ALGORITHMS IN EDUCATION: UNDERLYING MINDSETS

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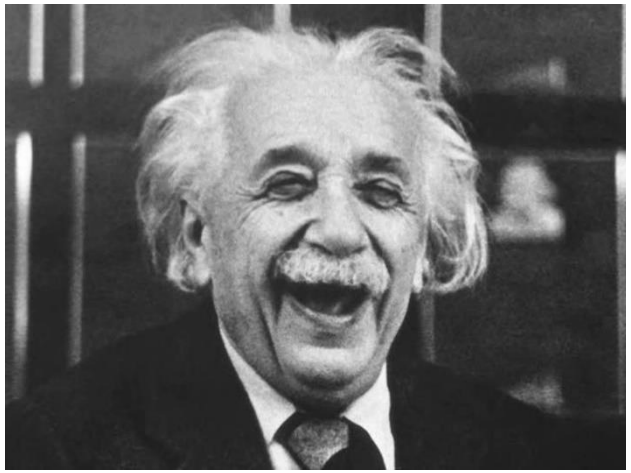
1. Science: truth and objective knowlege?



<u>What makes science distinct</u>

<u>from other human activities?</u>

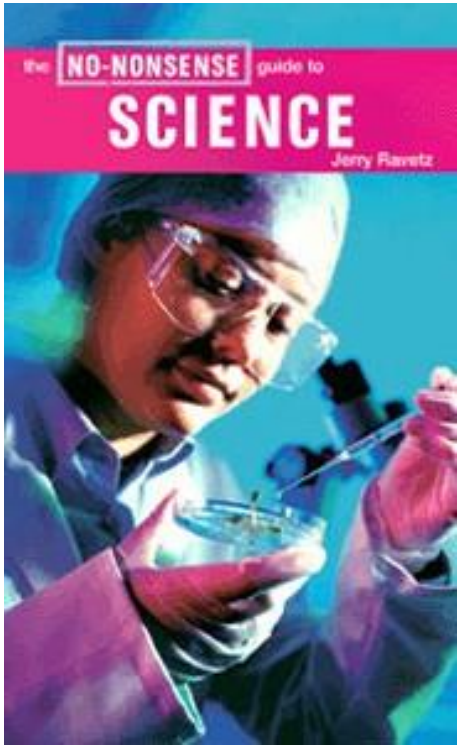
- Grounding knowledge in *empirical evidence*

Value-Free View of Science

'Science is about facts, not about values'

But…: science in transition → characteristics

- ‘Uncertainty’
- ‘Open about values’
- ‘Big interests’
- ‘Urgent choices’
- From ‘Mertonian norms’ to a ‘neo-liberal ethos’?



Mertonian norms …?

- ‘Communism’: de results of scientific research must be publicly accessible.

- ‘Universalism’: the evaluation of scientific research ought to be independent of the researcher’s gender, nationality, social position, religious identity, …

- ‘Disinterestedness’: personal views and convictions of the scientist are not allowed to influence the results of research.

Commodification…

- ‘Organized Scepticism’: systematic distrust regarding conclusions of scientific results is necessary.

