweater will most likely be scratchy.

The best way to challenge an inductive argument is to consider if the premises use enough specific evidence to make the conclusion likely. The example above claims "most wool is scratchy." But how much is most? 51%? 98%? How does the arguer know most wool is scratchy? Is this enough general evidence on the scratchiness of wool to conclude a specific wool sweater will likely be scratchy?

An inductive argument that uses enough specific evidence to make its conclusion is ***cogent***, while an inductive argument that lacks enough evidence to make its conclusion is ***weak***.

Deductive Argument – Deductive reasoning uses broad evidence to draw specific conclusions. In a deductive argument, the conclusion is certainly true if the premises are true.

> Premise – Apple trees only have blossoms in the Spring.
> Premise – All the apple trees outside have blossoms.
> Conclusion – It must be Spring.

Broad, common-sense-based premises like "Apple trees only have blossoms in the spring" are usually difficult (though not always impossible) to challenge. Often the best way to challenge a deductive argument is to consider if the conclusion logically follows from the premises.

Enthymemes – Some arguments, called ***enthymemes***, have an obvious, unstated premise that is left for the audience to fill in.

> Premise – All the apple trees have blossoms.
> Conclusion – It must be spring.

The conclusion does not follow without the unstated premise: *apple trees only have blossoms in the spring*. Enthymemes are a legitimate form of argumentation, but sometimes they conceal a weak or faulty premise by leaving the premise unstated. Fill in any unstated premises to test their legitimacy.

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