



Habermas' rationality to analyze proofs in textbooks

1.

## INTRODUCTION TO HABERMAS' CONCEPT OF RATIONAL BEHAVIOUR

«Only she who is capable of saying «I» or «we», and of thematizing what she is or does, and attributing it to herself, is rational» (Habermas, 1998)

1.

## INTRODUCTION TO HABERMAS' CONCEPT OF RATIONAL BEHAVIOUR

The construct of rationality is distinguished into three inter-related aspects: epistemic, teleologic, and communicative. Here we will present each dimension in different versions: firstly as introduced in Habermas (1998), then as adapted to mathematical reasoning analysis in Boero and Morselli (2009), and finally as adapted to textbooks analysis in Pollani, Branchetti, & Morselli (2022).

They all contribute to understand the meaning of the dimensions, pointing especially out how matters the consciousness in the choice-making both in the proving process and in the proof product.

## 2.

# THE EPISTEMIC DIMENSION OF HABERMAS' RATIONALITY

- “We *know* facts [...] only when we simultaneously know why the corresponding judgments are true. [...] the rationality of a judgment does not imply its truth but merely its justified acceptability in a given context.” (Habermas, 1998)
- “[Epistemic rationality is] inherent in the conscious control of the validity of statements and inferences that link statements together within a shared system of knowledge, or theory.” (Boero & Morselli, 2009)
- “[Epistemic rationality refers to] explication of used hypotheses, laws and results.” (Pollani et al., 2022)

## 2.

# THE TELEOLOGICAL DIMENSION OF HABERMAS' RATIONALITY

- “The rationality of an action is proportionate [...] whether the actor has achieved this result on the basis of the deliberately selected and implemented means.” (Habermas, 1998)
- “[Teleological rationality is] inherent in the conscious choice and use of tools and strategies to achieve the goal of the activity.” (Boero & Morselli, 2009)
- “[Teleological rationality refers to] goals, strategies, and decisions.” (Pollani et al., 2022)

## 2.

# THE COMMUNICATIVE DIMENSION OF HABERMAS' RATIONALITY

- “This communicative rationality is expressed in the unifying force of speech oriented toward reaching understanding, which secures for the participating speakers an intersubjectively shared lifeworld, thereby securing at the same time the horizon within which everyone can refer to one and the same objective world.” (Habermas, 1998)
- “[Communicative rationality is] inherent in the conscious choice and use of communication means within a given community, in order to achieve the aim of communication.” (Boero & Morselli, 2009)
- “[Communicative rationality refers to] choices inherent to text presentation, for example use of bullet lists, highlighted or boxed words or sentences, repetition and use of terms.” (Pollani et al., 2022)

### 3.

## FROM THE PROCESS OF PROVING TO PROOFS IN TEXTBOOKS IN A BOUNDARY CASE: PROOF IN PHYSICS TEXTBOOKS

- 1- Read the textbook excerpts and identify key elements of the explanation proposed by the textbook concerning the fact that the motion of a projectile is parabolic.
- 2- Analyse the excerpts in terms of rational behavior, with particular attention to the epistemic dimension of explanation proposed by the textbooks. What choices, explicitly and implicitly, are made? Do they have any disciplinary (mathematics or physics) ground?
- 3- Answer the question: “Is the explanation proposed by the textbooks a proof? why or why not?”

## 4.

# GUIDING QUESTIONS TO ANALYZE PROOFS IN TEXTBOOKS

You can use the following questions to orient yourself in the analytic process:

- **epistemic**: what kinds of disciplinary forms of reasoning are used? are there conjectures or proofs? how are they validated? what is the role of examples? are there criteria that are not mathematically acceptable?
- **teleological**: what strategies are used? what goals are pursued, explicitly or implicitly?
- **communicative**: what are the main communicative choices made? what representations and kind of language is used? what is explicit and implicit in the reasoning? is the language used with a logical role?



## REFERENCES

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