IDENTITIES

Enlightening
Interdisciplinarity
in **STEM**
for Teaching

Text Analysis

O3 – Parabola and parabolic motion

Co-funded by the
Erasmus+ Programme
of the European Union

Grant Agreement n° 2019-1-IT02-KA203-063184

Habermas' construct of rationality to bring out mathematics and physics disciplinary identities

INTRODUCTION

Analysing instructional materials, like physics textbooks

- to foster deep critical reflections about disciplines and their intertwining
- as preliminary step to design teacher education activities

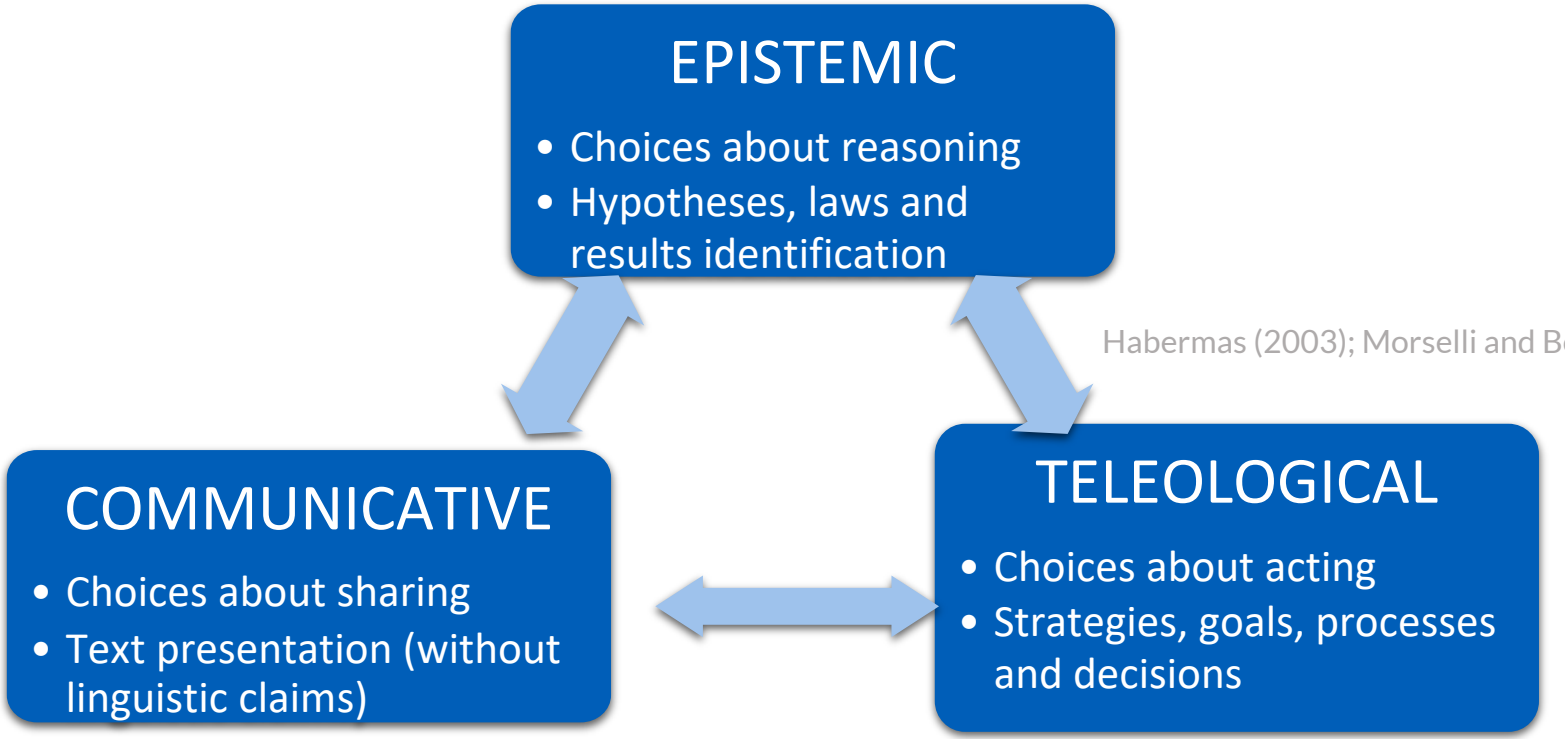
Non-definitory «identity of disciplines»

Epistemic core of a discipline

Figure 1. Family Resemblance Approach wheel (Erduran & Dagher 2014 p. 28).

«Disciplines ground their roots into the didactical necessity to re-organize knowledge in such a way that students, whilst building their knowledge, can also develop epistemic skills, like problem solving, modelling […]» (Branchetti et al., 2019)

The rational behavior roots



Habermas (2003); Morselli and Boero (2009)

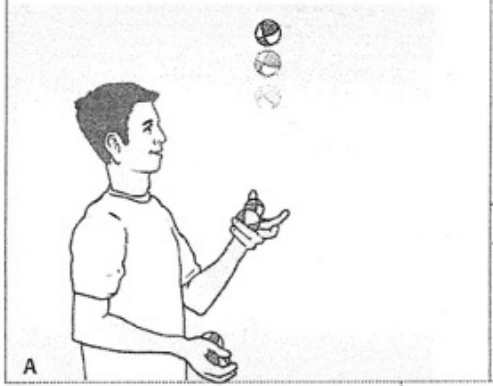
Data and research questions

The chapter of an italian high school physics textbook about motion of projectiles

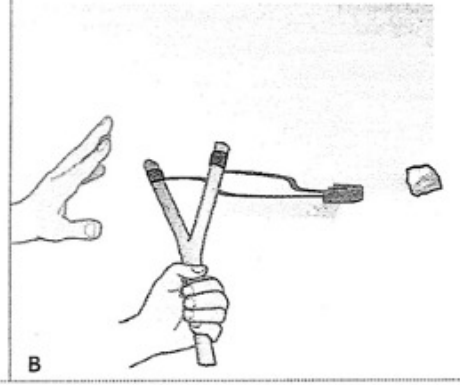
Which roots of rational behavior emerge in the chapter? What disciplinary key aspects of mathematics and physics reasoning, and what interdisciplinary issues emerge from the text?