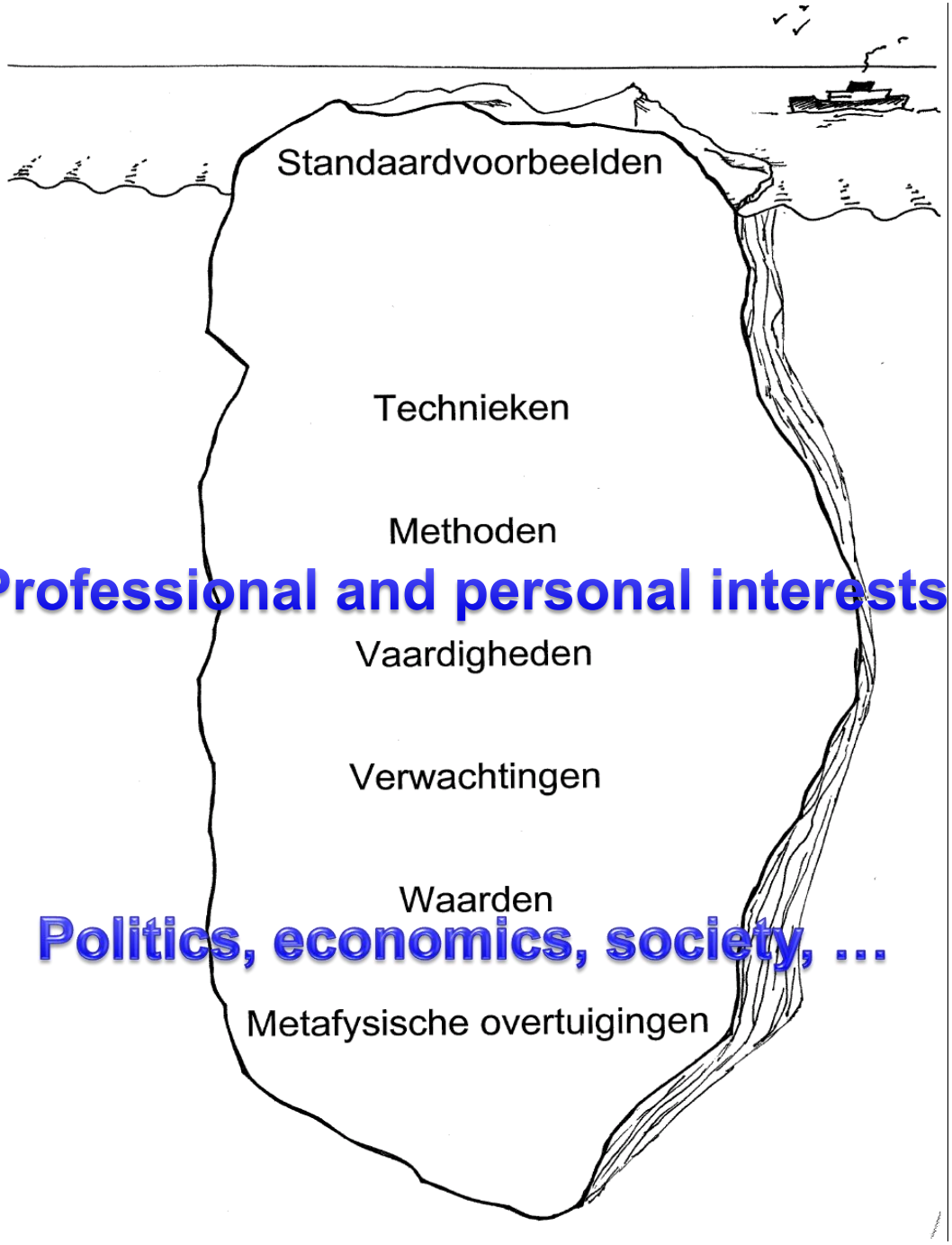
Example 1 Mertonian norms?

Studie	Resultaat	Gepubliceerd	Aantekening
1	Negatief	Neen	0 Publicaties
2	Positief	Ja	2 Publicaties
3	Negatief	Neen	0 Publicaties
4	Positief	Ja	3 Publicaties
5	Negatief	Neen	0 publicaties
6	Positief	Ja	2 Publicaties
7	Negatief	Neen	0 Publicaties
8	Negatief	Neen	0 Publicaties
9	Positief	Ja	1 Publicatie
10	Positief	Ja	1 Publicatie
			* 9 Pos. Pub. *

Example 2 ‘ON BEING A SCIENTIST’

