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Some more steps as critical thinkers (2nd day)

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At the end of these sessions you should be able to:

- Analyze a scientific paper using Paul & Elder guidelines;
- Design a scientific scenario using Paul & Elder adapted guidelines

Heuristics and cognitive biases

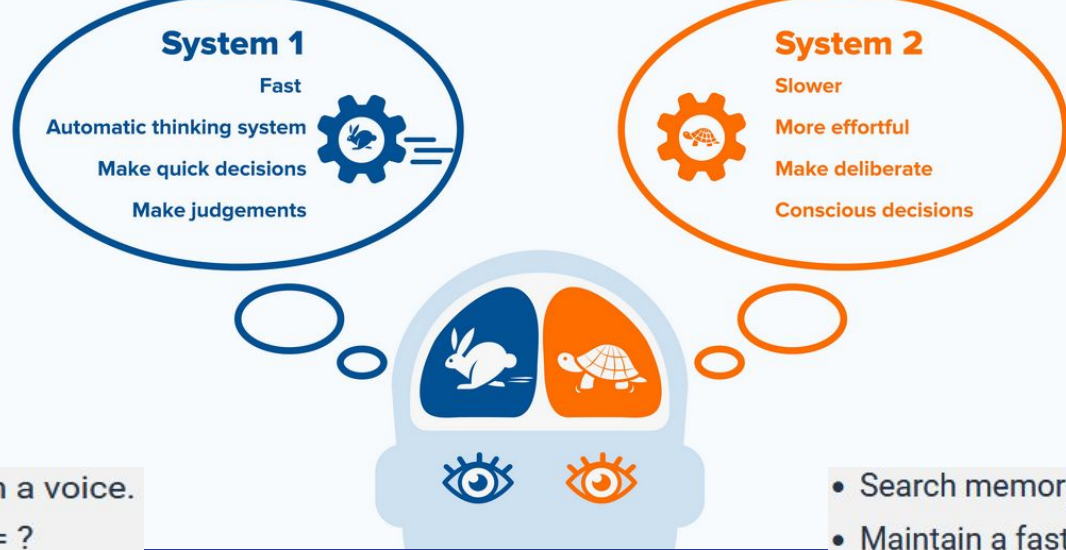
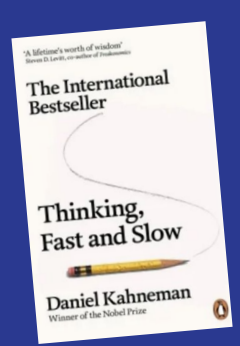
- **Heuristics** are mental shortcuts that can facilitate problem-solving and probability judgements.

<https://thedecisionlab.com/biases/heuristics>

- These strategies are generalizations, or rules-of-thumb, reduce cognitive load, and can be effective for making immediate judgements. However, they often result in irrational or inaccurate conclusions.

- A **cognitive bias** is a systematic error in thinking that occurs when people are processing and interpreting information in the world around them and affects the decisions and judgments that they make.

<https://www.verywellmind.com/what-is-a-cognitive-bias-2794963>



- Detect hostility in a voice.
- Answer to $2 + 2 = ?$

- Search memory to identify a surprising sound.
- Maintain a faster walking speed than is natural for you.

System 1

System 1 functions on mental shortcuts, heuristics. These are formulaic response patterns the brain has developed previously, and is responsible for immediate problem-solving, snap decisions, subconscious reactions, etc.

System 2

System 2 is a far slower process that engages conscious reflection and can evaluate System 1 conclusions for error. System 2 is used for more complicated and focused tasks.

Characteristics of critical thinking



System 1
Fast
Automatic thinking system
Make quick decisions
Make judgements

- Detect hostility in a voice.
- Answer to $2 + 2 = ?$

Fast	Slow
Effortless	Involves effort
Not conscious	Conscious
Automatic	Controlled
Associative	Based in rules
Contextualized	Decontextualized
Heuristic	Analytic
Intuitiv	Reflexive
Implicit	Explicit
Non verbal	Related with language
Regardless of intelligence	Intelligence-related
Working memory independent	Working memory related
Shared with other living beings	Exclusive to humans

System 2
Slower
More effortful
Make deliberate
Conscious decisions

- Search memory to identify a surprising sound.
- Maintain a faster walking speed than is natural for you

The contrast only indicates differences up to a certain level, rather than a clear and strict dichotomy.

