Contents

1 What is critical thinking

Ability to think clearly and rationally about what to do or what to believe, being able to engage in reflective and independent thinking

- Understand the logical connections between ideas
- Identify, construct and evaluate arguments
- Detect inconsistencies and common mistakes in reasoning
- Solve problems systematically
- Identify the relevance and importance of ideas
- Reflect on the justification of one's own beliefs and values (Not being biased)

2 Process of critical thinking

Analyze

- Identify facts, assumptions, conflicts, flaws, relevance, omissions, consistency, preferences, beliefs, biases, inherited opinions, etc.
- Ask the right questions when analysing: reliable, proven, qualified, quantified, debatable, etc.
- *Scrutinize* the evidence, reasons, arguments, claims

Evaluate

- Tolerate and deal with ambiguity
- Stay open-minded to alternatives
- Exert intellectual effort, develop reasons based on evidence

Conclude

- Formulate arguments to support claims
- Make judgement or suspend it
- Change position/stance based on well-founded arguments
- Actively think (progress intellectually) and communicate effectively.

3 Logic and reasoning

Logic is concerned with the principles of correct reasoning:

- How do we make conclusions
- How do we justify decisions

3.1 Assertions and Arguments

Assertion is a statement, where *proposition* is informational content of any statement or assertion.

Argument offers a series of related statements to support an assertion to give others good reasons to believe that the assertion is true rather than false.

3.2 Which propositions makes sense to argue about

A strong proposition has five characteristics:

- It is NOT matters of verifiable fact or matters of taste
  - If it's a verifiable fact it should be checked rather than argued aboutc
- It makes and assertion or urges a course of action in a declarative sentence.
  - Should hotels allow dogs in the rooms? **Not strong**
  - Hotels should allow dogs in the rooms. **Strong**
- It should not include words that reflect a position on the proposition, i.e., introduce bias
  - Example: The inadequate care of parks in the city must be improved
  - It is necessary to verify that inadequate care exists in order to have a proper debate. If the care is inadequate then there is no debate.
- It is un-ambiguous, i.e., clear about the idea it states. It should not allow for multiple interpretations.
  - For example: High-school students are given scholarship to study data science. All students with B average would qualify. That is put forward for discussion.
  - The staff is asking what B average means. B average in all subjects or only relevant subjects?
  - For example, if a student may have A in French and C in mathematics. Would the student be eligible for a technical scholarship?
  - Could be restated: High-school students are given scholarship to study data science. All students with B average would qualify. That is put forward for discussion.
- It must be singular. One cannot reasonably argue two ideas at once.

4 Turning propositions into arguments

Once an arguable proposition is created, we need to identify the **minor propositions** to support the argument. A minor premise shows the sense of the major proposition a reason to support the major proposition. For example:

- Major: Capital punishment should be abolished.
- Minor: Capital punishment is not a deterrent to crime.
- Major: Use of Marijuana by adults in the UK should be legalized.
- Minor: Prohibited use of Marijuana is contributing to the illegal activities.

The minor premise itself may be debatable, in which case one has to argue it individually. When stating the minor premise, one has to **link it back** to the major premise. When defending the main proposition, one has to consider the points that the opposing side of the argument is putting forward and refute them

5 Deductive and Inductive Reasoning

Deduction and induction used to be differentiated in terms of argument flow, from general to specific and vice-versa. Deduction was seen as **flowing from a general towards specific statements**.

- All men are mortal. PREMISE
- Socrates is a man. PREMISE
- Therefore, Socrates is mortal. CONCLUSION

In a deductive argument, it is **impossible** for the premises to be **true** and the conclusion to be **false**.
Induction was seen as **flow from particular facts to general statements**.

- Socrates was Greek. PREMISE
- Most Greeks eat fish. PREMISE
- Socrates ate fish. CONCLUSION

In an inductive argument the premises are supposed to support the conclusion so that if the premises are true, it is improbable that the conclusion would be false. (Here it's **assumed** that Socrates is in group of greeks who eat fish)

6 Informal and formal logic

Informal logic is often used to mean critical thinking.
Formal logic involves systems that are constructed to carry out proofs, where the languages and rules of reasoning are precisely and carefully defined.

7 Valid and invalid argument

The argument is valid if the **premises entail their conclusion** (It is logically impossible for its premises to be true and the conclusion to be false.)

7.1 Fallacties

- Ambiguity: Interpret the meaning of some element of an argument differently.
- Circular Arguments: Premises disguise the conclusion. Premises presuppose the truth of the conclusion.
- Unwarranted Assumptions: Assuming that some whole, composed of a set of parts, automatically has a certain property shared by each part
- Missing Evidence: Weak generalizations from experience that is too small or is biased in some way
- Incorrect Causation: Mismatch cause-effect.
- Irrelevant Premises: One or more premises not directly relevant to the asserted conclusion
- Appeal to Emotion, Authority, Beliefs: Seeking justification
- Incorrect Deduction: Argument does not have the structure to be valid

Reference section

Scrutinize
: examine or inspect closely and thoroughly.