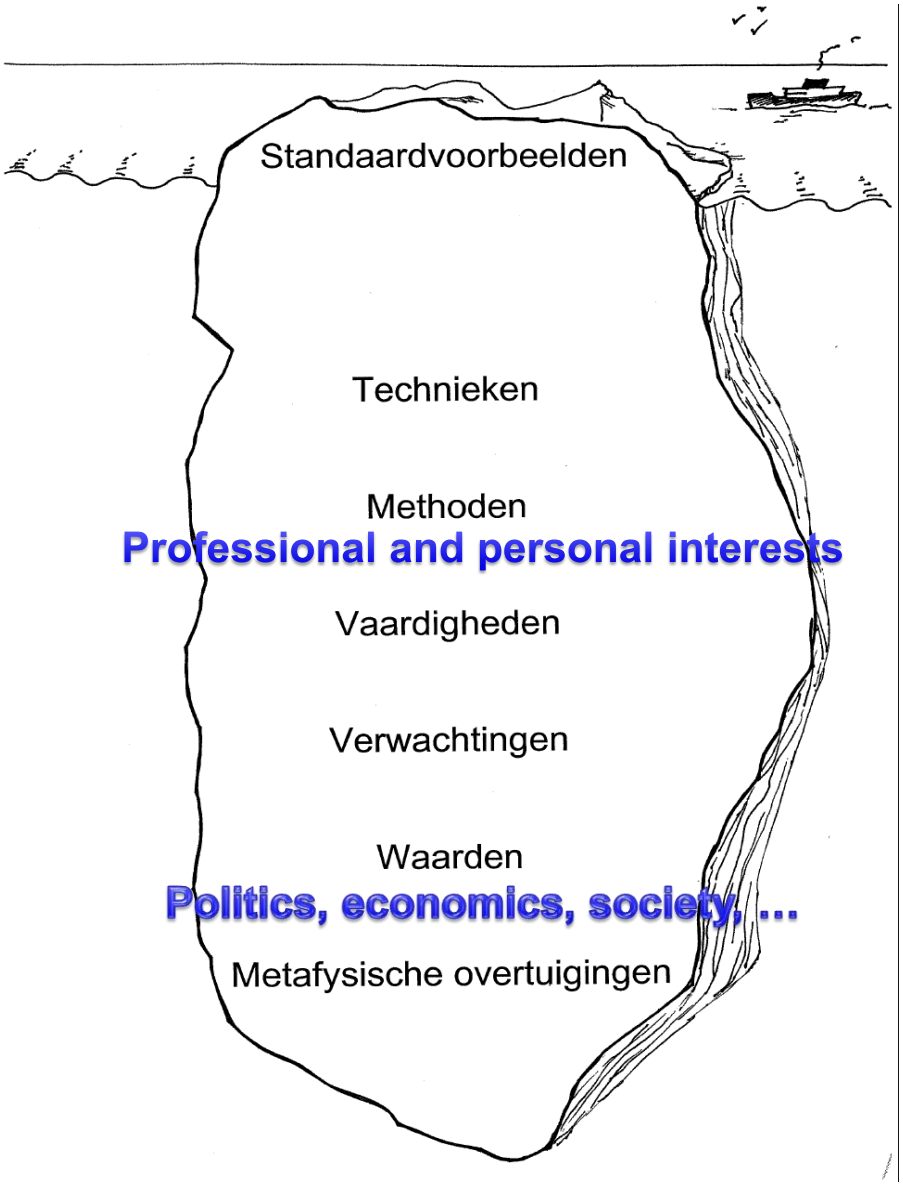
Sloppy science makes visible ‘the contextualization of science’:

a dynamic interaction between scientific disciplines, technology, economics, politics, society,…



2. Underlying Mindsets: science and algorithms

Underlying mindsets (theoretical perspectives, techniques, methods, skills, normative ideas about the structure of reality, values, interests, …) give direction to scientific results.



Algorithms: also dependent

on underlying mindsets!

Common sense:

- ❑ Algorithms: Big Data and “objective information”.
- ❑ E-court: “efficiency”, “impartiality”, “no subjective influences”.

- ➢ Is data “discovered”?
- ➢ Is data “manufactured” and dependent on assumptions?
- ➢ Are categories (used to order data) “biased”?

E-court

‘This example show that legal evidence, and law administration do not unambiguously emerge from the analysis of Big Data but are produced by and depend on invisible parameters such as indicators and criteria. These parameters result in certain categories that are themselves also created as the result of sets of underlying assumptions. It is therefore necessary to pay attention to the (often hidden) mindsets that, like invisible hands, guide the analysis of large collections of data.’

3. Education, mindsets and algoritms: DOLM

If (underlying) mindsets influence the construction of algorithms, it seems important to critically reflect upon their role in education.

- By way of the demonstration of examples.
- Example: E-court.

- By way of stimulating reflectivity: what is the relation between student's perspectives, mindsets and dealing with algorithms?
- DOLM: Dilemma Oriented Learning Model
- LBDM: Learning Results Based Development Model