DEFINITIONS

involve argumentation and criteria

«**Active, persistent, and careful** consideration of any belief or supposed form of knowledge in the light of the grounds that support it, and the further conclusions to which it tends.» John Dewey (1910) *How We Think*.

«**Rational, reflective thinking** focused on **deciding** what to do or what to believe.» Robert H. Ennis, 1996, *Critical Thinking*

«Critical thinking is that **way of thinking** ... in which the thinker improves the quality of his thinking by taking account of the **inherent structures of thought and imposing intellectual standards on it.**» Richard Paul, 2002, *Critical Thinking, tools for taking charge of your professional and personal life*.

Publication?



Edward is a new researcher. He has just finished his Ph.D.. He wants to work at the University. There is an open position in his area of expertise. To apply to this position, he should publish at least one paper in a high ranked journal. He prepared the manuscript and he submitted it at one of the best journals in the field.

David is the editor of this Journal. He sent the manuscript to 3 anonymous reviewers and he received the 3 reviews in time. The reviewers acknowledged the scientific potential of the manuscript but they found a lot of shortcomings:

- 2 of them suggested major revisions and resubmission, and
- the 3rd rejected the manuscript.
- David also carefully read the manuscript and he thinks that the overall quality of the manuscript is just below the quality level that he demands to allow the resubmission a manuscript.

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What David as the editor of the journal should do? Should he ask Eduard for resubmit the manuscript with major revisions?

① Start presenting to display the poll results on this slide.

Publication?



Questions for clarification

(Present your arguments and/or react by asking questions)

- What do you mean by _____?
- Could you put it in another way?
- Let me see if I understand you: you mean _____ or _____?
- Could you give me an example?
- Would this be an appropriate example?
- How does _____ relate to _____?
- What assumption is behind your argument?
- Is _____ an assumption?

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What David as the editor of the journal should do? Should Eduard for resubmission of the manuscript with major revisions?

① Start presenting to display the poll results on this slide.

01/12/2022 - CT Workshop:

2 practical tasks

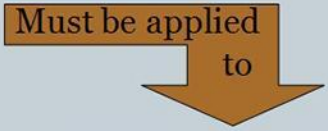
- 1) Recognize the **elements of thought** in a scientific article
- 2) Use the **critical thinking questioning rubric** to find a solution for a pollution problem you are aware of in a city

Paul & Elder guidelines (2001, 2006, 2015)*

Paul-Elder Critical Thinking Model

Intellectual Standards

- Accuracy
- Clarity
- Relevance
- Logical
- Sufficiency
- Precision
- Depth
- Significance
- Fairness
- Breadth

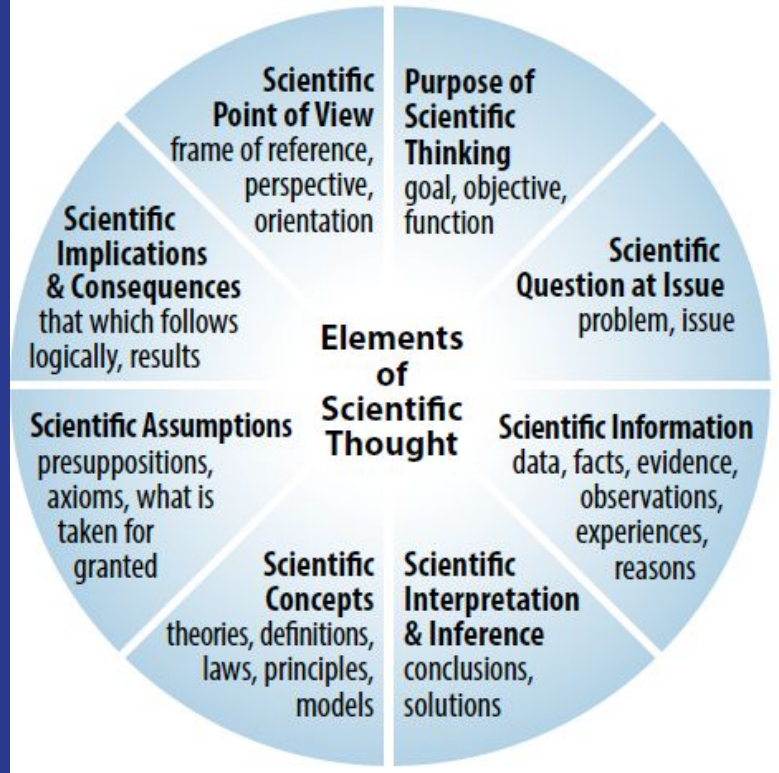


Elements of Reasoning

- Purposes
- Questions
- Points of view
- Information
- Inferences
- Concepts
- Implications
- Assumptions