4. Motion of projectiles

A ball is launched upward by a boy.



A stone is launched horizontally with a slingshot.



A cork is launched obliquely from a bottle.

LESSON
• Motion of projectiles

In all these launches, a force, acting for a short time, gives the projectile (the ball, the stone, or the cork) an initial speed. For example, the juggler exerts the force ONLY while the ball is in touch with his hand. Later, if we ignore air resistance, the only force acting on the projectile is gravity.

Amaldi (2007/2011, p. 298) Tr. en. auth.

The projectile: communicative root

4. Motion of projectiles

A ball is launched upward by a boy.

A stone is launched horizontally with a slingshot.

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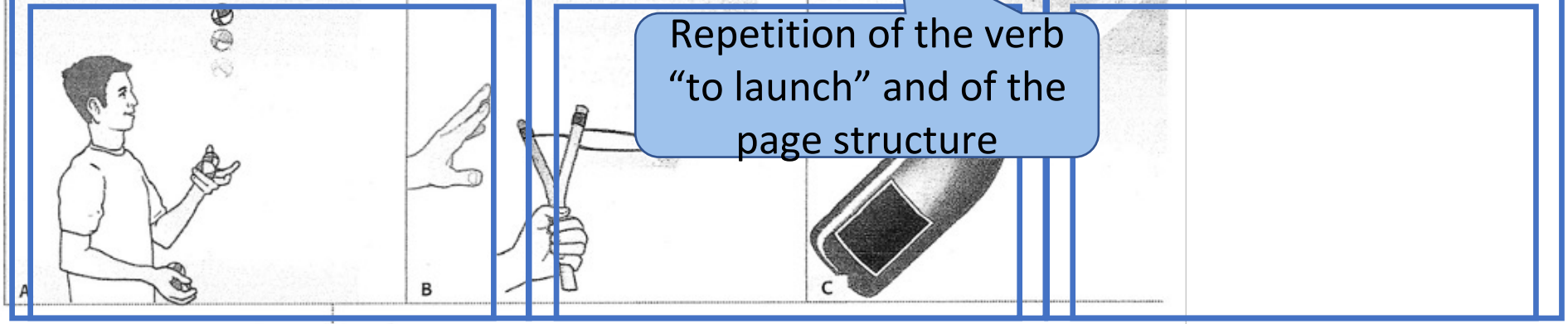

Repetition of the verb "to launch" and of the page structure

LESSON
• Motion of projectiles

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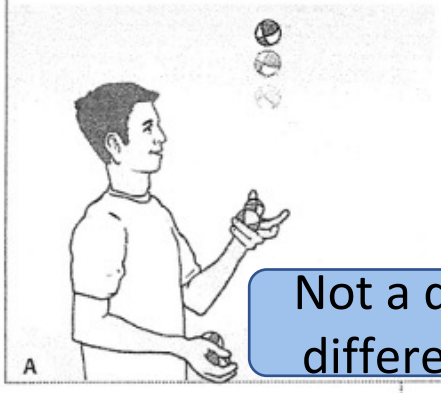
The projectile: epistemic root

4. Motion of projectiles

A ball is launched upward by a boy.



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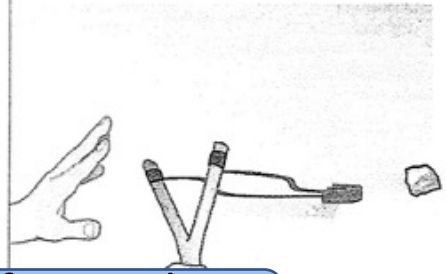

A cork is launched obliquely from a bottle.

Not a definition but different examples

LESSON
• Motion of projectiles

In all these launches, a force, acting for a short time, gives the projectile (the ball, the stone, or the cork) an initial speed. For example, the juggler exerts the force ONLY while the ball is in touch with his hand. Later, if we ignore air resistance, the only force acting on the projectile is gravity.

Amaldi (2007/2011, p. 298) Tr. en. auth.

The projectile: teleological root

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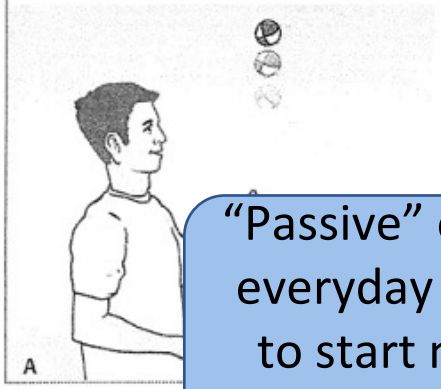

"Passive" observation of everyday life situations to start modeling the phenomenon

LESSON
• Motion of projectiles

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DISCUSSION

Which roots of rational behavior emerge in the chapter?

Communicative, Epistemic, Teleological

What disciplinary key aspects of mathematics and physics, and what interdisciplinary issues emerge from the text?

Physics: modelization, starting from real life

Mathematics: deductive reasoning

Interdisciplinarity: generalization strategies (use of different examples vs definition of a concept)

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