The Dilemma Oriented Learning Model

DOLM

A. Reflection on intuitive ideas

B. Reflection on relevant scientific knowledge

C. Philosophical reflection

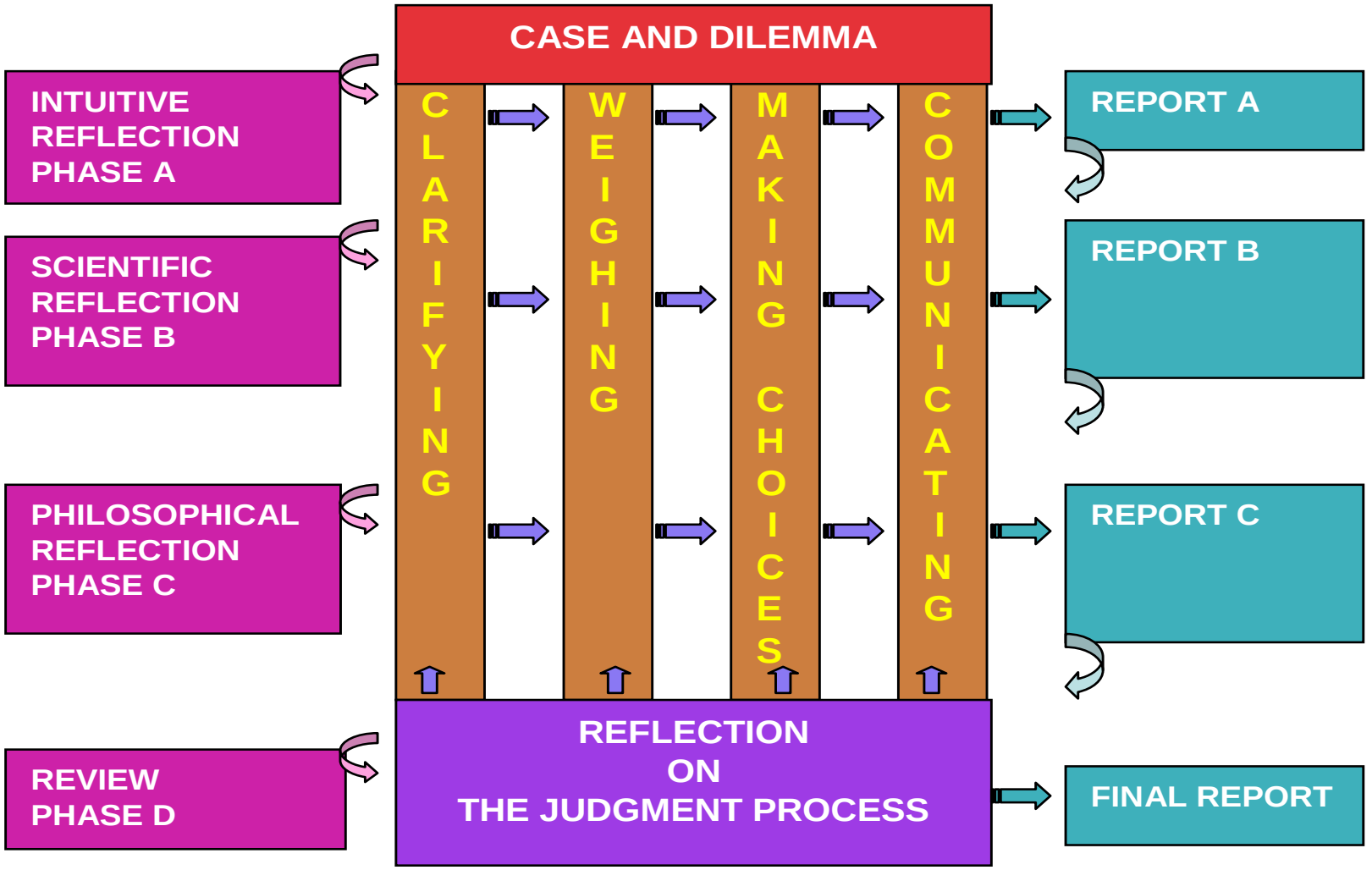
D. Retrospective phase

Main goal of DOLM

Students are able to deal with complex problems (in the context of interrelated scientific, societal, world view, philosophical and ethical aspects) in a critical, balanced and responsible way:

- *Critical*: taking into account their own perspectives as well as the underlying pre-scientific assumptions (‘mindsets’).
- *Balanced*: taking into account a critical and thorough assessment of arguments for and against. They demonstrate sympathy and respect for opposing arguments.
- *Responsible*: showing their willingness, ability and motivation to account for their choices and courses of action in their reports or communication.

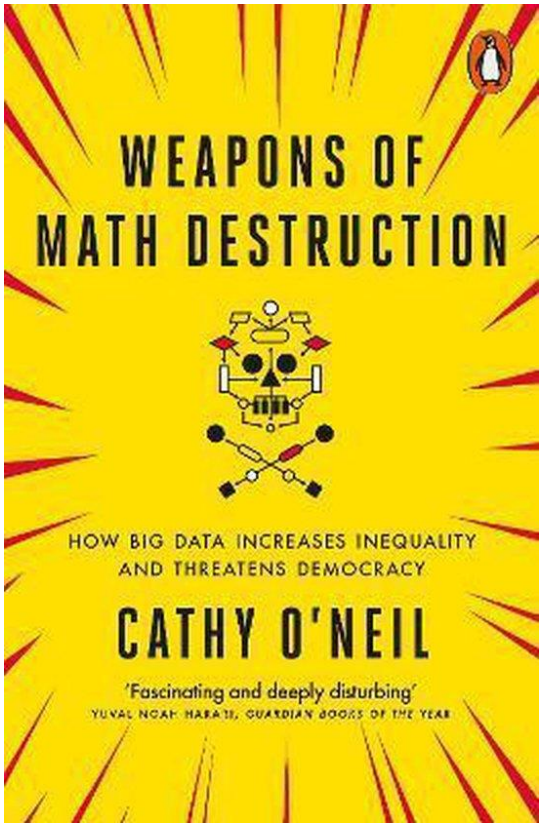
Diagram of the Dilemma Oriented Learning Model