Intellectual Traits

- Humility
- Autonomy
- Fair-mindedness
- Courage
- Perseverance
- Empathy
- Integrity
- Confidence in reasoning



*Adapted from *The Thinker's Guide to Scientific Thought*, p. 4, www.criticalthinking.org

Using Paul's wheel of analysis for a research scenario



The Critical Thinking Questioning Rubric*

Stages/dimensions	Guiding questions
1 – Problem definition	What exactly is the problem at hand? What are its dimensions, causes, consequences, etc.? This stage involves studying the context of the problem, how it arose, what consequences and dimensions it can assume and, basically, all aspects that will allow us to formulate and specify it.
2 – Beliefs and values	What beliefs and values do we have about this problem? It involves all the facts and information that we take for granted regarding the problem at hand.
3 – Questions	What questions and sub-questions emerge from the problem? It involves formulating questions to help us better understand the problem and study possible solutions. What? How? Where? When? Why? What if...?
4 – Information	What relevant information do we need to answer the questions and the problem? Are they credible and can we use them? It involves the search and analysis of information that will help us answer the questions and to build our sustained perspective on the problem.
5 - Solutions	What different solutions can be adopted to solve the problem and what are the main arguments that support them? It involves analyzing the different perspectives about the problem, assessing their assumptions, conclusions, and implications.
6 – Our solution	What is our solution and its implications? It involves the proposal of a perspective based on the whole analysis of the problem carried out in the previous steps, as well as the recognition of its implications.
7 – Objections to our solution	What are the weaknesses of our solution? It involves identifying possible objections to the solution presented, as well as weighing up their added value compared to such objections.

Topic: Air pollution in Portugal

Scenario: Ministers Council about air pollution



AMBIENTE
Portugal sem medidas de emergência quando qualidade do ar é má
Os centros de Lisboa, Porto e Braga são as zonas do país onde a poluição é maior. A qualidade do ar tem efeitos directos na saúde pública, aumentando o risco de problemas respiratórios, cardiovasculares e até neurológicos.
Ana Maia - 28 de Fevereiro de 2016, 6:10 242 visualizações

AMBIENTE
Poliuição do ar em Portugal estará a causar o dobro das mortes estimadas
Investigadores estimam que, em Portugal e durante 2015, a poluição do ar tenha causado 15 mil mortes, ou seja, 138 mortes por cada 100 mil habitantes. Problemas cardiovasculares provocam quase um terço dos óbitos, mas os cardiologistas alertam que as pessoas não estão conscientes do problema.
Rita Marques Costa - 19 de Março de 2016, 7:25 4870 visualizações

<https://dre.pt/home/-/dre/122059235/details/maximized>



1 – Problem: Air pollution in Portugal

Since the adaptation of Directive 2008/50/EC of the European Parliament and Council, of May 21st, on air quality and for a cleaner air in Europe, to the national legislation (in Portugal), through the Decree-Law no. 102/2010 of September the 23rd, Portugal seeks to establish measures to define and set objectives related to air quality to avoid, prevent or reduce its harmful effects on human health and the environment.

With this objective, more demanding procedures are being defined for the assessment of air quality, with a particular focus on control measures (and their quality assurance), on the traceability of all measurements, on the use of reference methods and approved equipment for measurements.

However, there are regular news messages (Público, 2018; Público, 2019) drawing the attention to the lack of emergency measures when the air quality is poor, and to the high number of diseases and deaths due to people's exposure to polluted air. Furthermore, doctors warn that people are not aware of the seriousness of the situation.

1 - Problem: Air pollution in Portugal

What exactly is the problem at hand? What are its dimensions, causes, consequences, etc.?

This stage involves studying the context of the problem, how it arose, what consequences and dimensions it can assume and all aspects that will allow us to formulate and specify it.

In face of this scenario, what can be done?

Imagine you are on a council of ministers or in the parliamentary assembly and you have to propose solutions...

2 – Beliefs and values

What beliefs and values do we have about this problem?

At this moment we have to question all the facts and information that we take for granted regarding the problem at hand.



3 – Questions

What questions and sub-questions emerge from the problem?

What? How? Where? When? Why? What if...?

This phase obliges to formulate questions to help us better understand the problem and study possible solutions.

- *What are the causes of the problem?*
- *How can I (as an individual) reduce air pollution effectively and sustainably?*
- *And as a society, what can we do to reduce air pollution effectively and sustainably?*
- *What are the current measures ?*
- *Do the current measures respond to the problem?*
- ...



5 – Solutions

What different solutions can be adopted to solve the problem and what are the main arguments that support them?

It involves analyzing different perspectives about the problem and assessing assumptions, conclusions, and implications.

We consider different options.



6 de maio às 09:31

É um banco com uma placa de musgo para a filtragem do ar, tem Wi-Fi e serve ainda como outdoor para anúncios de publicidade.

ENAR 2020

Publicações > Ar > ENAR 2020



Medidas associadas à ZER* da cidade de Lisboa

Medidas	Quantificação da redução de emissões:
Afetos à Atividade de Animação	✓
Medidas na cidade de Lisboa na oferta de frotas cativas e de gestão pública	✗
Medidas de promoção da mobilidade elétrica	✗
Minimização de emissões difusas de material particulado associadas ao sector metalúrgico na AML Sul	✓
Medidas de promoção da transferência modal para os Transportes Coletivos baseadas em preços de bens e serviços	✓

*ZER - Zona de Emissões Reduzidas

Governo intensifica aposta nas energias renováveis e lança leilões

28 Jan, 2019 - 12:11 · Susana Madureira Martins

O Plano Nacional de Energia e Clima 2030 foi apresentado esta segunda-feira pelo ministro do Ambiente. O objetivo é alcançar a neutralidade carbónica em Portugal. Educação ambiental em Portugal: 5 pontos essenciais



Catarina Mesquita 28-01-2018 Educação

É necessário fomentar a educação ambiental em Portugal e integrá-la na dimensão cívica e formativa da estrutura escolar portuguesa.



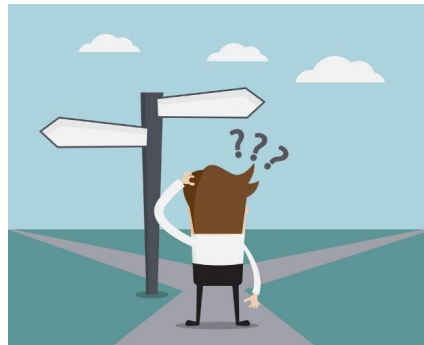
Conheça melhor o que se faz em Portugal, no âmbito desta área

6 – Our solution

What is our solution and its implications?

Now we can select that solution that results from the detailed and cautious analysis of a complex problem carried out in the previous steps. We recognize that this solution is a compromise and that it, most probably, has positive and negative impacts/implications.

- *Balance between the different perspectives (convergence);*
- *Individual and collective measures;*
- *Practical, social, economic implications, ...;*
- ...



7 – Objections to our solution

What are the weaknesses of our solution?

This phase challenges to identify possible objections to the solution presented, as well as consider alternatives.



Viabilidade

Mais poluição, custos e dependência. como a seca de 2017 é um alerta energético

Seca reduziu produção das barragens e aumentou poluição energética em 26%. Ambientalistas dizem que a energia solar não veio para ficar



pplware Apple Linux Android Windows Análises Smartp

pplware

Apple Linux Android Windows Análises Smartphones Humo

Será que os carros elétricos são assim amigos do ambiente?

03 NOV 2018 - MOTORES 136 COMENTÁRIOS

Estamos na era de mudar o paradigma no que toca aos combustíveis fósseis. Assim, facilmente ouvimos falar que os carros elétricos são sinónimo de "energia limpa", "respeito pelo meio ambiente", "emissões zero", além de outros títulos "verdes". Sem dúvida que em boa parte esta abordagem está correta, até porque, como sabemos, os veículos movidos por energia elétrica não emitem gases nocivos para a atmosfera, estes não queimam, no seu funcionamento, combustíveis fósseis.

Este novo mundo dos elétricos, contudo, consomem eletricidade e para gerar essa eletricidade, para carregar as suas baterias o que tem de ser "queimado", refinado, extraído, captado e reservado?

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**Use one word to express
what is critical thinking for
you, now.**

① Start presenting to display the poll results on this slide.

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Thank you very much!

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Extra activity

Please form the groups you made with Anne Laurence to formulate a research project. Now upgrade your first ideas, following the critical thinking questioning rubric