Dilemma for students regarding algorithms

Source: Cathy O'Neil, *Weapons of Math Destruction*.

Story of poorly performing schools and the dismissal, in and around 2010, of Sarah and hundreds of other teachers.

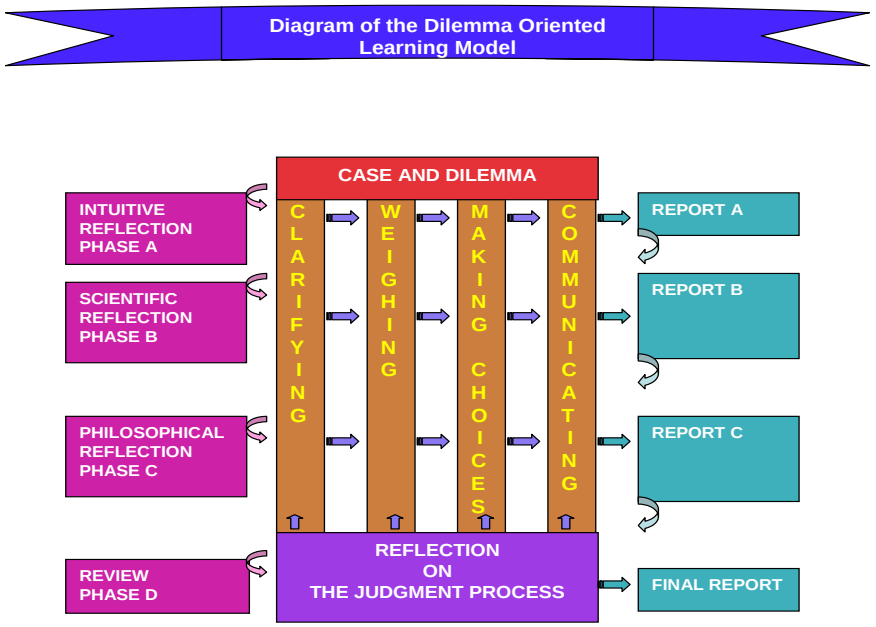


Dilemma: Is Sarah's dismissal

- ❑ … justified?
- ❑ … unjustified?

and why?

DOLM on Sarah's dismissal



A. Reflection on intuitive ideas

B. Reflection on relevant scientific knowledge

C. Philosophical reflection on (bedrock) assumptions

D. Retrospective phase

Phase A

In this phase, the main question is how students evaluate Sarah's dismissal by themselves without further information.

Possible views can be presented and discussed in the classroom:

- The decision is accepted because it was based on an algorithm; it is seen as "objective" and "reliable".
- The decision is not accepted because it is felt that the opinion of parents and school management is more important; the results obtained by the algorithm are questioned.

Phase B

In this phase, different experts are consulted.

This helps students understand, assess, and include different scientific theories in their arguments and choices.

- Defence of the IMPACT assessment tool over against “the subjective (positive) opinions” of school leaders and parents.
- Reliability problem: the outcome of IMPACT is based on the learning outcomes of only 25-30 students…
- Validity concerns: no accurate picture of the students’ learning performance at the start of Sarah’s teachings.

Phase C

In this phase critical reflection on the assumptions and presuppositions of these mindsets. Typical questions regarding the consistency, coherence, and plausibility of the assumptions and presuppositions under scrutiny.

- ❑ Problems of “objectivity”.
- ❑ Questions regarding the level of analysis.
- ❑ Ethical deliberations about the way the problem was solved.

Phase D

In this phase the student reflects on the developments, processes, and results of phases A-C.

What kind of information really helped to make choices and what kind of argument was crucial in the whole process?

- ❑ Reflection on the dilemma as a whole.
- ❑ Self-reflection.

(Education, mindsets and algoritms: LBDM)